



**TRADABLE/
COMMERCIALY
POTENTIAL AQUATIC
BIORESOURCES
OF KERALA**



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TRADABLE/ COMMERCIALLY POTENTIAL AQUATIC BIORESOURCES OF KERALA- Vol 2

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Project

Database of Tradable / commercially potential bioresources and economic valuation in Kerala, Rebuild Kerala Initiative, Government of Kerala

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EXECUTIVE SUMMARY

The aquatic ecosystem includes marine, freshwater and estuarine habitats. India has rich water resources in the form of oceans, marshy wetlands, backwaters, rivers, lakes, ponds etc all of which harbor rich aquatic bio-resources. The total number of reported aquatic fauna of India consists of about 29,900 species excluding micro-organisms (Marine fauna 20,444 and freshwater 9456 species).

River systems, their floodplains and wetlands, are among the most biologically diverse and productive ecosystems on the planet. Wetlands are also one of the most degraded ecosystems and it is estimated that in the 20th century, around two-thirds of all the world's remaining wetlands were drained, dammed and dyked, and they are disappearing three times faster than rainforests. The global and regional natural wetland indices show a higher average loss of coastal/marine wetlands than inland wetlands (39% and 35% respectively) (Living Planet Index 2021). Almost one in three freshwater species are threatened with extinction, with all taxonomic groups showing a higher risk of extinction in the freshwater, compared to the terrestrial system. India has the representation of almost all types of wetlands as defined by the Ramsar convention. At present, 115 wetlands have been identified under the National Wetland Conservation Programme (NWCP), and 49 wetlands declared as Ramsar sites for wise use of wetlands under Ramsar Convention, of which 3 are located in Kerala. Among the maritime states in India, Kerala occupies an important position in fish production accounting for about 15 % of the total landings. The well-known Wadge Bank is situated within the exploitable limit of Kerala. The mud banks (*Chakara*) between Alappuzha and Kannur are associated with the seasonal capture of certain species of fish.

The UN FAO estimates that fish consumption (including freshwater) provides more than 3.3 billion people with at least 20% of their animal protein intake, and that the fisheries

and aquaculture sectors provide direct employment for 59.5 million people globally. Fishing for human consumption is considered to have the greatest impact on ocean biodiversity, causing one in three fish stocks assessed to be considered overfished and leading to the unintended bycatch of species such as sharks, seabirds and turtles. Overfishing, pollution and coastal development, among other pressures, have impacted the entire marine ecosystem.

Therefore adequate emphasis must be given to protect aquatic environment thereby protecting the bio-resources and industry at large.

Over 1800 species of fish, crustaceans, molluscs, echinoderms, coelenterates and aquatic plants are harvested by global capture fisheries of which 10 species/species groups account for 28% of production.

The report on Tradable Bioresources- Aquatic systems attempts at consolidation of data on current status of aquatic resources, present utilization of resources, state of depletion, revival necessities, conservation initiatives, alternate uses of resources, regeneration of resources, employment generation, developing eco-friendly technologies, climate change mitigation and policy formulation. One of the major objectives of RKI Project is to consolidate the tradable bio-resources of Aquatic Ecosystems and to work out how ABS could be applied to it.

A database of >3900 aquatic species has been generated and a consolidated checklist of 185 tradable bio-resources and products prepared are presented in the report. The report was prepared after extensive consultation with the fisherman community and covered 138 marine landing centers and 4000 fishermen. Inputs has also been obtained from Kerala Fisheries Department, Matsyafed, Marine Products Export Development Authority (MPEDA), ICAR-CMFRI, ICAR-CMLRE, ICAR- NBFGR, ICAR- CIFT etc.

Aquatic resources and Livelihood

India is one of the largest fish producing country in the world and accounts for 7.58 per cent of global production. Fish production in India reached 14.16 million metric tonnes

The high value species among the fish catches are few and prominent among them are seer fish, prawns, ribbon fish and mackerel. The total fish consumption in the State is approximately 9.12 lakh tonnes per annum and about 3 to 4 lakh tonnes is imported from other states or countries. Kerala with it wide network of backwaters, and fresh water has great potential for reducing this gap between demand and supply by promoting aquaculture.

in 2019-20. The total fish production in Kerala was 6.14 lakh tonnes in 2020-21, 3.9 lakh tonnes from marine fisheries and 2.24 lakh tonnes inland fisheries. A total of 15.02 crore seed production was achieved through department hatcheries in 2020-21.

Fisheries and Aquaculture contributes 8.71 per cent of the Gross State Value Added (GSVA) at constant prices 2020- 21 (Quick estimates) from the agriculture and allied sectors.



Aquatic and related resources of Kerala.

Kerala has a coastline of 590 km, approximately 10 per cent of India's total coastline, with a continental shelf area of about 41 km². The aquatic open water areas include 44 rivers, 9 lakes (**1620 ha**), 51 backwaters (**65,213 ha**), 35 reservoirs outside wild life sanctuaries and 12 within. The state has 222 marine fishing villages, 113 inland fishing villages, 204 fish landing centre, 15 fishing harbours and 39 modern hygienic fish markets.

The fisherfolk population in Kerala is estimated to be around 10.44 lakh including 2.4 lakh inland fish workers. The fisherwomen play an important role in the terms of their involvement in fish related activities such as fish vending, fish drying, prawn peeling, sorting, grading, packing and net making. About 46.35 per cent of women are involved in marine fishing activities and 49 per cent of them are involved in inland fishing. Fish vending is a traditional occupation that has been a means of livelihood for

thousands of fisherfolk , especially for women. It is estimated that there are 25395 fish vendors in Kerala as of 2018-19. As per recent estimates Kerala has 21,781 fishing crafts of which Total mechanized are 4,722, Motorized 11,175 and Non- motorized 5,884.

Fisher women market a total of 38 fish species commercially. Most popular fish species handled among all the occupational groups of fisher women were sardine, mackerel, prawn, anchovies, and tuna etc. Generally, fish retailers and fish vendors marketed low value fishes. Income generating activities of fisherwomen include marketing of fresh fish, dry fish, value added fish products like pickle, fish curry, and fish cutlet, fish powder, and fish roast, packed dry fish and prawn masala etc.

Bioresources of Aquatic system.

Marine life constitutes almost 80% of the world biota with thousands of bioactive compounds and secondary metabolites are derived from marine invertebrates such as tunicates, sponges, molluscs, bryozoans, sea slugs and many other marine organisms.

Marine bioactive compounds are produced by microbes, sponges, gorgonids, soft and hard corals, sea weeds and other marine organisms. These products are currently used in industry for synthesis of new drugs and chemicals. Novel secondary metabolites including terpenes, acetogenins, alkaloids and polyphenolics are produced by a wide variety of marine organisms with some of these compounds differing fundamentally from terrestrial secondary metabolites.

A database of >3900 aquatic species has been compiled as part of the project and a summary of the same is given in the table below.

Bio-resources	Aquatic flora	Mangrove Ecosystem	Marine Ecosystem	Inland Ecosystem Estuarine	Subterranean	Alien species
Sea weeds/ sea grass/ algae/ phytoplankton	46		92	161		4
Inland floral resource	16					

Riparian vegetation	372					
Typical mangrove plants		20				
Associated plants		37				
Protista		63		39		
Zooplankton		53				2 (ascidian)
Sponges			34	13		
Corals			74			
Cnidaria		6	29			1
Gastrotricha				23		
Bryozoa				45		2
Rotifera				56		
Nematoda		53				
Annelida		36	64	107		
Crustacea		48	377	88	3	1
Insecta		76		113		
Mollusca		22	169	27		2
Echinodermata		33	60			
Ichthyofauna		118	718	151	11	
Fresh water fish				121		28
Frogs & Toads		14		71		
Herpetofauna/ reptiles		47	10	11		
Avi fauna		161	31	103		
Mammals		23	26	3		
Total	434	810	1,684	1,132	14	40

Major marine resources comprise of : fishes, prawns, crabs, lobsters, mollusks, sea weeds etc. Sponges have medicinal potential and about 34 spp. are reported from Kerala. Seaweeds are considered as a good source of food fiber, protein and minerals for human consumption. From Kerala 218 species of crustaceans have been reported which includes prawns and shrimps (84 species), coastal crabs (marine and inland 182), anomuran crabs (73), lobsters (9). Prawns and shrimps are highly economically important group of crustaceans. Their export value is enormous. Hence it contributes a

major share in the economy of the State. The marine fish diversity of Kerala is reported to be around 1020 species of marine fin fishes. IUCN Red List Assessment of 975 species occurring in Kerala showed that 20 species are in the Critically Endangered, 53 in the Endangered, 47 in the Vulnerable, 37 in the Near Threatened, 59 Data Deficient, 198 Not Evaluated and 561 under Least Concerned categories.

Among the demersal finfishes, the dominant resource was threadfin breams with annual landings of 28,469 t which formed 36.3% of the total demersal landings of the state, which was followed by lizardfishes (17.5%), soles (9.6%), other perches (7.8%) and black pomfret (6.5%) during 2020. Crustacean resources contributed 9.2% of the total marine fish landings of Kerala with estimated landings of 33,116 t, which was 41.8% lower than the previous year's estimates. About 85.0% was contributed by penaeid shrimps, followed by crabs (9.4%). 50% of the penaeid shrimps constituted *Metapenaeus dobsoni*.

Crab landings decreased by 64% compared to 2019 with *Portunus sanguinolentus* dominated the landings (48.4%), followed by *P. pelagicus* (33.6%) and *Charybdis feriatus* (18%). A total of 18,347 t of molluscs are landed in Kerala which formed 5.1% of the total marine fish landings of the state. The cephalopod landings were 18,123 t, which was 51.2% lower than that of the previous year. About 85% of the landings were contributed by multiday trawlers. Squids (48.7%) dominated in the catch followed by cuttlefish (39.6%) and octopus (11.8 %).



Among Inland aquatic resources Crustacean resources form an important group of organisms providing food and nutrition. Copepods, Prawns, shrimps, crabs constitute the major groups and all of them are economically important. 33 species of inland prawns, 19 species of shrimps, 36 species of crabs are listed. Some species like *Scyllaserrata*, *Scylla tranquebarica*, *Scylla olivacea* are commercially important. Rotifers (*Brachionus* spp.) are extensively used as first feed in marine larviculture. They are quite small (50 μm –2 mm), slow swimming, and are relatively easy to culture. Hence they are economically important and 56 species are listed. Estuarine fishes include strictly estuarine, migratory ones from sea and freshwaters, highly tolerant to salinity. There is a great demand for this group of fishes and a checklist of 151 species are provided. Inland fishery resources include : fishes such as – *Etroplus suratensis*, Murrels (*Channa striatus*, *Channa diplogramae*, *Channa*), Mulletts (*Mugil cephalus*, *Liza parsia* etc.), Tilapia, *Labeo fimbriatus*, Barbs, *Catla catal*, *Labeo rohita*, *Cirrhinus mrigala*, Common carp, *Chanos chanos*, *Wallago attu*, *Anguilla bicolor*, prawns (*Macrobrchium rosenbergii*, *M. idella*, *Peneus indicus*, *Penaeus monodon*, *Penaeus vannamei*), crabs (*Scylla serrata*, *Scylla tranquebarica*, *Scylla olivacea*), *Paphia malabarica*, *Villorita cyprinoides*, *Crassostrea madrasensis*, *Saccostre acuculat*, *Pangasius pangasiu* sand other resources. Clams bio-resources of Kerala constitute black clam (*Villorita cyprinoides*), Yellow clam (*Paphia*

malabarica) and white clam. Black clam is an important bio-resource of Vembanad Lake. 39,243 t was landed during 2019-20. One of the major fishery resource of Ashtamudi backwater system is short neck clam or yellow clam. It is a reputed export item to countries like Japan, Vietnam, Thailand, Malaysia, Indonesia and so on. Large scale dredging for the white clam shells is practiced in Vaikom and Allappuzha. The subsoil deposit of white clams in the lake is estimated at about 4.5 million tons. The shells are taken by dredging at a rate of 41,000 to 69,000t/ yr from 3 m deep and is at present under control of government.

Export prospects of aquatic products

In 2019-20, India exported 12,89,651 MT of seafood worth Rs 46,662.85 crore (US\$ 6.68 billion). Frozen shrimp contributed 51.36 per cent in quantity and 74.31 per cent of the total dollar earnings. From Kerala more than 700 items are exported. Matsyafed produces a variety of value-added 'Ready-to-Fry' and 'Ready-to-Eat' seafood products of international quality. The Ready-to-Fry products include Fish Slices, PUD Prawns, Squid Rings, Cleaned Mussel Meat, Frozen Cutlets and the Ready-to-Eat products include Pickles and Curries. The delicacies like Ribbon Fish, Tuna, Spanish Mackerel, Crabs and Octopus are currently exported to countries like China, Korea, the Middle-East & Sri Lanka. Seabass, mud crab, freshwater prawn organic aquaculture products; prepared fish/shrimp products such as ready to cook fish curries/ prawn curries; and fish oils have potential high value export value. Marine products such as frozen fishes, frozen shrimps, and live fishes such as shrimps, prawns, cuttle fish, squid, crabs, lobsters, tuna, mackerel, pomfret etc. are important exports from Kerala, and account for a share of 12.68 percent in India's total exports of marine products during 2018-19. Top markets for exports of marine products from Kerala primarily include Asian markets such as Vietnam, Thailand, and China, as also markets such as Spain, the USA, and Italy, among others. There exist opportunities for enhancing exports to other markets such as Japan, South Korea, and Russia for exports of frozen fish, and to countries like France, the Netherlands, Malaysia,

Portugal for exports of cuttle fish and squid, as these are among the top importers of these products globally. Kerala has made vital contributions to export of marine products in the country.

Fish processing and products :

Shrimp products : stretched shrimp (Nobashi), Barbecue, Sushi (Cooked butterfly shrimp), skewed shrimp, shrimp head-on (centre peeled), shrimp head-on cooked (centre peeled), AFD shrimp, AFD Powder, Blanched / Cooked shrimp, Cooked shrimp, IQF Head on/ Headless shrimp, IQF peeled Tail-on cooked shrimp, Cooked salad shrimp, IQF Tray pack shrimp, shrimp curry, Breaded and battered shrimp, IQF Marinated shrimp, Fried shrimp.

Cephalopod products : Double skinned cuttlefish IQF Sashmi Grade, AQF cooked/ blanched squid cuttlefish fillets, Sashimi grade, cuttlefish strips blanched, squid strips blanched, cuttlefish pine cut/ diamond cut, stuffed squid IQF Tray pack,

In 2020-21, export of marine products from Kerala was 1, 44,700 tonnes valued at ₹5,039.89 crore. It accounts for 12.59 per cent in terms of quantity and 11.53 per cent in terms of value of the marine products export from India.

squid tube tray pack, squid ring blanched IQF, IQF tray pack squid, cuttlefish skewers, Vacuum packed squid & Cuttlefish products in trays, marinated squid, battered breaded cephalopod products, AFD cuttlefish / Squid, CIFTEQ® Osmo-dehydrated squid rings, CIFTEQ® Microwave vacuum dried squid flakes

Lobster products : Half cut cooked lobster, IQF/ Tray packed peeled lobster meat, Blanched/cooked lobster tail

Crab products : Frozen crab meat, Frozen pasteurised crab, Frozen stuffed crab, Frozen crab claws, Frozen mud crab, Frozen cut crab with claws, Frozen cut

swimming crab, Frozen cut crab, Frozen dressed crab, Frozen swimming cut crab without claw, IQF whole crab, Frozen pasteurised, crab meat, Frozen whole crab, Frozen crab meat with shell/crab chunks, Frozen soft shell crab, Frozen crab stick, stuffed crab (crab balls/ saicie), crab cakes, Breaded crab cakes, paddle crab in trays.

Products from clams/ mussels : Mussels/ clam meat pickles, raw clam meat, Fried bivalves.

Battered and breaded products : (Portioning/ forming, predesting, battering, breading, prefrying, freezing) – fish finger or fish portion, fish fillets, fish cutlets, fish balls, Fish steaks, minced based products, ready to serve fish products in retortable pouch, extruded products, intermediate moisture products (IMF), seaweed products/ seaweed incorporated products, fish caviar substitutes

Other fish products : fish pickled products, pickled products from others bio-resources, fish curry, fish soup powder, fish flakes and wafers, fish paste, fish noodles, tray pack fish, pre-cooked lions, Fried fish, CIFTEQ[®] Chitosan coated dried Bombay duck: Improved drying method for production of dried Bombay duck, CIFTEQ[®] Shellac coated dried Bombay duck: Improved drying method for production of dried Bombay duck, CIFTEQ[®] INSTAFISH - Instant Fish Gravy Mix, CIFTEQ[®] Restructured product from Bombay duck isolate: functional value-added fish products from Bombay duck fish mince, CIFTEQ[®] Fish Pasta from Bombay duck, CIFTEQ[®] Nile Tilapia Gravad : Value added fish with extended shelf life, CIFTEQ[®] dehydrated fish fingers

Fish drying : sun drying, electric drying, CIFTEQ[®] Drish[®] Dry fish products

Other fishery products : Seafood and vegetable mix, mixed seafood skewers, seafood mix in tray pack, surini analogue products, patties, nuggets, seafood sausage, frozen seafood curry and rice, frozen seafood curry with porotta, seafood in brine/ oil/ sauce, CIFTEQ[®] NUTRIBAR - Ready to eat convenient snack of good

nutritional and sensory characteristics due to their high protein, carbohydrate, lipids and mineral content, CIFTEQ[®] NUTRIMAYO - Mayonnaise, fortified with tuna protein hydrolysate, CIFTEQ[®] Fish oil microencapsulates fortified pasta, CIFTEQ[®] Fish oil fortified sausage: enriched with with n-3 PUFAs, CIFTEQ[®] MARINE COLLAGEN PEPTIDE BISCUITS – Collagen peptide supplementation increases the bone mineral density and supports healthy joints, CIFTEQ[®] Gel Chito Film - Gelatin-chitosan film for enhancing the shelf life of chilled stored fish, CIFTEQ[®] ChitoBianano Film – Chito oligosaccharide based gelatin chitosan bio-nano composite film, CIFTEQ[®] Ginger PLA film – Biodegradable active films from poly lactic acid (PLA) added with ginger essential oil for fish packaging application, CIFTEQ[®] Freeze dried broth cubes from rohu frame waste: effective utilization of fish fillet frame waste for developing nutritive rich dishes.

Products from microbes : Nitrifying bioreactor, Microbial consortium for waste management, Microbial consortium for industrial odor control, Microbial consortium for bioremediation, Probiotics, Lactobacillus probiotics, (for detergents) - Fungal enzymes, Microbial protease, Microbial enzymes, L-asparaginase as human medicine, Bacterial pectinase in food processing, Microbial Beta Glucosidase (BGC) as biofuel, Bacterial melanin for human cosmetics, Polycyclic tetramatemacrolactam PTM as human medicine, Terreusinone for anti-inflammatory and UV protectant, Microbial polymers (PHB)

Products from seaweeds : CIFTEQ[®] NUTRIDRINK – Seaweed based nutritional drink rich in micronutrients and fucoida, CIFTEQ[®] NUTRIDRINK – Seaweed incorporated cookies, CIFTEQ[®] SEAJERKY – Energy and protein rich food from seaweed, CIFTEQ[®] Seaweed dietary fibre: Nutritional supplements, CIFTEQ[®] SEANOODLES: Seaweed and fish enriched noodles, CIFTEQ[®] Edible seaweed-based sachet : Biodegradable sachet from seaweed, CIFTEQ[®] Seaweed dietary fibre fortified fish

sausage, CIFTEQ® SEAYOGURT - Seaweed based preparation, CIFTEQ® Seaweed biofilm – Seaweed based biodegradable film for fish packaging application,

Value added products :Functional sea foods (or nutraceuticals) enriched with natural ingredients have proved good for human health and hence there has been serious research in recent years on the subject. High value secondary bioactive metabolites from the marine organisms are attracting attention because of the growing demand for new compounds of 'marine natural' origin, having potential applications in pharmaceutical fields, and concerns about the toxic effects by synthetic drugs and their derivatives. Marine bio-resources proved to contain vast resource for new medicines to combat major diseases such as cancer, AIDS, malaria, and neuromuscular diseases. Newer natural compounds of marine origin have delivered promising bioactive compounds with previously undescribed structures/skeletons, and these could be used as promising nutraceuticals and therapeutic agents against various ailments.

ICAR -CMFRI has developed a number of nutraceuticals and includes:

1. Cadalmin™ Green Mussel extract (Cadalmin™GMe) to combat joint pain and **rheumatoid arthritis**
2. Cadalmin™ Green Algal extract (Cadalmin™GAe) to combat **rheumatic arthritic pains**
3. Cadalmin™Antidiabetic extract (Cadalmin™ADe) for use against Type II diabetes
4. Cadalmin™Antihypercholesterolemic extract (Cadalmin™ACe) for dyslipidemia
5. Cadalmin™Antihypothyroidism extract (Cadalmin™ATe) to combat hypothyroid disorders
6. Cadalmin™ Antihypertensive extract (Cadalmin™AHe) for use against hypertension

7. CadalminTMAntiosteoporotic extract (CadalminTMAOe) to treat osteoporosis
8. CadalminTMImmunoboost extract (CadalminTMIBe) to boost innate immunity

Wealth from waste

Largely, seafood processing operations generate both liquid and solid wastes; solid waste being the bulk ranging from 30% to 65% of the weight of the landed fish. Head, viscera, skin, fin, swim bladder, bone, frame meat, dark meat, scale, gills, shells (crustacean, mollusca), cephalopod pen, ink sac etc. are the major components of solid waste. A significant, proportion of world fisheries production is processed into fishmeal and fish oil thereby contributing indirectly to human consumption when they are used as feed in aquaculture and livestock raising. The USA, Japan, India, Canada, China, South Korea, Russia, Norway and Other Asian countries generally use the reject of crustacean fishing waste for production of Chitin and Chitosan. The main industrial source used for the extraction of the biopolymer is the waste of the fishing industry, mainly the shell of prawns, crabs and lobsters. As per FAO projection, by 2025, fish meal produced from fish waste will represent 38% of world fish meal production. A better fish-waste management is necessary to overcome environmental issues and for the sustainable use of valuable bioresources.

During 2006-07, an estimate of 3, 02,750 tonnes of waste was generated from fish processing (both processing and pre processing taken together) industries of India alone. The maximum waste was generated from processing of shrimps followed by fin fishes and cephalopods. On the context of environmental pollution, waste generation from fish processing is of great concern today. This waste can be used for the preparation of high value added products including proteinaceous foods. These are also a valuable source of raw materials that can be produced from discards. Additionally, inappropriate disposal is a major cause of environmental pollution. These wastes can originate from landing centre, markets, processing plants and discards. From prawns

60% and from fish 25-30% wastes are being generated. If these wastes are not utilized properly environmental contamination will result and may cause consequent health problems for humans and other biota. Therefore, programmes and planning to wealth generation from waste is unavoidable.

The products from fisheries waste include :

From prawns, squilla, crabs, lobsters : products - chitin and chitosan production, carotenoid pigments. The presence and recovery of pigments like astaxanthin and its esters, b-carotene, lutein, astacene, canthaxanthin and zeaxanthin from crustacean waste.

From fish - Animal feed supplement : Fish meal, Fish solubles, Fish silage and foliar spray, Fish manure/ guano/ compost. Fish meal is the most vital products obtained from fish waste, by-catch, and other abundant species. Fish meal is usually used as an ingredient in food for fish and crustaceans. Fish silage is from viscera of fish (stomachs, pyloric caeca, intestines, liver, pancreas, etc.) and other organs like spleen and gonads.

Products from meat of fish waste/ underutilized fish : Fish protein concentrate (FPC), Fish protein hydrolysate (FPH), pet food. FPH is a liquefied product but different from silage.

Fish oil products : Fish body oil (eicosapentaenoic acid EPA; docosahexaenoic acid DHA), Fish liver oil, squalene. Fish oils are often extracted from the entire fish, skin or liver (in the case of some species).

Products from fish skin and scales : Leather, collagen peptides, gelatine, fish glue, pearl essence, ornamental products, shagreen.

Products from fish fin: shark fin rays- New biologically active compounds have been isolated from fishery discards. One example is the discovery of the antifungal and antibacterial properties of the epidermis, epidermal mucus of different fish species, liver, intestine, stomach, and gills of some fish species and the blood and shell of some crustaceans. Fish mucous is known to have significant biological functions, acting as an

immunological barrier. A variety of biologically active compounds, proteinases, peptides, or polypeptides with high molecular weight are responsible for these functions.

Products from fish bone : Calcium phosphate, Hydroxyapatite (HAp), fish bone meal, shark cartilage & Chondroinsulphate, ornamental products and pigments. Fish calcium can be used for the pharmaceutical purpose.

Products from air bladder: Fish maws and Isinglass, gelatin.

Products from fish viscera : Insulin, surgical suture, enzymes (various). Proteases or the proteolytic enzymes that are found within the gut might be helpful in fish protein hydrolysate production. Proteolytic enzymes like alkaline, α -chymotrypsin, neutralise, papain, pepsin, trypsin, pancreatin, flavourzyme, bromelain, pronase E, protamex, orientase, thermolysin, validase, protease A amano, protease N amano and cryotin F that derived from plant, animal, and microbial sources are successfully tested for the assembly of antioxidative peptides from fish protein sources. Today, there's an increasing demand for fish proteolytic enzymes thanks to their wide selection of applications. Proteases play an important role in industries due to their multifarious applications in leather and detergent industry, food and pharmaceutical industries and also in bioremediation processes.

Antifreeze proteins from waste : Antifreeze proteins (AFPs), which are found in diverse species of marine fishes, are characterized by their ability to stop ice formation by cooling below the melting point.

From mollusca : products – calcium carbonate, cuttle bone, cephalopod ink

Aquaculture potential

In Kerala a large number of native species are being cultivated for food, namely, *Penaeus indicus*, *Penaeus monodon*, *Penaeus semisulcatus*, *Macrobrachium rosenbergii*, *Scylla serrata*, *Scylla tranquebarica*, *Etroplus suratensis*, *Mugil cephalus*, *Liza* spp., *Chanos chanos*, *Lates calcarifer*, *Lutjanus argentimaculatus*, *Rachycentron canadum*, *Trachinotus blochii*, *Heteropneustes fossilis*, *Anabas testudineus*, *Channa striata*, *Channa marulius*,

Channa spp., *Clarias dussumieri*, *Perna viridis*, *Perna indica*, *Crassostrea madrasensis*, *Saccostrea cucullata* and so on. Major cultivating species in the state are those transplanted species, such as, *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Clarias batrachus*, *Anabas cobojus*, *Pincta dafucata*, *Ompok pabda*. There are several species brought over to India and also Kerala for aquaculture purpose. These are *Penaeus vannamei*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idellus*, *Cyprinus carpio*, *Oreochromis mossambicus*, *Oreochromis niloticus*, *Pangasius hypophthalmus*, *Pangasius pangasius*, *Pangasius sutchi*, *Piaractus brachipomus*,



Policy makers should pay attention to : utilize the areas of waters resources which are unutilized at present for aquaculture for which sustainable incentives must be announced; purposeful elimination of unwanted exotic fishes (species like *Clarias gariepinus*) from aquaculture in the state; stressfully protect native species for aquaculture (like pearl spot, giant freshwater prawn, naaranchemmeen, kaarachemmeen, red snapper, mud crabs and so on); actions for bringing a number of hill stream fishes for domestication and bringing them under cultivation at least in hilly areas and cage culture in reservoirs; establishing proper storage facilities throughout the state; proper supply chain development for marketing and economic development.

Ornamental fisheries

Ornamental fisheries is a multi-billion industry spread across more than 125 countries. Major marine ornamental mollusk are *Babylonia spirata* and *Babylonia zeylanica*. These are dominant in the marine catches of Kollam District.

Live feed

Almost all aquatic organisms require minute particulate food during their early life cycle. Under controlled conditions (hatcheries, aquaria) smaller sized feeds are developed from the larval or adult stages of minute organisms like micro-organisms, phytoplankton (microalgae), zooplankton such as, rotifers, copepods, cladocerans, artemia, tubifex, chironomid larvae. They are generally termed as live feeds. Live feed organisms contain all the nutrients such as essential proteins, lipids, carbohydrates, vitamins, minerals, aminoacids, fatty acids, minerals etc. hence are commonly called as 'Living capsules of

Nutrition' Micro algae cultured as live feed are : *Chetoceros*, *Skeletonema*, *Scendesmus*, *Isochrysis*, *Monochrysis*, *Tetraselmis*, *Dunaliella*, *Nannochloris*, *Chlorella* and so on. Microalgae are ideally small to be fed to larval forms of many species of fishes and mollusks. Moina used to be the most common live feed organism for feeding young fish larvae. Artemia are yet another important live feed in almost all prawn hatcheries. Fish hatcheries also make use of this live feed for successful rearing of larvae. Copepods are cultured for feeding the larvae of hatcheries.



Potential market opportunities in the aquatic bio-resources sector

The opportunities for starting up of new enterprises in fisheries sector are immense and will create a large number of employment opportunities Entrepreneur Models in Fisheries and Aquaculture under the Pradhan Mantri Matsya Sampada Yojana (PMMSY) of Government of India will provide support in start-up endeavours. For effective functioning incubation

centres are to be established to provide hand holding such as training, converting entrepreneurial ideas into business models and doling out seed money to the new as well as existing business entrepreneurs keen to make big in the segment.

Existing storage and processing facilities (chilled storage, dry storage and other storage) of marine products stood at 76,874 MT in 2018-19, which is significantly low as the fish production in the state stood at 8.01 lakh tonnes in 2018-19, of which an estimated 1.87 lakh tonnes was intended for the exports market necessitating state-of-the-art cold storage facilities. Seafood processing units in the state have a capacity to process nearly 4,352 tonnes of seafood, which is also much lower and the average annual capacity utilization is around 25-30 percent. The state should leverage these processing units for realizing greater value from exports of marine products.

The areas proposed are listed below.

1. Fish storage facilities, marketing (internet booking and door to door delivery system)
2. Fish seed production units (hatcheries)
3. Facilities for advanced rearing of fish seed units
4. Integrated, composite, mono-species aquaculture programmes
5. Aquaculture and disease management analyzing systems
6. Live feed culture centres
7. Brood stock centres for candidate species for aquaculture
8. Ornamental fish seed production units
9. Aquarium trade and accessories

10. Consultancies for aquaculture and ornamental fish seed management
11. Net production units
12. Fish processing units
13. Processed fish food marketing units
14. Fish Pre-Processing line ▪ Retort Pouch Processing unit ▪ Fish Canning line ▪ Fish Sausage production line ▪ Fish extruded product line ▪ Fish Curing and Drying line ▪ Fish battering and breading line ▪ Fish product packing system line
15. Health food from bio-resources from sea and inland waters (non-contaminated)
16. Fish Feed mill/Feed plant
17. Fish Value Add Enterprise units
18. Manure plants
19. Chitin & Chitosan Production line
20. Fish oil production units
21. Fish meal production units
22. Wealth from waste units
23. Nutraceutical units
24. Bioactive compound production at industry level
25. Tourism related activities
26. Brood stock centres for cobia, pompano and seabass , grouper, Pearl spot, red snapper
27. Hatcheries for production of seed of cobia, pompano, grouper , Pearl spot and seabass
28. Nursery rearing centres for production of ready to stock fingerlings of cobia, pompano, Pearl spot and sea bass
29. Development of cage/pond farms for cobia, pompano, grouper, pearl spot and seabass

30. Production of grow out feeds for cobia, pompano, grouper, pearl spot and seabass
31. Fabrication of site specific and cost effective cages and mooring systems
32. Establishment of hatcheries for green mussel, edible oyster and pearl oyster
33. Farming systems for green mussel, edible oyster and pearl oyster
34. Hatcheries for marine ornamental species
35. Conditioning centres for green certified wild collected ornamental species trade
36. Production of seaweeds through farming
37. Commercial level production of designer pearls
38. Development of commercial level Integrated Multi-trophic Aquaculture (IMTA) systems
39. Grow out Production through Recirculation Aquaculture Systems
40. Freshwater pearl production units
41. Curio trade centres with seashells
42. Training centres for HR development

Recommendations

Inland Biodiversity

Stagnation in marine fish production and increasing demand for fish and fish products in national and international markets necessitated developing inland fish production. The inland water bodies of 117,122 ha and coastal wetlands of 40,876 ha (Wetland Atlas of Kerala, 2011) offer immense scope for production of fish and shellfish. The potential of inland water resources for fish production is yet to be utilized optimally in Kerala.

Major issues confronting the sector are the following:

1. Biodiversity of inland aquatic systems are poorly recorded and urgent measures are necessary to document the fauna.

2. Inland fish catch data is scanty, unsustainable and illegal fishing methods catching of brooder fishes and other organisms is a very serious problem and with the present regulations, it is difficult to control also.
3. Dwindling area of wetlands (including rice fields), both freshwater and brackish water is a major concern.
4. Less diversified culture practices:. Cage culture in reservoirs should be encouraged with native high range fishes and prawns with good growth traits. Introduction of fishes like tilapia in reservoirs for purpose of aquaculture need to be regulated.
5. Pollution of wetlands is steadily increasing. It is causing damage to biota, polluting the open water source, aquifers and ground water. Brackish water aquaculture mainly concentrating on shrimps, high stocking density, heavy feeding lead to increased ammonia in water, ultimately resulting in pollution and degradation of inland wetlands
6. Encouraging value added product development and marketing is needed. At present storage facilities for storing produce in the inland sectors is limited. Government owned storage facilities will help to control adulteration of fish and fishery products.

Marine fisheries sector

Capture fisheries face multiple pressures as a result of overfishing, habitat modification and pollution. Major issues in the marine sector include increased fishing pressure in the coastal areas- stocks decline, overcapitalization and unwarranted capacity overload – more vessels, more powered and over exploitation of resources in the inshore waters. Discards/indiscriminate exploitation of juveniles/sub adults mainly by trawlers, biodiversity decline due to habitat destruction and damage to the benthos and benthic ecosystem, often destroying the food web of commercial species – mainly by bottom trawling, ornamental fish trade are also some of the issues flagged. The sector is also

burdened by increasing fishing cost and diminishing returns and inefficient domestic marketing system. There is a need to fix floor price and development of storage facilities under government as the product is highly perishable, this will also address the issues of adulteration. Nutraceutical, probiotic, bioactive compound production at industrial levels are still in its infancy stage. The higher diversity of fish and shellfish resources available in Kerala coast offers better prospects for diversification, especially with regard to development of new products and value addition.

Adoption of code of conduct for Responsible Fisheries (CCRF) is necessary and this includes taking measures to control open access by strict enforcement of a system of licenses (authorization to fish) in traditional, motorized and mechanized sectors. Since the Coastal Regulation Zone (CRZ) notification of February 1991 and Coastal Management Zone (CMZ) notification of 2011 are in vogue, 200 meter width of coastal areas are to be statutorily earmarked as no development zones, except for utilizing it for fishery related activities of the coastal fisher folk. Ecosystem services of the critical coastal and marine habitats have to be analyzed specifically through integrated inclusive research so as to prepare Integrated Coastal Zone Management Plans and for identifying hotspots for conservation and sustainable management. Mudflats, coastal wetlands, reefs, mangroves, sand dunes and shoals should be categorized as ecologically sensitive areas and conserved.

Periodically revalidating maximum sustainable yield of resources in the existing fishing grounds and determine fishing units in each category for sustainable harvesting of resources is needed. Promotion of selective fishing gear and practices, which include (i) Optimum mesh size in trawl cod ends, (ii) Optimum hook size and shape for lines, (iii) Square mesh windows in trawls, (iv) By-catch reduction devices in trawls, (v) Turtle Excluder Devices in trawls, (vi) Juvenile Excluder Devices in trawls, (vii) Trawl designs with improved resource specificity, (viii) Optimum mesh size for gill nets, (ix) Optimum mesh

size for purse seines, and (x) Escape windows in fish and lobster traps will enable to conserve biodiversity to a large extent and promote its sustainable use.

A major portion of the coastal areas of Kerala are protected by construction of sea wall. Alternate bio-engineering technologies need to be explored. Restoration of beaches and protection of sea shore through natural shields such as mangroves and typical coastal vegetation have to be promoted with the participation of coastal communities. In addition to mangroves, cultivation of economically valuable plants such as various species of *Pandanus*, *Calophyllum inophyllum* and *Morinda citrifolia* (Indian mulberry/noni) can be promoted in the littoral zone of coastal areas of the State. Coastal tree shield with indigenous coastal vegetation of a minimum of 30 m width should be promoted in areas of human settlements, with the participation of local communities. Planting of vegetation and deriving benefits from these resources should also be promoted as an alternate employment opportunity to the local population. Since coastal zone has a dense population in the State and local communities are least adapted for facing the climate vagaries, there is an urgent need for strengthening coastal protection methods with the participation of local communities, especially by promoting coastal bio-shields wherever ecologically feasible.

Considering the unabated increase in the quantity of marine debris, especially plastics in the coastal waters along Kerala coast, urgent interventions are required to manage plastic wastes in oceans and strengthen monitoring plastic debris. 'Suchitva Sagaram' (clean ocean) project launched by the fisheries department of Kerala in Kollam to remove plastic waste from the ocean with the help of fishers (and use the plastics collected for the construction of roads) should be extended throughout Kerala. Local bodies should take urgent measures to control the solid waste generation and take eco-friendly measures for proper recycling or disposal of the wastes. Specific programmes should be launched for the effective awareness on marine debris issue in Kerala coast, monitoring and management with the involvement of local communities and citizen

scientists. Ocean acidification problems currently facing is very serious and adequate planning on a multi layer model has to be adopted. Number of houseboats in backwaters should be strictly limited, based on carrying capacity studies. Strict rules and regulations for waste management, especially in backwater tourism using house boats, shall be formulated and enforced.

One of the pre-requisites for conservation is a strong quantitative and qualitative data base on the living marine resources of Kerala coast in order to frame conservation and management plans. Data base on coastal and marine biodiversity should be prepared with the help of researchers and made available in the public domain. The maximum sustainable yield of the commercially exploited species should be determined in coastal and brackish water habitats and harvesting should be regulated accordingly. Sustainable harvesting of resources should be ensured by strictly adhering to the existing rules such as Kerala Marine Fishing Regulation Act (1985) and by assessing the maximum permissible limit of mechanised fishing vessels. Mandatory registration and licensing of all motorized and mechanized boats, review of licensing every year, cancellation of registration of vessels violating fishing regulations, and temporary moratorium for further sanction of mechanized vessels for inshore waters should also be considered to reduce fishing pressure. Minimum legal size should be imposed on all commercially exploited fishery items of Kerala coast. By-catch reduction devices should be made mandatory in trawl nets to reduce the loss of biodiversity, especially the destruction of Rare, Endangered and Threatened (RET) species. Stake nets are found to be highly destructive in the sustenance of brackish water fishery resources of the State and therefore, may be removed in a phased manner.

Implementation of an integrated national conservation strategy involving *in situ* and *ex situ* and *in vitro* and *in vivo* methods for all marine Rare, Endangered and Threatened (RET) species has also become imperative. The sea ranching programme needs to be strengthened in India in order to replenish stocks, especially that of overexploited and

threatened species. At present there is no concerted effort to make the coastal communities aware of the present ecological status of the ocean ecosystem and impacts due to the depletion of biodiversity. Fishery co-operatives, self-help groups in coastal areas, NGOs and religious institutions should be networked along with government systems for this purpose. Similarly, conservation efforts should be strengthened taking clues from the rich traditional knowledge of the local fishing communities. Such technological knowledge of the local fisher folk remains to be documented. Considering the skills of marine fishers in Kerala, their services may be fully utilized in coastal biodiversity monitoring, climate change adaptation and for disaster management programmes of the State. The traditional method of integrated farming system practiced in Kuttanad, with salt and flood tolerant rice varieties at below sea level would serve as a model to plan adaptation strategies elsewhere.

Knowledge base has to be strengthened for better understanding of the impact of climate change on fish stocks in our coastal waters with proper modelling studies as the first step towards planning and framing better management strategies. Adaptation measures for the communities' reliance on fisheries for food and income should also consider options such as education, entrepreneurial training, training in tourism and aquaculture to prevent potential deterioration of social conditions in fisher communities associated with climate change. Value-addition to products and improved market access through eco-certification and other mechanisms should support not only better utilization of resources, but also ensure its effective management and responsible handling of resources. The fish processing sector in Kerala is managed predominantly by the women workforce and the efficiency and productivity are likely to be improved by ensuring that the rights and responsibilities of women are recognised in their employment conditions and their sustainable income is ensured.

The Biological Diversity Act has provision to notify threatened species for regulation of trade under Section 38. A total of 30 species has been suggested for inclusion under Section 38 of Biological Diversity Act for Inland water bodies of Kerala which includes Reptiles – 5, Frogs- 8, Fishes 17, Odonates 2, Fresh water crabs- 4, Fresh water prawns- 7 species

This report is a comprehensive account on almost all aspects of aquatic resources, biodiversity, checklist, production details, utilization, conservation, problems and policy options. The report satisfies the objectives for which the project has been proposed and presents a preliminary assessment of current aquatic biodiversity-related economy and discusses the key data and gaps to be addressed in order to address the pressures on biodiversity and the actions needed. The report explores a range of interlinking questions, starting with a consideration of bioresources involved in trade, those with potential value, the numerous stakeholders included in the supply chain, the benefits it brings, the challenges it poses.

AQUATIC RESOURCES OF KERALA

INTRODUCTION

India has rich water resources in the form of marshy wetlands, ponds, channels, streams, rivulets, rivers, backwaters and coastal waters and harbor a diversity of bio-resources. The bio-resources are comprised of micro-organisms, flora and fauna. The total number of reported aquatic fauna of India consists of about 29,900 species excluding micro-organisms (Marine fauna 20,444 and freshwater 9456 species). From the reports of Zoological Survey of India the aquatic faunal composition is as follows

Table 1.1 : Marine and Fresh water fauna of India

Marine fauna		Freshwater	
Group	species	Group	species
Protozoans	2577	Protozoans	291
Foraminiferans	500	Porifera	31
Cnidaria	1331	Cnidaria	9
Ctenophora	12	Platyhelminthes	163
Platyhelminthes	832	Rotifera	419
Annelida	584	Gastrtrocja	24
Archiannelida	20	Nematoda	422
Crustacea	2856	Annelida	167
Mollusca	2388	Arthropoda	5923
Echinodermata	777	Crustacea	822
Cephalochordata	522	Mollusca	217
Urochordata	443	Fishes	1027
Fishes	2618	Amphibians	275
Reprtiles	32	Reptiles	46
Birds	33	Birds	243
Mammals	33	Mammals	6

(**Source** : Kailash Chandra, Raghunathan, C. , 2016. Tamal Mondal and Dash, S. Current Status of Marine Faunal Diversity in India, *Zool. Surv. India*: 1- 525 (Published by the Director); Kailash Chandra, Gopi, K.C., Rao, D.V., Valarmathi, K. and Alfred, J.R.B., 2017. Current Status of Freshwater Faunal Diversity in India, *Zool. Surv. India*: 1- 624 (Published by the Director))

The wetlands are the most productive natural ecosystems in the world. India has the representation of almost all types of wetlands as defined by the Ramsar convention.

The wetland ecosystems in India constitute the natural water bodies, such as rivers, lakes, coastal lagoons, mangroves, peat land, coral reefs and man-made wetlands such as ponds, farm ponds, irrigated fields, sacred groves, salt pans, reservoirs, gravel pits, sewage farms and canals. At present, 115 wetlands have been identified under the National Wetland Conservation Programme (NWCP), and about 26 wetlands declared as Ramsar sites of international importance under Ramsar Convention (Ramsar, 2017).

Fish and other aquatic resources are the cheapest source of protein food and hence of great trade value. This sector contributes significantly towards strengthening household food and nutritional security, generation of gainful employment and income. Fish production has also increased from 0.75 million metric tonnes in 1950 to 14.2 in 2019-20. This sector has been showing steady growth in the total Gross value added and accounts for about 7.28% share of Agricultural GDP. The marine fish landings from the coast of the mainland of India in 2020 was estimated as 2.73 million tonnes against 3.56 million tonnes in 2019, experiencing a decline by about 23.45%. In 2020, the southwest region comprising Kerala, Karnataka and Goa had the maximum landings of 7.93 lakh tonnes (29% of national total) recording 26.45% reduction compared to 2019 landings. A total of 815 species was recorded in the landings during 2020 by sampling from the 1269 landing centres distributed along the 6069 km long coastline of India.

The aquatic ecosystems of the world are degrading day by day. This will result in the decline in aquatic bio-resources and consequent breakdown of the industry. Therefore adequate emphasis must be given to protect aquatic environment thereby protecting the bio-resources and industry at large.

1.1 WATER RESOURCES OF KERALA

Kerala receives very good rainfall from southwest monsoons. Summer rains are meagre. Annual average rainfall during the period 1989-2018 is reported to be 2855.6 mm. During the south-west monsoon period June reported 32.6%, July 32.9%,

August 21.0%, September 13% (68.5% during south-west monsoon period). The variability of annual and south-west monsoon and annual rainfall is 14% and 19% respectively. During 2021 the state recorded the highest rainfall of 3,610.2 mm against usual 2,924.7 mm during the last 60 years. Because of this the water resources of Kerala is rich and the details are given below.

Kerala Coastline

Kerala has a coastline of 590 km, approximately 10 per cent of India's total coastline, with a continental shelf area of about 41 km².

Table 1.2 Kerala coastline

Continental Shelf Area in different Depth Zones	
Continental Shelf	41 sq. km
Depth Zones (in m)	Area
18m depth	5000
18-73	25000
73-182	Balance area
Types of coastlines	
Sandy beach (%)	80
Rocky Coast (%)	5
Muddy flats (%)	15
Marshy coast (%)	-
Total Length(km)	590

(Source: <http://iomenvis.nic.in>)

Brackish and fresh water resources of Kerala

Table 1.3a State level abstract of open water bodies

Water bodies	No.	Area (ha)
River	44	85000
Fresh water Lakes	9	1620
Backwaters	51	46,128.94

Reservoirs outside wildlife sanctuaries	35	17780
Reservoirs within wild life sanctuaries	12	17209.5

Table 1.3b: Water spared areas - Panchayath ponds, Holy ponds and streams, village ponds and irrigation tanks.

Districts	Panchayat Ponds		Holy ponds and streams		Village ponds and other water holds		Irrigation Tanks	
	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)
Thiruvananthapuram	1706	297.25	67	20.03			34	1.54
Kollam	589	62.93	188	24.96	16	35.55	17	150.26
Pathanamthitta	390	43.28	66	3.97			6	15.48
Alappuzha	340	322.56	303	44.24			3	16.18
Kottayam	226	19.05	207	25.53	7	0.40	75	19.07
Idukki	65	2.81	25	0.71			47	4.03
Ernakulam	719	233.17	201	26.94	54	245.94	72	13.98
Thrissur	959	240.68	305	111.77	3	40.48	228	507.72
Palakkad	629	176.84	334	145.59	6	35.25	60	759.18
Malappuram	545	38.14	275	15.43	7	2.04	45	6.10
Kozhikode	96	13.53	264	17.64	11	2.10	24	1.11
Wayanad	28	5.16	5	2.08	22	10.66	61	5.44
Kannur	292	19.86	312	35.77	9	97.13	35	90.01
Kasaragod	264	11.43	137	4.71	50	25.94	145	1244.28
Total	6848	1486.69	2689	479.37	185	495.49	852	2834.38
Source : Fisheries handbook 2020	Grand total							5295.93

Table 1.3c State level abstract of Ponds, tanks and other innovative practices

Sl. No	Activity	Potential		Aquaculture Under taken	
		No.	Area/ Volume	No.	Area/ Volume
1.	Natural Fresh water private ponds (area in ha)	5991	6168.02	41817	3805.27
2.	Natural fresh water public pond under the control of LSGI (area in ha)	9047	1970.21	7324	1292.41
3.	Other fresh water ponds under the control of temple/ other institutions (area in ha)	2757	332.42	886	91.28
4.	Fresh water paddy fields suitable for Aqua culture (area in ha)	1022	49718.03	221	13706.14
5.	Biofloc for Tialpia (Volume in m ³)	10692	218648.50	3169	71979.50
6.	Biofloc for Vannamei (Volume in m ³)	20018	1067120	4	20
7.	Aquaponics & RAS (Volume in m ³)	1773	74311	691	35708.10
8.	Padutha (Volume in m ³)	19918	1383745	5208	391359
9.	Fresh water cage (Volume in m ³)	1044	55490	469	26220
10	Brackish water cage (Volume in m ³)	6159	296920	1898	89123
11	Mussel (area in ha)	3000	72250	1332	33275
12	Oyster (area in ha)	8275	3516175	21	2520
13	Natural Brackish water ponds (not infested with dense mangroves and not suitable for aquaculture (area in ha)	3051	2543.19	1631	1365.38
14	Natural Brackish water ponds (not infested with dense mangroves and not suitable for aquaculture (area in ha)	891	977.34	0	0
15	Brackish water field suitable for one paddy one shrimp farming (area in ha)	906	5428.10	387	2346.40
16	Natural Brackish water ponds (infested with dense mangroves) (area in ha)	499	1292.24	43	76.44

Table 1.3 d : Freshwater lakes and spared area of Kerala in (ha)

Sl. No.	Name of Lake	District	Area (ha)
1	Vellayani Lake	Thiruvananthapuram	250
2	Sasthamkotta Lake	Kollam	440
3	Eravikulam Lake	Idukki	3
4	Devikulam Lake	Idukki	10
5	Elephant Pond	Idukki	6
6	Periyar Lake	Idukki	605
7	Mankodi Lake	Thrissur	205
8	Muriyad Lake	Thrissur	94
9	Pookode Lake	Wayanad	7
Total area (ha)			1620
Source: Fisheries handbook 2020			

Table 1.3 e : Brackishwater spread area of Kerala

Sl No.	Name of District	Total area(ha)	Area Developed (ha)	Area for future development (ha)	%f unused area
1	Kasargod	3,248	14	3,234	99.0
2	Kannur	5,944	737	5,207	91.4
3	Kozhikkode	4,162	41	4,121	97.7
4	Malappuram	1,796	1	1,795	99.9
5	Thrissur	4,272	1,012	3,260	76.3
6	Ernakulam	16,213	11,067	5,146	31.7
7	Kottayam	4,327	53	4,274	97.1
8	Alappuzha	15,223	1,380	13,843	66.8
9	Kollam	8,604	570	8,034	90.4
10	Thiruvananthapuram	1,424	nil	1,424	100
Total		65,213	14,875	50,338	77.2
www.https://www.fisheries.kerala.gov.in/node/443					

Table 1.3 f : Rivers of Kerala and their total length and drainage area

Sl. No.	Names of Rivers	Drainage area	Length (km)	Sl. No.	Names of Rivers	Drainage area	Length (km)
West Flowing Rivers							
1	Manjeswar	90	16	22	Tirur	117	48
2	Uppala	250	50	23	Bharathapuzha	6186	209
3	Shriya	587	67	24	Kecheri	401	51
4	Mogral	132	34	25	Puzhakkal	234	29
5	Chandragiri	1406	105	26	Karivannur	1054	48
6	Chittari	145	25	27	Chalakydy	1704	130
7	Nileswar	190	46	28	Periyar	5398	244
8	Kariyangode	561	64	29	Moovattupuzha	1554	121
9	Kawayi	143	31	30	Meenachil	1272	78
10	Peruvemba	300	51	31	Manimala	847	90
11	Ramapuram	52	19	32	Pamba	2235	176
12	Kuppam	539	82	33	Achankoil	1484	128
13	Valapattanam	546	110	34	Pallichal	220	42
14	Anjarakandy	412	48	35	Kallada	1699	121
15	Tellicherry	132	28	36	Ithikkara	642	56
16	Mahi	394	54	37	Ayirur	66	17
17	Kuttiyadi	583	74	38	Vamanapuram	687	88
18	Korapuzha	624	40	39	Mamam	144	27
19	Kallayi	96	22	40	Karamana	702	68
20	Chaliyar	2923	169	41	Neyyar	497	56
21	Kadalundi	1122	130		TOTAL		3092
East Flowing Rivers							
42	Kabani		63		Flows only a few kilometers through Kerala terrain		
43	Bhavani		39				
44	Pambar		26				
Source: Govt. of Kerala, 1974. Water resources of Kerala, 111 pp.							



Table 1.3 g : Reservoirs of Kerala

No.	Reservoir	District	WSA at FRL (ha)	Custodian
1.	Peppara	Thiruvananthapuram	582.00	KWA
2.	Aruvikkara	Thiruvananthapuram	258.00	KWA
3.	Maniyar	Pathanamthitta	110.00	Irrigation Dept.
4.	Pampa	Pathanamthitta	200.60	K.S.E.B, Forest Dept.
5.	Gavi	Pathanamthitta	25.00	K.S.E.B, Forest Dept.
6.	Kakki	Pathanamthitta	1751.00	K.S.E.B, Forest Dept.
7.	Ponmudi	Idukki	278.80	K.S.E.B
8.	Neriyamangalam	Idukki	413.00	K.S.E.B
9.	Idamalayar	Idukki	2830.00	K.S.E.B, Forest Dept.
10.	Sengulam	Idukki	29.14	K.S.E.B
11.	Kallarkutty	Idukki	58.00	K.S.E.B
12.	Mattupetty	Idukki	323.75	K.S.E.B
13.	Kundala	Idukki	64.75	K.S.E.B
14.	Munnar Head Dam	Idukki	250.00	K.S.E.B
15.	Anayirangal	Idukki	485.50	K.S.E.B
16.	Kallar Divison	Idukki	220	K.S.E.B
17.	Lower Periyar	Idukki	44.50	K.S.E.B, Forest Dept.
18.	Irattayar	Idukki	200.00	K.S.E.B
19.	Malankara	Idukki	120.00	Irrigation Dept.
20.	Peringalkuth	Thrissur	263.00	K.S.E.B, Forest Dept.
21.	Poomala	Thrissur	75.00	Irrigation Dept.
22.	Pathayakunnu	Thrissur	14.00	Irrigation Dept.
23.	Asurankund	Thrissur	12.00	Irrigation Dept.
24.	Mangalam	Palakkad	393.00	Irrigation Dept.
25.	Meenkara	Palakkad	259.00	Irrigation Dept.
26.	Chulliyar	Palakkad	159.00	Irrigation Dept.
27.	Pothundy	Palakkad	363.00	Irrigation Dept.
28.	Walayar	Palakkad	259.00	Irrigation Dept.
29.	Kanjirappuzha	Palakkad	512.00	Irrigation Dept.
30.	Malampuzha	Palakkad	2313.00	Irrigation Dept.
31.	Kakkayam	Kozhikode	279.00	K.S.E.B

32.	Peruvannamuzhy	Kozhikode	1050	Irrigation Dept.
33.	Banasura sagar	Wayanad	1277.00	K.S.E.B
34.	Karappuzha	Wayanad	1660.00	Irrigation Dept.
35.	Pahzassi	Kannur	648.00	Irrigation Dept.
Wild Life Sanctuary				
36.	Neyyar	Thiruvananthapuram	1500.00	Forest Dept.
37.	Kallada/Thenmala	Kollam	2590.00	Forest Dept.
38.	Mullaperiyar	Idukki	660.00	Forest Dept.
39.	Idukki	Idukki	5983.00	K.S.E.B, Forest Dept.
40.	Bhuthathankett	Ernakulam	608.00	Irrigation Dept., Forest
41.	Chimmini	Thrissur	850.00	Irrigation Dept.
42.	Vazhani	Thrissur	255.00	Irrigation Dept.
43.	Peechi	Thrissur	1263.00	Irrigation Dept.
44.	Sholayar (lower)	Thrissur	870.45	K.S.E.B, Forest Dept
45.	Thoonakadav	Palakkad	283.00	Forest Dept.
46.	Peruvarippallam	Palakkad	255.00	Forest Dept.
47.	Parambikulam	Palakkad	2092.00	Forest Dept.
	Total		33291.49	

Table 1.3h: District wise brackish water area (in ha) and length of coastal line of Kerala

Sl. No.	Name of District	Area (in ha.)	Coastal Length (in Km)
1	Thiruvananthapuram	1424	78
2	Kollam	8604	37
3	Alappuzha	15223	82
4	Kottayam	4327	0
5	Ernakulam	16213	46
6	Thrissur	4272	54
7	Malappuram	1796	70
8	Kozhikode	4162	71
9	Kannur	5944	82
10	Kasaragode	3248	70
Total area (ha) length (km)		65213	590
Source: Fisheries handbook 2020			

Table 1.3 i : District wise Backwaters and area (in ha) of Kerala

Sl.No	Name of	Name of Backwater	Area (ha)
1	Thiruvananthapuram	1 Poovar Kayal	30.93
		2 Poonthura Kayal	97.59
		3 Veli Kayal	22.48
		4 Kadinamkulam Kayal	346.88
		5 Anchuthengu Kayal	521.75
		6 Edava – Nadayara Kayal	157.65
		Subtotal (ha)	1177.28
2	Kollam	1 Paravoor Kayal	662.46
		2 Ashtamudi Kayal	6424.15
		3 Kayamkulam Kayal	140.58
		Subtotal (ha)	7227.19
3	Alappuzha	1 Kayamkulam Kayal	1511.75
		2 Poomeen Kayal	3.37
		3 Vadakkal Kayal	1.46
		4 Chethi Kayal	4.11
		5 Arthungal Kayal	5.96
		6 Pozhichal Kayal	20.41
		7 Vettakkalchal Kayal	27.1
		8 Vembanattu Kayal	10661.23
		Subtotal (ha)	12235.39
4	Kottayam	1 Vembanattu Kayal	2926.77
		Subtotal (ha)	2926.77
5	Ernakulam	1 Vembanattu Kayal	2257.89
		2 Kochi Kayal	7503.8
		Subtotal (ha)	9761.69
6	Thrissur	1 Azhikode Kayal	82.02
		2 Kodungalloor Kayal	613.81
		3 Chettuva Kayal	713.87
		Subtotal (ha)	1409.7
7	Malappuram	1 Puthupponnani	150.83
		2 Ponnani Kayal	757.19
		3 Poorappuzha	62.98
		4 Kadalundi Kayal	323.56
		Subtotal (ha)	1294.56

		1 Kadalundi Kayal	83.85
		2 Beypore Kayal	783.74
		3 Kallai Kayal	160.13
		4 Korappuzha	1038.08
8	Kozhikode	5 Payyoli Puzha	26.7
		6 Kottapuzha	584.12
		7 Newmahe Puzha	88.28
		Subtotal (ha)	2764.9
		1 Mahe	91.89
		2 Dharmadam Kayal	359.06
9	Kannur	3 Valapattanam	3077.64
		4 Palakkode	598.25
		5 Cheruvathur	30.58
		Subtotal (ha)	4157.42
		1 Cheruvathur	1123.12
		2 Nileswaram	824.69
		3 Chittari Kayal	89.33
		4 Bekal Kayal	43.37
		5 Kappil Pozhi	2.22
		6 Neembil Kayal	22.47
		7 Chandragiri	575.81
10	Kasaragod	8 Mogral Puthur	89.74
		9 Kumbala	221.54
		10 Suvarnagiri	6.22
		11 Manjeswaram	158.41
		12 Thalappady	17.12
		Subtotal (ha)	3174.04
		Total (ha)	46128.94

Source: Fisheries handbook 2020

1.2 FISHING VILLAGES

Fish and fisheries constitute a major industry in the state from time in memorial and are traded through selected areas – fishing villages. Details of fishing villages in the coastal and inland regions are given below (Tables 1.4 a, b).

Table 1.4 a: District wise marine fishing villages

Thiruvananthapuram (42 Nos)			
	<i>Name of Fishing village</i>	Revenue village	Name of panchayat
1	South Kollengode	Karode&Kulathoor	Karode&Kulathoor
2	Paruthiyoor	Kulathur	Kulathur
3	Poovar	Poovar	Poovar
4	Karumkulam	Karumkulam	Karumkulam
5	Kochuthura	Karumkulam	Karumkulam
6	Puthiyathura	Karumkulam	Karumkulam
7	Pallam	Karumkulam	Karumkulam
8	Pulluvla	Karumkulam	Karumkulam
9	Adimalathura	Kottukal	Kottukal
10	Chowara	Kottukal	Kottukal
11	Vizhinjam North	Vizhinjam	TVM Corporation
12	Vizhinjam South	Vizhinjam	TVM Corporation
13	Kovalam	Venganoor	TVM Corporation
14	Panathura	Thiruvallom	TVM Corporation
15	Poonthura	Muttathara	TVM Corporation
16	Beemapally	Muttathara	TVM Corporation
17	Cherithura	Muttathara	TVM Corporation
18	Valiathura	Muttathara	TVM Corporation
19	Kochuthope	Petta	TVM Corporation
20	Valiathope	Petta	TVM Corporation
21	Sanghumughom	Kadakampally	TVM Corporation
22	Kannanathura	Kadakampally	TVM Corporation
23	Vettukadu	Kadakampally	TVM Corporation
24	Kochuveli	Kadakampally	TVM Corporation
25	Pallithura	Attipra	TVM Corporation
26	Valiaveli	Petta	TVM Corporation
27	Vettuthura	Menamkulam	Kadinamkulam
28	Puthenthoppu	Menamkulam	Kadinamkulam
29	Vettiyathura	Kadinamkulam	Kadinamkulam
30	Mariyanadu	Kadinamkulam	Kadinamkulam
31	Puthukurichi	Meenamkulam	Kadinamkulam
32	Perumathura	Sarkara	Chirayinkeezhu
33	Thazhampally	Sarkara	Chirayinkeezhu
34	Poothura	Chirayinkeezhu, Anchut	Chirayinkeezhu,
35	Anjengo	Anchuthengu	Anchuthengu
36	Mampally	Anchuthengu	Anchuthengu
37	Kaikkara	Anchuthengu	Anchuthengu

38	Arivalam	Anchuthengu	Anchuthengu
39	Vettoor	Vettoor	Vettoor
40	Chilakkur	Vettoor	Varkala(M)
41	Odayam	Edava	Edava
42	Edava	Edava	Edava
Kollam (27 Nos)			
	<i>Name of Fishing village</i>	Revenue village	Name of panchayat
43	Paravoor South	Kottapuram	Paravoor
44	Paravoor North	Paravoor	Paravoor
45	Mayyanad	Mayyanad	Mayyanad
46	Eravipuram North	Eravipuram	Kollam Corporation
47	Eravipuram south	Mundakkal	Kollam Corporation
48	Pallithottam	Kollam West	Kollam Corporation
49	Port Kollam	Kollam West	Kollam Corporation
50	Moodakkara	Kollam West	Kollam Corporation
51	Vady	Kollam West	Kollam Corporation
52	Thankasserry	Kollam West	Kollam Corporation
53	Kannimel	Sakthikulangara	Kollam Corporation
54	Sakthikulangara	Sakthikulangara	Kollam Corporation
55	Neendakara	Neendakara	Neendakara
56	Puthunthura	Neendakara	Neendakara
57	Karithura	Chavara	Chavara
58	Kovilthottam	Chavara	Chavara
59	Ponmana	Ponmana	Ponmana
60	Pandarathuruthu	Alappad	Alappad
61	Vellanathuruthu	Alappad	Alappad
62	Cheriyazheekal	Alappad	Alappad
63	Alappad	Alappad	Alappad
64	Kuzhithura	Alappad	Alappad
65	Parayakadavu	Alappad	Alappad
66	Shrayikkadu	Alappad	Alappad
67	Azheekkal	Alappad	Alappad
68	Maruthoorkulangara	Karunagapally	Karunagapally
69	Kulashekharapuram	Kulashekharapuram	Kulashekharapuram
Alappuzha (30 Nos)			
	<i>Name of Fishing village</i>	Revenue village	Name of panchayat
70	Valiazheekkal	Arattupuzha	Arattupuzha
71	Tharayilkadavu	Arattupuzha	Arattupuzha
72	Kallikadu	Arattupuzha	Arattupuzha
73	Arattupuzha	Arattupuzha	Arattupuzha

74	Pathiyankara	Thrikunnapuzha	Thrikunnapuzha
75	Thrikunnapuzha	Thrikunnapuzha	Thrikunnapuzha
76	Pallana	Thrikunnapuzha	Thrikunnapuzha
77	Thottapally	Purakkadu	Purakkadu
78	Punthala	Purakkad	Purakkad
79	Purakkad	Purakkad	Purakkad
80	Ambalapuzha	Ambalapuzha	Ambalapuzha
81	Neerkunnam	Ambalapuzha(N)	Ambalapuzha
82	Punnapra (South)	Punnapra	Punnapra (South)
83	Punnapra (North)	Punnapra (North)	Punnapra (North)
84	Vadakkal (South)	Alappuzha(W)	Alappuzha
85	Vadakkal(North)	Alappuzha(W)	Alappuzha
	Name of Fishing village	Revenue village	Name of panchayat
86	Kanjiramchira	Alappuzha(W)	Alappuzha
87	Thumboli (South)	Alappuzha	Alappuzha
88	Thumboli (North)	Alappuzha	Aryad
89	Chettikkad	Ambalapuzha	Mararikulam South
90	Kattoor	Ambalapuzha	Mararikulam South
91	Pollathai	Kalavoor	Mararikulam South
92	Chethy	Mararikulam North	Mararikulam north
93	Chennaveli	Mararikulam North	Mararikulam north,
94	Arthunkal	Cherthala South	Cherthala South
95	Thaikkal	Cherthala South	Cherthala South
96	Ottamassery	Kadekkarapally	Pattanakadu
97	Azheekkal	Pattanakadu	Pattanakadu
98	Pallithodu(South)	Pattanakadu	Thuravoor
99	Pallithodu(North)	Thuravoor	Thuravoor
Ernakulam (21 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
100	Chellanam	Chellanam	Chellanam
101	Maruvakkad	Chellanam	Chellanam
102	Kandakkadavu	Chellanam	Chellanam
103	Kannamali	Kumbalangi	Chellanam
104	Cheriyakadavu	Kumbalangi	Chellanam
105	Manassery	Rameswaram	Cochin Corporation
106	Azheekkal	Puthuvype	Elamkunnapuzha
107	Ochanthuruth	Puthuvype	Elamkunnapuzha
108	Malippuram	Elamkunnapuzha	Elamkunnapuzha
109	Elamkunnapuzha	Elamkunnapuzha	Elamkunnapuzha
110	Njarakkal	Njarakkal	Njarakkal

111	Nayarambalam	Nayarambalam	Nayarambalam
112	Edavanakkadu	Edavanakkadu	Edavanakkadu
113	Pazhangad	Edavanakkadu	Edavanakkadu
114	Ayyampilli	Kuzhupilli	Kuzhupilli
115	Kuzhupilli	Kuzhupilli	Kuzhupilli
116	Pallippuram	Pallippuram	Pallippuram
117	Cherai	Pallippuram	Pallippuram
118	Munambam	Pallippuram	Pallippuram
119	Saudi	Rameswaram	Cochin
120	Fishing Harbour Cochin*	Fortcochi	Cochin
Thrissur (18 Nos)			
	<i>Name of Fishing village</i>	Revenue village	Name of panchayat
121	Azheekode	Azheekode	Eriyad
122	Eriyad	Eriyad	Eriyad
123	Edavilangu	Edavilangu	Edavilangu
124	Vemballoor	P Vemballoor	SN Puram
125	Kulimuttam	Mathilakam	Mathilakam
126	Perinjanam	Perinjanam	Perinjanam
127	Kaipamangalam	Kaipamangalam	Kaipamangalam
128	Chendrappini	Edathiruthy	Edathiruthy
129	Cheppallipuram	Valappad	Valappad
130	Nattika	Nattika	Nattika
131	Thalikkulam	Thalikkulam	Thalikkulam
132	Vadanappally	Vadanappally	Vadanappally
133	Engandiyoor	Engandiyoor,Kundaliyu	Engandiyoor
134	Blangad	Kadappuram	Chavakkad
135	Manathala	Manathala	Chavakkad
136	Kadappuram	Kadappuram	Kadappuram
137	Edakkazhiyoor	Punnayur	Punnayur
138	Manthalamkunnu	Punnayurkulam,Vadakk	Punnayurkulam
Malappuram (23 Nos)			
	<i>Name of Fishing village</i>	Revenue village	Name of panchayat
139	Palapetty	Perumadappu	Perumadappu
140	Veliyancode	Veliyancode	Veliyancode
141	Puduponnani	Ponnani	Ponnani(M)
142	Thekkekadappuram	Ponnani	Ponnani(M)
143	Mukkadi	Ponnani	Ponnani(M)
144	Marakkadavu	Ponnani	Ponnani(M)
145	Meentheruvu	Ponnani	Ponnani(M)

146	Pallivalappu	Tirur	Mangalam
147	Purathur	Tirur	Purathur
148	Koottayi	Tirur	Mangalam
149	Paravanna	Tirur	Vettom
150	Thevarkadappuram	Niramaruthur	Niramaruthur
151	Puthiyakadappuram	Niramaruthur	Tanur(M)
152	Cheerankadappuram	Tanur	Tanur(M)
153	Ossankadappuram	Tanur	Tanur(M)
154	Pandakadappuram	Tanur	Tanur(M)
155	Edakkadappuram	Tanur	Tanur(M)
156	Kormankadappuram	Tanur	Tanur(M)
157	Elarankadappuram	Tanur	Tanur(M)
158	Parappanangadi	Parappanangadi	Parappanangadi(M)
159	Arayan kadappuram	Parappanangadi	Parappanangadi(M)
160	Alungal Beach	Parappanangadi	Parappanangadi(M)
161	Kadalundinagaram	Vallikunnu	Vallikunnu
Kozhikode (34 Nos)			
	<i>Name of Fishing village</i>	Revenue village	Name of panchayat
162	Chaliyam	Kadalundy	Kadalundy
163	Beypore	Beypore	Kozhikode
164	Kapaikkal	Panniyenkara	Kozhikode
165	Thaikadappuram	Nagaram	Kozhikode
166	Marad	Beypore	Kozhikode
167	Vellayil	Kasaba	Kozhikode
168	Puthiyakadavu	Kasaba	Kozhikode
169	Thoppayil	Kasaba	Kozhikode
170	Kampuram	Kasaba,Puthiyangadi	Kozhikode
171	Puthiyangadi	Puthiyangadi	Kozhikode
172	Pallikandy	Puthiyangadi	Kozhikode
173	Puthiyappa South	Elathur,Puthiyangadi	Kozhikode
174	Puthiyappa North	Elathur,	Kozhikode
175	Elathur	Elathur	Kozhikode
176	Kannankadavu	Chemenchery	Chemenchery
177	Edakkadavu	Chemenchery	Chemenchery
178	Ezhukudikkal	Chengottukave	Chengottukave
179	Valiyamangadu	Chengottukave,Panthala	Chengottukave,Koyil
180	Cheriyamangadu	Panthalayani	Koyilandy
181	Virunnukandy	Panthalayani	Koyilandy
182	Quilandy	Panthalayani	Koyilandy
183	Kollam-Mudady	Viyyoor	Koyilandy
184	Vanmugghaom	Moodadi	Moodadi,Thikkodi

185	Thekody	Thekody	Thekody
186	Melady	Payyoli	Payyoli (M)
187	Iringal	Iringal	Payyoli (M)
188	Vadagara (south)	Nadakuthazha	Vadagara
189	Kuriyadi	Chorode	Vadagara
190	Vadagara (north)	Vadakara	Vadagara
191	Mattungal	Chorode	Chorode
192	Madappally	Onchiyam	Onchiyam
193	Marakkara	Onchiyam	Onchiyam
194	Chompala	Azhiyoor	Azhiyoor
195	Azhiyoor	Azhiyoor	Azhiyoor
Kannur (11 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
196	Kurichiyil	Mahe, Kodieyeri	New Mahe
197	Chalil Gopalapetta	Thiruvangad	Thalassery
198	Pallissery	Dharmadom	Dharmadom
199	Edakkad	Muzhappilangad,	Muzhappilangad
200	Thayyil	Kannur-1	Kannur corporation
201	Kannur city	Kannur-1	Kannur corporation
202	Azhikode Kadappuram	Azhikode	Azheekode
203	Mattool	Mattool	Mattool
204	Puthiyangadi	Madai	Madai
205	Palacode	Ramanthali	Ramanthali
206	Kavvayi	Payyannur,	Payyanur
Kasargode (16 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
207	Thrikaripur	Valiyaparambu	Valiyaparambu
208	Valiyaparamba	Valiyaparambu	Valiyaparamba
209	Padannakadappuram	Padanna,	Valiyaparamba
210	Thaikadappuram	Neeleswaram	NeeleswaramMunici
211	Kadangode	Cheruvathur	Cheruvathur
212	Poonjakadappuram	Kanhangad	Kanhangad
213	Hosdurg	Hosdurg	Kanhangad
214	Ajanoor	Chithari	Ajanoor
215	Pallikkara	Pallikkara	Pallikkara
216	Kottikulam	Uduma	Uduma
217	Kizhoor	Kalanad	Chemmanad
218	Kasaba	Kasaragod	KasaragodMunicipali
219	Kavungoli	Kudlur	Mogral Puthur

220	Koyippady	Koyippady	Kumbala
221	Shiriya	Mangalpady	Mangalpady
222	Bengara Manjeswar	Hosabettu	Manjeswar

Source: fisheries handbook 2020

Table 1.4b: District wise Inland fishing villages

Thiruvananthapuram (4 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
1	Attupuram	Kulathoor	Kulathoor
2	Hariharapuram	Ayiroor	Elakamon
3	Chirayinkeezh	Chirayinkeezh	Chirayinkeezh
4	Vellayani	Venganoor,Kalliyoor	Venganoor,Kalliyoor
Kollam (26 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
5	Prayar	Clappana	Clapana
6	Sasthamkotta	Sastamkottah	Sasthamkotta
7	Puthukkadu	Chavara	Chavara
8	Mangadu	Kilikolloor	Kollam Corporation
9	Koyivila	Thevalakkara	Thevalakkara
10	Kadavoor	Thrikkadavoor	Kollam Corporation
11	Aravila	Sakthikulangara	Kollam Corporation
12	Neendakara	Neendakara	Neendakara
13	Prakulam	Thrikkaruva	Thrikkaruva
14	Perumon	Panayam	Panayam
15	Mundakkal	Panayam	Panayam
16	Sinkarapally	East Kallada	East Kallada
17	Chavara South	Thekkumbhagam	Thekkumbhagam
18	Chavara North	Chavara	Chavara
19	Koduvila	East Kallada	East Kallada
20	Kumbalam	Perayam	Perayam
21	Muttom	East Kallada	East Kallada
22	Chemmakkad	Perinad	Perinad
23	Kanjirakkodu	Perayam	Perayam
24	Manalikkadu	Thrikkaruva	Thrikkaruva
25	Kuripuzha East	Thrikkadavoor	Kollam Corporation
26	Mukkadu	Sakthikulangara	Kollam Corporation
27	Kottiyam	Adhichanalloor	Adhichanalloor
28	Padappakkara	Perayam	Perayam
29	Ayiramthengu	Clappana	Clappana
30	Arinelloor	Thevalakkara	Thevalakkara

Pathanamthitta (3 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
31	Paramala	Kadapra	Kadapra
32	Thiruvalla	Thiruvalla	Thiruvalla
33	Maramon	Thottapuzhassery	Thottapuzhassery
Idukki (No)			
	Name of Fishing village	Revenue village	Name of panchayat
66	Idukki	Idukki	Vazhathoppu
Ernakulam (15 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
67	Kadamakkudi	Kadamakkudi	Kadamakkudi
68	Ezhikkara	Ezhikkara	Ezhikkara
69	Mulavukadu	Mulavukadu	Mulavukadu
70	Cheranelloor	Cheranelloor	Cheranelloor
71	Maradu	Maradu	Maradu
72	Kumbalam	Kumbalam	Kumbalam
73	Udayamperoor	Manakkunnam	Udayamperoor
74	Ernakulam (West)	Ernakulam	Kochi Corporation
75	Poonithura	Poonithura	Kochi Corporation
76	Nedamagramam	Nadama	Thripunithura
77	Ernakulam (East)	Ernakulam	Kochi Corporation
78	Kumbalangi	Kumbalangi	Kumbalangi
79	Palluruthy	Palluruthy	Kochi Corporation
80	Vadakkekara	Vadakkekara	Vadakkekara
81	Puthenvelikkara	Puthenvelikkara	Puthenvelikkara
Thrissur (8 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
82	Anappuzha	Methala	Kodungallur
83	Pullute	Pullute	Kodungallur
84	Poyya	Poyya	Poyya
85	Puthenchira	Puthenchira	Puthenchira
86	Nedupuzha	Koorkanchery	Thrissur Corporation
87	Venkidangu	Venkidangu	Venkidangu
88	Karalam	Karalam	Karalam
89	Velur	Velur	Velur
Palakkad (2 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat

90	Muthalamada	Muthalamada	Muthalamada
91	Palakkad	Puthunagaram	Puthunagaram

Malappuram (6 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
92	Kadavonadu (Ponnani)	Ponnani	Ponanni Municipality
93	Gomughom	Tirur	Purathoor Panchayat
94	Purathoor	Tirur	Purathoor Panchayat
95	Kutturapuzha	Parappanangadi	Tanur Municipality
96	Palathungal	Parappanangadi	Parappanangadi
97	Kadalundipuzha	Parappanangadi	Vallikunnu
Kozhikkode (8 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
98	Karuvanthuruthy	Karuvanthuruthy	Feroke Municipality
99	Cheruvannoor	Cheruvannoor	Kozhikkode
100	Eranjikal	Elathur	Kozhikkode
101	Vengalam	Chemancheri	Chemancheri
102	Vellur	Atholi	Atholi Panchayat
103	Teragi	Atholi	Atholi Panchayat
104	Ulllookadavu	Ulleri	Chengottukavu + Ulliyeri Panchayat
105	Akalappuzha	Moodadi+Keezhariyoor	Moodadi Panchayat
Wayanad (1 No)			
	Name of Fishing village	Revenue village	Name of panchayat
106	Vythiri	Vythiri	Vythiri
Kannur (5 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat
107	Kurinjimangalam	Kurinjimangalam	Kurinjimangalam
108	Ezhome	Ezhome	Ezhome
109	Kattampally	Chirakkal	Chirakkal
110	Mandalloor	Dharmadom	Dharmadom
111	Eranholi	Eranholi	Eranholi
Kasaragod (2 Nos)			
	Name of Fishing village	Revenue village	Name of panchayat

112	Peelikode	Peelikode	Peelikode
113	Thrikkaripur	Thrikkaripur & Neeleswaram	Thrikkaripur, Padna, Valiyaparamba, Neeleswaram
Source: fisheries handbook 2020			

1.3 FISH LANDING CENTRES OF KERALA

For the convenience of fishermen for trade of their catches, there are specific landing centers in each fishing village and details of such centres in Kerala are consolidated and given below.

Table 1.5 a : District wise fish landing centres of Kerala

Sl.No	Name of Landing centre	Name of Fishing Village	Name of District	Latitude & Longitude
Thiruvananthapuram				
1	Kollamgode	Pozhiyoor	Trivandrum	08 17.57 N 077 05.79
2	Parithiyoor	Pozhiyoor	Trivandrum	08 18.14 N 077 05.11
3	Poovar	Pozhiyoor	Trivandrum	08 19.03 N 077 03.93
4	Karimkulam	Trivandrum	Trivandrum	08 19.51 N 077 03.40
5	Kochuthura	Karimkulam	Trivandrum	08 19.77 N 077 03.10
6	Puthiathura	Neyyantikara	Trivandrum	08 19.97 N 077 02.78
7	Pallom	Karimkulam	Trivandrum	08 20.31 N 077 02.49
8	Erayammanthura	Karimkulam	Trivandrum	08 20.53 N 077 02.17
9	Chempakaramthura	Karimkulam	Trivandrum	08 20.65 N 077 02.03
10	Adimalathura	Karimkulam	Trivandrum	08 21.11 N 077 01.10
11	Vizhinjam	Karimkulam	Trivandrum	08 22.70 N 076 59.47
12	Vizhinjam North	Vizhinjam	Trivandrum	08 22.73 N 076 59.32
13	Kovalam	Vizhinjam	Trivandrum	08 23.78 N 076 58.40
14	Poonthura	Vizhinjam	Trivandrum	08 26.46 N 076
15	Bheemapally	Muttathara	Trivandrum	08 27.02 N 076 56.19
16	Cheraithura	Muttathara	Trivandrum	08 27.41 N 076
17	Valiathura	Muttathara	Trivandrum	08 27.84 N 076 55.50
18	Vettucadu	Muttathara	Trivandrum	08 29.62 N 076 53.95
19	Kochuveli	Kadakampally	Trivandrum	08 30.03 N 076 53.58
20	Valiaveli	Kadakampally	Trivandrum	08 31.23 N 076 52.61
21	Pallithura	Attipra	Trivandrum	08 32.75 N 076 51.43
22	Fathima Thumba	Attipra	Trivandrum	08 33.12 N 076 51.12
23	St.Andrews	Kazhakoottam	Trivandrum	08 33.72 N 076 50.63

24	Puthenthoppu	Kazhakoottam	Trivandrum	08 34.32 N 076 50.15
25	Vettuthura	Munakmulam	Trivandrum	08 35.37 N 076 49.29
26	Santhipuram	Kadinamkula m	Trivandrum	08 35.70 N 076 49.03
27	Marinad	Kadinamkula m	Trivandrum	08 35.95 N 076 48.83
28	Puthukurichi	Kadinamkula m	Trivandrum	08 36.38 N 076 48.44
29	Muthalapozhy	Kadinamkula m	Trivandrum	08 38.10 N 076 47.28
30	Anjengo	Kadinamkula m	Trivandrum	08 39.73 N 076 45.79
31	Mampally	Kadakkavoor	Trivandrum	08 40.72 N 076 44.99
32	Vettoor	Kadakkavoor	Trivandrum	08 42.70 N 076 43.41
33	Chilakkoor	Chirayankeez hu	Trivandrum	08 43.17 N 076 43.10
34	Edava	Varkala	Trivandrum	08 45.97 N 076 41.03
35	Singarathoppu	Singarathopp u	Trivandrum	08 28.15 N 076 55.70
36	Thazampally	Thazampally	Trivandrum	08 39.10 N 076 45.60
37	Odayam	Kappil	Trivandrum	08 47.50 N 076 40.40
38	Kappil	Kappil	Trivandrum	08 46.70 N 076 41.00
39	Kannanthura	Kannanthura	Trivandrum	08 33.50 N 076 54.90
40	Valiathoppu	Valiathoppu	Trivandrum	08 30.10 N 076 55.05
41	Kochuthoppu	Kochuthoppu	Trivandrum	08 28.05 N 076 55.30
42	Poothura	Thumba	Trivandrum	08 32.65 N 076 53.17
Kollam				
1	Azheekkal	Allapad	Kollam	09 07.89 N 076 28.03
2	Parayakadavu	Allapad	Kollam	09 05.33 N 076 29.11
3	Cheriazheekal	Allapad	Kollam	09 03.31 N 076 30.04
4	Vallanathuruthi	Allapad	Kollam	09 01.38 N 076 31.00
5	Ponmana	Ponmana	Kollam	09 00.47 N 076 31.41
6	Kovilhottam	Chavara	Kollam	08 59.46 N 076 31.46
7	Puthenthura	Neendakara	Kollam	08 57.77 N 076 31.82
8	Neendakara FH	Neendakara	Kollam	08 56.20N 076 32.28 E
9	Sakthikulangara	Sakthikulangar a	Kollam	08 55.99 N 076 32.63
10	Valavilthoppu	Sakthikulangar a	Kollam	09 54.75 N 076 32.57
11	Ozhukkuthodu	Sakthikulangar a	Kollam	08 54.26 N 076 32.80

12	Thankasserry FH	Kollam	Kollam	08 51.93 N 076 34.31
13	Wadi	Kollam	Kollam	08 52.89 N 76 34.45 E
14	Moothakara	Kollam	Kollam	08 53.15 N 076 34.71
15	Jonapuram	Kollam	Kollam	08 52.88 N 07634.71 E
16	Quilon Port	Kollam	Kollam	08 52.32 N 076 34.85
17	Pallithottam	Kollam	Kollam	08 52.85 N 076 35.08
18	Kakkathoppu	Mundakkal	Kollam	08 51.63 N 076 36.55
19	Eravipuram	Eravipuram	Kollam	08 51.27 N 076 36.94
20	Kolathumpaddam	Eravipuram	Kollam	08 51.06 N 076 37.14
21	Mukkam	Mayyanad	Kollam	08 49.28 N 076 38.62
22	Chillickal	Kottapuram	Kollam	08 48.46 N 076 39.11
23	Thottupuzhi	Kottapuram	Kollam	08 47.68 N 076 39.74
24	Parakkada	Kottapuram	Kollam	08 47.51 N 076 39.61
25	Thanni	Mayyanad	Kollam	08 49.90 N 076 38.15
Alappuzha				
1	Chethy	Cherthala South	Alleppey	09 38.10 N 076 17.25
2	Punnapra Viyani	Punnapra	Alleppey	09 25.95 N 076 19.97
3	Alappuzha ESI	West Village	Alleppey	09 28.73 N 0760 19.27
4	Pallithodu	Kusliyathodu	Alleppey	09 46.30 N 076 16.88
5	Pallithodu Chappa	Kusliyathodu	Alleppey	09 47.21 N 076 16.67
6	Anthakaranazhy	Pattanakkad	Alleppey	09 44.85 N 076 17.07
7	Cheriyaserry	Pattanakkad	Alleppey	09 44.59 N 076 17.11
8	Arattuvazhy	Pattanakkad	Alleppey	09 43.67 N 076 17.18
9	Polackal	Pattanakkad	Alleppey	09 43.13 N 076 17.22
10	Thaikkal Beach	Pattanakkad	Alleppey	09 41.16 N 076 17.37
11	Arthungal	Cherthala South	Alleppey	09 40.29 N 076 17.51
12	Chenna Vally	Cherthala South	Alleppey	09 38.47 N 076 17.67
13	Pollethai	Kalavoor	Alleppey	09 34.65 N 076 18.12
14	Vadakkal	Apappanjha	Alleppey	09 27.80 N 076 19.52
15	Paravoor	Paravoor	Alleppey	09 20.95 N 076 19.75
16	Valiazheekkal	Arattupuzha	Alleppey	09 08.34 N 076 27.94
17	Trikkunnappuzha	Trikkunnappuzha	Alleppey	09 17.58 N 076 23.46
18	Viyani (Punnapra)	Punnapra	Alleppey	09 25.48 N 076 20.11
19	Valanjavazhy	Punnapra	Alleppey	09 23.81 N 076 20.73
20	Komana FLC	Ambalapuzha	Alleppey	09 22.81 N 076 21.12
21	Thottappally	Purakkad	Alleppey	09 19.14 N 076 22.72

22	Pallana HS FLC	Trikkunnapuzha	Alleppey	09 17.58 N 176 23.46
Ernakulam				
1	Murikkum Padam	Puthuvypeen	Ernakulam	09 59.29N 76 14.40 E
2	Kalamukku FLC	Puthuvypeen	Ernakulam	09 59.01 N 76 14.54 E
3	Kalamukku PVT	Puthuvypeen	Ernakulam	09 59.23 N 76 14.54 E
4	Gosree Puram FLC	Puthuvypeen	Ernakulam	09 58.93 N 76 14.56 E
5	Puthuvypeen FLC	Puthuvypeen	Ernakulam	09 29.90 N 76 13.12 E
6	Mulipuram Chappa	Elamkunnapuzha	Ernakulam	10 01.22 N 76 12.84 E
7	Ayyampilli Beach	Ayyampilli	Ernakulam	10 07.10 N 76 11.10 E
8	Kuzhupilly Beach	Kuzhupilly	Ernakulam	10 06.59 N 76 11.26 E
9	Puthankadappuram	Nayarambalam	Ernakulam	10 03.98N 76 11.91 E
10	Munambam FH	Kuzhupilly	Ernakulam	10 10.94 N 76 10.22E
11	Munambam Mini	Kuzhupilly	Ernakulam	10 10.51N 76 10.62 E
12	Kunji Thai	Vadakkekara	Ernakulam	10 09.94 N 76 11.09E
13	Ezhikkara (Inland)	Ezhikkara	Ernakulam	10 06.78N 76 13.09E
14	Chathanad (Inland)	Ezhikkara	Ernakulam	10 04.48N 76 14.39E
15	Thoppumpady	Rameswaram	Ernakulam	09 56.31 N 76 15.76 E
16	Gondu Parambu	Chellanam	Ernakulam	09 48.80 N 76 16.39E
17	Tholekkadavu	Palluruthy	Ernakulam	09 55.17N 76 15.08E
18	Cheriyakadavu	Palluruthy	Ernakulam	09 54.01N 76 15.38 E
19	Kannamaly	Kumbalangi	Ernakulam	09 52.89 N 76 15.64E
20	Puttenthodu	Kumbalangi	Ernakulam	09 52.11 N 76 15.79 E
21	Chellanam FH	Chellanam	Ernakulam	09 47.95 N 76 16.55E
22	Cherai Beach	Cherai	Ernakulam	10 08.43 N 076
23	Edavanakkadu	Ayyampilli	Ernakulam	10 05.91 N 076
24	Beach Road	Rameswaram	Ernakulam	09 56.41 N 076
Thrissur				
1	Azhikode	Azhikode	Thrissur	10 11.34 N 076 10.43
2	Munnakal	Azhikode	Thrissur	10 10.68 N 076 09.76
3	Eriyad	Eriyad	Thrissur	10 13.50 N 076 08.95
4	Kara	Edavilangu	Thrissur	10 14.01 N 076 08.77
5	Kathiyalam	Edavilangu	Thrissur	10 44.43 N 076 08.63
6	Attupuram	Vemballur	Thrissur	10 15.37 N 076 08.35
7	Perinjanam	Kulimuttam	Thrissur	10 17.61 N 076 07.73
8	Arattukadavu	Perinjanam	Thrissur	10 18.12 N 076 07.57
9	Vanchipura	Kaipamangalam	Thrissur	10 19.19 N 076 07.23
10	Companykadavu	Kaipamangala	Thrissur	10 20.10 N 076 06.91

		m		
11	Chamakala	Chantrapinni	Thrissur	10 20.90 N 076 06.64
12	Palapetty	Valapad	Thrissur	10 21.67 N 076
13	Kazhimbram	Valapad	Thrissur	10 22.14 N 076
14	Nattika Beach	Nattika	Thrissur	10 24.80 N 076
15	Nambikkadavu	Thalikulam	Thrissur	10 25.85 N 076
16	Vadanapally	Vadanapally	Thrissur	10 27.65 N 076
17	Chetuva	Eangandiyoor	Thrissur	10 30.91 N 076
18	Munakkadavu	Kadappuram	Thrissur	10 32.38 N 076
19	Blangad	Chevakkadu	Thrissur	10 34.32 N 076
20	Puthen Kadapuram	Chevakkadu	Thrissur	10 35.81 N 075
21	Edakazhiyur	Edakazhiyur	Thrissur	10 36.81 N 75
22	Panchavadi	Punnayur	Thrissur	10 37.22 N 75
23	Mannalamkunnu	Punnayur	Thrissur	10 39.48 N 075
Malappuram				
1	Palappetty	Perumpadap	Malappuram	10 42.09N 075
2	Veliyamcode	Veliyamcode	Malappuram	10 44.21N 075
3	Ponnani	Ponnani Nagaram	Malappuram	10 46.98N 075
4	Koottayi	Purattur	Malappuram	10 47.32N 075
5	Thekke Koottayi	Mangalam	Malappuram	10 50.80N 075
6	Pallivallapu	Mangalam	Malappuram	10 50.64N 075
7	Vakkad	Vettam	Malappuram	10 52.75N 075
8	Puthengadu	Vettam	Malappuram	10 53.84N 075
9	Thevar	Niramaruttur	Malappuram	10 54.84N 075
10	Tanur	Tanur	Malappuram	10 58.62N 075
11	Farukhpalli	Pariyapuram	Malappuram	10 59.94N 075
12	Parappanangadi	Parappanangadi	Malappuram	11 03.32N 075
13	Alungal Beach	Parappanangadi	Malappuram	11 04.38N 075

14	Vallikunnu/Angadi	Vallikunnu	Malappuram	11 06.64N 075
15	Kadalundi	Kadalundi Nagaram	Malappuram	11 07.35N 75
Kozhikkode				
1	Chaliyam	Kadalumidiyapalam	Kozhikode	11 09 .724N 075
2	Beypore	Beypore	Kozhikode	11 10 .308N 075
3	Kozhikode South	Kozhikode/Kasaba	Kozhikode	11 14 .315N 075
4	Chombala	Azhiyoor	Kozhikode	11 39.733N 075
5	Badagara	Badagara	Kozhikode	11 36.047N 075
6	Badagara Azhithala	Badagara	Kozhikode	11 34.535N 075
7	Kolavi (Irinjal)	Irinjal	Kozhikode	11 32 .942N 075
8	Thikkodi (Kodikal)	Thikkodi	Kozhikode	11 28 .692N 075
9	Valavil Kadapuram	Maddady	Kozhikode	11 27.949N 075
10	Muthayakadapuram	Moodady	Kozhikode	11 28.083N
11	Moodady	Veeyur	Kozhikode	11 27.935N 075
12	Koloth	Panthalazi	Kozhikode	11 27. 014N 075
13	Quilandy/Koloth	Koyilandi	Kozhikode	11 25.976N 075
14	Kovalad	Chegotta	Kozhikode	11 24.747N 075
15	Poiilkavu	Chegotta	Kozhikode	11 24.383N 075
16	Kappad	Chemamcheri	Kozhikode	11 23.539N 075
17	Edakadavu	Tiruvagure	Kozhikode	11 22.815N 075
18	Elathur	Elathur	Kozhikode	11 21. 258N 075
19	Puthiyappa	Elathur	Kozhikode	11 19.128N 075
20	Vellayil	Kasaba	Kozhikode	11 15 .909N 075
Kannur				
1	Edakkad	Muzhappilangad	Kannur	11 48.511N 075
2	Gopalpatai	Tiruvangad	Kannur	11 43.913N 075
3	Thalayikunhi	Tiruvangad	Kannur	11 43. 918N 075
4	Newmahe	Rodiyari	Kannur	11 42.293N 075
5	Dharmadam FC/	Dharamadam	Kannur	11 46.140N 075
6	Terminal	Mazhuppilangad	Kannur	11 46.756N 075
7	Ettikulam	Ramanthali	Kannur	12 00 .677N 075
8	Azheekal Jetty	Azhikode	Kannur	11 56 .597N 075
9	Tellicherry	Tellicherry	Kannur	11 44.791N 075
10	Ayikkara	Kannur	Kannur	11 51.390N 075
11	Azhikode South	Azhikode	Kannur	11 54.119N 075

12	Muzhappilangad	Muzhappilangad	Kannur	11 47 .022N 075
13	Palakode	Ramanthali	Kannur	12 01.624N 075
Kasaragod				
1	Pallikere	Pallikkere	Kasaragode	12 23 469N 075
2	Chittari	Chittari	Kasaragode	12 20 738N 075
3	Kotikulam	Pallikere III	Kasaragode	1224 683N 075 01
4	Bekal	Pallikere II	Kasaragode	12.24 290N 075
5	Kizhur	Kalanad	Kasaragode	12 27.811N 074
6	Kizhur Harbour	Kalanad	Kasaragode	12 28 380N 074
7	Talangara Jetty	Kalanad	Kasaragode	12 28.523N 074
8	Kasaba	Kasaragode	Kasaragode	12 29 574N 074
9	Adakathball	Kasaragode	Kasaragode	12 30 31.5N 074
10	Mogral	Kasaragode	Kasaragode	12 33 587N 074
11	Koipadi	Koipadi	Kasaragode	12 35 13.8N 074
12	Uppala	Uppala	Kasaragode	12 42 14.6N 074
13	Arikkadi	Kasaragode	Kasaragode	12 35.820N 074
14	Hosabettu	Hosabettu	Kasaragode	12 42. 526N 074
15	Kunzhathur	Kunzhathoor	Kasaragode	1244 319N 074 52
16	Ajanoor-N-Bella	Ajanoor	Kasaragode	12 20 162N 075
17	Chittari	Cheruvathur	Kasaragode	12 12 879N 075
18	Hosdurga-S-Bella	Hosdurge	Kasaragode	12 18 754N 075
19	Thaikkadappuram	Neeleswaram	Kasaragode	12 13 217N 075 07
20	Poonchavikadapp	Hosdurge	Kasaragode	12 16 632N 075 05

	uram		e	
Source: Fisheries handbook 2020				

1.4 FISHING HARBOURS OF KERALA

Fifteen fishing harbours have been completed, 9 are under construction and 2 new are proposed. Details are given in Table 1.6 below.

Table 1.6 : Fishing harbours in Kerala state

Sl. No	Completed	Sl. No	Under construction	Sl. No	Proposed for construction
1	Thankassery	1	Vizhinjam	1	Parappanangadi
2	Neendakara	2	Muthalappozhy	2	Pozhiyoor
3	Kayamkulam	3	Chethi		
4	Thottappally	4	Arthunkal		
5	Munambam	5	Chellanam		
6	Ponnani	6	Kasaragod		
7	Beyypore	7	Tanur		
8	Puthiyappa	8	Vellayil		
9	Chombal	9	Manjeswaram		
10	Mappila Bay				
11	Azheekal				
12	Cheruvathoor				
13	Chettuva				
14	Thalai				
15	Koyilandi				

1.5 FISHER FOLK POPULATION

The state has a marine fish fold population of around 11.33 lakh (against 1044361 in Fisheries Hand book 2020) (Table 1.7). Among them 2 lakh are active fishermen. This sector offers occupation to about 3.86 lakh population

directly and many more indirectly making it an important employment providing sector. The density of coastal areas of the state is 2168 per sq. km. against the average of 819. Hence fisheries sector is playing a major role in the economic status of the state.

1.6 FISH VENDORS

Fish vending is a traditional occupation that has been a means of livelihood for thousands of fisherfolk in India, especially for women. Various types of fish vendors in which

they procure their fish directly from landing centers, by daily auctions of the catch; or buy from traders and merchants; or they buy from the wholesale markets for resale at retail/ local markets. Vendors used to carry out sorting, grading, cleaning and icing the fish before selling their products. They market their products – fresh fish stored in ice-in local and distant markets on a door to door basis. Fish trade is carried out through vendors. In Kerala there is a good work force of vendors. Some details about them are given in Table 1.8.



Table 1.7: Fish folk population in Kerala

District	Marine			Inland			Total				Total in marine
	Male	Female	Children	Male	Female	Children	Male	Female	Children	Total	
Thiruvananthapuram	64533	56956	50601	455	531	455	64988	57487	51056	173531	183181
Kollam	40702	33816	20373	13784	12981	8303	54486	46797	28676	129959	100231
Pathanamthitta	0	0	0	951	826	385	951	826	385	2162	
Alappuzha	53601	48964	28512	25508	24424	13243	79109	73388	41755	194252	120104
Kottayam	0	0	0	10043	9517	5877	10043	9517	5877	25438	
Idukki	0	0	0	273	273	174	273	273	174	720	
Ernakulam	29269	27404	17312	24181	23674	17241	53450	51078	34554	139081	79493
Trissur	21129	21697	14271	8081	7404	4692	29210	29101	18964	77274	79494
Palakkad	0	0	0	880	871	889	880	871	889	2640	
Malappuram	36425	29034	26217	1845	1610	868	38270	30644	27085	95999	87270
Koziokkode	39769	34454	26299	4263	4484	3478	44032	38938	29777	112747	106281
Wynad	0	0	0	78	84	76	78	84	76	238	
Kannur	19648	10179	8770	2473	2615	1397	22121	12794	10167	45082	60484
Kasargod	17889	16475	9866	420	400	189	18309	16875	10055	45239	47523
Kerala	322965	278979	202221	93235	89694	57267	416200	368672	259488	1044361	864061

Active fishermen in the state consists of : mechanized sector – 34307; motorized – 86811; non-motorized – 19104 people.

Source: Fisheries handbook 2020; www.keralacoast.org/pdf/marine-book.pdf

Table 1.8 : Fish vendors in Kerala state

District	2015-16			2016-17			2017-18			2018-19		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Kasargod	1040	5789	6829	1249	5776	7025	148	237	385	299	1359	1658
Kannur	954	835	1789	954	855	1809	974	301	1275	0	410	410
Wayanad	0	0	0	0	0	0	0	0	0	154	2141	2295
Kozhikkode	3722	303	4025	5154	291	5445	1962	154	2116	0	1136	1136
Malappuram	11936	35	11971	7906	35	7941	1051	0	1051	0	376	376
Palakkad	0	0	0	0	0	0	264	0	264	221	974	1195
Trissur	2238	1727	3965	2238	1727	3965	899	133	1032	1454	2887	4341
Ernakulam	5089	19146	24235	5089	19146	24235	1451	931	2382	0	107	107
Idukki	0	0	0	0	0	0	113	0	113	420	647	1067
Kottayam	2999	7509	10508	2999	7508	10507	178	209	387	71	931	1002
Alappuzha	6300	9033	15333	6300	9033	15333	1891	42	1933	3	241	244
Pathanamthitta	0	0	0	0	0	0	209	17	226	3893	5028	8921
Kollam	3485	10216	13701	3135	9682	12817	1135	2893	4028	1589	2069	3658
Thiruvananthapuram	11730	15102	26832	11730	15102	26832	451	1060	1511	231	412	643
Kerala	49493	69695	119188	46754	69155	115909	10726	5977	16703	8335	18718	25395

Source: Fisheries handbook 2020

1.7 FISHING CRAFTS

Details regarding fishing crafts in different districts of Kerala is given below

Table 1.9 : Fishing crafts in different districts of Kerala

District	Trawlers	Gill netter	Ring seiner	Liners	Purse seiner	Total mechanized	Motorized	Non-motorized	Total
Thiruvananthapuram	0	0	0	0	0	0	2,880	2,304	5,184
Kollam	950	5	35	3	0	993	546	299	1,838
Alappuzha	30	0	8	0	0	38	1,503	1,980	3,521
Ernakulam	1,020	403	90	15	60	1,588	531	146	2,265
Thrissur	130	0	65	0	0	195	670	217	1,082
Malappuram	200	2	150	1	0	353	1,571	186	2,110
Kozhikkode	950	0	110	5	0	1,065	1,831	260	3,156
Kannur	237	50	33	5	0	325	542	97	964
Kasaragod	161	0	4	0	0	165	1,101	395	1,661
Total	3,678	460	495	29	60	4,722	11,175	5,884	21,781

1.8 FISHING GEARS

Details of fishing gears are given in Tables 1.10 a, b below

Table 1.10 a : Fishing gears owned by fisherfolk (100%)

Type	Thiruvananthapuram	Kollam	Alappuzha	Ernakulam	Thrissur	Malappuram	Kozhikkode	Kannur	Kasaragod	Total
Trawl net	371	375	288	12	13	450	155	32	57	1,753
Gill net	1,819	23	754	207	292	598	1,048	269	653	5,663
Drift net	341	25	1,218	572	49	64	155	122	62	2,608
Ring seine	33	35	244	54	32	1,017	111	56	57	1,639
Purse seine	35	11	72	4	26	25	14	8	1	196
Boat seine	303	12	64	14	5	23	11	2	3	437
Sagnet	55	2	35	38	77	2	6	78	10	303
Shoresel net	187	7	7	4	35	29	60	63	93	485
Cast net	25	30	31	309	63	182	300	37	104	1,081
Hooks & Trolls	746	66	1	16	0	1	18	9	0	857
Long net	155	4	0	0	0	0	1	2	0	162
Fixed net	2	2	26	13	0	0	0	1	0	44

Traps	4	0	0	0	0	0	0	0	0	4
Scoopnet	WI	7	9	5	2	0	0	8	5	180
Other	so	335	60	45	17	5	8	9	0	529

Table 1.10 b : Detailed fishing gears owned by fisherfolk (< 100%)

Type	Thiruv anant hapur	Kol la m	Alap puzh a	Erna kula m	Thris sur	Mala ppur am	Kozhi kode	Kann ur	Kas ego de	Total
Trawl net	3	11	52	2	2	56	92	4	5	227
Gill net	62	9	50	16	45	50	129	33	55	449
Orift net	3	3	174	34	6	9	15	13	10	267
Rlngselne	1	6	112	26	25	22	59	32	48	331
Purse seine	0	0	21	1	4	1	3	1	0	31
Boat seine	21	0	21	4	3	4	4	0	0	57
Bagnet	2	0	1	0	1	0	1	4	0	9
Shore sein	10	0	0	1	6	3	2	2	61	85
cast net	0	0	1	8	5	11	2	1	2	30
Hooks &	49	9	0	0	0	0	7	0	0	65
Troll line	3	0	0	0	0	0	0	0	0	3
Fixed net	0	0	2	0	0	0	0	0	0	2
Traps	1	0	0	0	0	0	0	0	0	1
ScooPnet	13	1	3	0	0	0	0	0	10	27
Others	0	11	14	3	0	0	0	2	0	30

1.9 FISH MARKETS IN KERALA

Details about fish markets are summarized below in Table 1.11

Table 1.11: Modern hygienic fish markets in Kerala

SI No	Name of the market	District	LSGD
1	Kulathur	Trivandrum	Kulathur Grama Panchayat
2	Chirayinkeezhu	Trivandrum	Chirayinkeezhu Grama Panchayat
3	Kazhakuttom	Trivandrum	Thiruvananthapuram Corporation
4	Venjaramoodu	Trivandrum	Nellanad Grama Panchayat
5	Vithura	Trivandrum	Vithura Grama Panchayat
6	Nedumangad	Trivandrum	Nedumangad Municipality
7	Pangode	Trivandrum	Tvm Corporation

8	Konni	Pathanamthitta	Konni grama panchayat
9	Palamel	Alappuzha	Palamel grama panchayat
10	Karuvatta	Alappuzha	Karuvatta grama panchayat
11	Ettumanoor	Kottayam	Ettumanoor Municipality
12	Changanassery	Kottayam	Changanassery Municipality
13	Vaikom	Kottayam	Vaikom Municipality
14	Kodimatha	Kottayam	Kottayam Municipality
15	Paika	Kottayam	Meenachil Grama Panchayat
16	North Paravur	Ernakulam	Paravur Municipality
17	Aluva	Ernakulam	Aluva Municipality
18	Palluruthy	Ernakulam	Cochin Corporation
19	Thevara	Ernakulam	Cochin corporation
20	Muvattupuzha	Ernakulam	Muvattupuzha Municipality
21	Kalady	Ernakulam	Kalady Grama panchayat
22	Mulanthuruthy	Ernakulam	Mulanthuruthy grama Panchayat
23	Udayamperoor	Ernakulam	Udayamperoor grama Panchayat
24	Irinjalakkuda	Thrissur	Irinjalakkuda Municipality
25	Mala	Thrissur	Mala Grama Panchayat
26	Wadakenchery	Thrissur	Wadakanchery Municipality
27	Pattambi	Palakkad	Pattambi Municipality
28	Wandoor	Malappuram	Wandoor grama panchayat
29	Nilambur	Malappuram	Nilambur Municipality
30	Kalpatta	Wayanad	Kalpatta Municipality
31	Sulthanbathery	Wayanad	Sulthan bathery Grama Panchayat
32	Thodupuzha	Idukki	Thodupuzha Municipality
33	Kumliy	Idukki	Kumliy Grama Panchayat
34	Payyoli	Kozhikode	Payyoli Municipality
35	Kannur	Kannur	Kannur Municipality
36	Thalassery	Kannur	Thalassery Municipality
37	Kasaragode	Kasaragode	Kasaragode Municipality
38	Karikkode	Kollam	Kottamkara Grama Panchayat
39	Mayyanad	Kollam	Mayyanad Grama Panchayat

1.10 AQUACULTURE FARMS IN KERALA AND RELATED ACTIVITIES

Aquaculture operations in Kerala are undertaken at Government farms as well as private farms. Seed production and supply has always been a problem in the state. The production of seeds in the state has been reported to be highly inadequate. Therefore, necessary steps have to be taken in providing

adequate number of seeds for successful aquaculture development. Details regarding farms, hatcheries and seed production and species involved in farming are dealt in the following tables.

Table 1.12 a : Hatcheries and Aquafarms under public sector in the state

	Name of Hatcheries/ Farms	Panchayat/ Municipality/	Name of District
I. Hatcheries			
a) Department Hatcheries			
1	National Fish Seed Farm , Neyyar Dam	Kallikkad	Thiruvananthapuram
2	Larvivorus fish seed production Centre, Thevally, Kollam	Kollam (C)	Kollam
3	West Kallada	West Kallada	Kollam
4	Kulathupuzha Hatchery	Kulathupuzha	Kollam
5	FFDA Hatchery, Neendakara	Neendakara	Kollam
6	Fisheries Complex, Pannivelichira	Mullappuzhassery	Pathanamthitta
7	National Fish Seed Farm, Polachira	Kaviyoor	Pathanamthitta
8	Government Model Fish Farm, Pallom	Kottayam (M)	Kottayam
9	Peechi Hatchery	Pananchery	Thrissur
10	Regional Shrimp Hatchery, Azheekode	Kodungallur (M)	Thrissur
11	National Fish Seed Farm, Malampuzha	Malampuzha	Palakkad
12	Seed Farm, Meenkara, Palakkad	Muthalamada	Palakkad
13	Mangalam, Palakkad	Vandazhy	Palakkad
14	Walayar, Palakkad	Pudussery	Palakkad
15	Chulliyar Hatchery, Palakkad	Muthalamada	Palakkad
16	Kallanod fish Seed Farm, Peruvannamuzhi	Kurachund	Kozhikode
17	Thalipuzha	Thabinjal	Wayanad

18	Multi-species eco Hatchery, Bhuthathankettu	Keerampara	Ernakulam
19	Fish Seed Farm ,Ullanam	Parappanangadi	Malappuram
b) Agency for Development of Aquaculture (ADAK)			
1	Multispecies shrimp Hatchery,Odayam	Varkala (M)	Thiruvananthapuram
2	Govt.Fish Farm Ayiramthengu,Kollam	Alappad	Kollam
3	Njarakkal Fish Farm, Ernakulam	Ernakulam	Ernakulam
4	Government Fish Farm, Edakochi	Ernakulam	Ernakulam
5	Government Fish Farm, Kadappuram	Thrissur	Thrissur
6	Model Shrimp Farm, & Training	Poyya	Thrissur
7	Fish Farm, Eranjholi, Thalassery,Kannur	Eranjholi	Kannur
c) MATSYAFED			
1	Prawn Hatchery, Thirumullavaram	Kollam (C)	Kollam
2	Fresh water Prawn Hatchery, Kaipamangalam	Kaipamangalam	Thrissur
3	Prawn Hatchery, Veliyamcode,Ponnani	Veliyamcode	Malappuram
4	Prawn Hatchery,Mappila Bay, Kannur	Kannur (C)	Kannur
d) Kerala Aqua Ventures International Limited			
1	Kadungalloor Seed Farm	Kadungalloor	Ernakulam
e) Fisheries University			
1	Prawn Hatchery , KUFOS	Kumbalam	Ernakulam
2	Fish seed production units, KUFOS	Kumbalam	Ernakulam
3	Natural seed collection centre at Puduveypu, KUFOS	Kumbalam	Ernakulam
	Name of Farms	Panchayat/ Municipality/	Name of District
I. Farms			
a) Department Hatcheries			
1	Kadappuram Fish Farm	Kadappuram	Thrissur
2	Peechi Dam (Rearing farm)	Pananchery	Thrissur
3	Chulliyar Dam (Rearing farm)	Muthalamada	Palakkad
4	Walayar Dam (Rearing farm)	Puthussery	Palakkad

5	Mangalam Dam (Rearing farm)	Mangalam	Palakkad
6	Pothundi Dam (Rearing farm)	Nenmara	Palakkad
7	Meenkara Dam (Rearing farm)	Muthalamada	Palakkad
8	Fresh Water Fish seed production centre, Kannatharkunnam, West Kallada	West Kallada	Kollam
9	Indigenous Fish Seed Production Centre	Kulathupuzha	Kollam
10	Ornamental Fish Seed Farm, Thevally	Thevally	Kollam
11	Estuarine Research Centre	Alappade	Kollam
12	Pulikeezh Fish Farm (<i>not functioning</i>)	Kadapra	Pathanamthitta
13	Kidangannoor farm (<i>not functioning</i>)	Aranmula	Pathanamthitta
14	Edathua farm	Edathuva	Alappuzha
15	Eda kochi Fish Farm	Kochi corporation	Ernakulam
16	Pookode Fish Farm	Vythiri	Wayanad
17	Andalloor Brackish Water Farm, Thalassery	Dharmadam	Kannur
18	Palayad Brackish Water Farm, Thalassery	Dharmadam	Kannur
b) Agency for Development of Aquaculture (ADAK)			
1	Model Shrimp farm and Training centre, Poyya	Poyya	Thrissur
2	Fish Farm, Eranholi	Eranjholi	Kannur
3	Njarakkal farm	Njarakkal	Ernakulam
4	Ayiramthengu Government Fish farm	Alappad	Kollam
c) MATSYAFED			
1	Palikari fish farm	Chembu	Kottayam
2	Brackish water fish farm, Malippuram	Elamkunnappuzha	Ernakulam
3	Brackish water fish farm, Njarakkal	Njarakkal	Ernakulam

Table 1.12 b : Basic information from department on fish seed production (Nos. in Lakhs)

I. Hatcheries						
a)	Department	2014-15	2015-16	2016-17	2017-18	2018-19
Hatcheries						
1	National Fish Seed Farm , Neyyar Dam	4.98	4.68	4.92	12.71	19.81
2	Larvivorus fish seed production Centre, Thevally, Kollam		0.001	0.698	0.52	0.60
3	West Kallada, Kollam					4.81
4	Kulathupuzha Hatchery, Kollam					15.45
5	Shrimp Hatchery, Neendakara	45.24	45.45	47.47	61.18	67.55
6	Fisheries Complex, Pannivelichira	20.5	21.16	22.71	26.05	14.15
7	National Fish Seed Farm, Polachira	20	27.43	34.65	43.63	23.55
8	Government Model Fish Farm, Pallom	8.41	11.52	32.61	20.02	9.18
9	Peechi Hatchery			9.581	8.8	54.59
10	Regional Shrimp Hatchery, Azheekode	41.24	86.28	91.91	125.26	122.67
11	National Fish Seed Farm, Malampuzha	100.41	80	82.25	88.75	92.36
12	Seed Farm, Meenkara, Palakkad		7.51	1.2	9.72	23.07
13	Mangalam, Palakkad			2.34	4.34	24.38
14	Walayar, Palakkad			4.14	4.85	14.56
15	Chulliyar Hatchery, Palakkad				1.21	7.60
16	Kallanod fish Seed Farm, Kozhikkode					6.18
17	Thalipuzha, Wayanad					8.5
18	Multi-species eco Hatchery, Ernakulam					10.00
19	Fish Seed Farm ,Ullanam, Malappuram					24.76
	Sub Total	240.78	284.031	334.479	407.04	543.77
b) ADAK Hatcheries						
1	Shrimp	70.54	78.39	93.93	96.65	6.82

	Hatchery,Odayam					
2	Fish Farm Ayiramthengu, Kollam		0.31	1.29	6.94	10.57
3	Njarakkal Fish Farm, Ernakulam					0.04
4	Fish Farm, Edakochi, Ernakulam					0.03
5	Fish Farm, Kadappuram, Thrissur					0.15
6	Model Shrimp Farm, Poyya		4.89	10.2	6.46	3.28
7	Fish Farm, Eranjholi, Kannur		4.02	7.24	3.85	2.65
	Sub Total	70.54	87.61	112.66	113.9	23.54
c) MATSYAFED Hatcheries						
1	Prawn Hatchery, Thirumullavaram	474.35	427.04	518.97	334.60	327.52
2	Fresh water Prawn Hatchery, Kaipamangalam, Thrissur	213.38	215.25	189.63	204.49	120.31
3	Prawn Hatchery, Veliyamcode,Ponnani	80.6	57.58	110.76	77.58	21.98
4	Prawn Hatchery,Mappila Bay, Kannur	159.63	266.10	97.45	109.50	90.47
	Sub Total	927.96	965.97	916.81	726.17	560.28
	State Total	1239.28	1337.61	1363.95	1247.11	1127.59

Table 1.13 c : Species wise fish seed production (nos. In lakhs) data from the Department of Fisheries

1. Fish Seed Farm, Neyyar Dam, Thiruvananthapuram					
Spawn	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	3.06	3.5	10.37		
Rohu	12.41	5	25.45		
Mrigal	8.57	15	23.8		
Cyprinus	6.31	1.5	1.93		
Labeo	14.57	18			
Total	44.92	43	61.55		
Fry					
Catla	1.525	1	1.98	10.58	11.88

Rohu	3.612	1.5	4.98	15.32	20.05
Mrigal	2.403	2.5	4.19	4.455	6.02
Cyprinus	1.36	1	1.6	2.22	2.34
Labeo	3.02	1.5			
Anabus				0.08	0.06
Gift Tilapia				0.33	3.82
Grass Carp					1.51
H. Fossils					0.02
Other Fish					3.44
Total	11.92	7.5	12.75	32.985	49.14
Finger lings					
Catla	0.61	0.3	0.79	4.23	4.75
Rohu	1.29	0.75	1.78	5.47	7.16
Mrigal	0.89	1.5	1.55	1.65	2.23
Cyprinus	0.68	0.57	0.8	1.11	1.17
Labeo	1.51	1.56			
Anabus				0.05	0.04
Gift Tilapia				0.20	2.29
Grass Carp					0.43
H. Fossils					0.02
Other Fish					1.72
Total	4.98	4.68	4.92	12.71	19.81
2. Larvivorus fish seed production Centre, Thevally, Kollam					
	2014-15	2015-16	2016-17	2017-18	2018-19
Etroplus (Fry)		0.001	0.698	0.74	0.086
Etroplus (Finger lings)		0.001	0.698	0.52	0.06
3. Seed production unit at West Kallada, Kollam					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					1.7
Rohu					7.79
Mrigal					1.13
Cyprinus					1.84
Total					11.76
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					0.68
Rohu					2.78
Mrigal					0.42
Cyprinus					0.92
Total					4.81
4. Kulathupuzha Hatchery, Kollam					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					8.35
Rohu					21.25

Mrigal					1.13
Cyprinus					4.76
Etroplus					0.03
Grass carp					5.95
Total					41.47
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					3.34
Rohu					7.59
Mrigal					0.42
Cyprinus					2.38
Etroplus					0.02
Grass carp					1.70
Total					15.45
5. Shrimp Hatchery, Neendakara					
Prawn	2014-15	2015-16	2016-17	2017-18	2018-19
Scampi		0.31			
F.Indicus		7.00	6.50	1.98	3.96
P. Monodon	45.24	38.26	40.97	59.20	63.59
Total	45.24	45.57	47.47	61.18	67.55
6. Fisheries Complex, Pannivelichira					
Spawn	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	25	28	30		
Rohu	19.25	22	32.35		
Gift Tilapia					
Etroplus					
Mrigal	12.25	13	46		
Tilapia					
Labeo	17.25	29.5			
Cyprinus	3	7.5	21		
Grass Carp					
Total	76.75	100	129.35		
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	10.275	7.6	9.68	13.425	2.55
Rohu	13.496	6.7	11.34	25.06	7.36
Gift Tilapia				0.63	2.75
Etroplus			0.002		
Mrigal	14.823	6.9	29.46	26.38	3.51
Tilapia			0.006		
Labeo	12.12	24.4			
Cyprinus	0.04	1.94	7.74	3.16	14.6
Grass Carp					1.19
Total	50.75	47.54	58.228	68.655	31.96
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19

Catla	4.11	3.03	3.87	5.37	1.02
Rohu	4.82	2.38	4.05	8.95	2.63
Gift Tilapia				0.38	1.65
Etroplus			0.002		
Mrigal	5.49	2.55	10.91	9.77	1.20
Tilapia			0.003		
Labeo	6.06	12.2			
Cyprinus	0.02	0.97	3.87	1.58	7.30
Grass Carp					0.34
Total	20.5	21.16	22.71	26.05	14.15
7. National Fish Seed Farm, Polachira					
Spawn	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	106.75	69	93.5		
Rohu	18.75	13.05	52.5		
Mrigal	19	13	32.5		
Labeo	21.25	45	21.85		
Cyprinus	0.72	17.755	66.25		
Anabas					
Grass Carp	1.1	0.2	1		
H. Fossiles					
H. Bracky soura					
Other Fish					
Total	167.57	158	267.6		
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	14.775	11.6	17.73	17.18	8.4
Rohu	14.532	2.7	26.94	34.78	31.7
Mrigal	5.13	5.9	21.33	30.13	9.34
Labeo	12.52	31.4	0.08		
Cyprinus	0.58	5.8	19.42	24.54	8.82
Anabas				1.15	0.85
Grass Carp	1.57	0.04	1.02	0.11	1.22
H. Fossiles					0.05
H. Bracky soura					0.02
Other Fish				0.38	0.14
Total	49.112	57.44	86.52	108.27	60.54
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	5.91	4.62	7.09	6.87	3.35
Rohu	5.19	2.03	9.62	12.42	11.32
Mrigal	1.9	2.19	7.9	11.16	3.47
Labeo	6.26	15.7	0.04		
Cyprinus	0.29	2.9	9.71	12.27	4.41
Anabas				0.69	0.51
Grass Carp	0.45	0.01	0.29	0.03	0.35

H. Fossiles					0.05
H. Bracky soura					0.02
Other Fish				0.19	0.07
Total	20	27.43	34.65	43.63	23.55
8. Government Model Fish Farm, Pallom					
Spawn	2014-15	2015-16	2016-17	2017-18	2018-19
Catla		3.28	20		
Rohu		2.15	13		
Mrigal			42		
Labeo		9.34			
Etroplus		0.05	0.27		
Cyprinus		20.25	58		
Anabas					
Grass Carp					
Total		35.07	133.27		
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	2.775	1.15	4.48	10.27	2.05
Rohu	0.224	1.34	2.73	16.18	11.37
Mrigal			32.27	15.76	3.00
Labeo	14.1	6.84			
Etroplus		0.03	0.04	0.25	0.21
Cyprinus		14.1	18.16	8.22	6.02
Anabas					0.002
Grass Carp					0.14
Channa		0.04			
Tilapia		0.08			
Total	17.099	23.28	57.68	50.68	22.80
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	1.11	0.46	1.79	4.11	0.82
Rohu	0.08	0.48	9.75	5.78	4.059
Mrigal			11.95	5.84	1.11
Labeo	7.05	3.42			
Etroplus	0.17	0.03	0.04	0.18	0.15
Cyprinus		7.05	9.08	4.11	3.01
Anabas					0.001
Grass Carp					0.04
Channa		0.04			
Tilapia		0.04			
Total	8.41	11.52	32.61	20.02	9.18
9. Peechi Hatchery, Thrissur					
Spawn	2014-15	2015-16	2016-17	2017-18	2018-19
Catla			0.13		
Anabas			0.05		

Channa			0.07		
Total			0.25		
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla				2.45	22.3
Rohu				11.09	70.42
Mrigal			21.87	7.37	15.60
Gift Tilapia			0.22	1.32	4.80
Etroplus			0.12	0.01	0.30
Cyprinus			2.16	0.62	
Anabas			0.03		
Channa			0.06		
Seabas			0.07		
Common Carp					23.42
Other Fish				0.04	
Total			24.53	22.9	136.84
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla				0.98	8.88
Rohu				3.96	25.15
Mrigal			8.1	2.73	5.76
Gift Tilapia			0.2	0.79	2.88
Etroplus			0.12	0.01	0.21
Cyprinus			1.08	0.31	
Anabas			0.025		
Channa			0.051		
Seabas			0.005		
Common Carp					11.71
Other Fish				0.02	
Total			9.581	8.8	54.59
10. Regional Shrimp Hatchery, Azheekode					
Prawn	2014-15	2015-16	2016-17	2017-18	2018-19
Scampi	1.27	1.34	7.75	1.62	4.85
F.Indicus	36.48	18.92	29	5.18	0.13
P. Monodon	3.04	64.62	53.30	115.35	114.16
Fish Seed					
Etroplus	0.46	1.40	1.77	2.74	3.19
Tilapia			0.08	0.06	0.05
Seabas				0.03	0.04
Other Fish				0.28	0.24
Total	41.25	86.28	91.90	125.26	122.67
11. National Fish Seed Farm, Malampuzha					
Spawn	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	70	62.3	103.42		
Rohu	185	185.1	90.09		

Mrigal	122	126	131.05		
Labeo	40	13.52			
Cyprinus	25	33	47.98		
Tilapia		0.24			
Total	442	419.92	372.54		
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	30.35	23.6	39.18	45.35	27.45
Rohu	112.95	94.22	45.86	92.82	147.42
Mrigal	93.69	68.04	70.77	91.34	44.74
Labeo	5.38	6.76			
Cyprinus	19.8	16.5	47.98	7.26	23.82
Tilapia	1.28	0.12			
Grass Carp					0.88
Total	263.45	209.24	203.79	236.77	244.31
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla	12.14	9.44	15.67	18.14	10.98
Rohu	40.34	33.65	16.38	33.15	52.65
Mrigal	34.7	25.2	26.21	33.83	16.57
Labeo	2.69	3.38			
Cyprinus	9.9	8.25	23.99	3.63	11.91
Tilapia	0.64	0.06			
Grass Carp					0.25
Total	100.41	80	82.25	88.75	92.36
12. Seed Farm, Meenkara, Palakkad					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla		11.2	0.63	0.45	1.25
Rohu		2.02	2.66	19.94	34.9
Mrigal				6.534	23.35
Labeo					
Cyprinus		4.98			2.88
Total		18.2	3.29	26.924	62.37
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla		4.01	0.25	0.18	0.50
Rohu		1.01	0.95	7.12	12.47
Mrigal				2.42	8.65
Labeo					
Cyprinus		2.49			1.44
Total		7.51	1.2	19.26	23.07
13. Mangalam, Palakkad					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla			0.9		9.43
Rohu			3.4	5.32	23.88
Mrigal				6.59	29.9

Cyprinus			1.5		2
Total			5.9	11.91	65.21
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla			0.37		3.77
Rohu			1.22	1.9	8.53
Mrigal				2.44	11.08
Cyprinus			0.75		1
Total			2.34	4.34	24.38
14. Walayar, Palakkad					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla			2.80		8.85
Rohu				10.78	17.7
Mrigal			4.82	2.7	9.31
Cyprinus			2.47		2.5
Total			10.1	13.48	38.36
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla			1.12		3.54
Rohu				3.85	6.32
Mrigal			1.785	1	3.45
Cyprinus			1.235		1.25
Total			4.14	4.85	14.56
15. Chulliyar Hatchery, Palakkad					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					3.5
Rohu				3.39	11.34
Mrigal					32.6
Cyprinus					1.88
Total				3.39	49.32
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					1.40
Rohu				1.21	4.05
Mrigal					1.21
Cyprinus					0.94
Total				1.21	7.60
16. Kallanod fish Seed Farm, Kozhikkode					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					3.33
Rohu					5.49
Mrigal					3.38
Cyprinus					0.44
Grass Carp					1.4
Gift Tilapia					1.7
Total					15.74

Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					1.33
Rohu					1.96
Mrigal					1.25
Cyprinus					0.22
Grass Carp					0.4
Gift Tilapia					1.02
Total					6.18
17. Thalipuzha, Wayanad					
Fry	2014-15	2015-16	2016-17	2017-18	2018-19
Rohu					8.46
Mrigal					0.22
Cyprinus					10.76
Mahaseer					0.03
Total					19.47
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Rohu					3.02
Mrigal					
Cyprinus					
Mahaseer					
Total					3.02
18. Multi-species eco Hatchery, Ernakulam					
Finger lings	2014-15	2015-16	2016-17	2017-18	2018-19
Catla					2.04
Rohu					3.05
Mrigal					0.79
Cyprinus					2.71
Tilapia					0.01
H. Fossiles					0.01
Grass Carp					1.41
Total					10.00
19. Model Shrimp farm and Training centre, Poyya					
	2014-15	2015-16	2016-17	2017-18	2018-19
Scampi	1.71	1.21	0.89	1.11	11.45
F.Indicus	1.95		32.50		
P. Monodon	66.81	77.13	60.50	95.48	49.29
Seabas			0.03		
H.Fossiles					0.03
Other Fish	0.07	0.05	0.01	0.06	0.05
Total	70.54	78.39	93.93	96.65	60.82
20. Fish Farm Ayiramthengu, Kollam					
Etroplus		0.30	0.93	1.71	3.41

Tilapia		0.01	0.01		
Chanos				4.72	6.89
Mullet				0.33	0.03
Seabas			0.35	0.02	0.05
Other Fish				0.17	0.19
Total		0.31	1.29	6.94	10.57
21. Njarakkal Fish Farm,Ernakulam					
Etroplus					0.04
Total		4.89	10.2	6.46	0.04
22. Fish Farm, Edakochi,Ernakulam					
Etroplus					0.03
Total					0.03
23. Fish Farm, Kadappuram,Thrissur					
Etroplus					0.15
Total					0.15
24. Model Shrimp Farm,Poyya					
Etroplus		0.09	0.001	0.95	2.21
Chanos		4.8	10.2	5.15	1.00
Seabas				0.36	0.08
Total		4.89	10.2	6.46	3.28
25. Fish Farm, Eranjholi,Kannur					
Etroplus		0.07	1.02	0.06	0.20
Chanos		3.95	6.22	3.75	1.92
Other Fish				0.04	0.53
Total		4.02	7.24	3.85	2.65
26. Prawn Hatchery,Thirumullavaram					
	2014-15	2015-16	2016-17	2017-18	2018-19
Scampi	4.06				
F.Indicus	0.00				
P. Monodon	465.08	426.21	516.39	333.84	327.52
Other Fish	5.21	0.83	2.58	0.76	0
Total	474.35	427.04	518.97	334.60	327.52
27. Fresh water Prawn Hatchery, Kaipamangalam,Thrissur					
Scampi	2.67	3.40		4.00	11.65
F.Indicus	0	0.00		0.00	
P. Monodon	210.71	211.85	189.63	200.49	108.66
Total	213.38	215.25	189.63	204.49	120.31
28. Prawn Hatchery,Veliyamcode,Ponnani					
Scampi	0	2.77			
F.Indicus	80.45	0.00			
P. Monodon	0	54.81	110.76	77.58	21.98
Other Fish	0.15				0
Total	80.6	57.58	110.76	77.58	21.98

29. Prawn Hatchery, Mappila Bay, Kannur					
P. Monodon	159.63	266.10	97.45	109.50	75.66
Scampi					14.81
Total	159.63	266.10	97.45	109.50	90.47

1.11 WOMEN IN FISHERIES SECTOR

Fisheries sector is very important in the state of Kerala and it is estimated that 368672 fisherwomen are engaged in various activities, viz., post harvest handling, preservation, processing, and marketing of seafood products, and provide an integral link between producers and consumers. They have also proved their ability of account keeping and planning of expenditure. Their involvement in the sector has impacted positively on the social status and economic power of fisher folk in general. Fish processing and marketing is considered as the vehicle for achieving empowerment of the women, in all spheres viz., social, cultural, political and economic. Much of India's national food security rests on the shoulders of its fisherwomen. The male, female ratio was found to be 1:1.128. The family members in total are involved in the fishery related activities. Because of this their educational progress is not up to the expected mark. Since they are educationally backward empowerment of the section of the population is progressing on a slow pace.

Fisherwomen marketed a total of 38 fish species. Most popular fish species handled among all the occupational groups of fisherwomen were sardine, mackerel, prawn, anchovies, and tuna etc. Generally, fish retailers and fish vendors marketed low value fishes.

Income generating activities of fisherwomen: Marketing of fresh fish, dry fish, value added fish products like pickle, fish curry, and fish cutlet, fish powder, and fish roast, packed dry fish and prawn masala etc. contributed to the major income generating activities of fisherwomen.'

AQUATIC BIORESOURCES OF KERALA

The south west coast of India is one of the hotspots of biodiversity due to richness of faunal and floral species. Tropical marine ecosystem of Kerala coast includes lagoons, mangrove swamps, sandy and rocky shores and open sea front. The important components of biodiversity along the Kerala coast are coastal fisheries, mud bank ecosystems, productive rocky bottoms, mussel beds, and traditional coastal mariculture area. A consolidated checklist of most of the bio-resources have been prepared under various categories incorporating details of more than 3900 species including Aquatic flora, Mangrove Ecosystem, Marine Ecosystem, Inland Ecosystem, Subterranean bio-resource, Alien bio-resource



Inland aquatic floral resources of Kerala waters consist of more than 608 species and they belong to Green algae (16 species), ferns and allied species (18 species) and flowering plants (574 species). The IUCN status for these species : critically endangered 12; Endangered 21; Vulnerable 21; Nearly threatened 8; Least concern 517 and data deficient 29.

2.1 AQUATIC FLORA

2.1.1 MARINE FLORA

Marine flora consists of micro and macro algae and sea grasses. Seaweeds are the marine macro algae under divisions, namely, Brown Algae (Phaeophyta), Red Algae (Rhodophyta) and Green Algae (Chlorophyta). Sea weeds are a good source of nutrients and are used as fertilizer for agricultural purposes. Seaweeds contain plenty of minerals also. The therapeutic applications of seaweeds cover a wide range where these are used for the purposes of treatment. This ecosystem provides massive infrastructure for many associated faunal communities.



Seaweeds are considered as a good source of food fiber, protein and minerals for human consumption. Mineral content of several edible brown (*Fucus vesiculosus*,

Laminaria digitata, *Undaria pinnatifida*) and red (*Chondrus crispus*, *Porphyra tenera*) algae was determined. Edible brown and red seaweeds could be used as a food supplement to fulfill the daily recommended intake of some essential minerals and trace elements. A total of 14 species of seagrasses are reported in Indian waters. Ecological contribution of this resource towards niche maintenance is remarkable. It provides the basic strata for many organisms for breeding and rearing of larvae. A total of 1059 species of animals belonging to 18 groups were reported from the seagrass ecosystems in the Indian seas which harbor 5.18 per cent of India's marine fauna. **From Kerala region 12 species of seagrasses have been reported and among them most important ones are : *Thalassia hemprichii*, *Halphila ovalis*, *H. decipiens*, *Cymodocea serrulata*.** The most abundant species found in the sea grass bed were *Hemirhamphus far*, *Lutjanus lutjanus*, *L. malabariucs*, *Sardinella gibbosa*, *Parupeneus indicus*, *Siganus canalicualtus* and large number of crustaceans and mollusks. . A total of 480 species of phytoplankton, 120 species of sea weeds and 12 species of sea grasses have been reported from Kerala waters. The present report details 92 species of sea weeds/ sea grass/ algae/ phytoplankton in marine, 161 in inland and 4 alien species from Kerala waters. A checklist of 42 species of economically important sea weeds of Kerala are given in Annexure 1. A checklist of 104 marine floral species of Kerala is given in Annexure 2

2.1.2 INLAND AQUATIC FLORA

Inland aquatic floral resources of Kerala waters consist of more than 608 species and they belong to Green algae (16 species), ferns and allied species (18 species) and flowering plants (574 species). The IUCN status for these species is : critically endangered 12; Endangered 21; Vulnerable 21; Nearly threatened 8; Least concern 517 and data deficient 29. A checklist of 121 species of tradable/ commercially potential value is given in Annexure 3.

2.1.3 RIPARIAN VEGETATION

Riparian vegetation is important bio-resources on the banks of water bodies with rooted plants. They are playing pivotal role in the protection of banks, absorbing excess nutrients from water bodies and terrestrial sources, cleaning water, allowing aquifers to refill water so as to enrich groundwater system, affording invisible strong environmental support for the sustenance of faunal component and so on. Mangrove forests stabilize the coastline, reducing erosion from storm surges, currents, waves, and tides. The intricate root system of mangroves also makes these forests attractive to fish and other organisms seeking food and shelter from predators. The state of Kerala has rich bio-resource of mangroves. These areas are the nursery grounds of many species of aquatic organisms and hence are integral part in saline areas and hence the importance.

The mangrove forests of Kerala can be seen predominantly on districts, namely, Kannur, Kozhikode, Ernakulam, Allepey and Quilon. Kannur is having the largest cover of 80% of total mangrove forests and can be divided into four ranges: Kasargod, Taliparamba, Kottiyur and Kanhangad.

Kasargod range has a cover of 56.6 ha and dominated by species, viz., *Avicennia officinalis*, *Avicennia marina*, *Kandelia candel*, *Excoecaria gallocha* and *Rhizophora apiculata*. Taliparamba range has dominant species - *Sonneratia alba*, *Avicennia officinalis*, *Avicennia marina*, *Rhizophora apiculata*, *Myriostachya wightiana*, *Bruguiera parviflora*, *Acanthus ilicifolius* and *Excoecaria gallocha* and *Kandelia candel*. Kottiyur is with a dense population of *Avicennia officinalis*, *Avicennia marina*, *Sonneratia alba* and *Rhizophora apiculata*. Kanhangad range is with dominant species, such as, *Avicennia officinalis*, *Avicennia marina*, *Rhizophora apiculata* and *Acanthus ilicifolius*. At Kozhikkode mangrove dominance is reported at Kadalundi where *Avicennia marina*, *Acrostichum aureum* and *Kandelia candel* plants dominated. Pithuvypin, Mangalvanam Bird Sanctuary and Kundannur – Kumbalam area are the places where mangroves exist.

Luxuriant mangrove vegetation is reported on the banks of Vembanad Lake where *Avicennia marina* and *A. officinalis* predominate. The density of the mangrove patch is

around 0 to 10 %. Adventure Park Ashramam (Ashtamudi lake area), Mandroruth islands and Kumbalam area are the places where mangroves exist at Quilon District. According to the present classification, Kerala has a mangrove cover of 6.63 km² contributed by five mangrove communities – *Rhizophora apiculata*, *Kandelia candel*, *Excoecariaa gallocha*, *Acrostichum aureum* and mixed population (assemblage of *Avicennia officinalis*, *A. marina*, *Rhizophora mucronata*, *R. apiculata*, *Sonneratia caseolaris*, *S. alba*, *Aegiceras corniculatum* and *Excoecariaa gallocha*). A list of 375 species is given in Annexure 4, while a list of mangrove bioresources with economic importance is given in Annexure 5.

2.2 MARINE BIORESOURCES

SPONGES

Marine bioactive compounds are produced by microbes, sponges, gorgonids, soft and hard corals, sea weeds and other marine organisms. These products are currently used in industry for synthesis of new drugs and chemicals. Sponges have medicinal potential due to the presence in sponges themselves or their microbial symbionts of chemicals that may be used to control viruses, bacteria, tumors and fungi and about 34 spp. are reported from Kerala and is given in Annexure 6. About 200 species of corals have been reported from marine waters of Kerala and nearby states and are included under Wild Life Protection Act (WLPA) 1972. A checklist of 74 species is given in Annexure 7. Cnidaria containing over 11,000 species of aquatic animals found both in freshwater and marine environments, predominantly the latter and about 29 species have been reported from Kerala in marine and 6 in mangrove ecosystem.

Polychaetes

Polychaetes are multi-segmented worms living in all environments in the world's oceans, present from abyssal depths to shallow estuaries and rocky shores, and even free swimming in open water and 64 species have been reported in the present study.



CRUSTACEANS

From Kerala 348 species of advanced crustaceans have been reported which includes prawns and shrimps (84 species), coastal crabs (marine and inland 182), anomuran crabs (73), lobsters (9). In crustaceans 48 species in mangrove, 377 in marine and 88 in Inland/ estuarine , 3 in subterranean and 1 alien species are reported in the present study. A checklist of 27 species excluding prawns, shrimps, crabs, anomurans and lobsters are given in Annexure 8.

From Kerala prawns and shrimps (84 species), coastal crabs (182), anomuran crabs (73), lobsters (9) are included. Prawns and shrimps are highly economically important group of crustaceans. Their export value is enormous. Hence it contributes a major share in the economy of the State.

Checklist of 84 species of Prawns and shrimps of marine ecosystem and of economic importance is given in Annexure 9. Anomura (sometimes Anomala) is a group of decapods crustaceans,

including hermit crabs and other organisms. There are a good number of species of this group are commercially important, namely, *Eumunida*, *Muniopsis*, *Blepharipoda* and so on. A very large variety of smaller species contribute to the size, complexity and functioning of tropical ecosystems. Anomuran crabs exhibit peculiar body morphology because of its dwelling habits. A list of 182 species of importance is given in Annexure 10 and 11 species of lobster in Annexure 11. Molluscs are another important group of marine bio-resources of Kerala. Reports indicate that 730 species of mollusks are reported from Kerala A list of 169 species of economic importance is given in Annexure 12.



ECHINODERMS

Echinoderms are poisonous animals. Novel secondary metabolites including terpenes, acetogenins, alkaloids and polyphenolics are produced by a wide variety of marine organisms with some of these compounds differing fundamentally from terrestrial secondary metabolites. The majority of studies that have addressed the bioactivity of echinoderm metabolites have screened compounds and crude extracts for their antibacterial, antifungal, antiviral, anti-inflammatory and antitumour activity. Hence these bio-resources are economically important. Echinoderm fauna of Kerala coast consists of 60 species belonging to starfish, brittlestar, sea urchins and sea cucumbers. Holothurians (or sea cucumbers) are included as Schedule I under Wild Life (Protection) Act (1972). Holothurians (or sea cucumbers) are included as Schedule I under Wild Life (Protection) Act (1972).

ICTHYOFAUNA

The marine fish diversity of Kerala is reported to be around 1020 species of marine fin fishes. A checklist of 725 species of tradable/ commercially potential ichthyofaunal resources is give in Annexure 13. Reptilian bio-resources include five species of turtles and five species of snakes. Marine bird fauna is vast. A total of 223 species of birds were recorded from the coastal wetlands of India, belonging to 30 families under 9 orders. Marine mammals are categorized under schedule of Wild Life Protection Act 1972 and the report includes 26 species.



According to the decadal trend analysis by Central marine fisheries research institute cat fishes, Unicorn cods were under declined category, white fish, sharks, rays are in the

declining category and threadfin, ribbon fish, mullets and sardine in less abundant category. Three Crocodiles and five marine Turtles listed under the Schedule I of Wildlife (Protection) Act, 1972. They are *Crocodylus porosus*, *Crocodylus palustris*, *Gravialis gangeticus*, *Dermochely scoriacea*, *Caretta caretta*, *Lepidochelys olivacea*, *Eretmochelys imbricata* and *Chelonia mydas*. Seahorse belongs to the family Syngnathidae, which includes pipe fishes and sea dragonets. They have peculiar biological characteristics such as spouse distribution, narrow habitat ranges and lengthy parental care makes these vulnerable to exploitation. Sea horse is under Schedule I of Wild life (Protection) Act, 1972.

A recent report from CMFRI funded by KSBB has recorded that IUCN Red List Assessment of 975 species occurring in Kerala showed that 20 species are in the Critically Endangered, 53 in the Endangered, 47 in the Vulnerable, 37 in the Near Threatened, 59 Data Deficient, 198 Not Evaluated and 561 under Least Concerned categories. A total of 10 marine species out of 20 are included in Critically Endangered (CR) category and include two species of grey sharks, one species of hammer-headed shark, three species of rays, two species of guitar fishes and two species of sawfishes. Among these *Carcharhinus hemiodon*, *Rhynchobatus djiddensis*, *Pristis microdon* and *Pristis zijsron* are also included in the Wildlife (Protection) Act 1972. A total of 53 species of fishes are included in the Endangered (EN) category includes 10 species of sharks, 6 species of rays, 7 species of catfishes, 28 species of fresh-water fishes and eel and pearl spot one each. Shark species include huge species such as Whale shark, Mako shark, Thresher shark, Grey shark, Hammer head shark and ray species include the great eagle rays of the species *Mobula*. A total of 47 species included in the Vulnerable (VU) category which includes sharks, stingrays, catfish and fresh-water species. It includes bigger sharks such as *Nebrius ferrugineus*, *Alopias superciliosus*, *Alopias vulpinus*, *Carcharhinus falciformis* and rays such as *Manta birostris* and *Rhinoptera javanica*.

All the marine mammals are protected under the Indian Wild life (Protection) Act, 1972. The IUCN has classified seven species as endangered and nine species as vulnerable. CITES listed holothurians in the Appendix II or III to control trade of these organisms. All the sea cucumbers are under the Wild Life (Protection) Act, 1972- Schedule I. Coral diversity and distribution occur along the Vizhinjam, Thagassery, Thirumullavaram and Enayam of Kerala coast. Among these *Montipora aequituberculata* categorized as dominant, *Acropora efflorescence*, *Pocillopora verrucosa*, *P. damicornis* and *P. meandrina* belong to common category. Coral species are included in the Schedule I of the Indian Wild life (Protection) Act, 1972. Protected Corals as per the Indian Wildlife (Protection)

Act, 1972 Schedule are Reef building corals (Scleractinians), Black Corals (Antipatharians), Organ Pipe Corals (Tubiporamusica) and Fire corals (Millipora spp.).

Table 2.1 Marine fishes belonging to IUCN category reported from Kerala

No	IUCN	Category	Number of fish species
1	CR –	Critically Endangered	20
2	EN-	Endangered	53
3	VU-	Vulnerable	47
4	NT-	Near Threatened	37
5	DD-	Data Deficient	59
6	NE-	Not Evaluated	198
7	LC	Least concern	561

(CMFRI, 2022)

2.2 MANGROVE

Zooplankton plays an important role in the food chain of aquatic systems. In mangrove area also zooplankton is important for the breeding fishes which harbor in this area. Limited studies are available on the zooplankton assemblage of zooplankton. 53 species have been described of which some such as Mesocyclos, Paraclanus are important as live feed culture. Crustaceans, benthic organisms support considerably fishery in the state. Into the mangrove area both marine and freshwater organisms migrate for breeding purpose. 48 species are economically important (Annexure 14). Gastropods occupy a central role in maintaining the functioning and productivity of mangroves through cleaning process of root systems from the encrusting fauna like barnacles. Bivalves in mangroves are highly zoned, typically occupying the upper half of the eulittoral and dominating the supra littoral fringe. They grow best in the soft mud. There are reports

that about 305 molluscs have been recorded from mangrove area. Among molluscan bioresources a total of 22 species (Annexure 15), and echinoderms about 33 species have economic importance (Annexure 16). Mangroves are the breeding grounds for a large number of fin fishes. Fishes migrate into the mangroves both from marine and freshwater regions. Larvae spend considerable time in mangrove areas and migrate back to the place from where they have come. Fishes support good fishery and adds to the socio-economic status of the people who depend on this ecosystem. A consolidated checklist of 118 species is presented in Annexure 17

2.3 INLAND AQUATIC BIORESOURCE

As part of the Rebuild Kerala Initiatives efforts are on to consolidate the biodiversity of flora and fauna of inland aquatic systems of Kerala and to identify major threats to fresh water ecosystem and strategies to address them. For this purpose consolidated checklists of flora and fauna in the following categories were prepared

1	Inland aquatic flora and Zooplankton		Ephemeroptera (may flies)
2	Protista	9	Crustacea – Prawns, Shrimps, Crabs
3	Sponge bio-resources	10	Mollusca
4	Gastrotricha	11	Fishes
5	Bryozoa	12	Amphibians
6	Rotifera	13	Reptiles
7	Annelida	14	Birds
8	Insecta - Hemiptera (bugs), Coleoptera (beetles), Trichoptera (caddis flies) Plecoptera (stone flies),	15	Mammals

A checklist of 152 aquatic flora and 9 zooplankton of economic importance is given in Annexure 18.

Several major taxonomic groups of protozoa, viz; flagellates, amoebae, actinopods and ciliates occur in biological sewage treatment plants. Their role in water purification

systems is very significant. Protozoa also play a vital role in controlling bacterial population and biomass. Thirty nine protozoan bioresources, 13 inland sponge are reported in the study. Nearly 23 species of gastrotrich have been described and as they inhabit in periphyton sedimentation, it is very important for aquaculture and hence have special importance in the consolidated checklists (Annexure 19).

The Phylum Ectoprocta, or Bryozoa, is primarily a marine group with over 8000 recognized species. This group has a rich fossil record. Freshwater bryozoans are comparatively less. Freshwater bryozoans are an important part of the benthic community in lakes, ponds, and rivers worldwide. They filter suspended particles from the water, and their fecal pellets provide nourishment for a wide variety of scavengers. Bryozoans are also significant biofouling organisms that often interfere with the function of irrigation, water treatment, and industrial cooling systems. Hence they are both beneficial and damaging group of organisms. The present report has listed 45 species .

Rotifers (*Brachionus* spp.) are extensively used as first feed in marine larviculture. They are quite small (50 μm –2 mm), slow swimming, and are relatively easy to culture. Hence they are economically important and 56 species are listed in Annexure 20.

Annelids are segmented worms with a tubular body and a specialized digestive system with a terminal mouth and anus. Their body cavity has thin transverse septa that delineate the segments. They generally reproduce sexually by cross-fertilization and are often hermaphroditic, but many also reproduce asexually by budding. The freshwater annelids include the oligochaetes, the leeches, and several other less diverse groups.

Some oligochaetes, such as *Tubifex*, are highly resistant to low dissolved oxygen concentrations and high levels of organic pollution. Thus, they indicate polluted waters and can be components of biotic indices to assess ecosystem health. Oligochaetes can also be vectors for important parasites such as whirling disease. Leeches (Hirudinea) are mostly predators that feed on midge larvae, amphipods, oligochaetes, and mollusks, but some are parasites that feed on the blood of vertebrates, including humans. Species of

leeches that use blood are being investigated for the pharmacological value of the anticoagulants used during feeding. They are used medically as a good option for removing congealed blood around a wound. Members of one annelid order, the Branchiobdellida are exclusively commensals and parasites of crustaceans, particularly crayfish. Hence they are interesting group of aquatic organisms and 107 species are listed.

Aquatic insects play very important role in the nutrient cycle in inland waters and hence are significant to ecosystem function and are very good indicators of human impact on the ecosystem. Aquatic insects are particularly suited for use in environmental impact assessment (EIA). From the reports it can be seen that about 5,000 species of aquatic insects are estimated to inhabit inland wetlands of India, represented predominantly by Hemiptera (bugs), Coleoptera (beetles), Ephemeroptera (mayflies), Plecoptera (stone flies), Odonata (dragonflies) and Trichoptera (caddiesflies). 41 species of aquatic hemipteran, 17 species of coleopteran, 38 species of Trichoptera, 9 species of Plecoptera, 8 species of Ephemeroptera (Mayflies) are listed.

Crustacean resources form an important group of organisms providing food and nutrition. Copepods, Prawns, shrimps, crabs constitute the major groups and all of them are economically important. 33 species of inland prawns, 19 species of shrimps, 36 species of crabs are listed as economically important in Annexure 21, 22 and 23.

The total diversity of molluscs recorded from India is around 5,180 species. It is estimated that 5,100 species of molluscs have been recorded from freshwater (22 families, 53 genera 183 species), land (26 families, 140 genera and 1,487 species) and marine habitats (242 families 591 genera, 3,400 species) of India. In the present report 27 species of mollusks are reported from Kerala.

The report also describes fishes Estuarine and Freshwater fish diversity. Estuarine fishes include strictly estuarine, migratory ones from sea and freshwaters. The fishes are highly

tolerant to salinity. There is a great demand for this group of fishes and a checklist of 151 species are provided in Annexure 24.

A consolidated list of fishes from 44 rivers, reservoirs, ponds, and inland swampy areas are presented in the checklist Annexure 25. These fishes come under the families, namely, Notopteridae, Anguillidae, Ophichthidae, Clupeidae, Cyprinidae, Cobitidae, Balitoridae, Nemacheilidae, Bagridae, Horabagridae, Claridae, Heteropneustidae, Schilbeidae, Siluridae, Aplocheilidae, Sisoridae, Belonidae, Adriarichthyidae, Hemirhamphidae, Synbranchidae, Anabantidae, Belonidae, Mastacembelidae, Ambassidae, Channidae, Nandidae, Osphronemidae, Badidae, Priostolepidae, Synbranchidae, Cichlidae, Eleotridae and Tetraodontidae. Number varies from 191 to 212 species because of some taxonomic confusion.

Aquatic amphibian fauna deserves special consideration because this group faces serious threats of destruction and their small population size. Frogs are valued as food by humans and also have many cultural roles in literature, symbolism and religion. Their decline in nature is usually considers as an index for environmental degradation. It is reported that the alkaloid epibatidine, a painkiller 200 times more potent than morphine, is made by some species of poison dart frogs. Other chemicals isolated from the skins of frogs may offer resistance to HIV infection. Dart poisons are under active investigation for their potential as therapeutic drugs. Frogs (55 species) is listed. Caecilians are limbless, vermiform or serpentine blind amphibians and protected in India by wildlife protection act. They mostly live hidden in the ground and in stream substrates. 11 species of reptiles, and birds 103 species of birds and aquatic mammals 3 species are described. Subterranean bioresources includes 16 species. Alien/invasive flora and faunal bio-resources recorded from the water bodies along southern Western Ghats and marine regions of Kerala are presented in Annexure 26.

Table 2.2 : Bio-resources of various aquatic ecosystems included in the report

Bio-resources	Aquatic flora	Mangrove	Marine	Inland & Estuarine	Subterranean	Alien species
Sea weeds/ sea grass/ algae/ phytoplankton	46		92	161		4
Inland floral resource	16					
Riparian vegetation	372					
Typical mangrove plants		20				
Associated plants		37				
Protista		63		39		
Zooplankton		53				2 (ascidian)
Sponges			34	13		
Corals			74			
Cnidaria		6	29			1
Gastrotricha				23		
Bryozoa				45		2
Rotifera				56		
Nematoda		53				
Annelida		36	64	107		
Crustacea		48	377	88	3	1
Insecta		76		113		
Mollusca		22	169	27		2
Echinodermata		33	60			
Ichthyofauna		118	718	151	11	
Fresh water fish				121		28
Frogs & Toads		14		71		
Herpetofauna/ reptiles		47	10	11		
Avi fauna		161	31	103		
Mammals		23	26	3		
Total	434	810	1,684	1,132	14	40

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TRADABLE BIO-RESOURCES OF AQUATIC ECOSYSTEM OF KERALA

3.1 TRADABLE BIO-RESOURCES

Aquatic ecosystem possesses rich biodiversity of economically useful plant and animal resources, many of which are used as food, nutraceuticals or for extraction of bioactive compounds. High value secondary bioactive metabolites from the marine organisms are having potential applications in pharmaceutical fields, Various bio-potential components have been isolated, identified and characterized from different marine organisms, such as mollusks, bryozoans, sponges, tunicates, corals, algae, microorganisms, echinoderms, cnidarians etc. Fisheries sector is very vital in the economy of Kerala as it is a major source of protein in food, provides substantial employment opportunity and also contributes significantly to the export market. Some of the important bioresources in Marine and Inland aquatic ecosystems involved in trade or have potential commercial use are presented in Annexures 5 to 25. The species landed in Kerala coast during the last 10 years is given in Annexure 27. Some resources are commercially traded in large quantities and more than 185 bio-resources (crustaceans – 39 species; mollusks – 16; fishes – 100; sponges – 12; ascidians -1; sea weeds – 18) with proven commercial value is given in Table 3.1. Some are coming under protected species group, but they are also included because of its bio-active contents.

Table3.1: Tradable bio-resources of aquatic ecosystem of Kerala

Sl.No	Scientific name	Common name	Trade information
	Crustaceans		
1	<i>Penaeus indicus</i> H. Milne Edwards, 1837	Indian prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
2	<i>Penaeus monodon</i> Fabricius, 1798	Tiger prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
3	<i>Penaeus semisulcatus</i> (de Haan, 1844)	Green Tiger Prawn	Used as food, processing, wealth from waste, Production of chitin,

			domestic & export markets
4	<i>Penaeus japonicus</i> (Bate, 1888)	Kuruma prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
5	<i>Melicertus canaliculatus</i> (Olivier, 1811)	Local Witch prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
6	<i>Metapenaeus dobsoni</i> (Miers, 1878)	Kadal shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
7	<i>Metapenaeus affinis</i> (Milne-Edwards, 1837)	Jinga Prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
8	<i>Metapenaeus monoceros</i> (Fabricius, 1798)	Brown/Speckled Shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
9	<i>Parapenaeopsis stylifera</i> (Milne-Edwards, 1837)	Kiddi Prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
10	<i>Litopenaeus vannamei</i> (Boone, 1931)	White leg prawn, Vannamei prawn	Used as food, chitin, aquaculture, domestic and export market, alien species
11	<i>Heterocarpus woodmasoni</i> Alcock, 1901	Indian Nylon Shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
12	<i>Heterocarpus gibbosus</i> (Spence Bate, 1888)	Tomato shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
13	<i>Parapandalus spinipes</i> (Bate, 1888)		Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
14	<i>Plesionika ensis</i> (Milne-Edwards, 1881)	Gladiator striped shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
15	<i>Aristeus alcocki</i> Ramadan, 1938	Arabian red shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
16	<i>Exhippolysmata ensirostris</i> (Kemp, 1914)	Hunter shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
17	<i>Solenocera hextii</i> (Wood-Mason & Alcock, 1891)	Deep-sea mud shrimp	Used as food, processing, wealth from waste, Production of chitin,

			domestic & export markets
18	<i>Solenocera crassicornis</i> (Milne-Edwards, 1837)	Coastal mud shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
19	<i>Solenocera choprai</i> Nataraj, 1945	Ridgeback shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
20	<i>Acetes indicus</i> Milne-Edwards, 1830	Jawla paste shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
21	<i>Acetes erythraeus</i> Nobili, 1905	Tsivakihini paste shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
22	<i>Acetes johni</i> Nataraj, 1947	Paste shrimp	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
23	<i>Macrobrachium idella</i> (Hilgendorf, 1898)	Slender river prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
24	<i>Macrobrachium rosenbergii</i> (de Man, 1879)	Giant freshwater prawn	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
26	<i>Portunus pelagicus</i> (Linnaeus, 1758)	Flower crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
27	<i>Portunus sanguinolentus</i> (Herbst, 1783)	Three spot swimming crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
28	<i>Scylla serrata</i> (Forskål, 1775)	Mud crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
29	<i>Scylla tranquebarica</i> (Fabricius, 1798)	Mangrove crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
30	<i>Scylla olivacea</i> (Herbst, 1796)	Orange mud crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
31	<i>Charybdis feriata</i> (Linnaeus, 1758)	Crucifix crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
31	<i>Charybdis smithii</i> (Fabricius, 1798)	Indian ocean swimming crab	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets

32	<i>Charybdis lucifera</i> (Fabricius,1798)	Yellowish brown crab	Used a food, processing, wealth from waste, Production of chitin, domestic & export markets
33	<i>Charybdis natator</i> (Herbst, 1789)	Ridged swimming crab	Used for food, processing, wealth from waste, Production of chitin, domestic & export markets
34	<i>Thenus unimaculatus</i> Burton & Davie, 2007		Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
35	<i>Panulirus homarus</i> (Linnaeus, 1758)	Scalloped Spiny Lobster	Used a food, processing, wealth from waste, Production of chitin, domestic & export markets
36	<i>Panulirus ornatus</i> (Fabricius,1798)	Ornate Rock Lobster	Used a food, processing, wealth from waste, Production of chitin, domestic & export markets
37	<i>Panulirus polyphagus</i> (Herbst,1793)	Spiny Lobster	Used a food, processing, wealth from waste, Production of chitin, domestic & export markets
38	<i>Panulirus versicolor</i> (Latreille,1804)	Painted Rock Lobster	Used a food, processing, wealth from waste, Production of chitin, domestic & export markets
39	<i>Puerulus sewelli</i> Ramadan, 1938	Arabian whip lobster	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
40	<i>Nephropsis stewarti</i> Wood-Mason, 1872	Indian Ocean lobsterette	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
	Molluscs		
41	<i>Lamellidens marginalis</i> (Lamark, 1819)	Freshwater mussel	Pearl production, domestic and export markets
42	<i>Saccostrea cucullata</i> (Born, 1778)	Hooded oyster	Used as food, processing, wealth from waste, lime production, domestic & export markets
43	<i>Crassostrea madrasensis</i> (Preston, 1916)	Indian Backwater oyster	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
44	<i>Meretrix casta</i> (Gmelin, 1791)	Backwater hard clam	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
45	<i>Meretrix meretrix</i> (Linnaeus, 1758)	Asiatic hard clam	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
46	<i>Perna perna</i> (Linnaeus, 1758)	Brown mussel	Used as food, processing, wealth

			from waste, Production of lime, domestic & export markets
47	<i>Perna viridis</i> (Linnaeus,1758)	Asian Green Mussel	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
48	<i>Pinctada margaritifera</i> (Linnaeus 1758)	Black-lip pearl oyster	Ornamental purpose, domestic & export markets
49	<i>Paphia malabarica</i> (Dillwyn,1817)	Short neck clam	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
50	<i>Villorita cyprinoides</i> (Gray, 1825)	black clam	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
51	<i>Sepia aculeata</i> (Van Hasselt,1835)	Needle Cuttle fish	Used as food, processing, wealth from waste, Production of chitin, domestic & export markets
52	<i>Sepia pharaonis</i> (Ehrenberg,1831)	Pharaoh cuttlefish	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
53	<i>Sepilla inermis</i> (Van Hasselt,1835)	Spineless cuttlefish	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
54	<i>Uroteuthis duvaucii</i> (d'orbigny,1835)	Indian Squid	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
55	<i>Octopus vulgaris</i> (Cuvier,1797)	Common octopus	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
56	<i>Cistopus incidus</i> (Raap,1835)	Pouched Octopus	Used as food, processing, wealth from waste, Production of lime, domestic & export markets
	Fishes		
58	<i>Chiloscyllium indicum</i> (Gmelin, 1789)	Slender Bamboo Shark	Used as food
59	<i>Alopias pelagicus</i> (Nakamura, 1935)	Pelagic Thresher Shark (Whiptail Shark)	Used as food
60	<i>Alopias vulpinus</i> (Bonnaterre, 1788)	Common Thresher (Thresher	Used as food
61	<i>Carcharhinus dussumieri</i> (Müller & Henle, 1839)	Whitecheek Shark	Used as food
62	<i>Carcharhinus limbatus</i> (Müller &	Blacktip Shark	Used as food

	Henle, 1839)		
63	<i>Rhizoprionodon acutus</i> (Rüppell, 1837)	Milk Shark	Used as food
64	<i>Scoliodon laticaudus</i> (Müller & Henle, 1838)	Spadenose Shark	Used as food
65	<i>Sphyrna zygaena</i> (Linnaeus, 1758)	Smooth hammer head	Used as food
66	<i>Pristis microdon</i> (Latham, 1794)	Large-tooth Sawfish	Used as food
67	<i>Himantura bleekeri</i> (Blyth, 1860)	Bleeker's Whip Ray	Used as food
68	<i>Himantura uarnak</i> (Gmelin, 1789)	Honeycomb Stingray	Used as food
69	<i>Hippocampus kuda</i> (Leach, 1814)	Spotted Seahorse (Yellow Seahorse)	Used as ornamental purposes
70	<i>Hippocampus trimaculatus</i> (Hamilton, 1822)	Longnose Seahorse (Three-spot Seahorse)	Used as ornamental purposes
71	<i>Rachycentron canadum</i> (Linnaeus, 1758)	Cobia (King Fish)	Used as food, aquaculture, processing plants, domestic and export market
72	<i>Parastromateus niger</i> (Lacepède, 1801)	Black Pomfret	Used as food, processing plants, domestic and export market
73	<i>Scomberoides commersonianus</i> (Forsskål, 1775)	Talang Queenfish	Used as food, processing plants, domestic and export market
74	<i>Scomberoides lysan</i> (Cuvier, 1832)	Double-Spotted Queenfish	Used as food, processing plants, domestic and export market
75	<i>Coryphaena hippurus</i> (Bloch & Schneider, 1801)	Common Dolphin fish	Used as food, processing plants, domestic and export market
76	<i>Lutjanus malabaricus</i> (Bloch, 1790)	Malabar Blood Snapper	Used as food, processing plants, domestic and export market
77	<i>Nemipterus japonicus</i> (Bleeker, 1853)	Japanese Threadfin Bream	Used as food, processing plants, domestic and export market
78	<i>Johnius dussumieri</i> (Mohan, 1976)	Sin Croaker	Used as food, processing plants, domestic and export market
79	<i>Mugil cephalus</i> (Bleeker, 1853)	Flathead Mullet	Used as food, processing plants, domestic and export market
80	<i>Siganus javus</i> (Valenciennes, 1835)	Streaked Spinefoot	Used as food, processing plants, domestic and export market

81	<i>Lepturacanthus savala</i> (Klunzinger, 1884)	Savalai Hairtail	Used as food, processing plants, domestic and export market
82	<i>Trichiurus lepturus</i> (Cuvier, 1832)	Large head Hairtail	Used as food, processing plants, domestic and export market
83	<i>Auxis rochei</i> (Lacepède, 1800)	Bullet Tuna	Used as food, processing plants, domestic and export market
84	<i>Auxis thazard</i> (Cantor 1849)	Frigate Tuna (Frigate Tuna)	Used as food, processing plants, domestic and export market
85	<i>Euthynnus affinis</i> (Rüppell 1836)	Kawakawa (Mackerel Tuna)	Used as food, processing plants, domestic and export market
86	<i>Katsuwonus pelamis</i> (Cuvier, 1816)	Skipjack Tuna (Skiy Jack)	Used as food, processing plants, domestic and export market
87	<i>Rastrelliger kanagurta</i> (Temminck & Schlegel, 1844)	Indian Mackerel	Used as food, processing plants, domestic and export market
88	<i>Scomberomorus commerson</i> (Bloch & Schneider, 1801)	Narrow-Barred Spanish Mackerel (King Seer)	Used as food, processing plants, domestic and export market
89	<i>Scomberomorus guttatus</i> (Kishinouye, 1915)	Indo-Pacific King Mackerel (Spotted Spanish Mackerel)	Used as food, processing plants, domestic and export market
90	<i>Scomberomorus lineolatus</i> (Bonnaterre, 1788)	Streaked Seer	Used as food, processing plants, domestic and export market
91	<i>Istiompax indica</i>	Black Marlin	Used as food, processing plants, domestic and export market
92	<i>Thunnus albacares</i> Bleeker, 1851	Yellow Fin Tuna	Used as food, processing plants, domestic and export market
93	<i>Thunnus tonggol</i> (Bleeker, 1851)	Longtail Tuna (Longtail Tuna)	Used as food, processing plants, domestic and export market
94	<i>Pampus argenteus</i> (Euphrasen, 1788)	Silver Pomfret	Used as food, processing plants, domestic and export market
95	<i>Pampus chinensis</i> (Günther, 1860)	Chinese Silver Pomfret	Used as food, processing plants, domestic and export market
96	<i>Parastromateus niger</i> (Bloch, 1795)		Used as food, processing plants, domestic and export market
97	<i>Cynoglossus puncticeps</i> (Day, 1877)	Speckled Tounge sole	Used as food, processing plants, domestic and export market
98	<i>Epinephelus malabaricus</i> (Bloch & Schneider, 1801)	Malabar Grouper	Used as food, processing plants, domestic and export market
99	<i>Sardinella longiceps</i>	Indian Oil	Used as food, processing plants,

	(Valenciennes, 1847)	Sardine	domestic and export market
100	<i>Chanos chanos</i> (Forsskal 1775)	Milk fish	Used as food, processing plants, domestic and export market
101	<i>Lates calcarifer</i> (Bloch 1790)	Barramundi	Used as food, processing plants, domestic and export market
102	<i>Epinephelus diacanthus</i> (Valenciennes 1828)	Spinycheek grouper	Used a food, processing plants, domestic and export market
103	<i>Epinephelus areolatus</i> (Forsskål 1775)	Areolate grouper	Used a food, processing plants, domestic and export market
104	<i>Lutjanus argentimaculatus</i> (Forsskål 1775)	Mangrove red snapper	Used a food, processing plants, domestic and export market
105	<i>Carinotetraodon travancoricus</i> (Hora & Nair, 1941)	Dwarf pufferfish	Ornamental purposes, domestic and export markets
106	<i>Dawkinsia arulius</i> (Jerdon, 1849)	Arulius barb	Ornamental purposes, domestic market
107	<i>Garra hughi</i> (Silas, 1955)	Cardamon garra	Ornamental purposes
108	<i>Hypselobarbus kurali</i> (Menon & Rema Devi, 1995)	Kooral	Ornamental and food purposes, domestic market
110	<i>Sahyadria denisonii</i> (Day 1865)	Denison barb	Ornamental purposes, domestic and export market
111	<i>Sahyadria chalakkudiensis</i> (Menon, Rema Devi & Thobias, 1999)	Chalak barb	Ornamental purposes, domestic market
112	<i>Batasio travancoria</i> (Hora & Law, 1941)	Travancore batasio	Ornamental purposes, domestic market
113	<i>Glyptothorax housei</i> (Herre, 1942)		Ornamental purposes, domestic market
114	<i>Mesonoemacheilus remadevii</i> (Shaji, 2002)	Devi's Loach	Ornamental purposes, domestic and export market
115	<i>Anguilla bengalensis</i> (Gray, 1831)	Indian mottled eel	Ornamental and food purposes, domestic market
116	<i>Barilius bakeri</i> (Day, 1865)		Ornamental purposes, domestic market
117	<i>Barilius gatensis</i> (Valenciennes, 1844)	River-carp baril	Ornamental purposes, domestic market
118	<i>Channa striata</i> (Bloch, 1793)	Striped snakehead	Ornamental and food purposes, aquaculture, processing, wealth from waste, domestic market
119	<i>Danio rerio</i> (Hamilton, 1822)	Zebra fish	Ornamental purposes, domestic market
120	<i>Dawkinsia filamentosus</i> (Valenciennes, 1844)	filament barb	Ornamental purposes, food fish, domestic market

121	<i>Devario malabaricus</i> (Jerdon, 1849)	Malabar danio	Ornamental purposes, domestic market
122	<i>Pseudetroplus maculatus</i> (Bloch, 1795)	Orange chromidae	Ornamental purposes, food fish, domestic market
123	<i>Etroplus suratensis</i> (Bloch 1790)	Green chromidae	Ornamental and food purposes, aquaculture, processing plants, wealth from waste, domestic and export markets
124	<i>Horabagrus nigricollaris</i> (Pethiyagoda & Kottelat, 1994)	Black collared catfish	Ornamental purposes
125	<i>Horabagrus brachysoma</i> (Günther, 1864)	Sun cat fish	Ornamental purposes, food fish, domestic market
126	<i>Laubuca fasciata</i> (Silas, 1958)	Malabar Hatchet Chela	Ornamental purposes, domestic market
127	<i>Macrogathus aral</i> (Bloch & Schneider, 1801)	one-stripe spiny eel	Ornamental, domestic market
128	<i>Mastacembelus armatus</i> (Lacepède, 1800)	zig-zag eel	Ornamental purposes, food fish, domestic market
129	<i>Nandus nandus</i> (Hamilton, 1822)	Gangetic leaf fish	Ornamental purposes, domestic market
130	<i>Nemacheilus guentheri</i> (Day, 1867)	Gunther's Loach	Ornamental purposes, domestic and export market
131	<i>Mesonemacheilus triangularis</i> (Day, 1865)	Stone loach	Ornamental purposes, domestic and export market
132	<i>Osteochilichthys nashi</i> (Day, 1869)	Nash's barb	Ornamental purposes, domestic market
133	<i>Parambassis thomassi</i> ((Day, 1870)	Western Ghat glassy perchlet	Ornamental purposes, domestic market
134	<i>Pethia conchoni</i> (Hamilton, 1822)	Rosy barb	Ornamental purposes, domestic market
135	<i>Pethia ticto</i> (Hamilton, 1822)	Ticto barb	Ornamental purposes, domestic market
136	<i>Travancoria elongata</i> (Pethiyagoda & Kottelat, 1994)	Periyar loach	Ornamental purposes, domestic market
137	<i>Channa diplogramma</i> (Day, 1865)	Malabar snakehead	Ornamental and food purposes, aquaculture, domestic and export market
138	<i>Channa marulius</i> (Hamilton, 1822)	Great snakehead	Food purposes, aquaculture, food fish, domestic and export market
139	<i>Channa striata</i> (Bloch, 1793)	Striped snakehead	Food purposes, food fish, aquaculture, domestic and export market
140	<i>Heteropneustes fossilis</i> (Bloch,	Stinging catfish	Food purposes, food fish,

	1794)		aquaculture, domestic market
141	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Wallago	Food purposes, food fish, domestic market
142	<i>Tor khudree</i> (Sykes, 1839)	Deccan mahseer	Food purposes, food fish, domestic market
143	<i>Tor malabaricus</i> Jerdon, 1849	Malabar mahseer	Food purposes, food fish, domestic market
144	<i>Amphiprion percula</i> (Lacepède, 1802)	Clown anemone fish	Ornamental fish, domestic and export market
145	<i>Amphiprion ocellaris</i> Cuvier, 1830	False clown anemone fish	Ornamental fish, domestic and export market
146	<i>Amphiprion sandaracino</i> Allen, 1972	Yellow sunk clown	Ornamental fish, domestic and export market
147	<i>Amphiprion frenatus</i> Brevoort, 1856	Tomato clown	Ornamental fish, domestic and export market
148	<i>Amphiprion clarkia</i> (J. W. Bennett, 1830)	Clark's Anemone fish	Ornamental fish, domestic and export market
149	<i>Amphiprion nigripes</i> Regan, 1908	Maldives Anemone fish	Ornamental fish, domestic and export market
150	<i>Premnas biaculeatus</i> (Bloch, 1790)	Maroon clown	Ornamental fish, domestic and export market
151	<i>Pseudochromis dielectus</i> Lubbock, 1976	Redhead dottyback	Ornamental fish, domestic and export market
152	<i>Dascyllus trimaculatus</i> (Rüppell, 1829)	Three spot damsel	Ornamental fish, domestic and export market
153	<i>Dascyllus aruanus</i> (Linnaeus, 1758)	Stripped damsel	Ornamental fish, domestic and export market
154	<i>Pomacentrus caeruleus</i> Quoy & Gaimard, 1825	Blue damsel	Ornamental fish, domestic and export market
155	<i>Neopomacentrus nemurus</i> (Bleeker, 1857)	Yellow tail damsel	Ornamental fish, domestic and export market
156	<i>Chrysiptera cyanae</i> Quoy & Gaimard, 1825	Sapphire devil	Ornamental fish, domestic and export market
157	<i>Chrysiptera unimaculata</i> (Cuvier, 1830)	One spot damsel	Ornamental fish, domestic and export market
158	<i>Chromis viridis</i> (Cuvier, 1830)	Green chromis	Ornamental fish, domestic and export market
	SPONGES (shown here to give emphasis on bio-active compounds)		
159	<i>Spongia officinalis</i> Linnaeus, 1759	Bath sponge	Nutraceuticals, industrial, domestic and export market
160	<i>Xestospongia sp.</i>		Nutraceuticals, industrial, domestic

			and export market
161	<i>Zezya fuliginisa</i>		Nutraceuticals, industrial, domestic and export market
162	<i>Euryspongia</i>		Nutraceuticals, industrial, domestic and export market
163	<i>Dactylospongia elegans</i> (Thiele, 1899)		Nutraceuticals, industrial, domestic and export market
164	<i>Tridemnum</i> sps.		Nutraceuticals, industrial, domestic and export market
165	<i>Tethyacrypta</i>		Nutraceuticals, industrial, domestic and export market
166	<i>Echinodactylum</i> sps.		Nutraceuticals, industrial, domestic and export market
167	<i>Discodermia dissolute</i>		Nutraceuticals, industrial, domestic and export market
168	<i>Lissodendorys</i> sps.		Nutraceuticals, industrial, domestic and export market
169	<i>Verongia aerophoba</i>		Nutraceuticals, industrial, domestic and export market
170	<i>Theonella</i> sp.		Nutraceuticals, industrial, domestic and export market
	ASCIDIAN		
171	<i>Lissodinium bistratum</i>		Nutraceuticals, industrial, domestic and export market
	SEA WEEDS		
172	<i>Gracilaria corticata</i>	Agar	Culture, industrial production, domestic an export
173	<i>Gracilaria foliifera</i>	Agar	Culture, industrial production, domestic an export
174	<i>Gelidiopsis variabilis</i>	Agar	Culture, industrial production, domestic an export
175	<i>Gelidium pusillum</i>	Agar	Culture, industrial production, domestic an export
176	<i>Sargassum wightii</i>	Algin	Culture, industrial production, domestic an export
177	<i>Sargassum duplicatum</i>	Algin	Culture, industrial production, domestic an export
178	<i>Sargassum tenerimum</i>	Algin	Culture, industrial production, domestic an export
179	<i>Stoechospermum marginatum</i>	Algin	Culture, industrial production, domestic an export
180	<i>Dictyota dichotoma</i> and <i>Padina</i>	Algin	Culture, industrial production, domestic an export market

181	<i>Padina</i> sp.	Algin	Culture, industrial production, domestic an export market
182	<i>Hypnea musciformis</i>	Carangineen	Culture, industrial production, domestic an export market
183	<i>Hypnea valentiae</i>	Carangineen	Culture, industrial production, domestic an export market
184	<i>Grateloupia filicina</i>	Carangineen	Culture, industrial production, domestic an export market
185	<i>Hypnea musciformis</i>	Carangineen	Culture, industrial production, domestic an export market
186	<i>Hypnea valentiae</i>	Carangineen	Culture, industrial production, domestic an export market
187	<i>Grateloupia filicina</i>	Carangineen	Culture, industrial production, domestic an export market
188	<i>Grateloupia lithophila</i>	Carangineen	Culture, industrial production, domestic an export market
189	<i>Gracilariopsis lemaneiformis</i>	Carangineen	Culture, industrial production, domestic an export market

Biological details

Brief accounts on biological aspects of major resources are given below. Each species is appended with common names, biological notes and an image. Details are given below.

***Penaeus indicus* H. Milne Edwards, 1837**

Common Name: Indian white prawn, **Local Name:** Naran chemmeen



Courtesy : <https://www.wikidata.org/wiki/Q6022724>

Biological note: Habitat and behavior : *Penaeus indicus* is found at depths of 2 to 90 m, inhabiting bottom mud or sand. It is most abundant in shallow waters of less than 30 m depth, on sand or mud. The adults are marine and breed offshore, while post larvae and juveniles are estuarine. They are euryhaline and live in brackish, estuarine and marine environments with temperature ranges between 18 and 34.5 °C and salinities of from 5 to 50 ppt.

Interest to Fishery and Trade : It is in demand in international as well as domestic markets and is exported as frozen head-on and de-shelled forms. It is numerically the most important species in the Indian shrimp fishery. The species is caught in multiday trawl nets (MDTN) that operate for 3 to 4 days and in single day mechanised trawl nets (MTN) that operate during the daylight hours, from depths of 10 to 30 m.

Distribution : The Indian white prawn inhabits the coasts of East Africa, South Africa, Madagascar, the Gulf, Pakistan, the Southwest and East coast of India, Bangladesh,

Thailand, Malaysia, Philippines, Indonesia, Southern China and the Northern coast of Australia.

***Penaeus monodon* Fabricius, 1798**

FAO Names: En - Giant tiger prawn, **Local name:** Kara chemmeen



Source : internet

Biological note: It is found at depths from 0 to 110 m, inhabiting bottom mud and sand in brackish, estuarine (juveniles) and marine (adults) environments. It tolerates the water temperatures of 18–34.5°C and salinities of 5–45 ppt. Commercially grown in salinities of 1–5 ppt. This appears to select muddy mangrove channels and often associates with marginal or floating vegetation.

Distribution: Indo-west Pacific : from east and southeast Africa to northern and eastern Australia, Japan, Pakistan and the Malay Archipelago.

***Penaeus semisulcatus* (de Haan, 1844)**

Common name Green tiger prawn; **Local name** : Kuzhikaara



Source : Internet

Biological note: Bottom mud, sand. Depth 2 to 130 m. Marine (adults) and estuarine (juveniles). Green tiger prawn is a commercially important penaeid shrimp species, dominant in the coastal waters of Tamil Nadu. Grows to 230 mm and 270 mm in TL in case of males and females, respectively.

Distribution: Indo-West Pacific: Red Sea, E. and S.E. Africa to Japan, Korea, the Malay Archipelago and northern Australia. Eastern Atlantic: The species has reached the eastern

Mediterranean through the Suez Canal; it is now found all along the coasts of Egypt, Israel, Lebanon, Syria and southern Turkey.

***Penaeus japonicus* Spence Bate, 1888**

Common name Kuruma shrimp, **Local name:**Chemmeen



Biological notes : This species is nocturnal, remaining buried in the substrate during the day. Its predators include bony fishes and cartilaginous fishes. When the sea temperature exceeds 20 °C (68 °F), spawning can begin. During copulation, the male transfers a spermatophore to the female, which she stores in a seminal receptacle. She travels to deep water, where she then releases around 700,000 eggs. These hatch as nauplii, and pass through further five nauplius stages, three zoeae, and three mysis stages by moulting before reaching the postlarval stage

***Penaeus canaliculatus* (Olivier, 1811)**

Common name: Local Witch prawn, **Local name:** Thavitthuvarayan Manjakonju



Biological note : *Penaeus canaliculatus* (Olivier) has assumed an important place in the marine shrimp landings of Kerala, by its reasonably good landing and its large size in the catches of multi-day trawlers. Found along west coast of India.

***Metapenaeus dobsoni* (Miers, 1878)**

Local Names: Thelly chemmeen (smaller specimens), Poovaalan chemmeen, Kadal chemmeen (larger specimens) (S.W. India), Chingri (east coast of India); **FAO Names:** Kadal shrimp (En), Crevette kadal (Fr), Camarón kadal (Sp).



Source : internet

Biological note: Interest to Fishery and Trade: The species is a marine and brackish water form and important in inshore and trawl fisheries along the west and south-west coast of India; in the state of Kerala a major part of the total prawn catch consists of this species. In Kerala, *M. dobsoni* is the most important species in the rice field shrimp farming. Great concentration of this prawn is reported in the vicinity of mud bank, locally known as "chaakara". As per reports the peak periods in the recruitment of post-larvae of the species into the backwaters of Cochin are June to August and November, during low saline months. Maximum size obtained in the trawl fishery is 125 mm for females, 114 mm for males. There is no farming or culture reported for the species.

Utilization: Utilized as food for various preparations, dried prawn product, pickles and shell waste is utilized for fertilizer production.

Distribution: Indo-West Pacific: west coast of India to Indonesia and the Philippines Islands. Under the FAO areas code the distribution covers land areas 422, 424 and 437, and water areas ISW and ISEW.

***Metapenaeus affinis* (Milne- Edwards,1837)**

FAO Names: Jinga shrimp (En), **Local Names:** Jinga (Bombay, N.W. India), Kazhantan chemmeen



Source : Internet

Biological note: Depth of occurrence is 5 to 92 m where bottom is mud. Commercially the most important species. Maximum total length 222 mm (exceptional), usually not more than 170 mm

Distribution: Indo-West Pacific: Arabian Sea to the Malay Archipelago and Hong Kong.

***Metapenaeus monoceros* (Fabricius,1798)**

FAO Names: Speckled shrimp (En), **Local name:** Choodan



Biological note : *M. monoceros* is a demersal species that lives in shallow water down to 60 meters, mostly between 10 and 30 meters. The species prefers sandy and sandy-mud bottoms. It is a euryhaline species which lives in brackish to marine salinities as low as 5 and up to 30‰. Juveniles are found in estuaries, lagoons or coastal areas, the adults further offshore.

Uses : The species has high commercial value. It is important in some African countries like Mozambique, Kenya and Tanzania and it is one of the dominant species of Madagascar. It is cultivated in rice fields in Bangladesh and India.

Distribution : Indo-West Pacific, along the African coast to the Red Sea and around India to the Bay of Bengal. It has migrated through the Suez Canal into the Eastern Mediterranean since 1927 being recorded in Egypt, Syria, Lebanon, Turkey, Greece and Tunisia

***Penaeus vannamei* Boone, 1931**

Common name: White leg shrimp; **Local name:** vannamei chemmeen



Source : Internet

Biological note : This species is an exotic. Owing to its fast growing even under very high stocking densities, it has been introduced in India for farming purpose. Even though there was great vigil not to get introduced into our natural systems, this species has been reported from the catches from sea.

Distribution : Pacific coast

***Parapenaeopsis stylifera* (Milne- Edwards,1837)**

Common name: Kiddi shrimp; **Local name** Karikkadi chemmeen, monsoon prawn



Source : Internet

Biological note : One of the important species of penaeid prawns landed in Kerala. A prominent fishery during monsoon months. Commercial catches include 40% of this prawn.

Distribution : Indian Ocean: from Kuwait and Pakistan to Bangladesh.

***Heterocarpus woodmasoni* Alcock,1901**

Common name Indian Nylon Shrimp



Source : Yang *et al.*, 2018

Biological note : Deep sea pandalid prawn. Commercially important. Size in the catches ranged from 72 to 135 mm in total length but dominated by 111-120 mm size groups in both the sexes

Distribution : Indo-West Pacific region

***Heterocarpus gibbosus* (Spence Bate,1888)**

Common name: Humpback nylon shrimp



Source : internet

Biological note : Deep sea pandalid prawn. Commercially important. Size in the catches ranged from 67 to 140 mm in total length but dominated by 111-120 mm size groups in both the sexes

Distribution: Southeast and Southwest coast off Cochin, off Alleppey at depths of 250-400 m. Immature specimens were found in greater numbers in shallow waters while the bigger prawns seemed to prefer deeper grounds beyond 350 m

***Plesionika spinipes* Spence Bate, 1888**

Common name : Oriental narwal shrimp; **Local name :** red shrimp



Biological note : mostly gonochoric. Mating behavior: Precopulatory courtship ritual is common (through olfactory and tactile cues); usually indirect sperm transfer.

Distribution : Indo Pacific and Atlantic Ocean

***Plesionika ensis*(Milne-Edwards, 1881)**

Common name: Gladiator striped shrimp



Biology Note : Benthic; depth range 100 - 1250 m, usually 230 - 730 m Subtropical. They are mostly gonochoric. Mating behavior: Precopulatory courtship ritual is common (through olfactory and tactile cues); usually indirect sperm transfer.

Distribution: Indo-Pacific, Atlantic Ocean and the Mediterranean: from Angola to northwest coast of Spain, and in the Mediterranean from the Alboran Sea, Crete Island, and Aegean Sea.

***Exhippolysmata ensirostris* (Kemp, 1914)**

Common name: Hunter shrimp

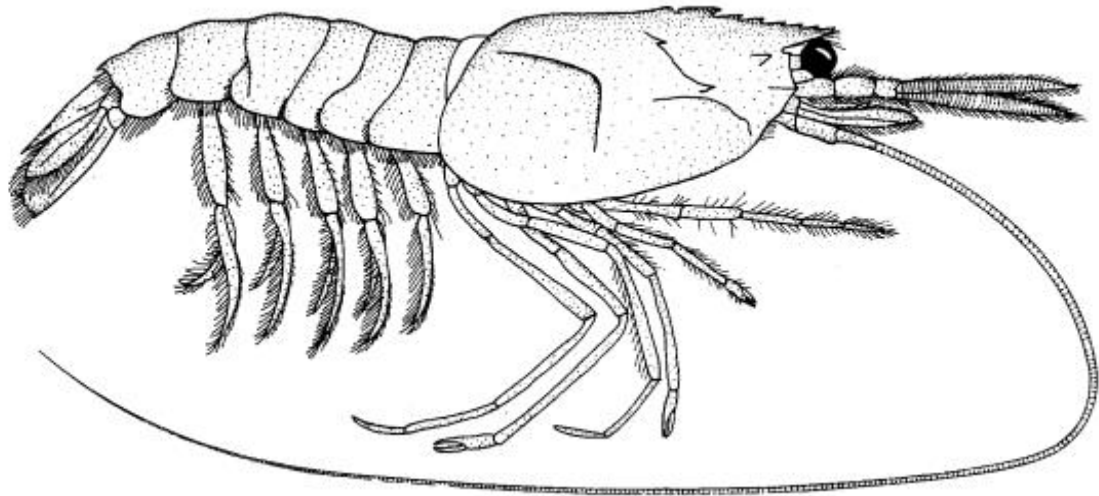


Biological note : It is a commercial species and fishery is seasonal. Members of the order Decapoda are mostly gonochoric. Mating behavior: Precopulatory courtship ritual is common (through olfactory and tactile cues); usually indirect sperm transfer.

Distribution: Indo-West Pacific: India, Kenya and Philippines.

***Solenocera hextii* (Wood-Mason & Alcock, 1891)**

Common name: Deep-sea mud shrimp

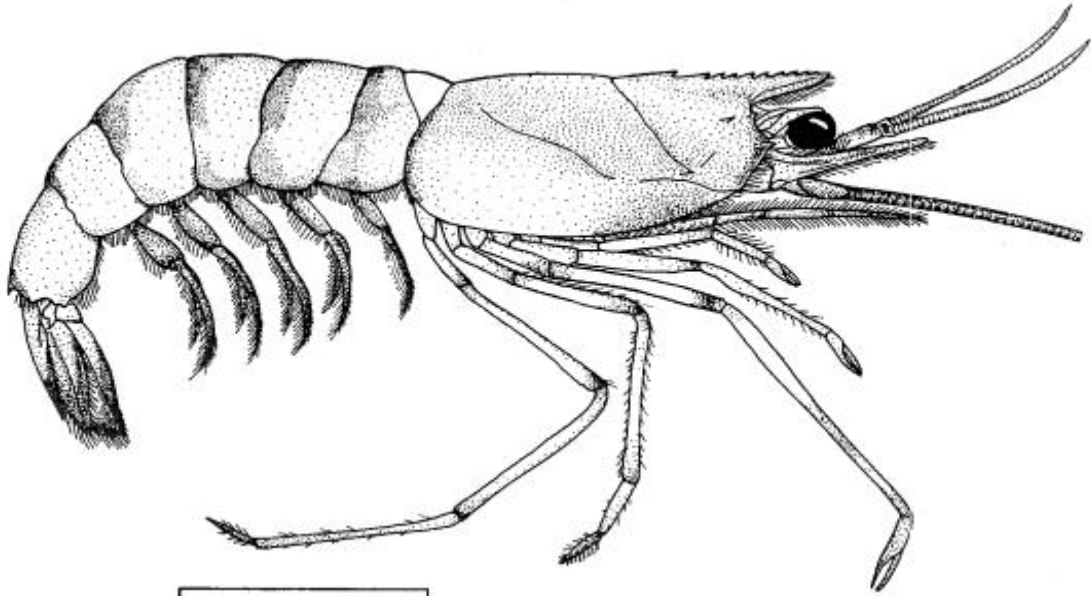


Biological note : At present the species is not exploited, but is of potential interest and may become commercially important in the Gulf of Aden and off the southwest coast of India. Caught with otter trawls. Occasionally marketed frozen. Spawns from November to April, with peak from January to February

Distribution : Indian Ocean: Gulf of Aden, Arabian Sea and Bay of Bengal.

***Solenocera crassicornis* (Milne-Edwards, 1837)**

Common name: FAO : En - Coastal mud shrimp

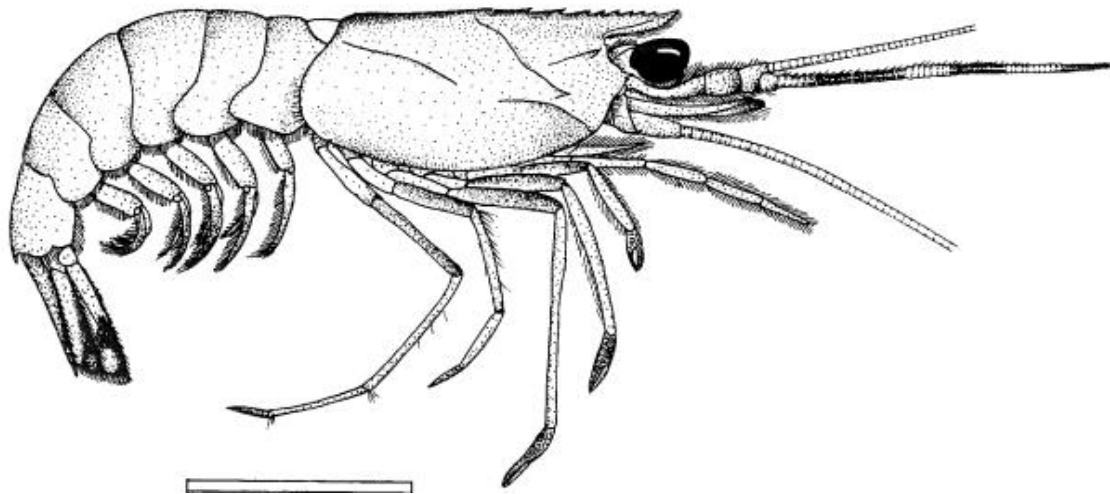


Biological note : Along the west coast of India near Bombay, the species supports a commercial fishery. Elsewhere, it is often present in the landings, mixed with other shrimps. Caught mainly with otter trawls; stake nets and boat seines are also used. Marketed fresh, frozen, cooked, peeled and canned or as dried shrimp pulp.

Distribution : Indo-West Pacific: from Persian Gulf to India, east to Papua New Guinea, and north to Japan and China. Introduced in the Mediterranean.

***Solenocera choprai* Nataraj, 1945**

Common name: Ridgeback shrimp



Biological note : Although 10 species belonging to the genus *Solenocera* were reported from the Indian coasts, only *Solenocera crassicornis* formed a regular commercial fishery. Along the Mangalore coast (south India), *S. choprai* emerged as a fishery resource at a depth of 60–100 m from 1993 onwards. During 2002 and 2003 the species contributed approximately \$US1.2m (Indian Rs. 60m) to the fishery, the economy and reduction of the landing of the species was found to affect the economic feasibility of fishing operations.

Distribution : It is widely distributed in the Indo-Pacific and reported from eastern coast of Africa, Madagascar, the Gulfs of Suez and Arabia, Pakistan, India, Malaysia, the Philippines, Indonesia, Taiwan, Thailand and north-east and northwest Australia.¹

***Aristeus alcocki* Ramadan, 1938**

Common name: Arabian red shrimp



Biological note : *Aristeus alcocki* forms an economically important crustacean resource in the southwestern and southeastern coast of India. In India, this was developed as a major targeting species from multiday bottom trawl fisheries. This species formed a beneficial fishery from the Southern coast of India and reported a landing of more than 2122 tons during 2011–2016 annually.

Distribution : This decapod is broadly distributed in the continental slope region (200 to 3200 m depth) of the Gulf of Aden to the islands of Lakshadweep in the southwestern coast and Andaman Sea through Bay of Bengal

***Acetes indicus* Milne-Edwards, 1830**

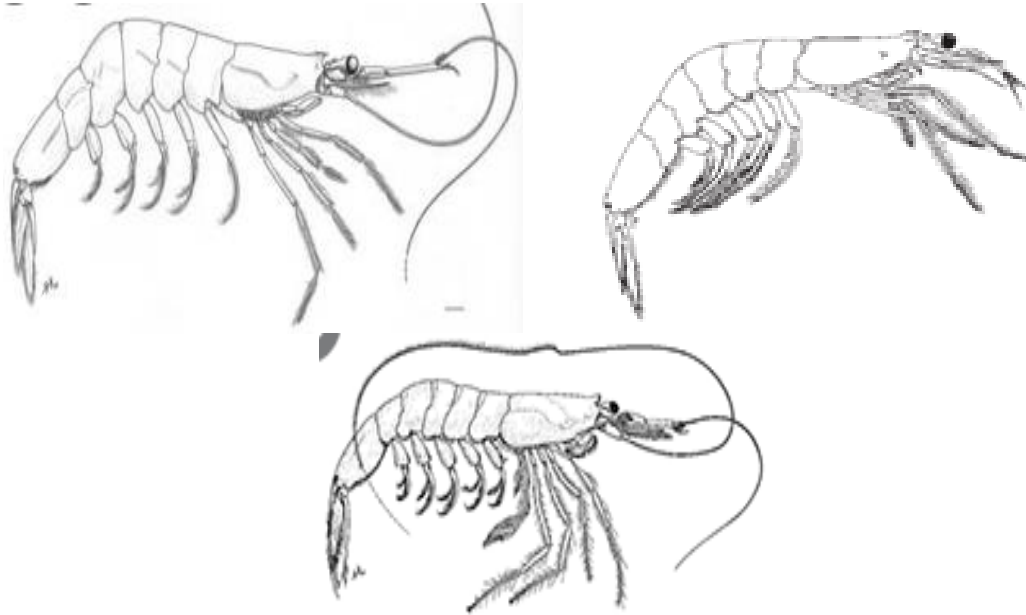
Common name: Jawla paste shrimp

***Acetes erythraeus* Nobili, 1905**

Common name: Tsivakihini paste shrimp

***Acetes johni* Nataraj, 1947**

Common name: Paste shrimp



Aceticus indicus

Acetes erythraeus

Acetes johni

Biological note : The main uses of the shrimp are as fermented food and as a dried product. The commercial importance of *Acetes* is derived from consumption by humans and its potential as a food for aquaculture.

Distribution : It occurs in the central part of the Indo-West Pacific, from the South China Sea through the Gulf of Thailand and the Bay of Bengal, Bangladesh the Straits of Malacca and Andaman Sea to the entire east and west coasts of India

***Macrobrachium rosenbergii* (de Man, 1879)**

FAO Names: En – Giant freshwater prawn, **Local name:** Aattu Konju



Biological note : This species is the most precious species of inland waters of Kerala. Commercially very important and support the economy of the state. This species is farmed throughout the world. To many countries this species has been imported for farming purpose.

Distribution : Indo-west Pacific: Pakistan, India, Sri Lanka to the Asian mainland in southern China, Taiwan and up to Malaysia, Borneo and Java.

***Portunus pelagicus* (Linnaeus, 1758)**

Common/FAO : Blue swimmer Name (English) crab; **Local names**: Local names Karachla (Gujarati Gujarati); Gujarati Khekhara (Marathi Marathi); Marathi Denji (Kannada); Kannada Kora njandu, Kavalan njandu (Malayalam); Malayalam Pulli nandu (Tamil); Gelai peeta (amil Telugu); Chitra kankda (elugu Oriya); Naksakankda Oriya (Bengali Bengali)



Biology note : It inhabits sandy and muddy bottoms in shallow waters at depths between 10 to 50 m, including areas near reefs, mangroves, seagrass and algal beds. Juveniles most commonly occur in intertidal shallower areas. It is a commercial species of India. As per FAO reports of 2014 the landing was 2,12,612t. China produces the highest quantity of crabs. There is an increase in demand for frozen and tinned crab meat throughout the Indo-West Pacific. It is sold in local markets as fresh or frozen or is sent for the crab-flesh canning industry. The price for the crab in local market in India is > Rs. 200/kg.

Distribution : The blue swimmer crab occurs throughout the Indian and the west Pacific Oceans: from Japan, and Philippines throughout south-east and east Asia, to Indonesia, the east of Australia, Fiji Islands and westward to the Red Sea and east Africa. It is present in the Mediterranean Sea as a lessepsian migrant, southern Pacific Ocean, along

the coast of Egypt, Mozambique, Kenya, Israel, Lebanon, Turkey, the Syrian Arab Republic, Cyprus and the east southern coast of Sicily

***Portunus sanguinolentus* (Herbst, 1783)**

Common name: Three-spot swimming crab; **Local name :** Muppottan Njandu



Biological note : This species along with *Portunus pelagicus* forms the major marine crab fishery of Kerala. There is high demand for this species. A number of products are being prepared out of this species. The price for the crab in local market in India is > Rs. 200/kg.

Distribution: From east Africa, through the Indo-Pacific region, to the Hawaiian Island.

***Scylla serrata* (Forskål, 1775)**

Common name Indo-Pacific Swamp Crab; **Local name** : Mud crab, Kaayal Njandu



Biological note : A precious species in inland waters of Kerala. It supports a good fishery. Habitat:Sandy and Muddy bottom. . Mud crabs can be killed by placing them in a freezer for up to two hours before cooking. High flesh content, and rapid growth rates in captivity and high market price has attracted aquaculturist to farm this species. In addition, they have a high tolerance to both nitrate and ammonia which is beneficial because ammonia-N is often the most limiting factor on closed aquaculture systems

Distribution : Indo-Pacific. It is found from South Africa, around the coast of the Indian Ocean, where it is especially abundant in Sri Lanka, to the Southeast Asian Archipelago, as well as from southern Japan to south-eastern Australia, northern New Zealand, and as far east as Fiji and Samoa, The species has also been introduced to Hawaii and Florida

***Scylla tranquebarica* (Fabricius, 1798)**

Common name Mud crab; **Local name** Kaayal Njandu



Biological note : Commercial species of Kerala. Found in sandy and muddy water. Important in aquaculture.

Distribution : Pakistan and Taiwan to the Malay Archipelago and other Indo-Pacific regions

***Scylla olivacea* (Herbst, 1796)**

Common name: Orange mud crab



Biological note : commercially important species of mangrove crab in the genus *Scylla*. It is one of several crabs known as the mud crab and is found in mangrove areas from Southeast Asia to Pakistan, and from Japan to northern Australia. This species is widely farmed in aquaculture using wild-caught stocks. They can be differentiated from other species of *Scylla* by having blunted spines on the dorsal distal corner of the palm (propodus) of the claw, and by the rounded frontal lobe spines with shallow separations in between the eyes.

Distribution : Indo-West Pacific

***Charybdis feriata* (Linnaeus, 1758)**

Common name: Crucifix crab



Biological note :. It usually occurs in muddy and sandy bottoms, as well as on rocky and stony coasts including coral reef flats, at depths of approximately 10-60 m. It has a high commercial value being caught in trawl nets, traps and fixed nets, and is usually sold frozen. However with the recent expansion of live fish markets, this species is now exported throughout eastern Asia. Its size and meat quality makes it a valuable target species for aquaculture.

Distribution : Indo-Pacific region from Japan and China to Australia in the east, to eastern and southern Africa, Gulf of Oman and Arabian Gulf in the west, encompassing Pakistan, India, Sri Lanka and Indonesia.

***Charybdis smithii* (Fabricius, 1798)**

Common name: Indian Ocean Swimming Crab



Biological note : They aggregate at night in the upper 150-m layer and are caught in trawl net. It is an important prey for more than 30 species of abundant epipelagic top predators. The average protein content was 9.38 g/100 g, fat 0.86 g/100 g, ash 0.34 g/100 g, fiber 0.13 g/100 g, and carbohydrate 1.8 g/100 g. A commercial species of seasonal catch. Good market in Tamil Nadu, Kerala.

Distribution : Widespread in Indian Ocean.

***Charybdis lucifera* (Fabricius,1798)**

Common name Swimming Crab; **Local name:** Neenthai Njandu



Source : internet

Biological note : Marine benthic species and resort to drag powered swimming to move around. A commercial species of importance. Catch seasonal.

Distribution : Indo-West Pacific: Hong Kong, Dampier Archipelago, Adriatic Sea (Mediterranean), Australia, China, India, Indian Ocean, Indonesia, Japan, Java, Malaysia, Pakistan, Queensland (Australia), Red Sea, Saudi Arabia, Sri Lanka, Sumatra, Taiwan, the Mediterranean Sea, Western Australia

***Charybdis natator* (Herbst, 1794)**

Common name: Ridged Swimming Crab, Wrinkled Swimming Crab or Rock Crab



Biological note : It gets its name from the ridges on the dorsal surface of the carapace. It is a crab species which is of minor importance in fisheries; It is a benthic species found in the inter-tidal zone and in the sub -tidal zone down to a depth of 60m and over a variety of substrates, including sandy or silty bottoms, rocky and coral reefs and beds of weed. It prefers to hide under rocks or stones.

Distribution : throughout the Indian and Pacific Oceans from eastern South Africa and Madagascar north to the Red Sea and across the Indian Ocean, including the Mascarene Islands and the Seychelles, to the western pacific where it extends north to Japan and south to northern Australia including Lord Howe Island

***Podophthalmus vigil* (Fabricius, 1798)**

Common name :



Biological note : A crab of commercial value. Occur in coastal and offshore waters. Subtidal inhabits sandy to muddy substrates to 42 m. seen abundantly in muddy flats. They are also found swimming at the surface waters especially at night.

Distribution : Indo-Pacific: From the Red Sea, to Thailand and Philippines to Hawaii and French Polynesia, north to Japan and south to Tanzania, Madagascar and Australia.

***Panulirus homarus* (Linnaeus, 1758)**

Common/FAO : Scalloped Name (English) spiny lobster; Local names: Titan (Gujarati Gujarati); Gujarati Shevand (Marathi Marathi); K Marathi onju (Kannada); P annada arra konchu, Kadal konchu, Raalu konchu (Malayalam); Malayalam Singi eral (Tamil); Rati royya (Tamil Telugu); Bama royya (elugu Oriya); Oriya Kanta chingri (Bengali Bengali)



P. homarus homarus subspecies has a broad geographic range extending. Forms fishery along southwest and southeast coast; promising species for aquaculture.

Biological note : It is a reef dwelling species, most commonly associated with coastal fringing rocky reefs and inshore areas of rocky reefs (1-15 m). It is found at depths of 1 to 90 m. Juveniles and adults are omnivorous, feeding on small crustaceans, molluscs, worms and algae. It is a nocturnal animal. It is also a social animal forming groups within and beneath reef structures. Major fisheries are on the southeast and southwest coast of India

Distribution : from East Africa to Japan including Indonesia, Australia, New Caledonia and the Marquesas Archipelago. Northwest, southwest, southeast coast of India, A& N Islands and Lakshadweep Islands.

***Panulirus ornatus* (Fabricius, 1798)**

Common/FAO : Ornate spiny Name (English) lobster; Local names: Titan (local names Gujarati Gujarati); Gujarati Shevand (Marathi Marathi); Konju (Marathi Kannada); Parra annada konchu, Kadal konchu, Chitta konchu (Malayalam); Malayalam Rani singi eral (Tamil); Rati royya (tamil Telugu); telugu Bama royya (Oriya); (Oriya); (Oriya); Jhata chingri (Bengali Bengali)



Biological note : In shallow, sometimes slightly turbid coastal waters; from 1 to 8m depth, with a few records from depths as great as 50m; on sandy and muddy substrates and sometimes on rocky bottom often near the mouth of rivers, but also on coral reefs. The species has been reported as solitary or as a living in pairs, but has also been found in larger concentrations. Mainly form fishery along the southeast coast of India

Distribution : Indo-West pacific region, from the Red Sea and east Africa (South to Natal) to southern Japan, the Solomon Islands, Papua New Guinea, Australia, New Caledonia and Fiji. In India, it is mainly distributed along south-east coast.

***Panulirus polyphagus* (Herbst,1793)**

Common name: Mud Spiny Lobster

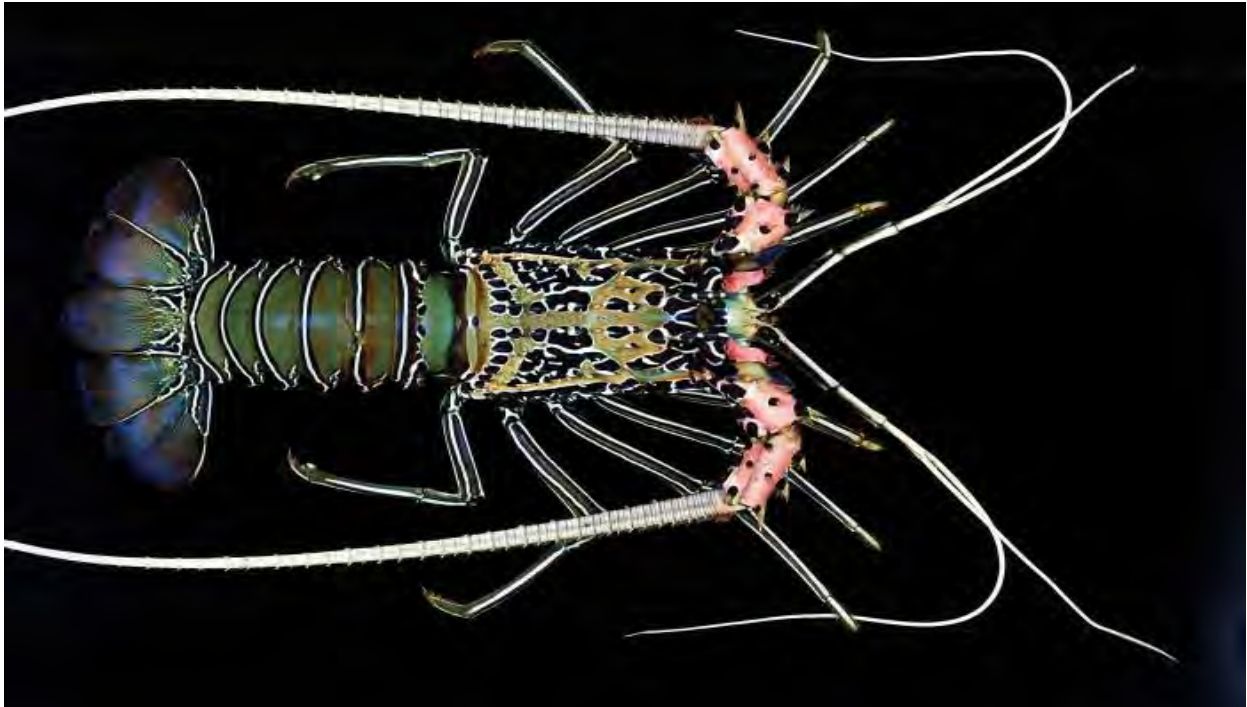
Biological note : In India this species is the most important commercial species contributing to nearly three-fourth of the total lobster catch of the country. Major fisheries are on the northwest coast of India. The species is commonly found in coastal waters on muddy and rocky substrates to a depth of 40m, although it is occasionally seen at 90m and is often seen near the river mouths. Exported in whole-cooked frozen form; promising species for aquaculture

Distribution : This species has abroad range from Pakistan and India to Vietnam, the phillippines, Indonesia, northwest Australia and the Gulf of Papua.



***Panulirus versicolor* (Latreille,1804)**

Common name:Painted Spiny Lobster



Biological note: This species is found in areas of coral reef, most often on the seaward edge of the reef plateau, where it utilizes the reef and rocks for shelter. It is found in shallow waters to a maximum depth of 15m. Furthermore, they are nocturnal and they only aggregate in very small numbers. Fishery of lower magnitude reported along the Chennai, Mandapam, Trivandrum coasts. In A& N Islands, *P.versicolor* formed 26% of total landings (0.12t) in 1999- 2000

Distribution: This species known throughout Indian ocean (east coast of Africa and the Red sea) east to Japan, Micronesia, Melanesia, Polynesia, and northern Australia. Along the Indian coast the species has been reported from southeast, southwest, A&N Islands and Lakshadweep

***Thenus unimaculatus* (Burton & Davie, 2007)**

Common/FAO Name (English) : Flathead lobster ; Local names: Kaka (local names Gujarati Gujarati); Gujarati Phatphati (Marathi Marathi); Konju (Marathi Kannada); Poozhi konchu, Manal konchu, annada Adippan konchu (Malayalam); Malayalam Madakku eral (Tamil); Tapatapalu (tamil Telugu); Toptepa (telugu Oriya); Patal Oriya chingri (Bengali Bengali)



Biological note : Flathead lobsters are bottom dwellers and prefer sand and mud habitats at depths ranging from 10 to 50 m. It is found associated with soft substrate, sand or mud, or a mixture of the two, sometimes with shells or gravel. It buries into the substrate with only eyes and antennules visible during the daytime. It contributes 5-24 % of the lobster landings along the Indian coast, with maximum landings from the north-west coast, followed by the south-east coast. Catch trends indicate decline in stock

Distribution : Indo-West Pacific from the east coast of Africa (Southern Red Sea to Natal) to China, southern Japan, the Philippines and tropical Australia (western Australia to Queensland). In India, it is distributed along the coasts of Gujarat, Maharashtra, Kerala and Tamil Nadu.

Puerulus sewelli Ramadan, 1938

Common name:Arabian Whip Lobster



Biological note : This species occupies on a substrate of coarse sand, hard mud and shells. It is heterosexual and sexually dimorphic. The coxopodite of the last pereopod in the mature male is extended as a fleshy projection, at the tip of which is located the gonopore. In female, the genital opening is situated at the base of coxa of the third pereopod. Further, the sternal plates between the third and fifth pereopods, it is relatively broader and wider in females than in males.

Distribution : Western Indian Ocean: Somalia, Gulf of Aden, off Pakistan, southwest and south India, Gulf of Mannar.

Nephropsis stewarti Wood-Mason, 1872

Common name: Indian Ocean Lobsterette



Biological note : It inhabits deep sea between 170 and over 1060 m, usually between 500 and 750 m on soft muddy substrates. Maximum body length 15 cm, common around 10 cm. Carapace length: male 2.2-7.1 cm; female 1.4-7 cm; ovigerous females 4.2-7 cm. It has some interest to fisheries in India.

Distribution : Indo-West Pacific region from the Gulf of Aden and East Africa to Japan (Sagami Bay to Tosa Bay), Taiwan, the Philippines, Indonesia and Western Australia.

***Lamellidens marginalis* (Lamarck 1819)**

Common name: Freshwater mollusc; **Local name:** Nanneer matti, Nanneer sippi, Karutha Chippi



Biological note :The species inhabits in sand and fine gravel mixed with mud and silt at a depth of 1 meter in water bodies. The animal is reported to be medicinally important and used by aboriginal people to control blood pressure. It also used in cement, lime, button, toys and cosmetic industries. In certain part of the country, the animal is consumed as food by poor people. Recently, successful pearl production has been reported using this species in the state. Additionally, the bivalve muscle contains little saturated fat and significant amount of vitamin C. Bivalve is also a good source of minerals such as calcium, potassium, zinc, iron, phosphorous and copper. They are "living filters" play an important role in natural ecosystems by helping to clean our water bodies eating algae and zooplanktons and providing food for many types of fish.

Distribution: India, widely distributed - Bihar, Assam, Tamil Nadu, Odissa, West Bengal, and Meghalaya

***Saccostrea cucullata* (Born, 1778)**

Common name: Indian backwater oyster; **Local names:** Muringa, Muru (Malayalam); Kalungu, Patti (Tamil); Muri (Kannada)

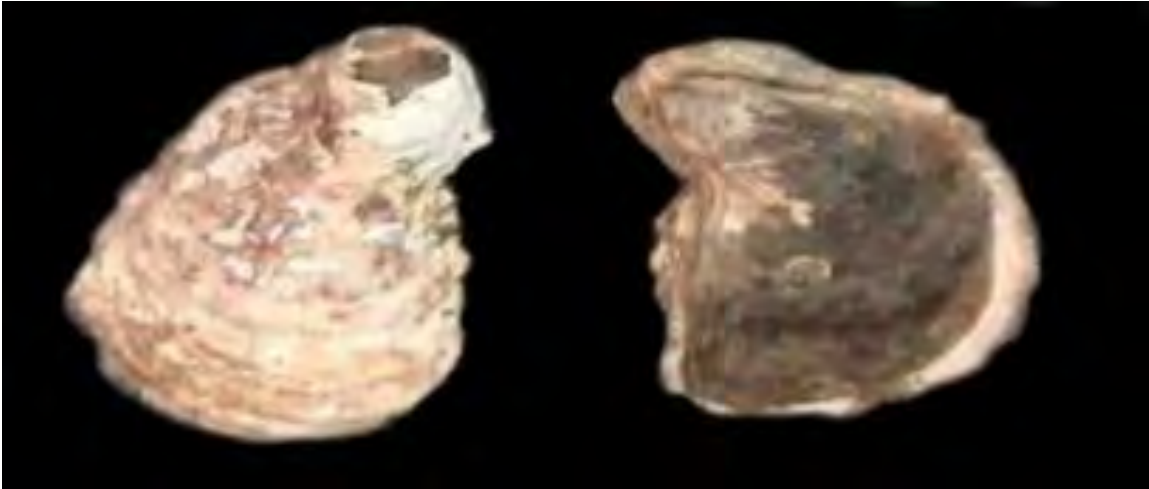


Biological note: This oyster is cultivated in backwaters and is quite popular in local markets. It is abundant on the south-west coast of India, where it often forms a distinct patch from mid to upper balanoid zone. It is exploited by coastal fisher folk and marketed.

Distribution : It is a tropical edible species widely distributed in the littoral zone of Indo-Pacific, Eastern Atlantic and the Mediterranean. In northern Australia, China, Thailand and India.

***Crassostrea madrasensis* (Preston, 1916)**

Common name: Indian backwater oyster; **Local names:** Muringa, Muru (Malayalam); Kalungu, Patti (Tamil); Muri (Kannada)



Biological note : It is a euryhaline brackish water oyster as thick bed. It is found in intertidal zones at depths of around 4 m. It grows to a maximum size of 212 mm and larger ones are available in estuaries. . Edible oysters are usually marketed as live oysters with shell, shucked oyster meat, frozen oyster meat and canned oyster meat. Value added products suitable for the Indian domestic market viz., oyster pickle, dried oyster, smoked oyster in oil, canned oyster in brine, minced meat products, battered and breaded IQF meat, soups, oyster chowder, and oyster extracts etc. have also been developed.

Distribution : *Crassostrea madrasensis* is widely distributed along both the east and west coasts of India. Along east coast, it is available in Bahuda estuary, Visakhapatnam; Sarada estuary, Kakinada; deltas of Godavari and Krishna rivers; Pulikat Lake; Ennore; Guggalore and Mandapam. Along west coast, it is distributed in Anchengo back water; Ashtamudi and Vembanad lakes; Kochin harbour and backwaters; Azhikode; Beypore; Thellicherry; Elathur; Chauyar estuary; Pavanji; Sambhavi; Sitanadhi; Coondapur; Venkatapur;

Sharavathi and Kalinadhi estuaries and Pirotan Islands, Gujarat. It also occurs along Pakistan coast

***Meretrix casta* (Gmelin, 1791)**

Common Name:- Yellow clam; **Local Name:-** Manja kakka



Biological notes : Commercially important species. Depth range is based on occurrence records in India. Found in estuaries on sand and in backwaters. In general, suspension feeding bivalves mainly depend on phytoplankton and detritus material for nutrition.

Distribution: *Meretrix casta* (Chemnitz) is an important venerid clam occurring in estuaries and backwaters of both east and west coast of India. It occurs in Goa, Aghnashini, Uppunda, Coondapur, Udyavara and Mulki estuaries in Karnataka and Ashtamudi, Chettuva, Beypore, Korapuzha, Moorad and Chaliyar estuaries in Kerala, contributing to sustenance fishery in these estuaries. In the east coast, it forms a fishery in Vellar, Pulicat and Bhimunipatnam backwaters

***Meretrix meretrix* (Linnaeus, 1758)**

Common Name:- Yellow clam; **Local name :** Manja kakka



Biological notes : It is commercially important species of Kerala. It has a hard shell covered with a delicate, brownish-greyish periostracum, and its posterodorsal margin has a greyish-blue- bluish-brown band. The shell is triangular to oval in shape. The posterior margin is slightly more pointed. It is equivalved, having no gape when closed. The lunule is not clear and the ligament is short. It has an umbo on anterior side. The shell exterior is white in colour. There is light purple or pink colouration along the radial lines. Hinge plate is hard. There are three cardinal teeth on the left and right valves.

Distribution : *Meretrix meretrix* is distributed in Philippines, Australia, Singapore, Indonesia, Thailand, South Africa, Malaysia, Indonesia, Vietnam, China, Japan, Korea and Papua New Guinea. It is also widely spread along the west and east coasts of India. It occurs along the west coast in Kalbadevi and Bhatea creeks of Maharashtra; Chaporal, Sal, Mandovi and Zuari estuaries of Goa; Kalinadi, Tadri and Coondapur of Karnataka and

Thellicherry and Ashtamudi lake of Kerala. Along the east coast, it occurs in major estuaries of Tamil Nadu, Andhra Pradesh and in the Chilika Lake.

***Perna indica* Kuriakose & Nair, 1976**

Name (English) : Brown mussel; **Local names:** Local names Kallumakkai, Kadukka (Malayalam)



Biological note : The species forms dense populations along the rocky coasts from the intertidal region to depths of 10 m. Large sized individuals are found at 0.5 to 2 m depth. Maximum recorded length is 121 mm. It has great preference for this species and hence of commercial value. Value added products are developed from this species. Mussels form an important item in the daily menu in most households of North Kerala. The fresh mussel meat is prepared in various traditional forms and delicacies like 'ari kaduka' (rice mussel), mussel stew, and mussel fried rice and mussel biriyani. Processed products such as dried and smoked mussel meat, marinated mussel meat, mussel meat pickle, mussel meat chutney powder, canned mussel meat and ready-to-serve fried mussel meat are also available in the market. The shell finds limited use in the lime industry.

Distribution : The mussel beds are spread both in west coast (Quilon to Cape Comorin) and east coast (Cape Comorin to Thiruchendur). Important centres are Cape Comorin, Colachal, Muttom, Poovar, Vizhinjam, Kovalam, Varkalai and Quilon.

***Perna viridis* (Linnaeus, 1758)**

Common name: Green mussel



Biological note : The major mussel beds along the South west coast are distributed across three districts of Kerala and in Mahe (Union Territory of Pondicherry). The mussel beds in Kozhikode (Calicut) district are Chombala, Thikkodi, Moodadi, Kollam, Elathur, South beach and Chaliyam, constituting about 435 ha. The major mussel beds in Kannur district are along Kadalayi, Koduvally, Thalasseri and Thalayi, constituting 125 ha. In Kasargod district, the mussel beds are off Chembarica, Kottikulum, and Bekal constituting 40 ha. The total area of mussel beds along the Malabar Coast constitutes 620 ha in area. Mussels form an important item in the daily menu in most households of North Kerala. The fresh mussel meat is prepared in various traditional forms and delicacies like 'ari kaduka' (rice mussel), mussel stew, and mussel fried rice and mussel biriyani. Processed products such as dried and smoked mussel meat, marinated mussel meat, mussel meat pickle, mussel meat chutney powder, canned mussel meat and ready-to-serve fried mussel meat are also available in the market. The shell finds limited use in the lime industry.

Distribution : Green mussels are found along the intertidal coasts of Quilon, Alleppey, Kochi, Kozhikode (Calicut), Kannur and Kasargod districts of Kerala, a state on the south west coast of India. Along the east coast of India, it ranges along Chilka Lake

(Orissa), Vishakapatnam (Andhra Pradesh), Chennai (Tamil Nadu), and Cuddalore (Pondicherry). It is also found along Mangalore, Karwar, Goa, Ratnagiri, and in the Gulf of Kutch and the Andamans and Nicobar Islands

***Pinctada margaritifera* (Linnaeus, 1758)**

Common/FAO: Black lip Name (English) pearl oyster; **Local names:** Muthu Chippi



Biological note : It is sedentary occupying the intertidal reef flats and is observed up to a depth of about 10 m. It is found attached to the coralline and sub-tidal regions in Andaman and Nicobar Islands. The black-lip pearl oyster is one of the valuable species for the pearl industry. It produces the black pearls and supports a multimillion dollar industry in the Pacific. It has traditionally been used as food, for ornaments, jewellery, tools and fish hooks in the Indo-Pacific region. French Polynesia and Cook Islands are the major producers of black south sea pearls. French Polynesia is also the major global supplier of Tahitian black pearl.

Distribution : *Pinctada margaritifera* is widely distributed in the Persian Gulf, Red Sea, Sudan, Papua New Guinea, Australia, French Polynesia, Indonesia, Andaman and Nicobar Islands, south-western part of Indian Ocean, Japan and Pacific Ocean. Along the Indian

coast, the occurrence of black lip pearl oyster is sporadic. It is reported from Vizhinjam (Kerala), Lakshadweep Island, Gulf of Mannar (Tamil Nadu), and Visakhapatnam (Andhra Pradesh). It is endemic to the Andaman and Nicobar Islands.

***Paphia malabarica* (Dillwyn, 1817)**

Common/FAO Name (English): Short Neck Clam; Yellow Clam



Source : Ampili & Shiny Sreedhar, 2015 (two different types)

Biological note : The short neck clam inhabits marine and estuarine habitats. It is distributed in the sandy mud flats upto a depth of 4 m. The short neck clam fishery of the Ashtamudi Lake of Kerala was the first Marine Stewardship Council (MSC) certified fishery of India. The meat of the short neck clam caught in the Ashtamudi Lake MSC certified fishery is exported to Vietnam, Thailand, Indonesia and Malaysia after processing and is valued to fetch nearly 10 crore/annum. This species is conserved by local people at Dalavapuram.

Distribution : It is distributed from the Gulf of Oman to Japan; covering India, China, Sumatra and the Philippines. It is distributed along both the east and west coast of India in many estuaries and coastal waters. Along the west coast, it forms a major fishery in Mulky, Gurupur, Udyavara and Coondapoor estuaries of Karnataka and Azhikkal, Chittari and Ashtamudi estuaries of Kerala

***Villorita cyprinoides* (Gray, 1825)**

Common name: Black Clam



Biological note : This species support a prominent fishery in Vembanad Lake. A large number of fisher folk depend on this resource for their income. It is highly nutritious and has great demand in domestic market. Its shell is converted to lime and sold for agricultural and other industrial purposes.

Distribution : India

***Sepia aculeata* (Van Hasselt, 1835)**

Common name : Needle Cuttle Fish



Source : FAO

Biological note : It is one of the commercially important marine fishery resources of Indian waters by virtue of its export demand, and is optimally exploited from east coast and under-exploited from west coast. Needle cuttlefish is a demersal, neritic species that occurs to 60 m depth.

Distribution : From the Arabian Sea to Southern Japan

***Sepia pharaonis* (Ehrenberg, 1831)**

Common name: Pharaoh Cuttlefish



Biological note : It is one of the most important species exploited along the Arabian Sea. It lives in fairly shallow waters, ranging as deep as 130 m. They tend to rise up in the water column at night to hunt for crustaceans and small fish. In the Andaman Sea and the Gulf of Thailand they are found in waters about 10 to 40 m deep. This ranges are also affected by the seasons, as they are migratory. During mating season, off the coast of Hong Kong, they are found at depths of 40 to 80 m. Their ink has been used for various homeopathic medicinal practices, such as cures for menstrual cramps and even depression. People have also been known to keep pharaoh cuttlefish as pets.

Distribution: It is a neritic demersal species endemic to the tropical waters of the Indo-Pacific region including Red Sea, Arabian Sea, Andaman Sea to South China Sea, East China Sea, Japan and Eastern Indonesia to Southern Australia including Gulf of Carpentaria

***Sepiella inermis* (Van Hasselt [in Férussac & d'Orbigny], 1835)**

Common name: Spineless Cuttlefish



Biological note : *S. inermis* is a demersal shallow water species. In Indian waters, it is widely distributed along both east and west coasts up to depths of about 40 m. Cuttlefish are becoming an increasingly abundant aspect of the fishing industry worldwide. Although the percentage caught varies depending on geographical location and time of year, they commonly make up a majority of all cephalopod catch. Trawlers are the main means by which cuttlefish are caught, both intentionally and as by catch. They are exploited all year long, with the percent catch typically decreasing in summer months because many species spawn in late spring. Even though they are consistently fished, there is still no evidence that implies over exploitation

Distribution : Indo-pacific.

***Uroteuthis duvauceli* (d'orbigny,1835)**

Common name: Indian squid



Biological note : Highly valuable sea food of export value. They are migratory species.

Distribution : Indo-West Pacific: Indian Ocean, Red Sea and Arabian Sea, eastwards from Mozambique to South China Sea and the Philippine Sea, northward to Taiwan.

***Octopus vulgaris* (Cuvier,1797)**

Common name:Common Octopus



Biological note : It is a benthic, neritic species occurring from the coastline to the outer edge of the continental shelf and is found in a variety of habitats, such as rocks, coral reefs and grass beds. The species is observed in rocky crevices all along the Mumbai coast especially in areas such as 'Madh' and Arnala. The species is caught by dol netters operating at a depth of 14-16 m. The octopus caught in dol nets are generally alive and can be used as an excellent species in the aquarium industry. The species is observed in the fishery almost throughout the year with peak period of abundance during January-April.

Distribution : The species has worldwide distribution in temperate and tropical waters.

***Cistopus incidus* (Raap, 1835)**

Common name: Old Women Octopus



Biological note : A benthic species, occurring from 0 to 50 m depth on mud bottom. Maximum total length 60 cm; maximum mantle length 18 cm, weight 2 kg. Caught in large number at certain seasons in Kerala and are having great export potential.

Distribution : Indo Pacific: mostly Indo-Malayan region, the Philippines, China, Bangladesh, India and Pakistan, and recorded off Mozambique

***Chiloscyllium indicum* (Gmelin, 1789)**

Common name:Slender Bamboo Shark; **Local name:** Udumban Sravu



Biological note : A common but little-known inshore sluggish bottom shark. It may possibly occur in fresh water in the lower reaches of the Perak River in peninsular Malaysia. Maximum total length (TL) is about 65 cm, with males maturing between 39 and 42 cm TL, and females at 43 cm TL. *Chiloscyllium indicum* is of considerable interest to fisheries in some areas and is regularly taken in inshore fisheries in India, Sri Lanka and Thailand and utilized fresh for food. It is caught in demersal trawls, demersal gill nets and occasionally pelagic gill nets and is likely to be threatened by overfishing, destructive fishing practices and habitat modification, including the damage and destruction of coral reefs throughout much of its range.

Distribution : Indo-West Pacific: Arabian Sea to India, Sri Lanka, Singapore, Thailand, Indonesia, Viet Nam, Taiwan, and Solomon Islands. Probably occurring in Korea and Japan

***Alopias pelagicus* (Nakamura, 1935)**

Common name: Pelagic Thresher Shark

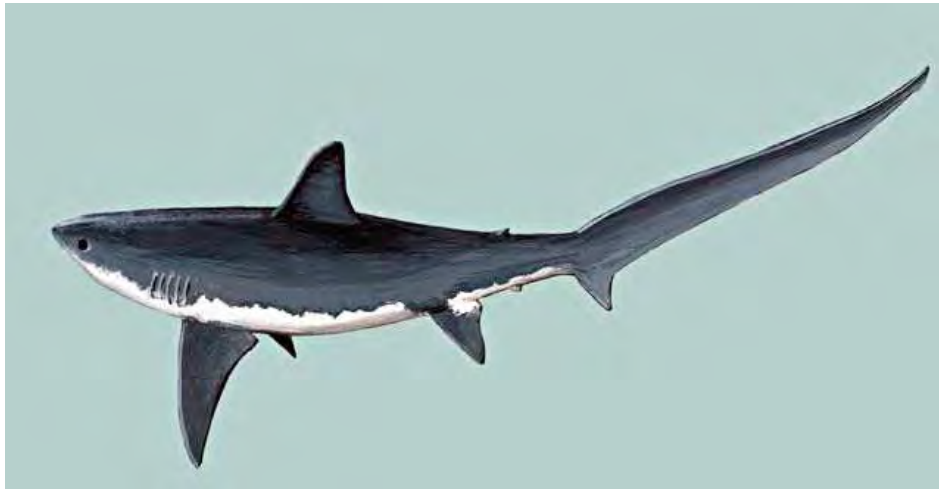


Biological note : Endangered. Meat for human consumption, liver for liver oil, hide for leather and fins for soup. Vitamin A is extracted from the liver

Distribution: Indian ocean : South Africa, Red Sea, Arabian Sea (Off Somalia, Oman, India and Pakistan). Western North Pacific : China, Japan. Western South Pacific : Australia, New Caledonia, Tahiti. Eastern Pacific : Gulf of California to Galapagos Islands

***Alopias vulpinus* (Bonnaterre, 1788)**

Common name: Thresher Shark



Biological note: IUCN:VU. The meat is of high quality, highly priced, used for human consumption. Fins are valuable for shark fin soup; the hide used as leather. The species is highly valued by big-game recreational fishers, and although many practice catch and release, recreational fishing could be a threat due to post-release mortality that has been estimated for the Common Thresher as 78% for tail-hooked and 0% for mouth-hooked animals

Distribution: Oceanic and coastal, virtually circumglobal in warm seas. Western Atlantic: New Found land to Cuba, Gulf of Mexico, Brazil, Argentina. Eastern Atlantic: Norway, British Isles to Mediterranean, Morocco, South Africa. Indo-West Pacific : South Africa, Tanzania, Somalia, Maldives, Gulf of Aden, Pakistan, India, Sri Lanka, Sumatra, Japan, Korea, China, Australia. Central Pacific: Hawaiian Islands, Society Islands, Fanning Islands. Eastern Pacific : British Columbia to Central Baja California, Panama & Chile

***Carcharhinus dussumieri* (Müller & Henle, 1839)**

Common name: Whitecheek Shark; **Local name:** Karithala Sravu



Biological note : IUCN:EN. Used as fish meat, liver oil, fin trade for soup. Drug and medicinal value: Liver oil and cartilage is used for preparation of medicine

Distribution: Indo - West Pacific: The "Gulf" and Arabian Sea between Gulf of Oman and Pakistan, India, Singapore, Malaysia, Java, Thailand, Borneo, Viet Nam, China, Japan

***Carcharhinus limbatus* (Müller & Henle, 1839)**

Common name : Ground Shark



Biological note : Commonly occurs close to shore off river mouths, estuaries, and in shallow muddy bays; rarely found in waters deeper than 30 m. Utilised fresh, frozen and dried salted for human consumption; carcass for fish meal and skin for leather, fins for soup. Fins and cartilage exported. Drug and medicinal value : Liver yields oil of a moderate vitamin 'A' value.

Distribution: Widespread in all tropical & subtropical continental waters. Western Atlantic : Massachusetts to South Brazil, Gulf of Mexico and Caribbean. Eastern Atlantic : Madeira, Mediterranean, Canary Islands, Senegal to Zaire. Indo - West Pacific : South Africa, Madagascar, Red Sea, India, Sri Lanka, Pakistan, Thailand, China, Taiwan Islands,

Philippines, Java, Borneo, Australia. Central Pacific : Tahiti, Marquesas, Hawaiian Islands.
Easter Pacific : Baja California, Peru, Revillagigedo and Galapagos Islands

***Rhizoprionodon acutus* (Rüppell, 1837)**

Comm on name : Requiem Shark; **English name :** Milk Shark



Biological note : Inshore species - upto 50 m . Meat utilized fresh and dried salted and for fish meal. Its flesh promotes lactation in women

Distribution: Eastern Atlantic : Madeira and Mauritiana to Angola. Indo- West Pacific: South Africa and Red Sea to Pakistan, India, Malaysia, Indonesia, Thailand, China, Japan, The Philippines and Australia (Queensland).

***Scoliodon laticaudus* (Müller & Henle, 1838)**

Comm on name : Spadenose shark **English name :** Indian Dog – shark



Biological note : A tropical shark occurring close inshore. Utilized for human consumption in fresh, dried and dried salted form. Processed to fish meal, as bait for other shark and bony fishes.

Distribution: Indo -West Pacific, Tanzania, Pakistan, India, Sri Lanka, Malaysia, Singapore, Thailand, Java, Borneo, China, Taiwan Island and Japan. Indo- West Pacific: South Africa and Red Sea to Pakistan, India , Malaysia, Indonesia, Thailand, China, Japan, The Philippines and Australia (Queensland)

***Sphyrna zygaena* (Linnaeus, 1758)**

Common name : Smooth Hammerhead Shark **English name :** Round Headed Hammerhead



Biological note : A coastal pelagic species occurring in depths from surface down to 20m and more; Meat used for human consumption, fins for soup, hide for leather, carcass for fish meal. Meat used fresh, dried/ salted and smoked. Fins and cartilage are exported; Cartilages exported for medicinal product and liver oil for vitamin ' A '.

Distribution : Western Atlantic : Nova Scotia ,Florida, Southern Brazil to Argentina . Eastern North Atlantic : Mediterranean, British Isles to Senegal, Cape Verde Islands, Guinea and Ivory Coast. Western Indian Ocean : South Africa, Southern Mozambique, India and Sri Lanka. Western Pacific : Viet Nam, Southern Japan, Southern Siberia, Australia. Eastern Pacific : Northern California to Gulf of California, Panama, Galapagos Islands and Chile. Central Pacific : Hawaiian Islands

***Pristis microdon* (Latham, 1794)**

Common name : Small Toothed Sawfish



Biological note : Flesh for human consumption, fins for export, skin used for smoothing the wood and rostrum for decoration. This species has very large liver about 50% of weight of fish yielding large quantity of oil of high vitamin A potency

Distribution: East coast of Southern Africa, the Mediterranean, Madagascar, India, the East India and the South-west Pacific. Shallow water, estuaries and frequently in fresh water. Very common in the estuaries of Ganga and Brahmaputra

***Himantura bleekeri* (Blyth, 1860)**

Comm on name : Whip Tail Stingray ; **English name :** Bleeker's Whipray



Biological note : Average weight of the liver is 2.2 Kg and yields 60% of oil. Flesh consumed fresh and dried salted form. Skin used for leather. Export potential : The skin is exported to Nepal to prepare bags, shoes, purse etc. The price of the skin depends on the size(Rs.15/- to 25/- Piece) at Mumbai

Distribution: Wide spread in the tropical Indo - West Pacific : Pakistan, India, Sri Lanka, Myanmar, Thailand, and Malaya Peninsula

***Himantura uarnak* (Gmelin, 1789)**

Common name : Honey Comb Sting Ray ; **English name** : Banded Whip Tail Sting Ray



Biological note : Shallow estuaries and lagoons; also offshore down to 50m depth; Flesh consumed in fresh and dried salted condition; Skin of this species exported to Nepal.

Distribution : Seas and estuaries of India, Cape of Good Hope, Natal, Madagascar, Seychelles, Zanzibar, Arabia, Sri Lanka, Myanmar, Siam, China, Melanesia and Polynesia

***Hippocampus kuda* Bleeker, 1852**

Common/FAO Name (English) : Spotted Seahorse; **Local names:** Kadal Kuthira (Malayalam)



Biological note : VU category. It is found in shallow inshore waters up to a depth of 40-50 m; in mangroves, seagrass beds and estuaries; and on steep mud slopes. It has also been recorded from open waters attached to drifting *Sargassum* at 20 km away from land. Adult lengths, measured as distance from the tip of the tail to the top of the coronet (a cup-like depression found on top of the head), ranges between 7.0 and 17.0 cm. It is one of the most valuable species in the trade for traditional medicine, curios and aquaria. Its demand is high because of its large size, smooth texture and pale complexion when dried. It possesses all the desirable qualities for traditional medicinal purposes.

Distribution : The spotted seahorse occurs in the Indo-Pacific; Pakistan and India to southern Japan, Hawaii and the Society Islands. It is found in Australia, Cambodia, China

(Hong Kong SAR and Province of Taiwan), Fiji, France (New Caledonia and Tahiti), Indonesia, Malaysia, Papua New Guinea, Philippines, Federated States of Micronesia, Singapore, Solomon Islands, Thailand, Tonga, United States of America (Hawaii) and Vietnam.

***Hippocampus trimaculatus* Leach, 1814**

Common/FAO Name (English) : Longnose Seahorse; **Local names:** Kadal Kuthira (Malayalam)



Source : Shutterstock.com.1758339641

Biological note: VU category. It inhabits gravel or sandy bottoms around shallow reefs; muddy estuaries and near mangroves, tolerating brackish waters. It is typically found at more than 10 m depth, with a maximum reported depth of 100 m. It feeds on zooplankton. Since they are poor swimmers, they utilize their thick snouts and specialized jaws to suck in their prey

Distribution: It occurs in the Indo-Pacific region: from southern India to Japan, Australia and Tahiti.

***Pampus argenteus* (Euphrasen, 1788)**

Common/FAO Name (English) : Silver pomfret; **Local names:** Paplet, Vichuda (Local names Gujarati Gujarati); P Gujarati aplet, Chandava, Saraga (Marathi Marathi); Marathi Surangat (Konkani); onkani Manji, Thondrette/Thondrotte (Kannada); V annada ella-avoli, Karuvolli, Veluthaavoli (Malayalam); Malayalam Karuvaval, Vavval, Vellavavvel, Vellaivaval

(Tamil); Chanduva, amil Nallachanduva, Thellachanduva (Telugu); Chandee, elugu Ghia (Oriya); Oriya Chandi, Pomfret (Bengali Bengali)



Source : Source : Shutterstock.com.149757740

Biological note : They are schooling meso-pelagic fishes inhabiting shallow to deep waters and muddy bottoms, up to 100 m depth. Young are commonly reported from estuaries. Diet studies have indicated that the diet of silver pomfret consists of a broad spectrum of food types, but was dominated by crustaceans, with copepods and their eggs constituting 39 % and other non-copepod crustaceans constituting 16 %. It is a highly valued food fish with great demand in international and domestic markets. The fishery is an economically significant one, particularly in countries like China, India, Kuwait and Iran

Distribution: Silver pomfret occurs in Indo-West Pacific waters, from Persian Gulf to Japan (north to Hokkaido), excluding Australia. They are also reported from the Adriatic, Hawaii and north-eastern Atlantic.

Pampus chinensis (Euphrasen, 1788)

Common/FAO : Chinese silver Name (English) pomfret; **Local names:** Kafri, Pathu, Vichuda (Gujarati); Chandava, Kapri, Kalwad, Khalwad (Marathi); Paplet (Konkani); Balimanji, Manji (Kannada); Avoli, Vella-avoli, Velutha-avoli (Malayalam); Karappuvavel,

Karu-valal, Mongang-valal (Tamil); Chanduva (Telugu); Dhala-chandi (Oriya); Chandi, Pomfret (Bengali)



Biological note : These are benthopelagic marine or brackishwater amphidromous fish, which enter estuaries. It occurs seasonally, either single or in small schools over muddy bottoms. This is a popular food fish in India. The fish is marketed as fresh as well as iced.

Distribution : *Pampus chinensis* is distributed in Indo-West Pacific regions from Persian Gulf to eastern Indonesia and north upto Japan. In India, it is found along both the east and west coasts

***Parastromateus niger* (Bloch, 1795)**

Common/FAO Name (English) : Black pomfret; **Local names:** Adadio, Halwa (Gujarati); Halwa (Marathi); Halwa (Konkani); Kari manji (Kannada); Avoli, Karutha, Maachan, Karuvoli, Vellavoli, Karauthakoli (Malayalam); Vaval, Karuvaval (Tamil); Nalla Chanduva (Telugu)



Biological note : Parastromateus niger is the only known member of its genus. It is a mid-water pelagic species living in marine and brackishwater environments and inhabits depth ranges from 15-105 m. Mostly, the adults inhabit coastal areas with muddy substrate. It is found near the bottom during daytime and near the surface at night. It enters estuaries and normally forms large schools

Distribution :The black pomfrets is distributed in the tropical, subtropical and temperate seas of the world; in Indian and Pacific oceans, across the Persian Gulf and Oman Sea, China and the Malay Archipelago. In India, it is widely distributed along both the east and west coasts.

***Thunnus albacares* (Bonnaterre, 1788)**

Order : Perciformes Family : Scombridae, **Common/FAO Name (English)** : Yellowfin tuna; **Local names:** Gedar, Gedara (Local names Gujarati Gujarati); Gujarati Bugudi, Kuppa (Marathi Marathi); Gedar, Marathi Kuppa (Kannada); annada Kerachoor, Manjachoor, Poovanchoora (Malayalam); Malayalam Quintal choora, Poovanchoora, Kannchmas (Lakshadweep); akshadweep Choor, Kelavalai, Soccer (Tamil); Reecasoora (amil Telugu); Baal (elugu Oriya)



Biological note : It is typically an epipelagic, oceanic fish which prefers to live around the thermocline ranging between 18 to 31 °C and do not generally occur below 100 m in depth. The species aggregates around island territories, seamounts and shelf break areas of mainland coasts. Juvenile fish form large aggregations along shelf-break areas and over seamounts. It forms strong schools with the same species and also with other species of tuna.

Distribution : It is typically a pelagic species distributed in all warmer (tropical and subtropical) areas, except the Mediterranean Sea

***Euthynnus affinis* (Rüppell 1836)**

Common name: little tunny



Biological note : Indian coast, *E. affinis* is exploited in all the coastal states and the island systems and forms the bulk of the tuna landings of the country. It contributes about 58% of the tuna landings in India

Distribution: It is a medium sized tuna occurring throughout the nearshore continental shelf areas of the Indo-Pacific waters where water temperatures vary between 18 and 29 o C. In the Indian Ocean, this species extends from Cape St. Francis, South Africa along the coasts of East Africa, Arabian Peninsula, the Indian sub-continent, and Malaysian Peninsula. It is also found in the Red Sea, Persian Gulf, and off islands in the Indian Ocean, including Madagascar, Comoros Islands, Mauritius, Reunion, Seychelles, Lakshadweep, Andaman and Nicobar Islands, Sri Lanka and Maldives

***Katsuwonus pelamis* (Cuvier, 1816)**

Common name-Skipjack tuna; **Local names:** local names: Gedara (Gujarati Gujarati); Gujarati Bugudi, Gedar, Kuppa (Marathi Marathi); Marathi Bugudi, Kuppa, Gedar (Kannada); V annada arayan choora (Malayalam); K Malayalam alililamas (Lakshadweep); V akshadweep arisoorai (Tamil); Mas choora, Namalasoora (Telugu); Baal, Disco tumbala (elugu Oriya)



Biological note : It generally forms large schools, often in association with other tunas of similar size such as juveniles of yellowfin tuna and bigeye tuna. The average distance between skipjack tagging and recovery positions was estimated around 640 nautical miles. It is an ideal species for the preparation of high quality sashimi and is reported to have stronger taste than other tunas and shorter shelf life. It is marketed fresh, frozen, dried, canned and also smoke dried

Distribution : Skipjack tuna has a cosmopolitan distribution and is reported from most of the tropical and temperate waters except the eastern Mediterranean Sea and the Black Sea. It is seen within the geographical limits of 55° - 60° N and 45° - 50° S Skipjack tuna (*Katsuwonus pelamis*) is a pelagic oceanic, oceanodromous, highly migratory and cosmopolitan species found in the tropical and subtropical waters of the Indian, Pacific and Atlantic Oceans in depth ranging from surface to 260 m depth¹.

***Rastrelliger kanagurta* (Temminck & Schlegel, 1844)**

Common name- Indian mackerel



Biological note : Maximum exploitation of the resource has been recorded from the southwest (Kerala, Karnataka and Goa) coast of India using seines, gillnets and trawls. The Indian mackerel is an important fishery resource in the Indian EEZ especially along the south-west coast of India as well as form an important forage item for the highly valued food fishes. It is widely distributed in the tropical Indo-west Pacific region, along both east and west coast of India and the Andaman and Nicobar Islands. Dense shoals occur in the coastal waters up to 50 m depths forming a major fishery along the west coast of India. Along the east coast, distribution and maximum abundance recorded at about 70 - 100 m depths

Distribution : Indo-West Pacific: Red Sea and East Africa to Indonesia, north to the Ryukyu Islands and China, south to Australia, Melanesia and Samoa. Entered the eastern Mediterranean Sea through the Suez Canal.

***Rachycentron canadum* (Linnaeus, 1766)**

Common/FAO Name (English) : Cobia;**Local names:** Modasa (Gujarati) (Gujarati); (Gujarati) Madusa, Maddus, Sakala, Sakla (Marathi) (Marathi); (Marathi) Robal (Kannada) (Kannada); (Kannada) Modha (Malayalam) (Malayalam); K (Malayalam) adal viral (Tamil);Nalla matta (Telugu)



Biological note : Cobia is found in both coastal and continental shelf waters, although it is typically considered to be an offshore species. It is also found inshore inhabiting bays, inlets and mangroves. It is eurythermal tolerating a wide range of temperatures, from 1.6 to 32.2 °C though it prefers warm water (>20 °C). Recently CMFRI has developed seed production technologies for this species.

Distribution: Cobia is distributed worldwide in tropical, subtropical and warm-temperate waters of the west and east Atlantic Ocean throughout the Caribbean and in the Indo-Pacific off India, Australia and Japan. In the western Atlantic Ocean, this pelagic fish occurs from Nova Scotia (Canada), south to Argentina, including the Caribbean Sea. It is abundant in warm waters off the coast of United States from the Chesapeake Bay south and throughout the Gulf of Mexico. In the eastern Atlantic Ocean, it ranges from Morocco to South Africa and in the Indo-West Pacific from East Africa and Japan to Australia. Cobia does not occur in the eastern Pacific Ocean. During autumn and winter

months, the fish migrates south and offshore to warmer waters. Cobia prefers water temperatures.

***Scomberomorus commerson* (Bloch & Schneider, 1801)**

Common name: Narrow-Barred Spanish Mackerel



Biological note : It is one of the most important and highly valued commercial species distributed throughout the Indo-West Pacific. In India, it is distributed along the Arabian Sea, including Lakshadweep Islands and Bay of Bengal including Andaman Islands. The species thrive predominantly in shallow coastal waters associated with continental shelves and the adults undertake extensive seasonal long-shore migrations. The capture production of this species in the Indian Ocean, where India being the second largest producer is with 1 54 723 tonnes (FAO, 2014). Spanish mackerel are known to aggregate on reefs in large numbers to spawn. The nature of *S. commerson* fishery is that a relatively large proportion of the catch is taken from a particular area/a stock where they aggregate to spawn

Distribution : Indo-West Pacific: Red Sea and South Africa to Southeast Asia, north to China and Japan and south to southeast Australia, and to Fiji). Immigrant to the eastern Mediterranean Sea by way of the Suez Canal. Southeast Atlantic: St. Helena.

***Scomberomorus guttatus* (Kishinouye, 1915)**

Common name: Spotted seerfish



Biological note : It is one of the highly priced table fishes in India. Even though, this fish is caught all along the Indian coast, fishery is dominant only in the north-west (Gujarat and Maharashtra) and east coasts of India (West Bengal, Andhra Pradesh and Tamil Nadu). In spite of its high value and importance in commercial and artisanal fishery in the northern Arabian Sea, export of the species from India is limited due to its smaller size, non-availability of large size fishes in larger quantities for all seasons. It is exploited by a variety of gears viz., drift gill nets, hook and lines, trolling, trawl nets and seines

Distribution : Indo-Pacific from Persian Gulf to the Sea of Japan

***Scomberomorus lineolatus* (Bonnaterre, 1788)**

Common name: Streaked seerfish



Biological note : Little is known about the biology of this species. Caught with drift gill nets, midwater trawls, purse seines, and by trolling. Marketed mainly fresh; also dried-salted

Distribution: A coastal species found from the west coast of India and Sri Lanka westward to Thailand, Malaysia, and Java

***Epinephelus malabaricus* (Bloch & Schneider, 1801)**

Common name: Malabar Grouper



This species is distributed in the Indo-Pacific from East Africa to the Red Sea, east to Tonga, north to the Ryukyu Islands, Japan and south to northern Australia. It is absent from the Persian Gulf. Its depth range is one to 150 metres. This is a common species along the west coast of India and in the Gulf of Mannar. It is also one of the dominant species in the Andaman Islands, and may be exploited there in large quantities for the live fish trade

Epinephelus malabaricus is one of the 13 principal species in the live-fish trade which sources wild-caught and maricultured large reef fishes from the Indo-Pacific for export primarily to Hong Kong, China

***Sardinella longiceps* (Valenciennes, 1847)**

Common name: Indian Oil Sardine



Distribution Indian Ocean (northern and western parts only, Gulf of Aden, Gulf of Oman, but apparently not Red Sea or the "Gulf", eastward to southern part of India, on eastern coast to Andhra; possibly to Andamans).

The Indian oil sardine, *Sardinella longiceps* (Valenciennes) is a small pelagic fish belonging to the family Clupeidae, which contributes to about 40% of the marine fish

catch in Kerala, India. It usually inhabits the pelagic zone confined to at a depth range of 20- 200 meters from the coast line. Oil sardine grows rapidly, mature early and a few continue to survive in the subsequent years

***Chanos chanos* (Forsskal 1775)**

Common name: Milk fish



Biological note : *Chanos chanos* is a euryhaline benthopelagic, amphidromous, tropical species under the order Gonorynchiformes is a monotypic species from the family Chanidae, inhabiting marine as well as brackish waters. Milkfish is mostly found in

offshore marine waters and shallow coastal embayment; reported to very often enter into estuaries and freshwater streams. In reef-associated coasts or islands, they occur as small to large schools. During 2018 milkfish farming accounted 11 327.2 thousand tones production which is 2.4% of total finfish produced globally from aquaculture. Milkfish is a high-quality food fish with a rapid growth rate, and it is highly resistant to diseases

Distribution : Milkfish is distributed in the Indo-Pacific region along the continental shelves and around islands, where temperatures are higher than 20°C. It is available in the Red Sea and South Africa to Hawaii and the Marquesas, north to Japan, south to Victoria, Australia and in the Eastern Pacific region like San Pedro, California to the Galapagos.

***Lates calcarifer* (Bloch, 1790)**

Common name: Sea Bass



Biological note : It is a euryhaline species, and can be cultured in freshwater, brackish water, and marine conditions. It has a complex life history of being a protandrous hermaphrodite and a catadromous species. It spends most of its growing period in

freshwater bodies and brackish water lakes which are connected to the sea. Sea bass is one of the most preferred food fishes and provides the basis of an extensive aquaculture industry.

Distribution : East Indian Ocean and Western central Pacific. Japanese Sea, Torres Strait or the coast of New Guinea and Darwin, Northern Territory, Queensland (Australia). Also, westward to East Africa.

***Epinephelus diacanthus* (Valenciennes 1828)**

Common name: SpinyCheek Grouper



Biological note : It is a demersal species belonging to the family Serranidae, which are commonly known as groupers, rockcods, and hamours, a group of percoid fishes in the order Perciformes. It is reported that the spinycheek grouper occurs on mud and muddy sand bottom from very shallow waters of about 2 m deep down to 110 m. It is highly preferred food species and hence has great market value.

Distribution : Indian Ocean: It is distributed on the continental shelf of the north-western Indian Ocean from the Gulf of Aden to Sri Lanka and Chennai (India), but is not known from the Persian Gulf or the Red Sea, and in the eastern Indian Ocean off Thailand and Hong Kong.

***Epinephelus areolatus* (Forsskål 1775)**

Common name: Areolate Grouper



Biological note : This continental shelf species is usually found in turbid water in seagrass beds or silty sand bottoms around isolated small rock outcrops, as well as near dead coral or soft coral as deep as 200 metres. This is a commercially valued species in many areas. It is taken with hook and line, traps and trawls. Highly preferred food species.

Distribution : This species is widespread in the Indo-Pacific from the Red Sea and the Persian Gulf to Natal (South Africa), east to Fiji, north to Japan and south to the Arafura Sea (and northern Australia. It has also been recorded from Tonga. It is apparently absent from Micronesia, Polynesia and most islands of the western Indian Ocean).

***Lutjanus argentimaculatus* (Forsskål 1775)**

Common/FAO names : Mangrove red Name (English) snapper; Local names: ocal names: Ratado (Gujarati Gujarati); Gujarati Chawari tamb, Tambusa (Marathi Marathi); T

Marathi ambus (Konkani); onkani Tamboos, Chembali (Kannada); Murumeen, P annada ahari, Chempalli, Chemkalava (Malayalam); Malayalam Chenganni, Cheppili, Karuvalai, Karva, Nethiprion, Paruthivala meen, Paruthikanni, Patani-keeli, Tokkal, Vekkattai (Tamil); Kaliviyya, Rangu, Rangoo, Thundava (Tamil Telugu); Dhala-chandi (elugu Oriya



Biological note : is a euryhaline species. It has a complex life history with distinct inshore and offshore phases. Juveniles are primarily found in estuaries, rivers, coastal wetlands and tidal creeks. Adults are often found in groups around coral reefs and sometimes they migrate to offshore, deeper reef areas, even penetrating to depths beyond 100 m. This is an excellent food fish because it does not get rancid easily when frozen. It commands a good export market price with no limit on body size. The fish is marketed fresh, frozen, dried or salted

Distribution : It is distributed in the Indian Ocean and Pacific Ocean, from Africa eastwards to Samoa and from the Ryukyus in the north to Australia in the south. It has also been recorded from the coast of Lebanon in the Mediterranean Sea though it is not established in the Mediterranean Sea. In India, it has been reported from both the east and west coasts with more landings from the southern states.

***Johnius dussumieri* (Cuvier, 1830)**

Common name: Sin Croaker



Biological note : Found in inshore and coastal waters, down to 40 m depth ;marine; brackish; demersal; oceanodromous; Found in coastal waters; enters estuaries; feeds on invertebrates and small fishes; marketed fresh, dried salted.

Distribution: West coast of India and southeast coast of Africa; outside Fishing Area 51, in the Andaman Sea (other records doubtful)..

***Scomberoides commersonianus* (Forsskål, 1775)**

Common name: Talang Queenfish



Biological note : It is found at depths of 15 to 30 m. This species is a coastal waters species that occasionally enters estuaries. This species generally swims in small schools near reefs and offshore islands. This species is a popular gamefish and is also harvested commercially for human consumption by drift setnets, gillnets, seines and hook and line. In some parts of its range, this species is taken as by-catch in shrimp trawl fisheries.

Distribution : This species is broadly distributed in the Indo-West Pacific, from South Africa to the Red Sea and the Persian Gulf, east to Papua New Guinea and New Caledonia, north to southern Japan, south to Western Australia, New South Wales.

***Scomberoides lysan* (Cuvier, 1832)**

Common name: DoubleSpotted QueenFish



Biological note : This species is a coastal water species that inhabits a variety of areas including shallow lagoons, seaward reefs and neritic waters over sandstone with coral, mud, and sand and over offshore areas to depths of 100 m. This species occurs singly or in small schools. This species is commercially harvested and caught using drift setnets, gillnets, seines and hook and line. This species is marketed fresh or dried salted. This species is economically important in inshore and offshore fisheries of Sri Lanka. This species is also a popular recreational species. In Sri Lanka, this species is consumed by mothers during pregnancy and immediately after delivery and is therefore highly prized and maintains a high market demand

Distribution : Indo-Pacific: Red Sea and East Africa to Hawaii, Marquesas, Line and Tuamoto islands, north to southern Japan, south to New South Wales and Rapa. In India, Andhra Pradesh, Tamil Nadu & Kerala Coast, Rameswaram island, Andhra Coast and Tuticorin, Chilka lagoon, Orissa.

***Coryphaena hippurus* (Bloch & Schneider, 1801)**

Common/FAO : Mahi-mahi Name (English); Local names: Local names: Himra machhi (Gujarati Gujarati); P Gujarati opat masa, Abanoos, Himra masa (Marathi Marathi); Marathi Thondrotte (Kannada); Avoli, K annada aruvoli, Vellavoli, Rocket fish, Affunosi, Pullimodha, Padalan, Chain cover (Malayalam); Malayalam Badahlan, Koppurair-kulavanna, (Tamil);Hylesu, Babbaasipara (Telugu); Baal elugu (Oriya)



Biological note : In early life stages it feeds on zooplankton and later, on all forms of fishes, crustaceans and squids. Mature fishes exhibit sexual dimorphism with males possessing a prominent bony crest in front of the head. It is an exceptionally versatile fish having firm white meat and a delicate flavour. Broiled, poached, baked, sautéed, grilled, or pan-fried mahi-mahi delivers a truly sensational taste. It is generally marketed fresh and frozen and has high demand in the export market, especially in Japan and Taiwan

Distribution : The common dolphinfish is widely distributed in tropical and subtropical waters and is commonly found in the Atlantic, Indian and Pacific oceans. It is available all along the Indian coast with large abundance in the southern region.

***Lutjanus malabaricus* (Bloch, 1790)**

Common name: Malabar Blood Snapper



Biological note : This species inhabits a variety of benthic habitats on the continental shelf, including coastal and offshore reefs, shoal grounds and areas of flat bottom with occasional epibenthos or vertical relief. This highly commercial species is caught mainly by trawl as well as handlines and bottom longlines. It is considered an excellent food fish. It is found at depths ranging from 12 to 140 m.

Distribution : This species is widespread in the Indo-West Pacific from Fiji to the Arabian Sea and Persian Gulf, and from Australia (Shark Bay, Western Australia to northern New South Wales) to southern Japan. It has also been identified from Tonga and Kosrae and Korea. There are unsubstantiated records from East Africa.

***Nemipterus japonicus* (Bleeker, 1853)**

Common name: Japanese Threadfin Bream



Biological note : This demersal species forms schools in shallow, coastal waters on mud or sand bottoms. Smaller individuals inhabit shallower waters of less than 27 metres depth, while larger individuals occur in waters deeper than 45 metres. This species is a dominant component of commercial trawl and other demersal fisheries off India, and demand by the surimi industry has been increasing in recent years. It also commonly occurs as bycatch in trawl fisheries. It is very abundant in coastal waters, found on mud or sand bottoms, usually in schools. The species feeds mainly on small fishes, crustaceans, mollusks (mainly cephalopods), polychaetes and echinoderms. Marketed mainly fresh, but also frozen, steamed, dried-salted, dry-smoked, fermented or made into fish balls and fish meal.

Distribution : This species is distributed in the Indo-West Pacific from Tanzania to the Red Sea, Sea of Oman and Persian Gulf, east to the Philippines. In China, it occurs from the Beibu Gulf (Gulf of Tonkin), the South China Sea and the Taiwan Strait. Records from the Ryukyu Islands of Japan are questionable. It has been recorded as a lessepsian migrant in the Mediterranean Sea from Haifa Bay, Israel.

***Mugil cephalus* (Bleeker, 1853)**

Common/FAO names : Flathead Name (English) grey mullet; **Local names**: Boi, Local names Gandhiya, Bhomat (Gujarati Gujarati); Gujarati Boi, Boita, Bol, Mangan, Pilsa, Pilsa, Sheroto (Marathi Marathi); Gobri, Marathi Wekhanu (Konkani); Mala (onkani Kannada); annada Thirutha, Thirutha kanambu (Malayalam); Malayalam Madavai, Kasmin, Manla (Tamil); Kathiparega, Meyman (Telugu)



Biological note : It is a coastal species that often enters estuaries and rivers. Usually it forms schools over sandy or muddy bottom, between 0 and 10 m, in highly salty to fresh waters that are warm or temperate from 8 to 24 °C. The grey mullet is catadromous and it can tolerate a wide range of water salinity. Adult mullet tolerates very high salinity, while juveniles reach high salinity tolerance at lengths of 4-7 cm. Adults form spawning aggregations and migrate offshore to spawn. It is marketed fresh, frozen, salted and dried and its eggs are considered a delicacy. In India the species has a good demand in the domestic market fetching up to 400/kg.

Distribution : distributed in Indian Ocean, Atlantic Ocean, Pacific Ocean and Mediterranean Sea. They are cosmopolitan in nature i.e. found in coastal waters of the tropical, subtropical and temperate zones of all seas. It is distributed from California, USA to Chile in Eastern Pacific; from Japan to Australia in Western Pacific; from India to South Africa in Western Indian Ocean; from Nova Scotia, Canada to Brazil in Western Atlantic;

Cape Cod to southern Gulf of Mexico; Bay of Biscay to South Africa, including the Mediterranean Sea and Black Sea in Eastern Atlantic.

***Siganus javus* (Valenciennes, 1835)**

Common name: Streaked SpineFoot



Biological note: This species occurs in small schools, inhabiting shallow coastal waters around rock and coral reefs and in brackish lagoons; however, it is not considered a coral reef species. This species also occurs on hard-bottom structures. Feeds on algae attached to the substrate and on floating algal fragments. This species is collected using seines, gillnets, and in fixed traps.

Distribution : Indo-Pacific: Persian Gulf, Gulf of Oman, Pakistan, India, Sri Lanka, Burma, Andaman Islands, Thailand, Viet Nam, southern China, Malaysia, Indonesia, Philippines, Australia, New Guinea, Vanuatu and New Caledonia. Records for the Ryukyu and Ogasawara Islands could be based on strays.

***Lepturacanthus savala* (Klunzinger, 1884)**

Common name: Savalai Hairtail



Biological note : Inhabits coastal waters and often comes near the surface at night. Highly predaceous and feeds on a variety of small fishes and crustaceans. It is caught mainly with shore seines, bagnets and coastal bottom trawls in Asian countries. Marketed fresh and iced as well as dried salted.

Distribution : Indo-West Pacific: India and Sri Lanka to Southeast Asia, north to China, and south to New Guinea and northern Australia.

***Trichiurus lepturus* (Cuvier, 1832)**

Common name: LargeHead Hair Tail



Biological note : Generally over muddy bottoms of shallow coastal waters. Often enter estuaries; Juveniles feed mostly on euphausiids, small pelagic planktonic crustaceans and small fishes; adults feed mainly on fishes and occasionally on squids and crustaceans; adults and juveniles have opposing complementary vertical diurnal feeding migration. Large adults usually feed near the surface during the daytime and migrate to the bottom at night. Juveniles and small adults form schools 100 m above the bottom during the daytime and form loose feeding aggregations at night near the surface. Commercial fisherman have caught fish of up to 5 kg. Marketed salted or dried and also frozen; Excellent taste when fried or grilled; also for sashimi when fresh.

Distribution : This species is globally distributed in temperate and tropical waters except the central Pacific (Hawaii etc.). In the eastern Atlantic it is known from southern England south, throughout the Mediterranean, along West Africa from Morocco to South Africa. In the western Atlantic it is known from Virginia south along the U.S., Bermuda, in the Gulf of Mexico from Tampa (Florida) west along the Gulf coast down to Campeche (Mexico) and scattered records from the Florida Keys and Cuba, in the Caribbean Sea from Jamaica to Tobago, and along Central and South America from Belize to northern Argentina. In the Indo-Pacific it is known from the Red Sea, along East Africa to South Africa, Madagascar, the Persian Gulf, India, Indonesia, the Philippines, Japan, and Australia. In the eastern Pacific it is known from southern California (USA) to Peru including some offshore islands.

***Auxis rochei* (Lacepède, 1800)**

Common name: Bullet Tuna



Biological note : This species is cosmopolitan in warm waters and is present in the Atlantic, Indian, and Pacific oceans, including the Mediterranean Sea. This is a pelagic, oceanodromous species that forms schools. It is an off-shore predator feeding on whatever abundant resource is available with a preference for planktonic crustaceans, small cephalopods, and fish larvae. This species is fished throughout its range, with high regional importance in some areas.

Distribution : Atlantic, Indian and Pacific (Western): including the Mediterranean Sea. The eastern Pacific population is recognized as subspecies *Auxis rochei eudorax* (ranges from California and the mouth of the Gulf of California to Peru, including the Galápagos, Cocos and Malpelo Islands). Highly migratory species, Annex I of the 1982 Convention on the Law of the Sea

***Auxis thazard* (Cantor 1849)**

Common name: Frigate Tuna



Biological note : This is a pelagic, oceanodromous species that is also epipelagic in neritic and oceanic waters. Adults are coastal or near-coastal, while juveniles are more widely spread throughout the world's ocean. It feeds on small fish, squids, planktonic crustaceans (megalops), and stomatopod larvae. Because of their abundance, they are considered an important element of the food web, particularly as forage for other species of commercial interest. It is preyed upon by larger fishes, including other tunas and billfishes. The species is landed all along the Indian coastline and the major landing is along the south-west coast with Kerala contributing the most. The species is exploited by a variety of gears viz., drift gill nets, shore seines, ring seines and hooks and lines.

Distribution : This species is present in the Atlantic, Indian, and Pacific oceans. It is considered vagrant in the Mediterranean Sea. However, there are only a few records of this species in the Atlantic as most of the *Auxis* in the Atlantic are *Auxis rochei*.

***Istiompax indica* (Cuvier, 1832)**

Common name: Black Marlin



Biological note : An important commercial species. The flesh is of good quality; marketed refrigerated, smoked or frozen and prepared as sashimi in Japan. This pelagic and oceanodromous species is usually found in surface waters above the thermocline at temperatures from 15–30°C, often close to land masses, islands and coral reefs. It is found to depths of 100 m.

Distribution : This species is distributed throughout the tropical Indo-Pacific, and occasionally enters temperate waters. Stray individuals migrate into the Atlantic Ocean by way of the Cape of Good Hope, but the existence of Atlantic breeding stocks is unlikely. In the Eastern Pacific it is found from southern California to the southwestern and northeastern Gulf of California to Chile, including all of the oceanic island

***Thunnus tonggol* (Bleeker, 1851)**

Common name: Longtail Tuna

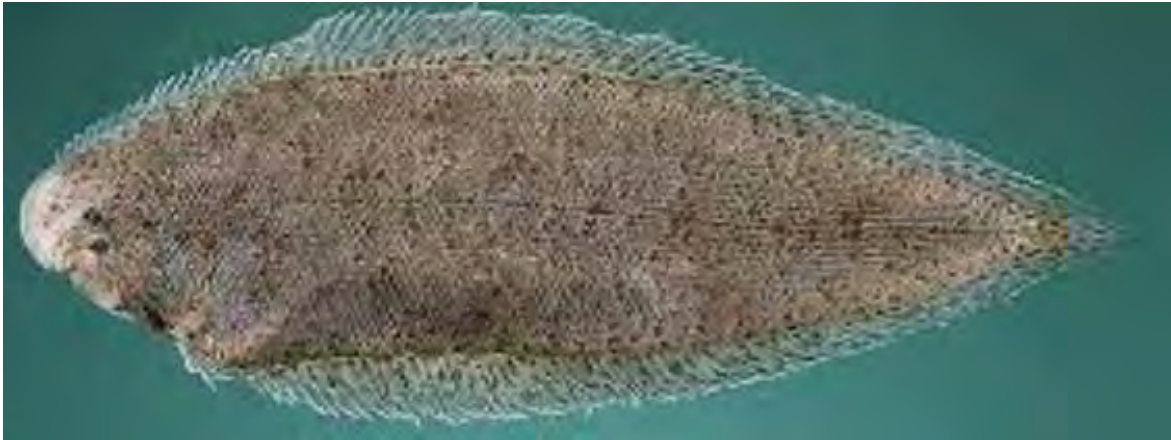


Biological note : This species is pelagic and oceanodromous. It is a predominantly neritic species avoiding very turbid waters and areas with reduced salinity such as estuaries. It may form schools of varying size. The population does not appear to be continuous. It is a commercial species. It is marketed mainly fresh and dried salted, but also smoked, canned, and frozen.

Distribution : This Indo-West Pacific species is found from the Red Sea and East Africa to Papua New Guinea, north to Japan, and south to Australia..

***Cynoglossus puncticeps* (Richardson, 1846)**

Common name: Speckled Tongue Sole



Biological note : This demersal, marine species inhabits the soft substrates of estuaries, mangroves, other coastal areas and along continental shelves. It is caught by bottom trawls and seines throughout much of its range. It is sold fresh, frozen and dried-salted

Distribution : Indo-West Pacific: India eastward to the Malay Archipelago and the South China Sea, southward to the Philippines and northwest Australia; eastward to New Guinea.

***Etroplus suratensis* Bloch, 1790**

Common name : pearl spot; **Local name :** Karimeen



Biological note : This is the state fish of Kerala. The green chromide lives in brackish water habitat types, such as river deltas. It eats mainly aquatic plants, including filamentous algae and diatoms, but it consumes the occasional mollusk and other animal matter. This species engages in attentive parental care in which several adults care for each brood. It is a popular food fish and it is considered a delicacy. This fish is farmed extensively in India and abroad.

Distribution : Western Indian Ocean: India and Sri Lanka.

***Channa marulius* (Hamilton, 1822)**

Common name: Great snakehead



Biological note : Inhabits large lakes and rivers; prefers deep, clear stretches of water with sandy or rocky bottom. Found in rivers, streams, deep water of beels, ponds. Airbreathing fish with sturdy nature. Carnivorous, surface dweller and predatory; feeds on small fishes, frogs and tadpoles. Breeds during monsoon season, building floating nest made of weeds and leaves; parents guard the fry for about one month. Eggs are orange-yellow colored. In Kerala it is farmed extensively. Seed production at hatcheries are at a low level.

Distribution Asia: India to China, south to Thailand and Cambodia (Ref. 12693) and Pakistan

***Channa striata* (Bloch, 1793)**

Common name: Striped Snakehead



Biological note : It is an important food fish of Kerala. It is air breathing and sturdy in nature. Dishes using this fish eaten with rice is very popular among Bengalis of Bangladesh and West Bengal. The fish is also an esteemed delicacy in other parts of India, including Andhra Pradesh, Tamilnadu and Kerala. The Bathini Goud Brothers in Hyderabad, India, promote the swallowing of live murrel fish and herbs claimed as a treatment for asthma, although the high court ruled they cannot call it "medicine".

Distribution : Asia: Pakistan to Thailand and south China. Several countries report adverse ecological impact after introduction

***Heteropneustes fossilis* (Bloch, 1794)**

Common name: Stinging catfish; local name : In India in Kerala, it is locally called as *kadu* or *kaari*. It is highly preferred in [Assam](#) and locally known as *singhi*. In Bangladesh, this fish is called *singi mach*, In Sri Lanka, this fish is called *hunga* by the [Sinhala](#)-speaking community.



Biological note : *H. fossilis* is found mainly in ponds, ditches, swamps, and marshes, but sometimes occurs in muddy rivers. It can tolerate slightly brackish water. It is omnivorous. This species breeds in confined waters during the monsoon, but can breed in ponds, derelict ponds, and ditches when sufficient rain water accumulates. It is in great demand due to its alleged medicinal value

Distribution: Asia: Pakistan and Sri Lanka to Myanmar. In many places it has been introduced.

***Wallago attu* (Bloch & Schneider, 1801)**

Common name: Wallago; **Local name :** Attu Vaala.



Biological note : Found in large rivers, lakes and tanks. A large, voracious and predatory catfish which thrives in heels with grassy margin; mostly hides under holes in river banks and canals. Associated with deep, still or slow-flowing water with a mud or silt substrate. Sluggish and stays on muddy or silty bottom in search of food. Juveniles feed mainly on insects; adults feed on smaller fish, crustaceans, and mollusks. Oviparous, distinct pairing possibly like other members of the same family. Abundant during the warm season; a pre-monsoon summer breeder. Threatened due to over harvesting

Distribution: On the Indian subcontinent, its range includes all the major rivers of India, Pakistan, Bhutan, Nepal and Bangladesh, such as the Ganges, Indus, Narmada, Godavari, Krishna and Mahanadi as well as the island of Sri Lanka. To the Northwest, its range extends beyond Pakistan into Iran and Afghanistan. To the East, it can be found as far as the Irrawaddy river basin in MyanmarAsia: Pakistan to Viet Nam and Indonesia. Reported from Afghanistan. *W. attu* thus stands as an example for a species with a disjunct distribution

***Tor khudree* (Sykes, 1839)**

Common name: Deccan mahseer



Biological note : *Tor khudree* has been assessed as Endangered due to continuing decline in the overall population. However, it is to be noted that beyond the Krishna drainage, *T. khudree* is now considered non-indigenous and in some cases (e. g. River Cauvery) invasive and detrimental to endemic aquatic biodiversity. However, it is to be noted that beyond the Krishna drainage, *T. khudree* is now considered non-indigenous and in some cases (e. g. River Cauvery) invasive and detrimental to endemic aquatic biodiversity

Distribution : All available evidence suggests that the historic distribution range of *T. khudree* was limited to the northern and Central Western Ghats (current day Maharashtra, Telengana and Karnataka states) in the eastward flowing Krishna River system including its tributaries, the Indrayani, Mula Mutha, Koyna, Krishna, Tungabhadra and Panchaganga. However, the species is currently known to be distributed throughout peninsular India, particularly in the westward flowing river systems originating from the southern Western Ghats.

***Tor malabaricus* Jerdon, 1849**

Common name: Malabar mahseer



Biological note : It forms the target of subsistence fisheries by local communities in all major river systems in which they occur. Although levels of offtake are not very high, the life history traits of the species (K selective) coupled with increasing anthropogenic stressors in their habitats, including habitat loss due to hydropower dams and reservoirs, pollution from multiple sources and sand mining, the species has been assessed as Endangered. Tor species also generally have high religious and cultural significance throughout South and Southeast Asia.

Distribution : The Malabar mahseer, *Tor malabaricus*, was described from the mountain streams of Malabar (an erstwhile province of Southern India; currently in the northern part of Kerala State), India. Known to be endemic to the Western Ghats region (part of the Western Ghats Sri Lanka Biodiversity Hotspot), the species has been recorded from the upper and middle reaches of westward flowing rivers in the states of Karnataka, Kerala and Tamil Nadu.

PRODUCTION DETAILS OF AQUATIC RESOURCES

Marine and inland ecosystems ensure food and nutritional security, economic growth and socio-economic development of the nation. In India, fisheries constitute an important economic activity contributing significantly to the national food security, income to the stakeholder community and for earning valuable foreign exchange. India is the second largest fish producing country in the world and accounts for 7.58 per cent of global production. Fish production in India reached an all-time high of 14.16 million metric tonnes in 2019-20. The sector contributes 1.24 per cent to GVA in the economy and 7.28 per cent to GVA from the agricultural sector. The export of marine products was 12.9 lakh metric tonnes with a value of ₹46,662 crore in 2019-20. Marine fish landings of India in 2019-20 was 3.73 million tonnes.

Fish production of India, both from marine and inland sections for the years 2015-16 to 2019-20 is given below (source : Handbook on Fisheries statistics, Govt. of India 2020). It can be seen that there is a shift in production from marine side to inland side.

	2015-16	2016-17	2017-18	2018-19	2019-20
Marine (in lakh tons)	36.00	36.25	37.56	38.53	37.27
Inland (in lakh tons)	71.62	78.06	89.48	97.2	104.37
Total (in lakh tons)	107.62	114.31	127.04	135.73	141.64



The estimated potential of marine fisheries in different realms for the year 2018 has been reported to be 71,58,368 t. Details on the conventional and non-conventional resources are represented in a tabular form and is presented below-

Conventional (t)		Non-conventional (t)	
Demersal resource (mainland)	22,98,281	Deep sea Myctophids	10,00,000
Pelagic (mainland)	26,31,827	Oceanic squid	6,30,000
Lakshadweep (excluding oceanic)	14,490	Jelly fish	2,00,000
Andaman & Nicobar (excluding oceanic)	43,794	Marine macro algae	17,775
Oceanic for entire EEZ	2,30,832	Subtotal	18,47,775
Others	91,369	Total for conventional and non-conventional	71,58,368 t
Subtotal	53,10,593		

Fisheries sector has contributed to 46,589.37, 46,662.86 and 43,720.98 crores through export during 2018-19, 2019-20 and 2020-21 respectively. The details of exports are given appended below –

Items	Quantity		Value (crore)	
	Year	2018-19	2019-20	2019-20
Frozen shrimp		6,14,145	31,800.51	6,52,213
Frozen fish		3,38,933	4916.82	2,23,318
Frozen cuttlefish		62,210	1975.97	70,906
Frozen squid		1,01,101	2506.99	87,631
Dried items		95,296	1323.45	84,417

Live items	10,179	338.88	7,287	324.26
Chilled items	17,207	616.22	21,202	631.84
Others	1,55,487	3,060.53	1,42,638	2,756.84
Total	13,92,559	46,589.37	12,89,652	46,662.86

Source : Fisheries Statistics 2020, Govt. of India

Performance of different species (some) of export figures for the years 2019-20 and 2020-21 are summarized below (source : MPEDA)

Resource/ Year/ quantity (MT)/ value (crore)	2019-20		2020-21	
	Quantity	Value	Quantity	Value
Tilapia	1597	13.03	2489	18.89
Ornamental items	32	10.84	54	13.08
Tuna	36,287	396.72	41,586	384.10
Scampi	1855	125.91	1,334	97.21
Crab	6,733	549.07	5,489	397.81
Exported to countries : Japan (8%), USA (25%), European Union (13%), China (19%), South- East Asia (19%), Middle East (4%), others (12%)				

MPEDA report indicates that during the years 2019-20 and 2020-21 export contributions of items were through aquaculture and capture fisheries in the percentage ratio 43.97 : 56.03 and 46.44 : 53.56 respectively. Income also in the ratio 63.57 : 36.43 and 68.06 : 31.94 respectively for these years.

Fishermen population engaged in marine fisheries activities during the year 2019-20 is 22,37,839 (Full time – 11,53,553; part time - 4,85,306; Occasional engagement – 84,801; unspecialized – 4,41,769; Deep sea – 72,410). Gender wise population ratio for the same period is : Inland sector – 130,13,978 (male) : 101,03,842 (female) and marine sector – 26,51,652 (male) : 22,94,066 (female).

Although the state forms only 1.1 % of geographic area, its long coastline of 590 km., the 44 rivers that flows to the sea and the extensive backwaters and other wetlands ecologically connected to the sea makes the marine ecosystem one of the most productive in the world.

The total fish production in Kerala was 6.14 lakh tonnes in 2020-21, 3.9 lakh tonnes from marine fisheries and 2.24 lakh tonnes inland fisheries. It was lower than the fish production in 2019-20 (6.8 lakh tonnes). The high value species among the fish catches are still few and prominent among them are seer fish, prawns, ribbon fish and mackerel.

The fisheries sector is a source of livelihood of 2.8 crore people (including fishers, fish farmers, fish workers, fish vendors) at the primary level and several crores along the supply and value chain. In Kerala, the share of fisheries sector in the total GSVA (at constant prices) in 2020-21 constitutes 0.82 per cent and accounts for 0.72 per cent of GSDP. Fisheries and Aquaculture contributes 8.71 per cent of the Gross State Value Added (GSVA) at constant prices 2020- 21 (Quick estimates) from the agriculture and allied sectors.

Inland fish production in Kerala has increased gradually during the last four years. It has increased from 1.89 lakh tonnes in 2017-18 to 2.24 lakh tonnes in 2020-21. The total fish consumption in the State is approximately 9.12 lakh tonnes per annum and about 3 to 4 lakh tonnes is imported from other states or countries. Kerala with its wide network of backwaters, and fresh water has great potential for reducing this gap between demand and supply by promoting aquaculture. The species that are promoted in Kerala include tilapia, murrel, basa, anabas, carp, giant freshwater prawn, *Penaeus vannamei*, *Penaeus monodon*, Asian sea bass, pompano, cobia, mullets, crab and mussel.

Production from aquatic resources is reaped through fishing and is an age old practice. Major marine resources comprise of : fishes, prawns, crabs, lobsters, mollusks, sea weeds etc. Fish resources of marine ecosystem include pelagic fishes : Wolf herring, oil sardine, other sardines, Hilsa shad, other shad, Anchovies, like, *Coila*, *Setipinna*, *Stolephorus*, *Thryssa*, other clupeids, Bombay duck, Half beak, full beak, Flying fishes, ribbon fishes, carangids like horse mackerel, scads, leather jackets, other carangids, Indian mackerel, seer fishes like – *Scomberomorus commerson*, *Scomberomorus guttatus*, *Scomberomorus lineatus*, various species of *Acanthocybium*, Tunas like *Euthynnus affinis*, various species of *Auxis* spp., *Katsuwonus pelamis*, *Thunnus tonggol*, *Thunnus albacore*, other tunnies, bill fishes, barracudas, mullets, unicorn cod; and demersal fishes : Elasmobranchs – sharks, skates, rays, eels, cat fishes, lizard fishes, perches like, rock cods, snappers, pig-face breams, threadfin breams, big jawed jumper, other perches, goat fishes, thread fins, croakers, silver bellies, white fish, pomfrets like black pomfrets, silver pomfrets, Chinese pomfrets, flat fishes like halibut, flounders, soles, *Odonus niger*,

crustaceans like penaeid prawns (*Penaeus indicus*, *Penaeus monodon*, *Penaeus semisulcatus*, *Penaeus japonicus*, *Melicertus canaliculatus*, *Metapenaeus monoceros*, *Metapenaeus dobsoni*, *Metapenaeus affinis*, *Parapenaeopsis stylifera*) crabs like *Portunus pelagicus*, *Portunus sanguinolentus*, *Charybdis feriata*, *Charybdis natator*), lobsters like - *Panulirus homarus*, *Panulirus versicolor*, *Panulirus polyphagus*, *Panulirus ornatus*, Molluscs like – bivalves, mussels and oysters, clams, gastropods, cephalopods like – squids, cuttlefish, octopus and other resources.



4.1 MARINE FISHERIES RESOURCES PRODUCTION DATA- KERALA

Marine fish landing data of Kerala (species wise) for the years 2016-17 to 2019-20 is given in the table below-

Table 4.1. Species wise composition of Marine Fish Landings (in MT) in Kerala during the period from 2016-17 to 2019-20

Sl.No	Species	2016-17	2017-18	2018-19	2019-20
1	Elasmobranchs	7051	5226	7645	2764
2	Fels	662	2006	593	878
3	Cat Fish	1456	477	30	259
4	Chirocenrtus	0	127	23	108
5 (a)	OilSardine	34073	60251	87331	44500
(b)	Lesser Sardine	23372	12094	19337	33199

(c)	Hilsa ilisha	0	0	0	0
(d)	Other Hilsa	0	0	0	312
(e)	Anchovilla	18027	9843	33242	58490
(f)	Trissocles	5098	2179	8444	7376
(g)	Other Clupeids	3027	1554	6177	5803
6	Harpodon nehereus	0	0	0	0
(b)	Saurida&Saurus	8127	4010	14215	17444
7	Hemirhamphus&Belone	10	583	9581	739
8	Flying Fish	0	89	3818	8
9	Perches	53286	37550	34962	40956
10	Red Mullet	1429	130	463	443
11	Polynemides	20	221	3925	8
12	Sciaenides	11849	4950	16519	5406
13	Ribbon fish	16776	16132	10617	5425
14	(a) Caranx		513	1053	5412
(b)	Chorinemus	427	886	1427	268
(c)	Thachynotus	0	0	1814	10
(d)	Other Carang ds	22269	29107	56389	37776
(e)	Coryphaena	0	1559	881	1046
(f)	E acate	0	0	16	287
15	Leiognathus		6277	1807	1761
(b)	Gazza	0	0	233	0
16	Lactrious	496	68	246	839
17	Pomfrets	8902	3892	4624	2146
18	Mackerel	59890	49070	127419	35895
19	Seer fish	17021	18005	6230	4328
20	Tunnies	26984	55420	29810	16793
21	Sphyraena	634	1058	3131	3480
22	Mugil	2	58	25	54
23	Bregmaceros	0	1428	0	0
24	Soles	6717	5304	8547	14196
25	Penaeid Prawn	56667	63366	52331	39905
(b)	Non Penaeid Prawn	238	5978	8613	2515
(c)	Lobsters	6809	5185	172	41
(d)	Crabs	13625	3394	2777	5079
(e)	Stomatopods	0	1	0	488
26	Cephalopods	56530	69945	30679	35686

27	Miscellaneous	20072	9680	10271	45152
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The landing data of CMFRI differs a little from the data provided by State Fisheries department (Economic Review, GoK) and is consolidated below for comparison.

2016-17	2017-18	2018-19	2019-20
5,22,000	5,85,000	6,42,081	5,44,000

The species landed along Kerala coast during the period 2010-2019 is given in [Annexure](#)

27.



CMFRI reports that: The total marine fish landings in Kerala during 2020 were 3,60,742 t, which was 34% lower than that of the previous year's estimates (2019). About 68% of the catch was landed by mechanized gears and 31% by motorized units. The major resources in the catch were Indian mackerel (15.4%) followed by lesser sardines (9.1%), Stolephorus (8.4%), scads (8.3%), threadfin breams (7.9%) and penaeid shrimps (7.8%). Pelagic fin fishes dominated in the landings with a share of 62.3%, which was 19.5% lower than that of the previous year's estimated pelagic catch. Demersal fin fishes constituted 21.7% of the total marine fish landings of Kerala with estimated landings of 7,84,38 t, which was 20.1% lower than that of the previous year's estimates. Table 6.1.1 a provides production details of marine fishery resources for the period from 2016-17 to 2019-20



There was a considerable decline in oil sardine fishery of Kerala with estimated landings of a meager 13,116 t registering a decline of 70% of that of the previous year. However, In spite of the relatively low abundance of spawners of oil sardine in recent years, maturation and fecundity indices indicated potential for a normal recruitment process during the year. Catch of Indian mackerel increased significantly (37%) in 2020 compared to the previous year with an estimated catch of 55,695 t. The stock status indicated sustainable exploitation at MSY level. The landings of the scads increased by 82.2% and that of barracudas increased by 26% compared to that of 2019. The landings of ribbonfishes showed a significant decline (-76.9%) with an estimated landing of meager 1370 t.

Among the demersal finfishes, the dominant resource was threadfin breams with annual landings of 28,469 t which formed 36.3% of the total demersal landings of the state, which was followed by lizardfishes (17.5%), soles (9.6%), other perches (7.8%) and black pomfret (6.5%). There were substantial increase in the landings of black pomfret (524%) and rock cods (43.3%) in 2020 compared to that of the previous year and marginal increase in threadfin breams (1.7%) and silverbellies (3.8%), whereas all other demersal resources declined substantially during 2020, especially lizardfishes (-21.7%) and other perches (-41.7%). There was a significant decline (-47.6%) in the landings of elasmobranchs in 2020 (1648 t), of which rays contributed 52.8%, followed by sharks

(39.1%) and guitarfishes (8.1%). Only eight species of sharks were observed in the landings of sharks, of which *Carcharhinus falciformis* (51%) was the dominant one with an annual mean length of 164 cm, which was below their size at first maturity.

The unusual fishery for *Odonus niger* (red-toothed trigger fish) observed during 2018-19 period along the Kerala coast, declined substantially in 2020 with a meager landings of 1354 t, mostly landed during pre-Covid lockdown period. Mean length in the catch was 15 cm, all the samples were immature. Resource was caught all along the coast and sold at `15-25/kg with a CPUE of 2-6 t/unit, mainly targeting the surimi industries based at Mangalore. trend in landings reported all along the west coast, and a concerted study on the unusual landings of this species was carried out. The major predators of *O.niger* in the region are *Coryphaena hippurus*, *Katsuwonus pelamis*, *Rachycentron canadum* and *Trichiurus lepturus* . Analysis of data indicates that large quantities of these predators were increasingly caught until 2017. However, their catch in 2018, 2019 and 2020 decreased substantially. The removal of major predators until 2017 would have caused the successful recruitment of this species in huge quantities along the region. In 2020, not much effort was expended to catch this resource due to COVID19 pandemic situations and subsequent reduction in fishing days. Crustacean resources contributed 9.2% of the total marine fish landings of Kerala with estimated landings of 33,116 t, which was 41.8% lower than the previous year's estimates. About 85.0% was contributed by penaeid shrimps, followed by crabs (9.4%). 50% of the penaeid shrimps constituted *Metapenaeus dobsoni*. Crab landings decreased by 64% compared to 2019 with *Portunus sanguinolentus* dominated the landings (48.4%), followed by *P. pelagicus* (33.6%) and *Charybdis feriatus* (18%). A total of 18,347 t of molluscs landed in Kerala which formed 5.1% of the total marine fish landings of the state. The cephalopod landings were 18,123 t, which was 51.2% lower than that of the previous year. About 85% of the landings were contributed by multiday trawlers. Squids (48.7%) dominated in the catch followed by cuttlefish (39.6%) and octopus (11.8 %). In case of major squid

U(P). duvaucelii, the mean lengths were marginally below the optimum length of capture.

Table 4.2 : District wise marine fish landings 2019-20 (in lakh tones)

District	Marine Fish Productio	Total Fish Production
Thiruvananthapuram	0.41386	0.44201
Kollam	0.96662	1.03103
Alappuzha	0.16979	0.6711
Pathanamthitta		0.06558
Kottayam		0.50277
Ernakulam	1.52367	1.86143
Idukki		0.01922
Thrissur	0.35602	0.55953
Palakkad		0.02636
Malappuram	0.2166	0.2683
Kozh1kkode	0.87637	0.89694
Wayanad		0.01326
Kannur	0.10711	0.1272
Kasargode	0.12634	0.32597
State (Kerala)	4.75638	6.8107

Source : Fisheries Department, GoK, Economic Review, GoK

4.2 PRIMARY PRODUCTION DATA FROM LANDING CENTRES

Data were collected from actual fishermen by using pre-set questionnaires from landings centres of 9 maritime districts as part of RKI project. The data collected were subjected to statistical analysis for 103 bio-resources. Some of the resources were pooled and other shown as species wise. The methodology followed has been –

Fishermen	68699	Sample size	5380	Vessels	21708
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The formula applied for arriving at total landings for the year, total value has been : Total quantity = Quantity per day* Total fishermen / (Sample size* Vessel to fishermen ratio).

The results obtained are summarized below in the table 4.2.1

Table.4.3: Species wise landings of fishes and shellfishes on the day of data collection and converted values of quantity per day, total price per day, price per kg, projected quantity per year and total price in lakhs per year

Sl. No	Scientific Name	Quantity (Kg)/day	Total Price(Rs.) /day	Price(Rs.) /Kg	Projected quantity(in Ton)/year	Total Price (in lakhs)
1	<i>Acanthocybium salandri</i>	4550	1900000	418	4584.1	19161.6
2	<i>Alepius kleini</i>	135	13500	100	136	136
3	<i>Ambasis</i> SP.	47	2680	57	47.4	27
4	<i>Anodontostoma chacunda</i>	60	8800	147	60.5	88.9
5	<i>Auxis thazard</i>	1423	239150	168	1433.7	2408.6
6	Belonidae	230	29800	130	231.7	301.2
7	<i>Branchiurus</i> sp.	92	22900	249	92.7	230.8
8	Carangids	675	115500	171	680.1	1162.9
9	<i>Carangoides malabaricus</i>	40	12000	300	40.3	120.9
10	<i>Caranx bucculentus</i>	1161	348570	300	1169.7	3509.1
11	<i>Caranx</i> sp.	975	321450	330	982.3	3241.6
12	<i>Carcharhinus limbatus</i>	524	78500	150	527.9	791.9
13	<i>Chirocentrus dorab</i>	1671.5	122950	74	1684	1246.2
14	<i>Coryphaena hippurus</i>	821	272170	332	827.2	2746.2
15	<i>Cynoglossus semifasciatus</i>	9854	1322920	134	9927.9	13303.4
16	<i>Cynoglossus</i> sp.	3574	679170	190	3600.8	6841.5
17	<i>Dasyatis bennettii</i>	915	128630	141	921.9	1299.8
18	<i>Dasyatis bleekeri</i>	4040	564400	140	4070.3	5698.4
19	<i>Decapterus russelli</i>	6018	406670	68	6063.1	4122.9
20	<i>Dussumieria acuta</i>	1291	84890	66	1300.7	858.5
21	<i>Ehirava fluviatilis</i>	5433	510960	94	5473.7	5145.3
22	<i>Elagatis bipinnulata</i>	25	3750	150	25.2	37.8
23	<i>Epinephelus fasciatus</i>	421	70020	166	424.2	704.1
24	<i>Epinephelus malabaricus</i>	670	97250	145	675	978.8
25	<i>Epinephelus</i> sp.	2078	249360	120	2093.6	2512.3

26	<i>Epinephelus tauvina</i>	240	37950	158	241.8	382
27	<i>Escualosa thoracata</i>	11114	1162144	105	11197.4	11757.2
28	<i>Euthynnus affinis</i>	4603	702930	153	4637.5	7095.4
29	<i>Exocoetus volitans</i>	460	81350	177	463.5	820.3
30	<i>Hemirhamphus</i> sp.	56	11200	200	56.4	112.8
31	<i>Hilsa kelee</i>	2197	230400	105	2213.5	2324.2
32	<i>Hyporhamphus dussumieri</i>	79	15800	200	79.6	159.2
33	<i>Istiompax indica</i>	600	86000	143	604.5	864.4
34	<i>Johinus dussumieri</i>	41	4680	114	41.3	47.1
35	<i>Johnius</i> Sp.	306	27000	88	308.3	271.3
36	<i>Katsuwonus pelamis</i>	2237	220300	98	2253.8	2208.7
37	<i>Lactarius lactarius</i>	293	31890	109	295.2	321.8
38	<i>Leiognathus equulus</i>	3698.5	323395	87	3726.2	3241.8
39	<i>Leiognathus</i> sp.	11079	1268240	114	11162.1	12724.8
40	<i>Loligo</i> sp.	2700	945000	350	2720.3	9520.9
41	<i>Lutjanus argentimaculatus</i>	8408	2126865	253	8471.1	21431.8
42	<i>Makaria indica</i>	1508	410340	272	1519.3	4132.5
43	<i>Megalaspis cordyla</i>	380	40200	106	382.9	405.8
44	<i>Metapenaeus affinis</i>	3373	688000	204	3398.3	6932.5
45	<i>Metapenaeus dobsoni</i>	8852	1446335	163	8918.4	14537
46	<i>Metapenaeus monoceros</i>	2608	339100	130	2627.6	3415.8
47	Mud crab	12	4000	333	12.1	40.3
48	<i>Nemipterus japonicus</i>	20149	2383670	118	20300.1	23954.1
49	<i>Nemipterus</i> sp.	639	81550	128	643.8	824.1
50	<i>Nibea soldado</i>	5343	591190	111	5383.1	5975.2
51	<i>Opisthopterus tardoore</i>	18	1080	60	18.1	10.9
52	<i>Pampus argenteus</i>	10619.5	8163610	769	10699.1	82276.4
53	<i>Pampus chinensis</i>	88	10560	120	88.7	106.4
54	<i>Pampus</i> sp.	10	7000	700	10.1	70.5
55	<i>Panulirus homarus</i>	1096	2411200	2200	1104.2	24292.8
56	<i>Parapenaeopsis stylifera</i>	4691	805435	172	4726.2	8129
57	<i>Parastromateus niger</i>	9396	3685860	392	9466.5	37108.6
58	<i>Penaeus indicus</i>	8186	2508840	306	8247.4	25237
59	<i>Penaeus monodon</i>	5685	1473200	259	5727.6	14834.6
60	<i>Perna viridis</i>	480	57600	120	483.6	580.3
61	<i>Portunus pelagicus</i>	144	20900	145	145.1	210.4
62	<i>Portunus sanguinolentus</i>	2690	476900	177	2710.2	4797

63	<i>Portunus</i> sp.	350	97080	277	352.6	976.8
64	<i>Rachycentron canadum</i>	140	12800	91	141.1	128.4
65	* <i>Rastrelliger kanagurta</i>	143107	1458635 5	102	144180.3	147063.9
66	<i>Rhinoptera javanica</i>	279	43600	156	281.1	438.5
67	<i>Saedinella fimbriata</i>	15	1000	67	15.1	10.1
68	<i>Sarda orientalis</i>	785	107400	137	790.9	1083.5
69	<i>Sardinella albella</i>	8297	758250	91	8359.2	7606.9
70	<i>Sardinella fimbriata</i>	15342.5	1447195	94	15457.6	14530.1
71	<i>Sardinella gibbosa</i>	48860	7102500	145	49226.5	71378.4
72	<i>Sardinella longiceps</i>	10604	1444515	136	10683.5	14529.6
73	<i>Sardinella melanura</i>	140	15400	110	141.1	155.2
74	<i>Saurida brasiliensis</i>	850	59500	70	856.4	599.5
75	<i>Scomber albacares</i>	2055	287300	140	2070.4	2898.6
76	<i>Scomberomorus commerson</i>	7689	4182850	544	7746.7	42141.9
77	<i>Scomberomorus guttatus</i>	10989	2235210	203	11071.4	22475
78	<i>Scomberomorus lineolatus</i>	5709	3515750	616	5751.8	35431.2
79	<i>Scylla serrata</i>	33	10400	315	33.2	104.7
80	<i>Selar crumenophthalmus</i>	522	54750	105	525.9	552.2
81	<i>Sepia aculeata</i>	151	48260	320	152.1	486.8
82	<i>Sepia pharaonis</i>	4217	1430680	339	4248.6	14402.8
83	Sole Fish	14	3500	250	14.1	35.3
84	<i>Sphyrnaena barracuda</i>	1300	169850	131	1309.8	1715.8
85	<i>Stolephorus commersonii</i>	15635	1634830	105	15752.3	16539.9
86	<i>Stolephorus indicus</i>	8118	629870	78	8178.9	6379.5
87	<i>Thryssa dussumieri</i>	8602	809975	94	8666.5	8146.5
88	<i>Thryssa purva</i>	200	12000	60	201.5	120.9
89	<i>Thryssa</i> sp.	9401	1150255	122	9471.5	11555.2
90	<i>Tuna albacore</i>	5162	1121200	217	5200.7	11285.6
91	<i>Tunasp.</i>	13669	2575630	188	13771.5	25890.5
92	<i>Uroteuthis duvauceli</i>	7550	2130490	282	7606.6	21450.7
93	Podimeen	40	2000	50	40.3	20.2
94	Bombla	30	4500	150	30.2	45.3
95	Chaavuri	214	34700	162	215.6	349.3
96	Kalava	295	30000	102	297.2	303.2
97	Klathi	443	34740	78	446.3	348.1
98	Konithi	35	5600	160	35.3	56.4

99	Kuttan	191	12400	65	192.4	125.1
100	Lizard fish	880	86650	98	886.6	868.9
101	Kakka	70	6050	86	70.5	60.7
102	<i>Octopus dollfusi</i>	610	74000	121	614.6	743.6
103	Miscellaneous	6394	587100	92	6442	5926.6
					523688.8	896792

* The figure indicates high landings of this single species (*Rastrelliger kanagurta*) from Malappuram and Kozhikkode districts (together comes to a lakh kg.)

Fish and shellfish resources landed more than 1000 kg are : *Acanthocybium salandri*, *Auxis thazard*, *Caranx bucculentus*, *Cynoglossus spp.*, *Dasyatis bleekeri*, *Decapterus russelli*, *Dussumieria acuta*, *Ehirava fluviatilis*, *Epinephelus sp.*, *Escualosa thoracata*, *Euthynnus affinis*, *Hilsa kelee*, *Katsuwonus pelamis*, *Leiognathus equalus*, *Leiognathus sp.*, *Loligo spp.*, *Lutjanus argentimaculatus*, *Makaria indica*, *Metapenaeus affinis*, *Metapenaeus dobsoni*, *Metapenaeus monoceros*, *Nemipterus japonicas*, *Nibea soldado*, *Pampus argenteus*, *Panulirus homarus*, *Parapenaeopsis stylifera*, *Parastromateus niger*, *Penaeus indicus*, *Penaeus monodon*, *Portunus sanguinolentus*, *Rastrelliger kanagurta*, *Scomber albacores*, *Scomberomorus spp.*, *Sardinella spp.*, *Sepia pharaonis*, *Sphyræna barracuda*, *Stolephorus spp.*, *Thryssa spp.*, *Tuna spp.*, *Uroteuthis duvauceli*. All these fishes and shellfishes contribute substantially to the economy of the state.

Age-wise distribution (%) of actual fishermen in almost all districts belonged to 30-59 age groups. In Thiruvananthapuram and Kasaragod Districts more number of 20-29 age group fishermen are reported to be active in fishing (no fishermen of this age group in Thrissur district). Old people (age group 60-69) also engaged in fishing in districts such as Kollam, Alappuzha, Ernakulam, Thrissur, Malappuram, Kannur. Active fishermen in the state (average) also reported to belong to the age group : 30-39 to 60-69. It is pleasant to note that fishermen belonging to 70-79 age group are negligible in districts, such as, Kollam, Ernakulam, Thrissur, Kozhikkode, Kasaragod.

Table 4.4: Details of age group of active fishermen from age 20 to 79 (10 years interval)

Age	Percentage distribution									
	TVM	KLM	ALP	EKM	TSR	MLPM	KZKD	KNR	KZGD	Total
20-29	11.8	3.9	3.9	1.5	0	1.8	1.9	4.6	10.9	5.3
30-39	25.9	15.3	25.1	22.2	1.8	10.4	18.8	23.4	38.1	21.4
40-49	28.9	27.3	34.8	33	33	34.2	46.3	37.2	35.5	33.5
50-59	22.4	37.1	23.8	35.1	37.2	35.6	30.7	22.7	14.7	28.2
60-69	9.3	16.3	11.2	8.2	28	16.2	2.4	11.3	0.8	10.8
70-79	1.7	0.2	1.1	0	0	1.8	0	0.7	0	0.8
Total	100	100.1	99.9	100	100	100	100.1	99.9	100	100

Abbreviations : TVM – Thiruvananthapuram; KLM – Kollam; ALP – Alappuzha; EKM – Ernakulam, TSR – Thrissur; MLPM – Malappuram; KZKD – Kozhikkode; KNR – Kannur; KZGD - Kasaragod

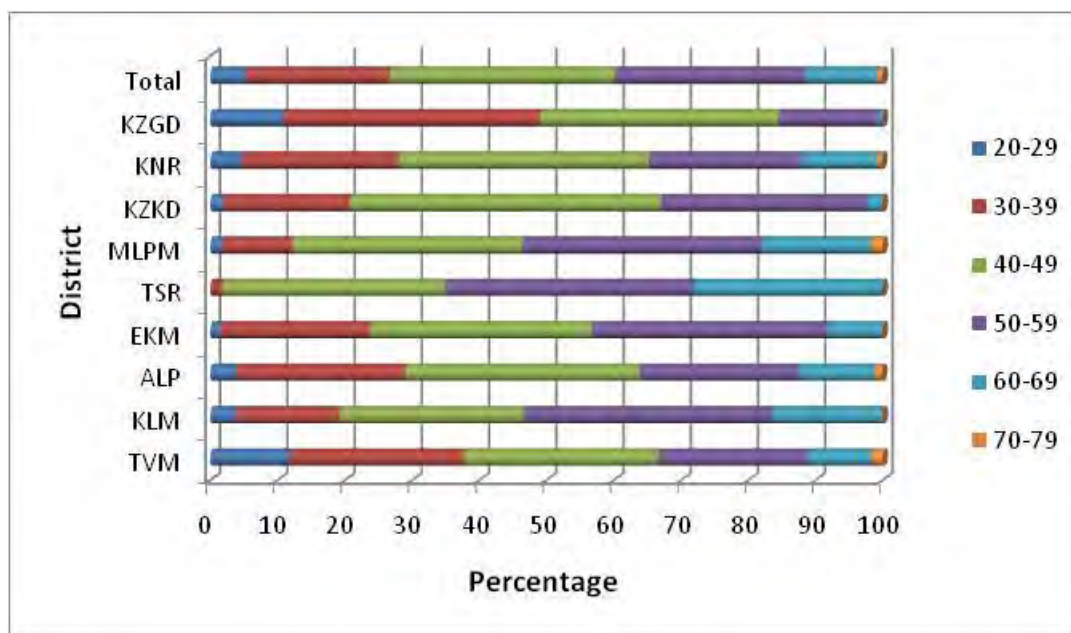


Fig. 4.1 : Graphical representation of active fishermen from age 20 to 79 (10 years interval)

It is of interest to note that those who are having low educational background are going for active fishing. More over people coming forward for education is also less. School education is the highest level of education. Therefore careful planning is necessary to give education to these people and at the same time equip them for technically oriented fishing and modern marketing of the fish they brought in from the sea so as to elevate active fishermen economically in the state.

Table 4.5 Details of educational background of active fishermen in the maritime districts

Education	TVM	KLM	ALP	EKM	TSR	MLPM	KZKD	KNR	KZGD	Total
Illiterate	17.4	17.5	7.4	6	1.8	14.4	1.6	36	3.4	12.9
Up to 5th	22.8	36.3	7.2	34	2.8	29.9	10.6	15.5	36.6	20.6
Up to 10th	47.3	43.8	76.5	42	84.8	51.4	77	37.9	51.7	57.5
Plus Two	9.6	1.6	6.6	16	10.6	1.4	7.9	9.5	8.3	7.1
Degree	2.8	0.8	2.3	2	0	0	0.5	0.7	0	1.3
Other	0.1	0	0	0	0	2.9	2.4	0.4	0	0.6
Total	100	100	100	100	100	100	100	100	100	100

Abbreviations : TVM – Thiruvananthapuram; KLM – Kollam; ALP – Alappuzha; EKM – Ernakulam, TSR – Thrissur; MLPM – Malappuram; KZKD – Kozhikkode; KNR – Kannur; KZGD - Kasaragod

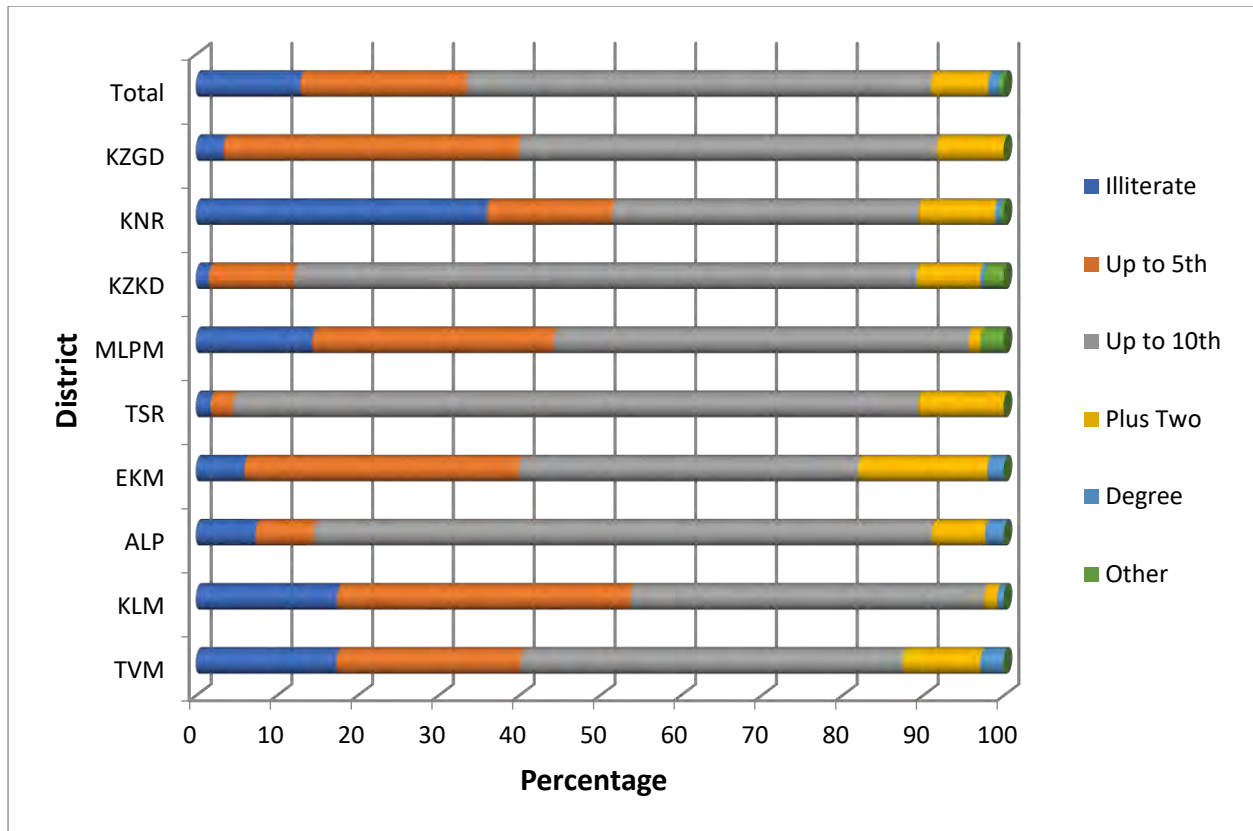


Fig 4.2 Graphical representation of educational background of active fishermen at different maritime districts of the State.

The above data is in agreement with the landings data reported from Kerala State by Planning Boards, State fisheries Department, CMFRI and Government of India for various years.

4.3 INLAND FISHERY RESOURCES PRODUCTION DATA

Inland fishery resources include : fishes such as – *Etroplus suratensis*, Murrels (*Channa striatus*, *Channa diplogramae*, *Channa*), Mulletts (*Mugil cephalus*, *Liza parsia* etc.), Tilapia, *Labeo fimbriatus*, Barbs, *Catla catal*, *Labeo rohita*, *Cirrhinus mrigala*, Common carp, *Chanos chanos*, *Wallago attu*, *Anguilla bicolor*, prawns (*Macrobrchium rosenbergii*, *M. idella*, *Peneus indicus*, *Penaeus monodon*, *Penaeus vannamei*), crabs (*Scylla serrata*, *Scylla tranquebarica*, *Scylla olivacea*), *Paphia malabarica*, *Villorita*

cyprinoides, Crassostrea madrasensis, Saccostrea cuculat, Pangasius pangasius and other resources.

Table 4.6 Species wise fish landings inland fishes of Kerala during the period from 2009-10 to 2012-13 (in MT)

SI No	Name of fishery item	2009-10	2010-11	2011-12	2012-13	% range
1	Prawn	20031	22607	21270	23812	15.19-18.65
2	crabs	988	1006	1086	1323	0.78-0.89
3	Mussel	22395	23172	23269	21231	14.24-19.17
4	Edible oysters	1500	1540	1545	1750	1.10-1.28
5	Etroplus	4858	4941	5526	6290	3.95-4.22
6	Murrels	4544	4623	4716	5174	3.37-3.89
7	Mullet	4821	4906	5007	5540	3.58-4.13
8	Cat fish	5211	5301	5409	6059	3.86-4.46
9	Jew fish	2994	3046	3109	3397	2.22-2.56
10	Tilapia	8440	8584	9200	10459	7.01-7.22
11	<i>Labeo fimbriatus</i>	2273	2313	2360	2643	1.68-1.95
12	Barbus	563	573	585	656	0.42-0.48
13	Catla	10229	10245	16558	17861	8.45-11.98
14	Rohu	8486	9316	15883	16998	7.69-11.4
15	Mrigal	6479	6017	8831	9317	4.96-6.25
16	Common carp	8633	8508	9420	8818	5.91-7.39
17	Chanos	480	488	498	558	0.36-0.41
18	Eels	69	70	71	79	0.05-0.06
19	Miscellaneous	3842	3959	5688	7133	3.27-4.79
	TOTAL	116836	121215	140031	149098	

Source : Kerala Inland Fisheries statistics- 2013, Department of Fisheries, GoK

Data for inland fish landings is scanty and not fully adoptable. The data provided are only indicative. Hence the ups and downs in inland fish landings is difficult to narrate.

Table 4.7 Species wise fish landings inland fishes of Kerala during the period from 2016-17 to 2019-20 (in MT)

Sl.No	Species	2016-17		2017-18		2018-19		2019-20	
		Production	%	Production	%	Production	%	Production	%
1	2	3	4	5	6	7	8	9	10

1	Prawn	27018	14.36	40802	21.58	26312	13.7	26454	12.88
2	Etroplus	8298	4.41	4879	2.58	4194	2.18	4319	2.1
3	Murrells	5102	2.71	3517	1.86	2967	1.55	2108	1.03
4	Mulletts	6685	3.55	3188	1.69	2936	1.53	3392	1.65
5	Cat fish	5780	3.07	4657	2.46	3895	2.03	4773	2.32
5	Jew fish	4070	2.16	1719	0.91	312	0.16	130	0.06
7	Tilapia	12776	6.79	5199	2.75	1597	0.83	4707	2.29
B	Labeo fimbriatus	3187	1.69	1215	0.64	3	o	175	0.09
9	Barbus	788	0.42	429	0.23	838	0.44	1382	0.67
10	Mrigal	13910	7.39	6302	3.33	4096	2.13	1338	0.65
11	Crabs	1612	0.86	2870	1.52	845	0.44	2081	1.01
12	Common carps	11712	6.23	4703	2.49	3137	1.63	1228	0.6
13	Catla	30830	16.39	11282	5.97	9096	4.74	6713	3.27
14	Chanos	690	0.37	487	0.26	609	0.32	1063	0.52
15	Eels	93	0.05	78	0.04	41	0.02	15	0.01
16	Labeo Rohitha	26504	14.09	10889	5.76	5149	2.68	4897	2.38
17	Mussel	9537	5.07	2541	1.34	2097	1.09	3119	1.52
18	Edible Oyster	1774	0.94	139	0.07	344	0.18	548	0.27
19	Miscellaneous	17764	9.44	84185	44.52	123560	64.35	136987	66.68
	Total	188130	100	189081	100	192027	100	205430	100

Source : Fisheries Department, GoK; Economic review, GoK

**Table 4.8 District wise landings of inland fishes of Kerala for the year 2019-20
(in Lakh tones)**

District	Marine Fish	Total Fish production
Thiruvananthapuram	0.41386	0.44201
Kollam	0.96662	1.03103
Alappuzha	0.16979	0.6711
Pathanamthitta		0.06558
Kottayam		0.50277
Ernakulam	1.52367	1.86143
Idukki		0.01922
Thrissur	0.35602	0.55953
Palakkad		0.02636
Malappuram	0.2166	0.2683
Kozh1kkode	0.87637	0.89694

Wayanad		0.01326
Kannur	0.10711	0.1272
Kasargode	0.12634	0.32597
State (Kerala)	4.75638	6.8107

Source : Fisheries Department, GoK, Economic Review, GoK

4.4 CLAM RESOURCES PRODUCTION DATA

Clams bio-resources of Kerala constitute black clam (*Villorita cyprinoides*), Yellow clam (*Paphia malabarica*) and white clam (fossil deposit). The state contributed 66.8% to the total estimated bivalve production. Clams dominated the bivalve fishery followed by edible oysters and mussels. Black clam, *Villorita cyprinoides* was the most important clam species exploited in India (55%), with Kerala contributing to more than 90% to the fishery. Black clam catch rate in Vembanad Lake decreased from 321 kg/unit in 2018 to 204 kg/unit in 2019, resulting in 15% reduction in the clam production. In spite of the recommendations from the Government, the juvenile clam exploitation continued for meeting the demand in the shell and poultry industries. Juvenile black clams (<20mm) formed 6.8% of the catch from Vembanad Lake.

4.4.1 BLACK CLAM RESOURCE

Black clam (*Villorita cyprinoides*) is an important bio-resource of Vembanad Lake. As per the production statistics this species is the largest resource of clams in India. It is a highly euryhaline species. Because of this physiological adaptation, the species thrive in freshwaters also. Sometimes a varietal status has been assigned to the freshwater resource but its varietal status is yet to be get approved. Maximum production of this species was reported in the year 2005-06 with 75,592t and is continuously been declining. In 2008-09 it was reduced to 66,000t. The trend can be seen from the Production figures given below –

2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
40,298	37,129	42,883	49,394	42,036	39,243

It is alarming to report that capture of clams of the size <15 mm is damaging to the resource (mallikakka) and every year around 200t are captured. Strict regulation in this regard is absolutely necessary. Clams can grow up to 49 mm in size but dominant size of present capture is just < 29 mm. Fishing rights are vested with eight black clam societies located around the lake in Kottayam and Alappuzha districts. Total harvesting area is around 4,582 acres. Fishing rights and licenses for harvesting in the lake are issued by the State Department of Mining and Geology to the society members. Harvesting is done by both men and women. Processing is with the help of entire family. Processing is not hygienically done. This meat is very tasty and hence great demand. The shell is used for lime preparation. There are several kilns functioning on the banks of Vembanad Lake.

Lime shell resource from Vembanad Lake

The clam and limeshell collection is a livelihood of more than 5000 fishermen around the Vembanad Lake. Both black clam (live clam) and white clam (dead shell) are extracted from the lake. Black clam ensures dual income as the fishermen can market both the meat as well as the lime shell.

White clam or the lime shells are the sub fossil deposits formed by the accumulation of the clam shells. There are co-operative societies established around the lake to carry out the extraction of shells and fishermen take membership in these societies. The fishermen are given licenses for lime shell extraction from the Mining and Geology department through the societies. Presently, there are 3 co-op. societies around the lake which are

active in Kottayam district. The shells are collected from the lake using a hand dredge locally known as 'Kolli' or 'Varandi' from the canoe and gathering it in the canoeer by mechanized manner using motor locally known as 'Veenju'. This is operated to gather shells in large mass from the lake bed. The collected shells are brought to the land and measured. These are then thoroughly washed to remove the adhered dirt and stocked at the society. The role of the society is to stock the lime shells collected by the fishermen and give payment according to the quantity. The shells are sold to poultry and animal feed manufacturing units based in Tamil Nadu.

In the case of black clam, these are collected using the hand dredge from the canoe. One or two fishermen work in a canoe. Women also collect by diving and picking by hand normally in shallow reaches. On an average, a worker extracts 3-6 kg daily. The clams are boiled for 5-10 minutes in large vessels. After boiling, the clams are shaken well in a meshed plank or meshed cylinder to get the meat separated from the shell. The meat is then marketed fetching Rs. 35-50/kg based on the size. The shells are gathered up and later sold to the society. The quantity of lime shell collected and the sale value of the three co-operative societies in the district for the last five years is given in the following tables.

Sl. No	Year	Limeshell Co-operative Society, Kumarakom		Vaikom Taluk White Lime shell cooperative Society, Vechoor		Vechoor Lime Shell Cooperative Society, Vechoor(Black Shell)	
		Quantity (kg)	Sale Value (Rs.)	Quantity (kg)	Sale Value (Rs.)	Quantity (kg)	Sale Value (Rs.)
1	2015-16	2259640	7939289	546000	1754298	1903000	5263697
2	2016-17	1792565	6731608	279000	2144394	985000	2997385
3	2017-18	1391280	5642868	454000	3663780	2003000	6581858

4	2018-19	1004870	446784	162000	1464318	734000	2977838
5	2019-20	666383	3290756	954000	8623206	1319000	5351183



4.4.2 YELLOW CLAM RESOURCE

One of the major fishery resource of Ashtamudi backwater system is short neck clam or yellow clam. It is a reputed export item to countries like Japan, Vietnam, Thailand, Malaysia, Indonesia and so on. This is the only resource which the stakeholders themselves are conserving. The species is *Paphia malabarica*. (Its scientific name changed recently, but yet to be fully used). This species has been the first MSC certified bio-resource from India during 2014. It has been reported that 13,199 t could be fished out. The current report says that this resource is being declined alarmingly. During 2018 the clam catch declined lower than the Low Rate Production (LRP) 6000 t. Average annual income reported is Rs. 17,050. Landing of the clam (t) for different years are given below (source : CMFRI annual report) -

2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
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10,120	14,850	13,700	11,050	9,850	11,698	11,426
2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
11,174	10,907	10,811	10,368	9,035	11,204	5,210

CMFRI has proposed an Ashtamudi Clam Fisheries Governance Council (ACFGC) to protect the resource. The 20-member Council met twice and decided on the following:

1. Number of fishing days reduced from 6 days per week to 5 days
2. Registration of the fishing boats engaged in clam fishery
3. Licensing of fishermen and issuance of identity cards
4. Enforcement of strict surveillance for conservation of juvenile clams
5. Measures for immediate removal of sandbars by dredging

A major threat to short neck clam and other speices including aquaculture species is the widespread population of an invasive mussel species - *Mytella strigata*. It is native to Central and South America and established since 2018 in the backwaters - Ashtamudi, Kayamkulam and Vembanad Lakes of Kerala. This species was recently been reported from the Philippines, Singapore and Thailand. It established to a density of 150 per m² in Ashtamudi Lake. Serious steps necessary to control this species.

4.4.3 WHITE SHELL RESOURCE

Large scale dredging for the white clam shells is practiced in Vaikom and Allappuzha. The subsoil deposit of white clams in the lake is estimated at about 4.5 million tons. The shells are taken by dredging at a rate of 41,000 to 69,000t/ yr from 3 m deep and is at present under control of government. Dredges are used where waters are about 3 m (8–9 ft) deep.

4.4 AQUACULTURE PRODUCTION DATA

India is 2nd largest aquaculture nation in the world after China. The Blue Revolution in India give adequate emphasis on the importance of Fisheries and Aquaculture sector for human welfare. The sector is considered equally important to play a significant role in the Indian economy and provide food security. In the recent past, Indian fisheries has witnessed a paradigm shift from marine dominated fisheries to inland fisheries, with the latter emerging as a major contributor of fish production from 36% in the mid-1980 to 70% in the recent past. Within inland fisheries, a shift from capture to culture-based fisheries has paved the way for sustained blue economy. **About 68% of India's fish comes** from the aquaculture sector. Moreover, India stands as the largest producer and exporter of culture shrimp in the world

Although inland fisheries and aquaculture have grown in absolute terms, the development in terms of its potential is yet to be realized. The unutilized and underutilized vast and varied resources, in the form of 191,024 km of rivers and canals, 1.2 million ha of floodplain lakes, 2.36 million ha of ponds and tanks, 3.54 million ha of reservoirs and 1.24 million ha of brackish water resources offer great opportunities for enhanced production along with livelihood development and ushering economic prosperity.

Kerala is gifted with abundant Brackish and Fresh water resources. The estimated inland water area is 16,0000 ha and brackish water about 65,213 ha out of which 14,875 ha are only developed for Aquaculture practices. About 2.22 lakh fisherfolk are dependant on these water resources for their livelihood. Monthly fish consumption of people of Kerala is reported to be 2,26 kg at rural area and 2.10 kg at urban.

In Kerala a large number of native species are being cultivated for food, namely, *Penaeus indicus*, *Penaeus monodon*, *Penaeus semisulcatus*, *Macrobrachium rosenbergii*,

Scylla serrata, *Scylla tranquebarica*, *Etroplus suratensis*, *Mugil cephalus*, *Liza* spp., *Chanos chanos*, *Lates calcarifer*, *Lutjanus argentimaculatus*, *Rachycentron canadum*, *Trachinotus blochii*, *Heteropneustes fossilis*, *Anabas testudineus*, *Channa striata*, *Channa marulius*, *Channa* spp., *Clarias dussumieri*, *Perna viridis*, *Perna indica*, *Crassostrea madrasensis*, *Saccostrea cucullata* and so on. Major cultivating species in the state are those transplanted species, such as, *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Clarias batrachus*, *Anabas cobojus*, *Pinctada fucata*, *Ompok pabda*. There are several species brought over to India and also Kerala for aquaculture purpose. These are *Penaeus vannamei* (= *Litopenaeus vannamei*), *Hypophthalmichthys molitrix*, *Ctenopharyngodon idellus*, *Cyprinus carpio*, *Oreochromis mossambicus*, *Oreochromis niloticus*, *Pangasius hypophthalmus*, *Pangasius pangasius*, *Pangasius sutchi*, *Piaractus brachipomus*. Species of ornamental value are included in the respective chapter on Ornamental aquatic resources.

In Kerala aquaculture is still in its infancy stage. Seed production and supply is not adequate enough. Introduction and cultivation of many non-native species have already damaged our systems. Therefore policy makers should pay attention to : utilize the areas of waters resources which are unutilized at present for aquaculture for which sustainable incentives must be announced; purposeful elimination of unwanted exotic fishes (species like *Clarias gariepinus*) from aquaculture in the state; stressfully protect native species for aquaculture (like pearl spot, giant freshwater prawn, naaran chemmeen, kaara chemmeen, red snapper, mud crabs and so on); actions for bringing a number of hill stream fishes for domestication and bringing them under cultivation at least in hilly areas and cage culture in reservoirs; establishing proper storage facilities throughout the state; proper supply chain development for marketing and economic development. This is one way of elimination or avoidance of contamination of aquatic

food source. major constraint in inland fisheries is the availability of good quality fish seed.

To ensure self-sufficiency in fish seed production, new hatcheries were established. A total of 15.02 crore seed production was achieved through department hatcheries in 2020-21. According to a MPEDA report²⁹, if the state utilizes 0.1 percent of its 42,000 hectares reservoir area (i.e., 42Ha) for cage culture³⁰ of the commercially important species of fish such as seabass, the resultant production is expected to garner revenues worth ` 3-6 crore, depending on the species farmed. Similarly, the state also has nearly 65,000 hectare of brackish water area which can be developed for organic farming of 'vannamei' or crab or seabass. Of this, even if 2,500 hectares of area is used for the development of scientific vannamei farming, the resultant yield could garner an estimated revenue of nearly ` 750 crore³¹. The state may also consider earmarking traditional farming systems such as 'Pokkali' or 'Kol' lands exclusively for native species of shrimp such as black tiger shrimp and white shrimps, as they have huge niche market globally.

Table 4.9 Aquaculture potential of Kerala

Sl. No	Component	Estimated Potential	Unit Production	Expected Production (t)
1.	Fresh water pond (Private)	6168 ha	4 t/ha	24672
2.	Fresh water pond (Public)	2302 ha	0.4 t/ha	921
3.	Brackish water pond	2543 ha	4 t/ha	10172
4.	Fresh water fields	49.718 ha	0.4 t/ha	19887
5.	Brackish water fields	5428 ha	0.4 t/ha	2171
6.	Brackish water cage aquaculture	6159 no	0.8 t/ha	4927
7.	Fresh water cage aquaculture	1044 no	1.6t/ha	1670
8.	Recirculatory Aquaculture (50 Cum)	1773 no	1.6 t/ha	2837
9.	Biofloc aquaculture system (20 Cum)	10692 no	0.8 t/ha	8553
10.	Biofloc aquaculture system (160 Cum)	20018 no	1.6 t/unit	32028

11.	Farming in Padutha (100 Sm)	19918 no	0.8 t/unit	15934
12.	Mussel farming (100 m)	3000 no	0.8 t/unit	2400
13.	Oyster farming	8275 no	0.8 t/unit	6620
	TOTAL			132792

Table 4.10 Inland fish landings (averages for the periods 2007-12 and 2012-17) of species including culture fishes of Kerala and India

(In '000 tonnes)

Period	State	Major Craps	Minor Carp	Exotic carps	Murrels (Channa spp.)	Catfishes	Other fresh water fishes	Others	Total
2007-12	Kerala	38312	0	4784	5512	64971	0	22357	135936
	India	3418794	338252	535844	150081	279684	622722	264317	5609694
2012-17	Kerala	323268	304308	60086.53	7895.36	18653.07	10836		451170
	India	5863263	586321	753560	188753	613136	753017		8758050

Major carps Catla, Rohu, Mrigal and Calbasu etc

Exotic carps Common, Silver and Grass Crap

Catfishes *Wallago attu*, *Pangasius*, *bagarius*

Table 4.11 Aquaculture production of exportable species from Kerala and India during 2020-21

Sl. No.	Year	Kerala		India	
		Area (Ha)	Production (MT)	Area (Ha)	Production (MT)
1.	Crab	120.9	8	4023.1	4519.05
2.	Sea bass	2	21.95	15247	3625
3.	Tilapia	227.5	230.08	6700	6473
4.	Pangassius	159.6	150.55	16847.6	182198.3
5.	Tiger shrimp	2814	1129	58196	27616
6.	L. vannamei	157.39	420.85	108526.27	8,15,745
7.	Scampi	2	0.22	9,924	8,303

4.5 AQUATIC ORNAMENTAL BIO-RESOURCE PRODUCTION DATA

Ornamental bio-resources include freshwater fishes, plants, marine fishes, gastropods.

4.5.1 ORNAMENTAL FISHES

Ornamental fisheries has immense export potential. It is a multi-billion industry spread across more than 125 countries. The overall trade including non-exported products, wages and retail sales including accessories and fish feed is around US\$ 15 billion. The top exporting countries during 2011 - 2012 was Singapore followed by Japan, Czech Republic, Thailand, Malaysia, Israel, Indonesia, Netherlands and Sri Lanka.

India possesses rich resources of ornamental fishes with over 195 indigenous varieties reported from NE region and Western Ghats, and nearly 400 species from marine ecosystems. The major fish exported from India are of wild varieties collected from rivers of the Northeast and Southern States that contributes about 85% to the total export of all types of ornamental fish from country. Quantity of export from India is given below (Fig. 2.3)

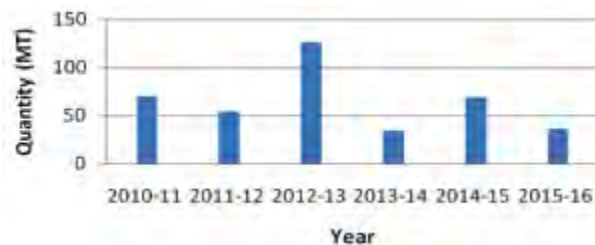


Fig 4.3 Quantity-wise Ornamental Fish Export from India during 2010-2016

Freshwater ornamental fishes are mainly grouped into two categories, viz., Oviparous (egg - layers) and Viviparous (live-bearers). Management of these two categories are different in nature. According to water tolerance fishes are hard water tolerant, soft water tolerant species and those with wider tolerance. Common fresh water ornamental species and their prices are given in Table 2.10. Currently the marine ornamental fish trade relies solely on wild catch which is not desirable for the sustainable development of the sector. A list of important marine ornamental fishes are given in Tables. To reduce the dependence on wild catch from seas, emphasis must be given on captive breeding and rearing of marine ornamental fishes. The technology of breeding and larval rearing has now been developed for certain species by research institutes like CMFRI. Species for which captive breeding techniques developed are given in Table.13

Aquarium trade as on today is depends on exotic species. Their breeding technologies have been perfectly long back. Because of this reason and along with acceptance has led to flourish the trade on these species. Table 2.12 provides a detailed account on the exotic fishes.

There are many varieties of ornamental aquatic plants and the market for these is growing steadily. Some of the commonly occurring species in India are *Nymphaea nouchali*, *Nymphaea pubescence*, *Myriophyllum oliganthum*, *Nymphoides indica*, *Nymphoides cristatum*, *Bacopam onnieri*, *Limnophila heterophylla*, *Limnophila repens*, *Utricularia aurea*, *Utricularia exoleata*, *Alternanthera philoxeroides*, *Hydrilla verticillata*, *Vallisneria natans*, *Eichhornia crassipes*, *Hygroryza aristata*, *Najas graminea*, *Marsilea quadrifolia* and *Ceratopteris thalictroides*. There is high demand for aquarium plants in the domestic and international market

Table 4.12 Major freshwater indigenous ornamental fishes of India (Prices varies based on size, coloration, quality, seasons and market)

Sl.No.	Species	Trade Name	FOB (US\$)
1	<i>Channa micropeltes</i>	Snake head	5
2	<i>Puntius denisonii</i>	Red line torpedo fish	5
3	<i>Channa gachua</i>	Brown Snake head	4
4	<i>Barilius canarensis</i>	Jerdon'sbaril	3.5
5	<i>Channa striatus</i>	Snake head	3
6	<i>Gonoproktopterus curmuca</i>	Recltail silver shark	3
7	<i>Gonproktoptems thomassi</i>	Nilgiri shark	3
8	<i>Horabagrus brachysoma</i>	Yellow catfish	3
9	<i>Horabagrus nigricolaris</i>	White collaredimperial	2.5
10	<i>Puntius arulius</i>	Arulibarb	2.25
11	<i>Gonoproktopterus amphibius</i>	Scarlet banded barb	1.6
12	<i>Lates calcarifer</i>	Giant sea perch	1.5
13	<i>Wallago attu</i>	Killer catfish	1.2
14	<i>Nemacheilus striangularis</i>	Zodiac leach	0.8
15	<i>Puntius filamentosus</i>	Indian tiger barb	0.8
16	<i>Puntius mahecola</i>	Malini's barb	0.8
17	<i>Channamarulius</i>	Peacock snake head	0.75
18	<i>Pangasiuspangasius</i>	-	0.7
19	<i>Channa orientalis</i>	Snake head	0.6
20	<i>Barilius bakeri</i>	Blue spottedhilltrout	0.5
21	<i>Xenentodon cancila</i>	Pipe fish	0.5
22	<i>Amblypharyngodon mola</i>	Brass fish	0.4
23	<i>Macrogathus aral</i>	Spiny eel	0.4
24	<i>Notopterus notopterus</i>	Grey feather back	0.4
25	<i>Etroplus suratensis</i>	Pearl spot	0.35
26	<i>Gatra (gotyla) gotyta</i>	-	0.3
27	<i>Nandus nandus</i>	Leaf fish	0.3

1.	<i>Notopterus notopterus</i>	Grey feather back	0.4
2.	<i>Etroplus suratensis</i>	Pearl spot	0.35
3.	<i>Gatra (gotyta) gotyta</i>	-	0.3

4.	<i>Nandus nandus</i>	Leaf fish	0.3
5.	<i>Ompok bimaculatus</i>	-	0.3
6.	<i>Puntius bimaculatus</i>	Two spot barb	0.3
7.	<i>Macrognathus aral</i>	SpfretailParadise fish	0.29
8.	<i>Apiocheilus lineatus</i>	Striped panchax	0.25
9.	<i>Danio malabaricus</i>	Malabar danio	0.25
10.	<i>Anabas testudineus</i>	Climbing perch	0.2
11.	<i>Etroplus macu/arus</i>	Orangachromide	0.2
12.	<i>Myslls viltallls</i>	Striped leach	0.2
13.	<i>Puntius scphore</i>	Soft fin swamp barb	0.2
14.	<i>Cheladadybufiori</i>	Burjor's Brilliance	0.17
15.	<i>Puntius lasciatu</i>	Melan barb	0.16
16.	<i>Eleotris fusca</i>	Bicolor goby	0.15
17.	<i>Apolocheilus blocki</i>	-	0.14
18.	<i>Mastacembelus armatus</i>	Marble spiny eel	0.12
19.	<i>Puntius ticto</i>	Tic tac toe barb	0.12
20.	<i>Puntius vittatus</i>	Silver barb	0.12
21.	<i>Banius bama</i>	Silver hill trout	0.1
22.	<i>Tetraodon travancoricus</i>	Puffer	0.1
23.	<i>Rasbora daniconius</i>	Slender rasbora	0.09
24.	<i>Chanda ranga</i>	High fin glass fish	0.08
25.	<i>Esomus danricus</i>	Flying barb	0.05
26.	<i>Jocheilus panchax</i>	Reel panchax	0.04
27.	<i>Lepidocephalus thermalis</i>	Loach	0.04
28.	<i>Oryzias melastigma</i>	Blue eyes	0.04

Source : Journal of Aquatic Biology and Fisheries, 2012

Table 4.13 Major marine indigenous ornamental fishes of India (Prices varies based on size, coloration, quality, seasons and market)

SI. No.	Species	Trade Name	European Price (US\$)
1	<i>Pomacanthus imperator</i>	Emperor angel fish	114.9

2	<i>Gymnothorax sp.</i>	Moray eels	106
3	<i>Narcine timlei</i>	Black spotted numb fish	100
4	<i>Pomacanthus semicirculatus</i>	Blue angel fish	99.99
5	<i>Heniochus acuminatus</i>	Pennet coral fish	75
6	<i>Arothron sp.</i>	Puffer fish	64.9
7	<i>Thalassoma lunare</i>	Moon wrasse	64.9
8	<i>Cephalopholis sp.</i>	Coral-cod	60
9	<i>Zanclus ornatus</i>	Moorish idol	57.5
10	<i>Chelonodon patoca</i>	Milkspotted puffer	50
11	<i>Chaetodon collare</i>	Redtail butterfly fish	47.5
12	<i>Diodon hystrix</i>	Porcupine Fish	39.99
13	<i>Pterois sp.</i>	Lion fish	39
14	<i>Epinephelus sp.</i>	Grouper	35
15	<i>Scarus ghobban</i>	Parrot fish	35
16	<i>Chaetodon vagabondus</i>	Vagabond butterflyfish	34
17	<i>Chaetodon auriga</i>	Threadfin butterflyfish	33.5
18	<i>Acanthurus nigrofuscus</i>	Brown surgeonfish	32.9
19	<i>Lutjanus sp.</i>	Snapper	30
20	<i>Siganus sp.</i>	Rabbit fish	30
21	<i>Cantherhines pardalis</i>	Honeycomb file fish	25
22	<i>Platax teira</i>	Long fin bat fish	24.5
23	<i>Plectorhinchus gibbosus</i>	Harry hotlips	24.5
24	<i>Therapon sp.</i>	Croaker	22
25	<i>Ostracion cubicus</i>	Yellow box fish	21.9
26	<i>Sargacentron rubrum</i>	Soldier fish	21.9
27	<i>Odonus niger</i>	Trigger fish	20.5
28	<i>Amphirion sp.</i>	Clown Fish	20.05
29	<i>Myripristis murdjan</i>	Pinecone soldier fish	17
30	<i>Canthigaster bennetti</i>	Mooitoble	16.99
31	<i>Halichoeres sp.</i>	Wrasse	15
32	<i>Platax orbicularis</i>	Orbicular batfish	15
33	<i>Plotosus lineatus</i>	Striped eel catfish	15
34	<i>Chromis viridis</i>	Damsel fish	10.05
35	<i>Apogon sp.</i>	Cardinal fish	10
36	<i>Pomacentrus caeruleus</i>	Blue damsel	8.9

Source : Journal of Aquatic Biology and Fisheries, 2012

Table 4.14 Exotic Ornamental Fishes traded in domestic market along with their price per piece (Prices varies based on size, coloration, quality, seasons and market)

Sl. No.	Common Name	Scientific Name	Price Range (Rs)*
1	Tinfoil Barb	<i>Puntius schwanefeldi</i>	15-50
2	Tiger Barb	<i>Puntius tetrazona</i>	15-50
3	Black Ruby Barb	<i>Puntius nigrofasiatus</i>	15-50
4	Clown Barb	<i>Barbodes everetti</i>	15-50
5	Long fin Rosy Barb	<i>Barbus conchoni</i>	15-50
6	Filament Barb	<i>Barbus conchoni</i>	50-200
7	Scissor tail Rasbora	<i>Rasbora trilineata</i>	15-50
8	Yellow tail Rasbora	<i>Rasbora dusonensis</i>	15-50
9	Red tail Rasbora	<i>Rasbora borapetensis</i>	15-50
10	Dwarf Rasbora	<i>Rasbora maculata</i>	15-50
11	Harlequin Rasbora	<i>Rasbora heteromorpha</i>	15-50
12	Green Line Rasbora	<i>Rasbora beauforti</i>	15-50
13	Slender Gold Rasbora	<i>Rasbora einthovenii</i>	15-50
14	Golden Line Rasbora	<i>Rasbora agilis</i>	15-50
15	Zebra Barb	<i>Rasborapauciperforata</i>	15-50
16	Red tail Black Shark	<i>Labeo bicolor</i>	50-200
17	Rainbow Shark	<i>Labeo erythrurus</i>	50-200
18	Albino Rainbow Shark	<i>Labeo frenatus</i>	50-200
19	Black Shark	<i>Labeo chrysophekadion</i>	50-200
20	Silver Shark	<i>Balantiocheilosmelanopterus</i>	50-200
21	Blood Parrot Cichlids	<i>Cichlasoma synspilum</i>	200-2000
22	Texas Cichlid	<i>Cichlasoma carpinte</i>	200-2000
23	Emerald Cichlid/Parro Fish	<i>Cichlasoma temporalis</i>	200-2000
24	Convict Cichlid	<i>Cichlasoma nigrofaciatum</i>	200-2000
25	Trout Cichlid	<i>Cichlasoma citrinellum</i>	200-2000
26	Peacock bass	<i>Cichlasoma ocellaris</i>	200-2000
27	Fire mouth cichlid	<i>Cichlasoma meeki</i>	200-2000
28	Red terror	<i>Cichlasoma festae</i>	200-2000
29	Green terror	<i>Aequidens rivulatus</i>	200-2000

30	Dwarf Cichlid	<i>Apistogramma luelingi</i>	200-2000
31	Flower horn	<i>Amphilophus labiatus</i>	200-2000
32	Pearl Gourami	<i>Trichogaster leeri</i>	50-200
33	Moonlight Gourami	<i>Trichogaster microlepis</i>	50-200
34	Blue Gourami	<i>Trichogaster trichopterus</i>	50-200
35	Dwarf Gourami	<i>Trichogaster falius</i>	50-200
36	Thick-lipped Gourami	<i>Trichogaster labiosa</i>	50-200
37	Snake Skin Gourami	<i>Trichogaster pectoralis</i>	50-200
38	Giant Gourami	<i>Osphronemus goramy</i>	50-200
39	Gold fish	<i>Carassius auratus</i>	15-50
40	Red Oranda	<i>Carassius auratus</i>	15-50
41	Red Cap Oranda	<i>Carassius auratus</i>	15-50
42	Blue Oranda	<i>Carassius auratus</i>	15-50
43	Red Ryukins	<i>Carassius auratus</i>	15-50
44	Red & White Ryukins	<i>Carassius auratus</i>	15-50
45	Celestial Gold	<i>Carassius auratus</i>	15-50

Source : Mission Ornamental Fisheries, 2017, NFDB

Table 4.15 Indigenous ornamental Fish species bred successfully in captivity

Sl. No.	Scientific Name	Common Name	Distribution
Freshwater	<i>Ornamental Fishes</i>		
1	<i>Pethia conchonius</i>	Indian Rosy Barb	All over India
2	<i>Puntius sarana</i>	Olive Barb	All over India
3	<i>Amblypharyngodon mola</i>	Mola	NER Odisha and West Bengal
4	<i>Botia dario</i>	Bengal Loach	NER and Northern Hill States
5	<i>Chitala chitala</i>	Chitala	All over India
6	<i>Labeo dero</i>	Dero	NER and Northern Hill States
7	<i>Mastacembelus armatus</i>	Eel	All over India
8	<i>Ompok bimaculatus</i>	Buter Fish	All over India
9	<i>Puntius arulius</i>	Shining barb	NER
10	<i>Puntius denisonii</i>	Miss Kerala	Western Ghats
11	<i>Tor Putitora</i>	Mahaseer	NER and Northern Hill States
12	<i>Macroganathus aculeuts</i>	Eel	NER
13	<i>Badis badis</i>	Dwarf Chameleon	NER

14	<i>Devario aequipinnatus</i>	Giant danio	West Bengal ,NER and Northern Hill States
Marine	Ornamental Fish		
1	<i>Amphiprion percula</i>	Orange clown	Andaman Nicobar Islands
2	<i>A. ocellaris</i>	False clown	Andaman Nicobar Islands
3	<i>A. sebae</i>	Sebae Clown	Gulf of Mannar and Andaman & Nicobar Islands
4	<i>A. nigripes</i>	Blackfinned clownfish	Lakshadweep Islands
5	<i>Premnas biaculeatus</i>	Maroon clown	Gulf of Mannar, A&N Islands, Lakshadweep Islands
6	<i>A. perideraion</i>	Skunk clown	Gulf of Mannar, A&N Islands
7	<i>A. frenatus</i>	Tomato clown	Gulf of Mannar, A&N Islands
8	<i>A. ephippium</i>	Fire clown	Gulf of Mannar, A&N Islands, Lakshadweep Islands
9	<i>A. clarckii</i>	Yellowtail clownfish	Lakshadweep Islands, Gulf of Kutch
10	<i>Pomacentrus cearuleus</i>	Blue damsel	Gulf of Mannar, A&N Islands, Lakshadweep Islands
11	<i>Pomacentrus pavo</i>	Peacock damsel	Gulf of Mannar, A&N Islands, Lakshadweep Islands
12	<i>Dascyllus trimaculatus</i>	Three spot damsel	Gulf of Mannar. A&N Islands, Lakshadweep Islands
13	<i>Dascyllus aruanus</i>	Dascyllusaruanus	Gulf of Mannar, A&N Islands, Lakshadweep Islands
14	<i>Chromis viridis</i>	Bluegreen damsel	Gulf of Mannar. A&N Islands, Lakshadweep Islands
15	<i>Neopomacentrusnemurus</i>	Yellowtail damsel	Gulf of Mannar, A&N Islands, Lakshadweep Islands
16	<i>Neopomacentrus cyanomos</i>	Filamentous tail damsel	Gulf of Mannar, A&N Islands, Lakshadweep Islands
17	<i>Chrysiptera cyanea</i>	Sapphiredevil damsel	Gulf of Mannar, A&N Islands, eep Islands

Source : Mission Ornamental Fisheries, 2017, NFDB

State and Central governments are offering a large number of schemes for the development of ornamental fish trade in India.

4.5.2 ORNAMENTAL GASTROPODS

Major Gastropods exploited and traded include *Babylonia*, *Turbinella*, *Harpulina*, *Bufonaria*, *Rapana*, *Turritella*, *Conus*, *Natica*, *Tibia*, *Oliva*, *Nassarius*, *Ficus* and *Phallium*. Major marine ornamental mollusk are *Babylonia spirata* and *Babylonia zeylanica*. These are dominant in the marine catches of Kollam District. Owing to the high export value these species are not considered as aquarium species. Gastropods catch was mainly contributed by *Babylonia* species because of its targeted fishery carrying out every year during April – June. During 2019, the gastropods landing as a by-catch in Kerala coast was 2080 tonnes. As shell processing is not done in Kerala, large number of ornamental gastropods are transported annually from Kollam to Rameswaram, Tuticorin, Cuddalore and Chennai.

Name of species	2016-17	2017-18	2018-19	2019-20
<i>Babylonia spirata</i> (%)	91.7	78.63	78.63	99
<i>Babylonia zeylanica</i> (%)	6.0	7.52	7.5	
Total gastropod catch in tonnes	1616.6	590	1534.5	2080

Source : CMFRI

For putting India in the forefront for ornamental fisheries, the Department is making efforts for holistic development of the sector through creation of ornamental fish clusters in selected inland and marine areas. Focus is also being given on promoting public private partnerships for establishment of various fish production units to make the sector vibrant and remunerative. State and Central governments are offering a large number of schemes for the development of ornamental fish trade in India.

4.6 LIVE FEED CULTURE DATA

Almost all aquatic organisms require minute particulate food during their early life cycle. Under controlled conditions (hatcheries, aquaria) smaller sized feeds are

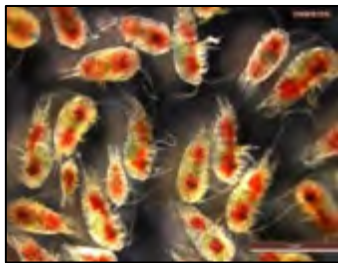
developed from the larval or adult stages of minute organisms like micro-organisms, phytoplankton (microalgae), zooplankton such as, rotifers, copepods, cladocerans, artemia, tubifex, chironomid larvae. They are generally termed as live feeds. Live feed organisms contain all the nutrients such as essential proteins, lipids, carbohydrates, vitamins, minerals, aminoacids, fatty acids, minerals etc. hence are commonly called as 'Living capsules of Nutrition'

Bacteria, yeast and other microbes are used as live feed organisms. Generally bacterial cells have good nutritional value as they contain essential aminoacids, proteins and polysaccharides, It is an excellent source of exogenous enzymes, helps in digestion and absorption of food by breaking down larger food molecule to smaller molecule in the gut of larva. Bacteria can also be used as probiotics and have been used as feed supplement in fish culture. The fish fed with such probiotics (Bacillus).

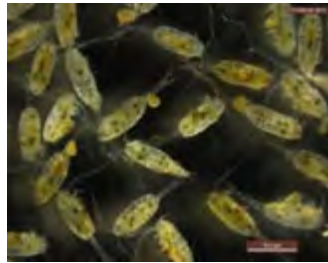
Micro algae cultured as live feed are : *Chetoceros*, *Skeletonema*, *Scendesmus*, *Isochrysis*, *Monochrysis*, *Tetraselmis*, *Dunaliella*, *Nannochloris*, *Chlorella* and so on. Microalgae are ideally small to be fed to larval forms of many species of fishes and mollusks.

Rotifers are commonly called as 'wheel animalcules'. They serve as starter diet for early larval stages of many fish and prawn species because of their high nutritive value and better digestibility. *Brachionus* spp. are largely cultivated for feeding in larvae. Rotifers are composed of about 50-60% protein, 13% fat and 3.1% HUFA which are essential for growth and survival of larvae. rotifers are mass cultured using marine chlorella or baker's yeast as food in countries like Japan on large scale. Cladocerans are generally called 'water fleas'. *Daphnia* and *Moina* proved to be the best live feeds. Twocladocerans namely *Daphnia* and *Moina* are important as live food. *Daphnia* is found in fresh water ponds and lakes of all over the world. *Daphnia* consists of broad spectrum digestive enzymes such as protease, peptidase, amylase, lipase and even cellulose which

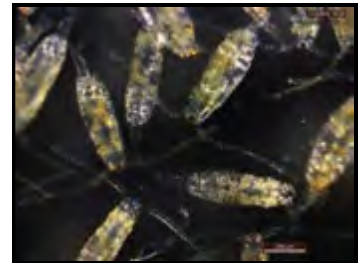
serve as exogenous enzymes in the gut of fish/prawn and increase their digestibility. Being larger in size than moina it serves as live food for advanced stages of fishes. Moina, found in temporary ponds and ditches. They are smaller than daphnia containing 50-60% protein and 20-30% fats therefore, goes well as replacement for artemia in aqua hatcheries. Moina used to be the most common live feed organism for feeding young fish larvae. Artemia are yet another important live feed in almost all prawn hatcheries. Fish hatcheries also make use of this live feed for successful rearing of larvae. Copepods are cultured for feeding the larvae of hatcheries. Copepod itself is small and its nauplius must be ideal for a large number of larvae who demand for very small sized feed, preferably live feed. CMFRI, KUFOS and a few entrepreneurs have developed the technique of rearing copepod. It fetches high profit also.



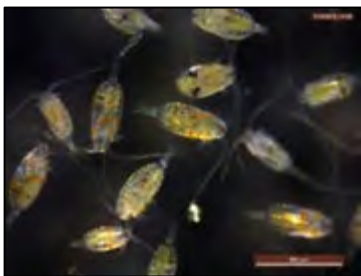
Temora turbinata



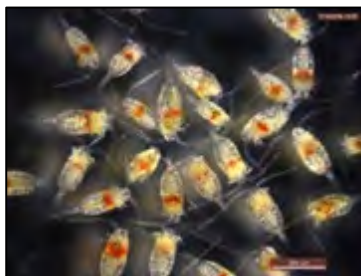
Pseudodiaptomus serricaudatus



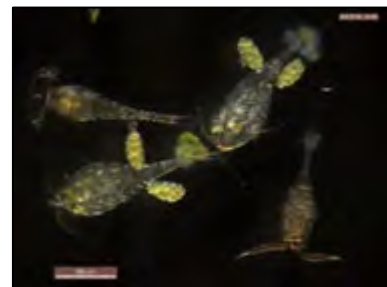
Acartia southwelli



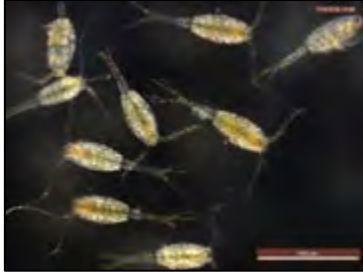
Parvocalanus crassirostris



Bestiolina similis



Apocyclops cf. Apocyclops



Dioithona sp.



Dioithona oculata



Euterpina acutifrons

AQUATIC PRODUCTS

5.1 AQUATIC PRODUCTS

During the financial year 2020-21, India exported 11,49,510 MT of Seafood worth US\$ 5.96 Billion. USA and China are the major importers of Indian seafood. Frozen shrimp continued to be the major item of export in terms of quantity and value, accounting for a share of 51.36 % in quantity and 74.31% of the total USD earnings. Frozen Fish retained the second position as the largest export item, accounting for a share of 16.37% in quantity and 6.75% in USD earnings. Marine fish, including sardines, shrimps, lobsters, cuttlefish, squid and tuna, account for a share of 76 percent in the total fish production of Kerala. Kollam is the leading marine fish producing district, while Alappuzha and Kottayam are the leading inland fish producing districts in the state. From Kerala more than 700 items are exported (Annexure 28) .Marine products include frozen fishes, frozen shrimps, and live fishes such as shrimps, prawns, cuttle fish, squid, crabs, lobsters, tuna, mackerel, pomfret etc.

Matsyafed produces a variety of value-added 'Ready-to-Fry' and 'Ready-to-Eat' seafood products of international quality. The Ready-to-Fry products include Fish Slices, PUD Prawns, Squid Rings, Cleaned Mussel Meat, Frozen Cutlets and the Ready-to-Eat products include Pickles and Curries. The delicacies like Ribbon Fish, Tuna, Spanish Mackerel, Crabs and Octopus are currently exported to countries like China, Korea, the Middle-East & Sri. Lanka.Seabass, mud crab, freshwater prawn organic aquaculture products; prepared fish/ shrimp products such as ready to cook fish curries/ prawn curries; and fish oils have potential high value export value. Marine products such as frozen fishes, frozen shrimps, and live fishes such as shrimps, prawns, cuttle fish, squid, crabs, lobsters, tuna, mackerel, pomfret etc. are important exports from Kerala, and account for a share of 12.68 percent in India's total exports of marine products during

2018-19. Top markets for exports of marine products from Kerala primarily include Asian markets such as Vietnam, Thailand, and China, as also markets such as Spain, the USA, and Italy, among others. There exist opportunities for enhancing exports to other markets such as Japan, South Korea, and Russia for exports of frozen fish, and to countries like France, the Netherlands, Malaysia, Portugal for exports of cuttle fish and squid, as these are among the top importers of these products globally.

The products developed from aquatic bio-resources and commercialized are given in Table 5.1 and technology transferred by ICAR- CIFT for development of value added products are given in Annexure 29.

Table 5.1 : Products developed from aquatic bio-resources of Kerala

Sl. No.	Products	Source	Purpose
1	Frozen crab meat	Crab	Edible purpose
2	Frozen pasteurized crab	Crab	Edible purpose
3	Frozen stuffed crab	Crab	Edible purpose
4	Frozen Crab claws	Crab	Edible purpose
5	Frozen mud crab	Crab	Edible purpose
6	Frozen cut crab with claws	Crab	Edible purpose
7	Frozen cut crab without claws	Crab	Edible purpose
8	Frozen cut swimming crab	Crab	Edible purpose
9	Frozen cut crab	Crab	Edible purpose
10	Frozen dressed crab	Crab	Edible purpose
11	IQF whole crab	Crab	Edible purpose
12	Frozen pasteurised crab meat	Crab	Edible purpose
13	Frozen whole crab	Crab	Edible purpose
14	Frozen crab meat with shell/crab chunks	Crab	Edible purpose
15	Frozen soft shell crab	Crab	Edible purpose
16	Frozen crab stick	Crab	Edible purpose
	NUTRACEUTICALS		
17	Cadalmin TM Green Mussel extract (Cadalmin TM GMe) CMFRI	From Green mussel by CMFRI	To combat joint pain and rheumatoid arthritis

18	Cadalmin™ Green Algal extract (Cadalmin™ GAe) CMFRI	From alga by CMFRI	To combat rheumatic arthritic pains
19	Cadalmin™ Antidiabetic extract (Cadalmin™ ADe)	By CMFRI	For use against Type II diabetes
20	Cadalmin™ Antihypercholesterolemic extract (Cadalmin™ ACe)	By CMFRI	For dyslipidemia
21	Cadalmin™ Antihypothyroidism extract (Cadalmin™ ATe)	By CMFRI	To combat hypothyroid disorders
22	Cadalmin™ Antihypertensive extract (Cadalmin™ AHe)	By CMFRI	To use against hypertension
23	Cadalmin™ Antiosteoporotic extract (Cadalmin™ AOe)	By CMFRI	To treat osteoporosis
24	Cadalmin™ Immunoboost extract (Cadalmin™ IBe)	By CMFRI	To boost innate immunity
	LIVE FEED CULTURE		
25	<i>Chlorella vulgaris</i>	Alga	Hatcheries
26	<i>Chlorella</i> sp.(freshwater strain)	Alga	Hatcheries
27	<i>Dunaliella salina</i>	Alga	Hatcheries
28	<i>Nannochloropsis oculata</i>	Alga	Hatcheries
29	<i>Nannochloropsis salina</i>	Alga	Hatcheries
30	<i>Chaetoceros calcitrans</i>	Alga	Hatcheries
31	<i>Isochrysis galbana</i>	Alga	Hatcheries
32	<i>Dicrateria gilva</i>	Alga	Hatcheries
33	<i>Tetraselmis gracilis</i>	Alga	Hatcheries
34	<i>Spirulina</i> spp.	Alga	Hatcheries
35	<i>Acartia (Euacartia) southwelli</i> Sewell, 1914	Copepod by Santhosh, CMFRI	Hatcheries
36	<i>Temora turbinata</i> (Dana, 1849)	Copepod by Santhosh CMFRI	Hatcheries
37	<i>Pseudodiaptomus serricaudatus</i> (Scott T., 1894)	Copepod by Santhosh CMFRI	Hatcheries
38	<i>Parvocalanus crassirostris</i> (Dahl F., 1894)	Copepod by Santhosh CMFRI	Hatcheries
39	<i>Bestiolina similis</i> (Sewell, 1914)	Copepod by Santhosh CMFRI	Hatcheries
40	<i>Apocyclops cmfri</i> Loka et al.,	Copepod by	Hatcheries

	2017	Santhosh CMFRI	
41	<i>Dioithona oculata</i> (Farran, 1913)	Copepod by Santhosh CMFRI	Hatcheries
42	<i>Dioithona</i> sp.	Copepod by Santhosh CMFRI	Hatcheries
43	<i>Euterpina acutifrons</i> (Dana, 1847)	Copepod by Santhosh CMFRI	Hatcheries
44	<i>Thermocyclops crassus</i> (Fischer, 1853)	Copoepod by Resmi & Jayachandran, KUFOS	Hatcheries
45	<i>Heliodiaptomus cinctus</i> (Gurney, 1907)	Copoepod by Sabu at hatchery	Hatcheries
46	<i>Mesocyclops hyalinus</i> (Rehberg, 1880)	Copepod by Sabu at hatchery	Hatcheries
47	<i>Moina macrura</i> Kurz, 1875	Cladocera by Sabu at Hatchery	Hatcheries
48	<i>Cereodaphnia cornuta</i> G.O. Sars, 1885	Cladocera by Sabu at Hatchery	Hatcheries
49	<i>Daphniosoma sarsi</i> Richar 1894	Cladocera by Sabu at Hatchery	Hatcheries
50	<i>Brachionus calyciflorus</i> Hermann, 1783	Cladocera by Sabu at Hatchery	Hatcheries
51	<i>Brachionus angularis</i> Gosse, 1851	Cladocera by Sabu at Hatchery	Hatcheries
	MICROBES FROM MARINE ENVIRONMENT		
52	<u>Microbial products</u> a. Nitrifying bioreactor b. Microbial consortium for waste management c. Microbial consortium for industrial odor control	Microbes	Industrial purpose, domestic and export market

	<p>d. Microbial consortium for bioremediation</p> <p>e. Probiotics</p> <p>g. Lactobacillus probiotics</p> <p>h. For detergents :</p> <ul style="list-style-type: none"> * Fungal enzymes * Microbial protease * Microbial enzymes <p>i.L-asparaginase as human medicine</p> <p>j.Bacterial pectinase in food processing</p> <p>k.Microbial Beta Glucosidase (BGC) as biofuel</p> <p>l. Bacterial melanin for human cosmetics</p> <p>m. Polycyclic tetramate macrolactam PTM as human medicine</p> <p>n. Terreusinone for anti-inflammatory and UV protectant</p> <p>o. Microbial polymers (PHB)</p>		
	FISH AND SHRIMP PROCESSED PRODUCTS		
53	Chilled Fish	Fish products	Fish processing products, used as food, domestic and export market
54	Frozen Fish Fillets	"	Fish processing products, used as food, domestic and export market
55	Stretched Shrimp (Nobashi)	Shrimp speciality products	Shrimp processing products, used as food, domestic and export market
56	Barbecue, Sushi (Cooked Butterfly Shrimp),	Shrimp speciality products	Shrimp processing products, used as food, domestic and export market
57	Skewed Shrimp	Shrimp speciality products	Shrimp processing products, used as food, domestic and export market

58	Shrimp Head-On (Centre Peeled),	Shrimp speciality products	Fish processing products, used as food, domestic and export market
59	Shrimp Head-On Cooked (Centre Peeled)	shrimp speciality products	Shrimp processing products, used as food, domestic and export market
60	Fish Finger Or Fish Portion	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
61	Fish Fillets	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
62	Shrimp Products	Battered and breaded fish products	Shrimp processing products, used as food, domestic and export market
64	Squid Products	Battered and breaded fish products	Squid processing products, used as food, domestic and export market
65	Clam Products	Battered and breaded fish products	Clam processing products, used as food, domestic and export market
66	Fish Cutlets	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
67	Fish Balls	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
68	Crab Claw Balls	Battered and breaded fish products	Crab processing products, used as food, domestic and export market
69	Minced Based Products	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
70	Ready To Serve Fish Products In Retortable Pouch	Battered and breaded fish products	Fish processing products, used as food, domestic Fish processing products, used as food, domestic and export market and export market
71	Extruded Products	Battered and breaded fish	Fish processing products, used as food, domestic and export

		products	market
72	Intermediate Moisture Products (IMF),	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
73	Seaweed Products/ Seaweed Incorporated Products	Battered and breaded fish products	Sea weed processing products, used as food, domestic and export market
74	Fish Caviar Substitutes	Battered and breaded fish products	Fish processing products, used as food, domestic and export market
	Pickled Products	Fish/ shrimp	Fish shrimp processing products, used as food, domestic and export market
75	Fish Soup Powder	Fish product	Fish processing products, used as food, domestic and export market
76	Fish Flakes And Wafers	Fish product	Fish processing products, used as food, domestic and export market
77	Fish Paste	Fish product	Fish processing products, used as food, domestic and export market
78	Fish Noodles	Fish product	Fish processing products, used as food, domestic and export market
79	Dried Fish	Fish product	Fish processing products, used as food, domestic and export market
	PRODUCTS FROM FISH/ SHRIMP/ MOLLUSCAN WASTE		
80	Chitin And Chitosan	Prawn/ shrimp/ crabs	Industry, domestic and export market
81	Carotenoid Pigments	Prawn/ shrimp/ crabs	Industry, domestic and export market
82	Fish Meal - Animal Feed Supplement	Fish	Industry, domestic and export market
83	Fish Solubles - Animal Feed Supplement	Fish	Industry, domestic and export market
84	Fish Silage And Foliar Spray -	Fish	Industry, domestic and export

	Animal Feed Supplement		market
85	Fish Manure/ Guano/ Compost- Animal Feed Supplement	Fish	Industry, domestic and export market
86	Fish Protein Concentrate (FPC) – From Waste Meat	Fish	Industry, domestic and export market
87	Fish Protein Hydrolysate – From Waste Meat	Fish	Industry, domestic and export market
88	Pet Food – From Waste Meat	Fish	Industry, domestic and export market
89	Fish Body Oil (Eicosapentaeonic Acid EPA; Docosahexaenoic Acid DHA), Fish Liver Oil, Squalene	Fish oil product	Industry, domestic and export market
90	Leather – Products From Fish Skin And Scales	From fish waste	Industry, domestic and export market
91	Collagen Peptides – Products From Fish Skin And Scales	From fish waste	
92	Gelatin – Products From Fish Skin And Scales	From fish waste	
93	Fish Glue – Products From Fish Skin And Scales	From fish waste	Industry, domestic and export market
94	Pearl Essence – Products From Fish Skin And Scales	From fish waste	Industry, domestic and export market
95	Ornamental Products – Products From Fish Skin And Scales	From fish waste	Industry, domestic and export market
	Shagreen – Products From Fish Skin And Scales	From fish waste	Industry, domestic and export market
	Shark Fin Rays	From shark	Industry, domestic and export market
96	Calcium Phosphate, Hydroxyapatite (Hap), Fish Bone Meal, Shark Cartilage &Chondroin Sulphate, Ornamental Products And Pigments	From fish bone	Industry, domestic and export market
97	Fish Maws And Isinglass, Gelatin	From fish air bladder	Industry, domestic and export market
98	Insulin, Surgical Suture,	From viscera of	Industry, domestic and export

	Enzymes	fish	market
99	Calcium Carbonate, Cuttle Bone	From molluscan shell	Industry, domestic and export market
100	Cephalopod Ink	From cephalopod molluscs	Industry, domestic and export market



Other fishery products : Seafood and vegetable mix, mixed seafood skewers, seafood mix in tray pack, surini analogue products, patties, nuggets, seafood sausage, frozen seafood curry and rice, frozen seafood curry with porotta, seafood in brine/ oil/ sauce, CIFTEQ[®] NUTRIBAR - Ready to eat convenient snack of good nutritional and sensory characteristics due to their high protein, carbohydrate, lipids and mineral content, CIFTEQ[®] NUTRIMAYO - Mayonnaise, fortified with tuna protein hydrolysate, CIFTEQ[®] Fish oil microencapsulates fortified pasta, CIFTEQ[®] Fish oil fortified sausage: enriched with with n-3 PUFAs, CIFTEQ[®] MARINE COLLAGEN PEPTIDE BISCUITS – Collagen peptide

supplementation increases the bone mineral density and supports healthy joints, CIFTEQ[®] Gel Chito Film - Gelatin-chitosan film for enhancing the shelf life of chilled stored fish, CIFTEQ[®] Chito Bianano Film – Chito oligosaccharide based gelatin chitosan bio-nano composite film, CIFTEQ[®] Ginger PLA film – Biodegradable active films from poly lactic acid (PLA) added with ginger essential oil for fish packaging application, CIFTEQ[®] Freeze dried broth cubes from rohu frame waste: effective utilization of fish fillet frame waste for developing nutritive rich dishes.

Products from microbes : Nitrifying bioreactor, Microbial consortium for waste management, Microbial consortium for industrial odor control, Microbial consortium for bioremediation, Probiotics, Lactobacillus probiotics, (for detergents) - Fungal enzymes, Microbial protease, Microbial enzymes, L-asparaginase as human medicine, Bacterial pectinase in food processing, Microbial Beta Glucosidase (BGC) as biofuel, Bacterial melanin for human cosmetics, Polycyclic tetramate macrolactam PTM as human medicine, Terreusinone for anti-inflammatory and UV protectant, Microbial polymers (PHB)

Products from seaweeds : CIFTEQ[®] NUTRIDRINK – Seaweed based nutritional drink rich in micronutrients and fucoida, CIFTEQ[®] NUTRIDRINK – Seaweed incorporated cookies, CIFTEQ[®] SEAJERKY – Energy and protein rich food from seaweed, CIFTEQ[®] Seaweed dietary fibre: Nutritional supplements, CIFTEQ[®] SEANOODLES: Seaweed and fish enriched noodles, CIFTEQ[®] Edible seaweed-based sachet : Biodegradable sachet from seaweed, CIFTEQ[®] Seaweed dietary fibre fortified fish sausage, CIFTEQ[®] SEAYOGURT - Seaweed based preparation, CIFTEQ[®] Seaweed biofilm – Seaweed based biodegradable film for fish packaging application,

5.2 NUTRACEUTICALS

Functional sea foods (or nutraceuticals) enriched with natural ingredients have proved good for human health and hence there has been serious research in recent years on the subject. High value secondary bioactive metabolites from the marine organisms are attracting attention because of the growing demand for new compounds of 'marine natural' origin, having potential applications in pharmaceutical fields, and concerns about the toxic effects by synthetic drugs and their derivatives. Marine bio-resources proved to contain vast resource for new medicines to combat major diseases such as cancer, AIDS, malaria, and neuromuscular diseases. Newer natural compounds of marine origin have delivered promising bioactive compounds with previously undescribed structures/skeletons, and these could be used as promising nutraceuticals and therapeutic agents against various ailments. Blunt *et al.* (2016) have a useful data of distribution of bio-active compounds phyla wise of marine organisms and is reproduced below in Fig.

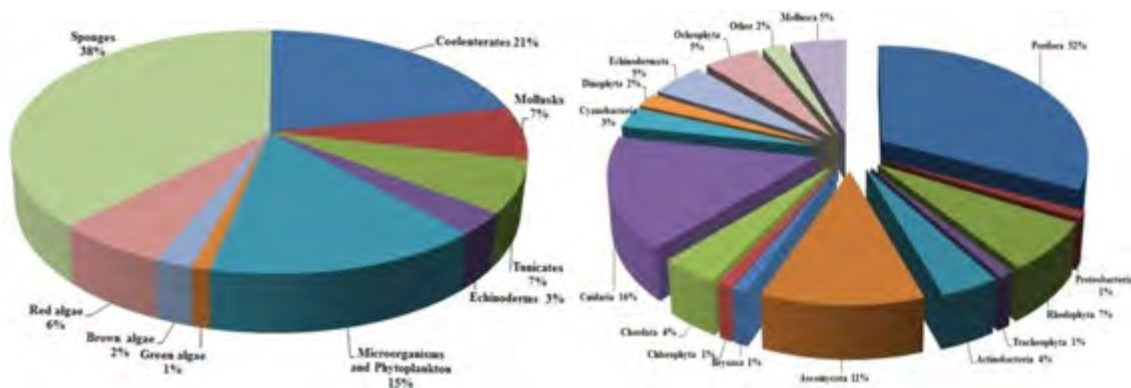


Fig 5.1 Products developed from aquatic bio-resources

5.3 PRODUCTS DEVELOPED BY CMFRI

- a. Cadalmin™ Green Mussel extract (Cadalmin™ GMe) to combat joint pain and rheumatoid arthritis
- b. Cadalmin™ Green Algal extract (Cadalmin™ GAe) to combat rheumatic arthritic pains
- c. Cadalmin™ Antidiabetic extract (Cadalmin™ ADe) for use against Type II diabetes
- d. Cadalmin™ Antihypercholesterolemic extract (Cadalmin™ ACe) for dyslipidemia
- e. Cadalmin™ Antihypothyroidism extract (Cadalmin™ ATe) to combat hypothyroid disorders
- f. Cadalmin™ Antihypertensive extract (Cadalmin™ AHe) for use against hypertension
- g. Cadalmin™ Antiosteoporotic extract (Cadalmin™ AOe) to treat osteoporosis
- h. Cadalmin™ Immunoboost extract (Cadalmin™ IBe) to boost innate immunity



Green mussel *Perna viridis*, which is abundant in the coastal waters of Kerala, has been used to develop Cadalmin™ Green Mussel extract

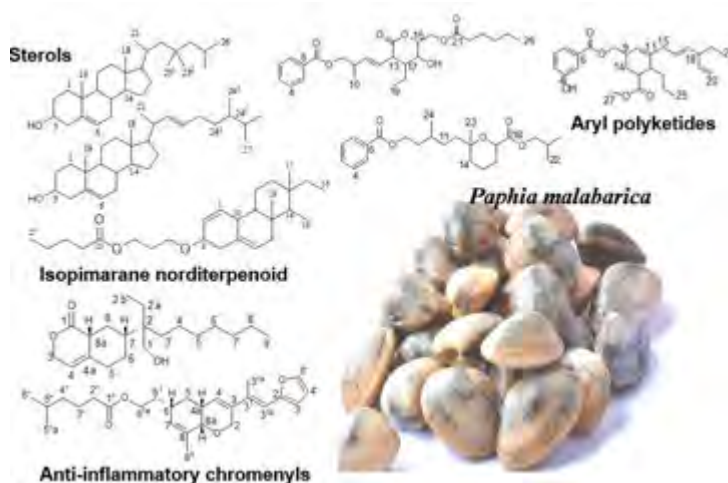
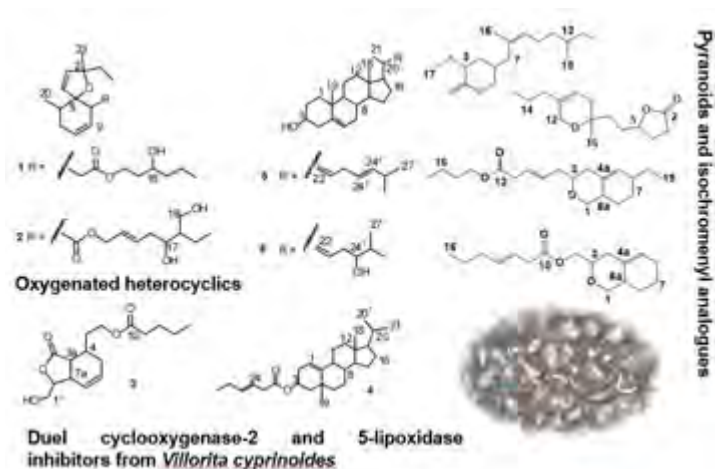
- *Most of the bioactive substances isolated from seaweeds are chemically classified as brominated, aromatics, nitrogen-heterocyclic, nitrosulphuric-heterocyclic, sterols,*

dibutanoids, proteins, peptides, sulphated polysaccharides, terpenes, acetogenins, alkaloids and polyphenolics.

- *Marine macroalgae have been identified as rich sources of structurally diverse bioactive compounds with great pharmaceutical potential (Blunt et al 2014). Variety of biological compounds including phlorotannins, polysaccharides, and fucoxanthin were isolated from brown algae and characterized on their biological activities.*
- *Dieckol, a phlorotannin isolated from Ecklonia cava was revealed to play an important role in the prevention of type II diabetes; aplysistatin, a brominated sesquiterpene with high degree of unsaturation isolated from Laurencia snackeyi. Eckol, dieckol, 2-phloroeckol and 7-phloroeckol isolated from Ecklonia stolonifera, perennial brown algae widely distributed throughout the Eastern and Southern coasts of Korea, exhibited a selective dose-dependent inhibitory activity against AChE(Newman and Cragg 2012).*

Bioactive compounds from mollusks *Paphia malabarica* and *Villoritta cyprenoides*

Other low-value bivalve clams are also used to develop bioactive products and nutraceuticals by Central Marine Fisheries Research Institute, Kochi.



5.4 PRODUCTS DEVELOPED OUTSIDE INDIA

Products developed from Algae: Most of the bioactive substances isolated from seaweeds are chemically classified as brominated, aromatics, nitrogen-heterocyclic, nitrosulphuric-heterocyclic, sterols, dibutanoids, proteins, peptides, sulphated polysaccharides, terpenes, acetogenins, alkaloids and polyphenolics. Marine macroalgae have been identified as rich sources of structurally diverse bioactive compounds with great pharmaceutical potential. Variety of biological compounds including phlorotannins, polysaccharides, and fucoxanthin were isolated from brown algae and characterized on their biological activities. Dieckol, a phlorotannin isolated from *Ecklonia cava* was revealed to play an important role in the prevention of type II diabetes; aplysiastatin, a brominated sesquiterpene with high degree of unsaturation isolated from

Laurencia snackeyi. Eckol, dieckol, 2-phloroeckol and 7-phloroeckol isolated from *Ecklonia stolonifera*, perennial brown algae widely distributed throughout the Eastern and Southern coasts of Korea, exhibited a selective dose-dependent inhibitory activity against AChE (Newman and Cragg, 2012).

Compounds derived from sponge

Bengamides and Derivatives – Bengamides A & Bengamides B from Fijian sponge, *Jaspiscorlancea* useful for antibiotic and antihelminthic activity against nematode

Contignasterol (IZP -94005, IPL 576, 092) from sponge, *Petrosia contignata* useful as anti asthmatic drug; IPL 576, 092 for treatment carrying inflammation of eyes and skin.

Debromohymenialdisine (DBH) from Palavian Marine Sponge, *Stylotella aurantium* used as anti Alzheimer agent

Discodermlide from Bahamian deep sea sponge, *Discodermiadissoluta* used as anti-cancer drug

Halichonidrins B from sponge *Halichondria okadae*.

Hemiasterlins (H-286) from sponge *Aulettasp.* & *Siphonochalina*

Hemiasterlins A & Hemiasterlins C from sponge *Aulettasp.* & *Siphonochalina* for mitotic inhibition

KRN 7000 from sponge *Agelasmauritianus* for antitumour

Lasonolides from sponge *Forcepia* sp. from Mexico

Manoalide from sponge *Luffariella variabilis*

Topsentius from sponge *Spongosorites ruetzleri* for anti-inflammatory creams

Diazonomide A from Philippine Ascidian, *Diazona angulata*

Vitelevuamide from ascidian, *Didemnum cuculiferum* & *Polysyncrator lithostrotum*

Byostatin 1 from Bryozoan, *Bugula neritina* from Gulf of California and Mexico

Anabaseine (Hoplonemertine toxin), from helminths

Cryptophycins from sponge, *Dysidea arenaria*

Curacin A from *Lyngbyamajuscula*

Thiocoraline from actinomycete bacterium, *Micromonospora marina*

Source : compiled by : Prof. K. V. Jayachandran from various sources

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5.5 VALUE ADDED PRODUCTS FROM FISH WASTE

Huge quantities of fish and shell fish wastes are accumulated during processing. During 2006-07, an estimate of 3, 02,750 tonnes of waste was generated from fish processing (both processing and pre processing taken together) industries of India alone. The maximum waste was generated from processing of shrimps followed by fin fishes and cephalopods. **On the context of environmental pollution, waste generation from fish processing is of great concern today. This waste can be used for the**

preparation of high value added products including proteinaceous foods. These are also a valuable source of raw materials that can be produced from discards.

Additionally, inappropriate disposal is a major cause of environmental pollution. These wastes can originate from landing centre, markets, processing plants and discards. From prawns 60% and from fish 25-30% wastes are being generated. If these wastes are not utilized properly environmental contamination will result and may cause consequent health problems for humans and other biota. Therefore, programmes and planning to wealth generation from waste is unavoidable.

The wealth that can be generated from fisheries waste and details are given below.

Sources of fishery wastes

Fisheries wastes are from fishes, crustaceans, mollusks and sea weeds.

1. From prawns, squilla, crabs, lobsters : products - chitin and chitosan production, carotenoid pigments. The presence and recovery of pigments like astaxanthin and its esters, b-carotene, lutein, astacene, canthaxanthin and zeaxanthin from crustacean waste. Carotenoids are a group of fat-soluble pigments that can be found in many plants, algae, microorganisms, and animals, and are responsible for the colour of several shellfishes. Chitin, a polysaccharide and one of the major components of crustacean shell waste, has been found to be a potential source of antimicrobial substances. Chitosan has strong antimicrobial activity against a variety of microorganisms, and its non-toxic, biocompatible and biodegradable properties make it adequate for applications as a food ingredient and in medical applications.

2. From fish :

3. Animal feed supplement : Fish meal, Fish solubles, Fish silage and foliar spray, Fish manure/ guano/ compost. Fish meal is the most vital products obtained from fish waste, by-catch, and other abundant species. It is highly concentrated dry nutritious feed supplement consisting of high-quality protein (70%), minerals (10%), fat (9%) and water (8%). It can have different compositions and qualities, in terms of amino acid profile, digestibility, and palatability, depending on the raw material used for its production and the type of process employed for obtaining the meal. Fish meal is usually used as an ingredient in food for fish and crustaceans.

Viscera of fish include the digestive tissues (stomachs, pyloric caeca, intestines, liver, pancreas, etc.) and other organs like spleen and gonads. Viscera waste was used to obtain fish silages. Almost any low-cost species of fish can be used to make silage, though cartilaginous species like sharks and rays liquefy slowly. Fish silage are often defined as a product made up of whole fish or parts of the fish to which no other material has been added aside from an acid and in which liquefaction of the fish is brought about by enzymes already present in the fish.



4. Products from meat of fish waste/ underutilized fish : Fish protein concentrate (FPC), Fish protein hydrolysate (FPH), pet food. FPH is a liquefied product but different from silage. FPH may be defined as fish proteins that are broken down into peptides of various sizes. These products are produced by employing commercially available proteolytic enzymes for isolation of enzymes from fish waste. By selection of suitable enzymes and controlling the hydrolysis conditions, properties of the end product can be selected. Hydrolysates find application in milk replacers and food flavourings. That is the rationale why fish protein hydrolysates are getting more popular. The degradation can be carried out either chemically (using acid or alkali) or biologically (using enzymes). Such processes not only maintain a high essential amino-acid content but also generate many improved functions for food or pharmaceutical application. For example, improved capacities of oil-binding and emulsifying are required for meat products and spread texture food respectively. Similarly, natural anti-oxidants like FPH could be used for improved anti-oxidation and anti-hypertension activities and to control high blood pressure, in addition, to replace synthetic products which may have negative side effects. So the production of fish hydrolysates from fish processing waste will reduce the pollution due to the accumulation of fish waste in the environment from the fishery based industries. Most hydrolysates are bitter in taste after the time of production. Therefore flavouring agents are like cocoa, and sugar should be used during the fortification in food preparation to mask the bitter taste.

5. Fish oil products : Fish body oil (eicosapentaenoic acid EPA; docosahexaenoic acid DHA), Fish liver oil, squalene. Fish oils are often extracted from the entire fish, skin or liver (in the case of some species). Fish oils are rich sources of polyunsaturated fatty acids, especially Eicosapentaenoic acid (EPA) and Docosa hexanoic acid (DHA). These two compounds have shown different interesting bioactivities. Among the properties of omega-3 fatty acids, the best known are the prevention of atherosclerosis, reduction of

blood pressure and protection against arrhythmias. Squalene is a lipid found in large quantities in shark liver oil. The large by-catch of shark within the fishing industry round the world provides a useful source of fish oils whose value are often substantially increased by processing them to obtain fractions such as squalene. Squalene is interesting bio-active oil and their applications have been reported in the treatment of diabetes, cancer, and tuberculosis. It also has antifungal and anti-oxidative properties. At present, the medicinal values of fish oil are very well known. Fish oil, a fish powder by-product, was pre-treated by filtration, placed during a reactor with two catalysts (iron oxide and phosphate monobasic) and mixed with ozone bubbling (about 8000 ppm) for one hour temperature which is named primary ozone treatment. Some scientists evaluated the ozone treated fish waste oil as a transportation diesel oil .

6. Products from fish skin and scales : Leather, collagen peptides, gelatine, fish glue, pearl essence, ornamental products, shagreen. Fish skin is a crucial by-product of the fish-processing industry, causing wastage and pollution. Collagen is the major structural protein found in the skin and bones of animals and gelatins are their degradation products. The collagen obtained has potential use for a spread of applications like edible casings for the meat processing industries, cosmetics (because it's good moisturizing properties) and biomedical materials or pharmaceutical applications, which include the production of wound dressings, vitreous implants or carriers for drug delivery. Some reports also show that collagen may evince high anti-radical activity. It is well established that the amount of gelatin used in the food industry worldwide is increasing annually. It has been also demonstrated that fish gelatin can stabilize emulsions, remaining moderately stable to droplet aggregation and creaming, even after being subjected to changes in temperature, salt concentration, and pH. Gelatin from marine source can be a possible alternative to bovine gelatin in future days. Pearl essence Pearl essence is the suspension of crystalline guanine in a solvent. It is the iridescent substance located in the

epidermal layer of the scales of pelagic fishes. This is used for coating the objects to give them a lustrous effect. Fish glue Fish glue is made from fish skins (better quality glue) and fish heads (lesser quality glues). A sequential cooking of fish skin with acid and alkali yields fish glue.

7. Products from fish fin : shark fin rays- New biologically active compounds have been isolated from fishery discards. One example is the discovery of the antifungal and antibacterial properties of the epidermis, epidermal mucus of different fish species, liver, intestine, stomach, and gills of some fish species and the blood and shell of some crustaceans. Fish mucous is known to have significant biological functions, acting as an immunological barrier. A variety of biologically active compounds, proteinases, peptides, or polypeptides with high molecular weight are responsible for these functions.

8. Products from fish bone : Calcium phosphate, Hydroxyapatite (HAp), fish bone meal, shark cartilage & Chondroitin sulphate, ornamental products and pigments. Fish calcium can be used for the pharmaceutical purpose.

9. Products from air bladder : Fish maws and Isinglass, gelatin. Sturgeon fish's air bladder or swim bladder is usually referred as isinglass. In India, air bladder of eels and catfishes are used for the production of isinglass. The air bladders are separated from fish and temporarily preserved in salt during the time of transport. On reaching the shore, they are split open, thoroughly washed and outer membrane are removed by scraping and then air dried. Then cleaned, desalted, air dried, and hardened swim bladders are called fish maws. Isinglass is used as clarifying agents for beverages, wines, beer, and vinegar by enmeshing the suspended impurities in the fibrous structure of swollen isinglass.

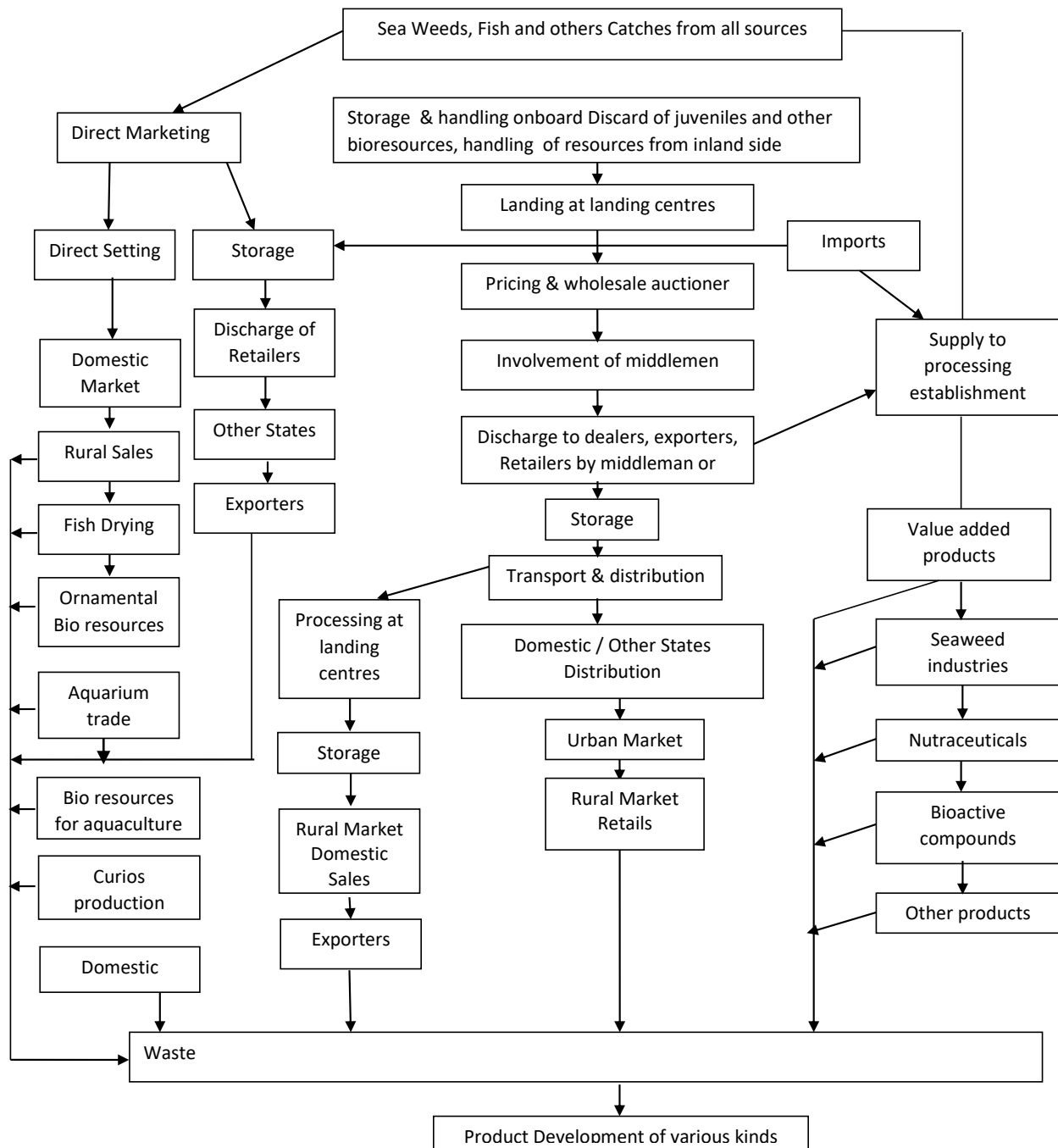
10. Products from fish viscera : Insulin, surgical suture, enzymes (various). Proteases or the proteolytic enzymes that are found within the gut might be helpful in fish protein hydrolysate production. Proteolytic enzymes like alkaline, α -chymotrypsin, neutralise, papain, pepsin, trypsin, pancreatin, flavourzyme, bromelain, pronase E, protamex, orientase, thermolysin, validase, protease A amano, protease N amano and cryotin F that derived from plant, animal, and microbial sources are successfully tested for the assembly of antioxidative peptides from fish protein sources. Today, there's an increasing demand for fish proteolytic enzymes thanks to their wide selection of applications. Proteases play an important role in industries due to their multifarious applications in leather and detergent industry, food and pharmaceutical industries and also in bioremediation processes.

11. Antifreeze proteins from waste : Antifreeze proteins (AFPs), which are found in diverse species of marine fishes, are characterized by their ability to stop ice formation by cooling below the melting point

12. From mollusca : products – calcium carbonate, cuttle bone, cephalopod ink
Fish waste as a material for enzyme production

5.6 SUPPLY CHAIN IN FISHERIES SECTOR

Fisheries sector is a complex system. Fish commodity is highly perishable. Therefore, disposal of the product is of utmost importance. The following patterns describe how fish is marketed and waste is utilized for product generation. Business involved in this sector is huge but many areas need relook.



6. FISHERIES RELATED INDUSTRIES

6.1 INDUSTRIES (DOMESTIC AND EXPORT)

The details provided in this section include : industries dealing with fish and fishery products in the domestic and export market, resources they deal with and countries/ places to where the sea foods are exported

Table 6.1: Domestic and export industries in Kerala dealing with seafoods

Name of Industries	Bio- resource utilized, Products developed for domestic / export market
A M Fisheries, Vandanam P O, Alappuzha	Fish, Cephalopods, Crustaceans
A S Marine Industries Private Limited, Palluruthy, Cochin 682 006 Ernakulam	Sea foods
A-Marine Exports, Palliport P O, Ernakulam	Fish oil, squalene
Aasha Biochem, Badagara	Sea foods
Aazra Marine Industries, Kadavanthra, Cochin	Sea foods
Abad Exim Pvt Ltd, Kakkanad, Cochin	Sea foods
Abad Fisheries Pvt. Ltd., Kochangadi, Cochin	Frozen seafood- Frozen canned fish, fresh / chilled on board, frozen tuna, dry salted frozen canned fish
Abad Overseas Pvt. Ltd., Kochangadi, Cochin	Sea foods, canned food items, fish pickle, processed sea food items
Abm Marine Products, Palluruthy, Cochin	Canned sea foods
Abn Trades, Kadavanthra, Cochin	crabs, prawns, lobsters, oysters, mussels
Accelerated Freeze Drying Company Ltd, Wellington Island, Cochin	Ornamental fish,seafoods: fish.crabs, prawns
Al Badr Seafoods Pvt Ltd, Kakkanad, Cochin	Sea foods
Al Fouzan Exports, Kambalakkad P O, Wynad	Frozen Sea foods-Squid (Loligo), Clam, Brown Shrimp, Scampi,

	Cephalopods, Octopus, Green Mussel, Lobster, Gastropoda, Fresh fishes
Alga International, Palluruthy, Cochin	Cooked shrimps, Raw shrimps, cephalopods, ribbon fish, Indian mackerel, Yellow fin tuna, grouper, red snapper
Amalgam Nutrients And Feeds Ltd, Cherthala	Indigenous Fishes, Exotic Fishes, Live Plants
Anchuthara Food Products, Cherthala	Ornamental fish exporter
Aqua Geno Exim, Cherthala	Dried fish export
Aqua King Exports, Cherthala	Frozen tuna, fishes, cephalopods and shrimps
Aqua Life, Calicut	Sea foods, tuna and shrimps
Aquatic Fisheries, Calicut	prawn, lobster, crab, bonefish, tuna, shrimp
Aravind Exports, Cochin	Squid, Cuttle Fish, Octopus, Ribbonfish, Indian Mackerel, Sardine, Snapper, Tuna, Crab etc
Aravind Exports, Trivandrum	Cuttlefish, squids, octopus, shrimps & fishes
Arbee Agencies, Thalayolaparambu, Kottayam	Shrimp, Cephalopods, Fish, Crabs, Value added products like-cooked Shrimp
Arbee Aquatic Proteins Pvt Ltd, Cherthala	Lobster, cuttlefish, squid etc.
Arbee Biomarine Extracts Pvt Ltd, Thalayolaparambu, Kottayam	Raw and frozen shrimps, cephalopods and fishes
Assa Seafoods, Alappuzha	Sea foods
Aswin Associates, Karuvelipady, Cochin	Shrimp, cuttlefish, crab, squid, grouper, octopus, vannamei shrimp
Avla Nettos Exports, Kollam	Cooked shrimps, raw shrimps, cephalopods, fish
Baby Marine (Eastern) Exports, Kollam	Sea foods
Baby Marine International, Cochin	Frozen sea foods
Baby Marine Products, Kollam	Sea foods
Bathsha Marine Exports Pvt Ltd, Cherthala	Sea foods
Bay Prince Exports, Cochin	Sea foods
Bell Foods (Marine Division), Cochin	Value added sea foods

Bharath Sea Foods, Cherthala	Raw, blanched cooked shrimps, Raw, frozen cephalopods, raw head on shell on shrimps & sand lobster, sea food mix raw, clam meat
Blue Crest Forzen Foods Pvt Ltd., Cochin	Cephalopods, marine fishes, shell fishes
Blue Sea Exports, Cochin	Sea food, cuttlefish, squid
Brisote Exportrs, Malappuram	Sea foods
Buhari Fishries, Calicut	Sea foods
Canaan Marine Products, Cherthala	Frozen sea foods
Cap Sea Foods Pvt Ltd., Cochin	Sea foods
Capithan Exporting Company, Kollam	Sea foods, fish, crab, shrimp and prawn
Charly Fisheries, Kollam	Chilled sea food
Chemmeens, Cochin	Shrimp, sole fish, sand lobster
Cherukattu Industries Pvt Ltd., Cherthala	Black Pomfret Fish, Dry Fish and Sand Lobster
Cochin Cosmos Foods Ltd, Cochin	Fish pickle, prawn pickle, prawn chutney powder
Cochin Frozen Foods	Crustaceans, fish
Cochin Forozen Food Exports Pvt Ltd., Cherthala	Sea foods
Colombia Sea Foods, Cochin	Sea food pickle
Coral Exports, Cochin	Sea food
Crescent Seafoods Private Limited, Cochin	Cuttlefish, squid, octopus
Del Sea Exports Pvt Ltd., Cochin	Sea foods
Dolphin Wires Private Limited, Alappuzha	Sea foods
Eastern Condiments Pvt Ltd, Idukki	Frozen cuttlefish, squid, yellow clam, baigai, ribbon fish, octopus
Economic Food Solutions Pvt Ltd., Cochin	Frozen cuttlefish, squid, chilled tuna
El-Te Marine Products, Alappuzha	Sea foods
Elixiar Exotic Foods & Allied Products Pvt Ltd, Cochin	Frozen marine products, chilled marine products, fish crab, oyster
Emerald Exports And Imports, Cochin	Octopus, cuttlefish, squid, crab
Eminent Seafoods Pvt Ltd., Cochin	Sea foods
Esmario Export Enterprises Private Limited, Kollam	Black Tiger Shrimps, Fish, Prawns, Crabs
Fabha Exim, Thiruvananthapuram	Sea foods

Febin Marine Products, Alappuzha	Frozen sea foods
Fine Sea Products, Kollam	Fishes, clam and Baigai, Crabs, Octopus
Finesse Market Link, Thiruvananthapuram	Squid and other sea foods
Fisherman Exports, Cherthala	Ornamental fish
Foodco Delicacies India (P) Ltd., Alappuzha	Frozen seafood, yellow fin, king fish
Freeze Engineering Industries Pvt Ltd., Cochin	Block frozen/ IQF, raw/ blanched/ cooked products, shrimps, cuttlefish, squid, octopus
Fresh Catch Exports, Cochin	Frozen seafood: yellowfin, king fish,
Friends Marine Industries, Alappuzha	Dried fish
Frontline Exports Pvt Ltd, Cochin	ornamental fish
G K S Business Associates Pvt Ltd., Alappuzha	Sea foods
Genious Aquarium, Kannur	Ornamental fish
Geo Aquatic Products Pvt Ltd., Alappuzha	Octopus, cuttlefish, squid, crabs
Geo Seafoods, Cochin	Ornamental fish, frozen cephalopod, frozen shrimp
Global Exporters, Thrissur	Fish meal (non-edible), edible fish oil
Global Exports & Imports, Kottayam	value added marine products, Freeze Dried Shrimp, Frozen Tuna Flakes
Global Fisheries & Traders, Cochin	Sea foods
Global Marine International, Cochin	Cuttlefish, Ribbon Fish, Shrimps, Squid
Global Ornamental Fish Farms, Kannur	Sea foods
Globe Exporting Co., Kollam	Chitin, Fish Peptone, Chondroitin Sulphate, Glucosamine Sulphate, Glucosamine Hydrochloride, Organic Manure, Chitosan
Grand Marine Foods	Cuttlefish, squid, fishes
Green Marine Exports, Cochin	Skipjack tuna, yellow fin tuna, Indian mackerel, sardine
Heiploeg Seafood India Pvt.Ltd	Shrimps, Cuttlefish, Squid
Heralad Marine Products Pvt Ltd., Cochin	Chilled fish
Hic-Abf Special Foods Pvt Ltd., Alappuzha	Biotechnology based products, chitin powder, chitosan powder

High Seas Exim, Alappuzha	Dried fish
Imk Seafood Agency, Calicut	Sea foods
India Seafoods, Cochin	Sea foods
Indian Aquatic Products, Kollam	Frozen Seafood-Cuttlefish, Squid, Octopus
Indian Marine Industries, Cochin	Shrimps, Bony fishes, Lobster, Snapper, Molluscs, Flat fishes
Indo French Shellfish Company Pvt Ltd., Cochin	marine and Fresh water fishes
Intergrow Goods And Beverages Private Limited, Cochin	Fish meal, fish foods
International Freezefish Exports, Alappuzha	Canned, fish pickle, prawn pickle
International Trade Links, Thrissur	Sea foods
Interseas, Alappuzha	Crabs, prawns, lobsters, oysters, mussels
Jis International Exports Pvt. Ltd., Cochin	Ornamental fish, seafoods: fish crabs, prawns
Jolly Marine Exports, Kollam	Sea foods
Jude Foods India Pvt. Ltd., Cochin	Frozen seafoods-Squid, Clam, Brown shrimp, Scampi, Cephalopods, Octopus, GreenMussel, Lobster, Gastropoda, Fresh fishes
Kamala Sea Foods Exports, Kollam	Cooked shrimps, raw shrimps, cephalopods, fish – ribbon fish, Indian mackerel, Yellow fin tuna, grouper, red snapper
Kamala Seafood Exports, Kollam	Indigenous Fishes, Exotic Fishes, Live Plants
Kay Kay Exports, Cochin	Ornamental fish
Kerala Aqua Ventures International Ltd. (Kavil), Cochin	Ornamental fish
Kerala State Co-Operative Federation For Fisheries Development Ltd., Matsyafed, Cochin	Frozen tuna, frozen cephalopod, frozen shrimps
Manay Marine Foods, Kottayam	Cuttlefish, squid, octopus, shrimps, fishes
Mangala Marine Exim India Pvt Ltd, Cochin	Shrimp, Cephalopods, Fish, Crabs, Value added products like-cooked Shrimp, Squid
Mangala Sea Foods, Alappuzha	Shrimp, Cephalopods, Fish, Crabs, Value added products like-cooked

	Shrimp, Squid
Manjilas Food Tech Pvt Ltd., Thrissur	Lobster, cuttlefish, squid
Manna Seafood Exports, Kollam	Lobstrer, cuttlefish, squid
Mare Food Products India Pvt Ltd., Cherthala	Raw frozen shrimps, raw frozen cephalopods, raw frozen fishes
Marine Chemicals, Cochin	Sea foods
Marine Fins, Cochin	Shrimp, Crab, fish
Marine Harvest India, Cochin	Shrimp, cuttlefish, Crab, Squid, Grouper, Octopus, Vannamie shrimp
Marwa Sea Foods, Thrissur	Sea foods
Mas Seafood, Kollam	Cood shrimps, raw shrimps, cephalopods, fish
Mira Marine Foods, Cherthala	Sea foods
Monsun Foods Pvt. Ltd., Cochin	Frozen sea foods
Moon Fishery (India) Pvt. Ltd., Cherthala	Sea foods
Muhas Marine Exports, Cherthala	Sea foods
Murugha Enterprises, Cochin	Sea foods
N G Exports International, Cherthala	Sea foods
N P M Aquatic Fish Links Pvt. Ltd., Thrissur	Value added marine products
Nas Fisheries Pvt Ltd, Cochin	Raw, blanched, cooked shrimps IQF, raw, frozen cephalopods, raw head on shell on shrimps, sand lobster, sea food mix raw and blanched, clam meat
National Seafoods Company, Cochin	Sea foods
Nettos Exporting & Importing Company, Kollam	Cephalopods, marine fishes, shell fish
Nissy Corporation, Cherthala	Sea foods, squid, cuttlefish
Nitta Gelatin India Ltd., Cochin	Sea foods
Notel Exports, Thrissur	Frozen sea food
Ocean Gems Exports, Alappuzha	Frozen sea foods
Orchid Marine, Alappuzha	Seafoods, fish, crab, shrimp and prawn
Paragon Seafoods Pvt. Ltd., Cochin	Chilled sea foods
Paramount Seafoods, Cochin	Chilled sea foods
Parayil Food Products Pvt. Ltd., Alappuzha	Shrimp, Sole Fish, Sand Lobster
Pargon Seafoods, Cochin	Sea foods
Pearl Coast Marine Foods, Cherthala	Black Pomfret, Dry Fish and Sand

	Lobster
Penver Products Pvt. Ltd., Cochin	Fish Pickle, Prawn Pickle, Prawn Chutney Powder
Pioneer Impex, Kannur	Seafood
Popular Exports, Pathanamthitta	Fish, crustaceans
Popular Trades And Exports, Cochin	Sea food pickles
Poyilakada Fisheries Pvt. Ltd., Kollam	Sea food
Premier Exports International, Cherthala	Cuttlefish, squid, octopus
Premier Innovative Foods, Cochin	Frozen cuttlefish, squid, yellow clam, baigai, ribbonfish, octopus
Premier Marine Enterprises, Alappuzha	Frozen cuttlefish, squid, yellow clam, baigai, ribbonfish, octopus
Premier Marine Exports, Alappuzha	Frozen cuttlefish, squid, yellow clam, baigai, ribbonfish, octopus
Premier Marine Foods, Alappuzha	Frozen cuttlefish, squid, chilled tuna
Premier Seafoods Exim Pvt Ltd, Cochin	Seafoods
Prime House, Cochin	Sea foods
Profand Vayalat Marine Exports Private Ltd., Cochin	Sea foods
R F Exports, Alappuzha	Frozen marine products, chilled marine products
R K Exports, Alappuzha	Fish, crab, oyster
Rabia Sea Foods, Cochin	Octopus, cuttlefish, squid, crabs
Relish Foods, Alappuzha	Black tiger shrimp, fish, prawn, crabs
Roshan Foods Pvt.Ltd., Cochin	Seafoods
Royal Oceans, Kollam	Frozen fishes, clam, baigi, crabs, octopus
S H Marine Exim, Cochin	Frozen fishes, clam, baigi, crabs, octopus
S H Marine Exim, Alappuzha	Squid and sea food
S L S Exports Pvt Ltd, Cochin	Ornamental fish
Saad N Faraj International, Kottayam	Frozen seafood: yellow fin, king fish
Sabal Foods, Calicut	Block frozen/ IQF, RAW/ blanched/ cooked products, shrimps, cuttlefish, squid, octopus
Sabari Marine Exports, Cochin	Sea foods

Safa Enterprises, Thrissur	Frozen sea food, yellow fin, king fish
Safera Food International, Cochin	Dried fish
Sagara Exports, Alappuzha	Live fish export
Sait Exim Company, Cochin	Sea foods
Samrat Middle East Exports Pvt Ltd., Cochin	Sea foods
San Marine Exports, Kollam	Octopus, Cuttlefish, squid, crab
Sea Bay Exports Pvt. Ltd., Alappuzha	Live fish export
Seaboy Fisheries Pvt Ltd, Trivandrum	Frozen cephalopods, frozen shrimp
Seafood Innovations, Cochin	Frozen Cephalopods, frozen shrimp
Seafood Park India Ltd., Cherthala	Fish meal (non-edible), fish oil edible
Seafresh Exports Ltd, Alappuzha	value added marine products, Freeze Dried Shrimp, Frozen Tuna Flakes
Seastar Industries, Cochin	Cuttlefish, Ribbon Fish, Shrimps, Squid
Silver Star Seafoods Ltd., Alappuzha	Sea foods
SLS Seafoods Private Limited, Alappuzha	Chitin, Fish Peptone, Chondroitin Sulphate, Glucosamine Sulphate, Glucosamine Hydrochloride, Organic Manure, Chitosan
Star Fish Exports, Cochin	Shrimps, Cuttlefish, Squid
Sun Aquatic Products Pvt Ltd., Cochin	Chilled fish
The Canning Industries Cochin Ltd., Cochin	Cuttlefish, Ribbon fish, shrimps, squid
The State Trading Corporation Of India Ltd., Cochin	Shrimp, prawn, squid
Three Star Marine Exports, Cochin	Sea foods
Torry Harris Seafoods Pvt Ltd., Alappuzha	Cephalopods, crustaceans, mollusca, fishes
Travancore Aquapets, Cochin	Sea foods
T A S Marine Traders, Cochin	Dried fish
U & Co Marine Exports, Cochin	Ornamental fish
Uniroyal Marine Exports Ltd, Calicut	Sea foods
Upasana Exports, Cochin	Frozen seafood, chilled seafood
V T J Fisheries Pvt Ltd., Cochin	Frozen sea food- cuttlefish, dry

	fish
V T J Seafoods	Sea foods
Veronica Marine Exports Private Limited, Kollam	Frozen seafood, chilled seafood
Vignesh Foods, Cochin	Fish pickcle, prawn pickcle
We One Exports, Alappuzha	Sea foods
West Coast Hatcheries & Research Centre Pvt Ltd., Cherthala	Dried fish
White Nile Marine Pvt Ltd., Cochin	Squid,Vannamei shrimp, black tiger, white shrimp, fishes, cuttlefish, Octopus
Winner Foods, Alappuzha	Live Lobster, Live mud crab, Live Baigai
Wintime Imports & Exports, Cochin	Frozen seafood, Chilled seafood
Yas Marine, Nilambur, Malappuram	Frozen seafood-Frozen canned fish, fresh/ chilled on board frozen tuna, dry salted frozen canned
Source : MPEDA	

Table 6.2 Major marine nutraceutical-based Industries in India and their products

Sl. No.	Name of Industry	Products
1	Pioneer Pharmaceuticals,Kochi-682025, Kerala	Seaweed based nutraceuticals
2	Accelerated Freeze drying Company Ltd., Kochi	Mollusk based nutraceuticals
3	Chazah Pharmaceuticals Ltd, Kochi	Seaweed based nutraceuticals, astaxanthin
4	SNAP Natural and Alginate Products Pvt. Ltd., Ranipet, Tamil Nadu	Alginates, carrageenan, plant growth stimulant, aquaculture inputs etc.
5	AquaAgri Processing Private Ltd., New Delhi	Carrageenan, plant growth stimulant, animal feed ingredient etc.
6	Marine Hydrocolloids, Cochin, Kerala	Agar, agarose, carrageenan, sodium alginate, pulverized seaweed
7	Biostadt India Limited, Mumbai	Growth stimulant, fish growth stimulant
8	HiMedia Laboratories, Mumbai	Agar, alginic acid
9	AquaRev, Una, Gujarat	Carrageenan, stabilizer for ice cream,

		khoya & paneer
10	Jumat Agar-Agar Industries, Tirupur, Tamil Nadu	Agar-agar
11	Hifield - Ag Chem. India Private Limited, Aurangabad, Maharashtra	Seaweed powder, flakes
12	Sarda Biopolymers Pvt. Ltd., Mumbai	Carrageenan
13	Altrafine Gums, Ahmedabad, Gujarat	Food grade kappa carrageenan

Table 6.3: Countries to where sea foods exported and industry in Kerala

Industry	Item	Countries/ Places where exported
A.M. Fisheries	Frozen Marine foods,	Bangkok, Beihai, Cat Lai, Haiphong, Hamad, Hochimin City, Kobe, Lat Karabang, Nagoya, Ningpo, Osaka, Qingdao, Rotterdam, Sendai, Singapore, Taijiang, Tokyo, Vancouver, Zeebrugge, Zhangjiagang, Xiamen, Catia La Mar, Fozhou, Kaohsiung, Laem Chabang, Mawei, Port Kelang, Taipei, Tianjin, Westport, Jeddah, Saudi
Abad Exim Pvt. Ltd.		
Abad Fisheries	Frozen vannamei	
Abm Marine		
Accelerated Freez Drying Co Ltd	Frozen fish	
Acqua Pearl Properties And Exports		
Aqua Gerro Exim	Frozen ribbon fish	
Aquatic Fisheries		
Assa Sea Food	Frozen leather jack	
Aswin Associates		
Alva Nettos Exports	Frozen shrimp	
Baby Marine Eastern Exports		
Baby Marine Exports	Frozen Baigai	
Baby Marine Sarass		
Bathsha Marine Exports	Frozen yellow tuna	
Bell Exim P. Ltd		
Bell Foods	Frozen	
Bharath Seafoods		
Blue Sea (India) Exports		
Blue Cast Frozen Food P. Ltd		
Busthan Al Wathaniya		
Cannan Marine Products		

Cap Seafoods P Ltd	octopus	Arabia, Dammam,
Capithan Exporting Co		King Abdullah, New
Charly Fisheries	Frozen squid	York, Shanghai,
Cherukattu Industries		Antwerp, Ashdod,
Choice Trading Corporation Ltd	Frozen skipjack	Auckland, Beirut,
Cochin Cosmos Foods Ltd	tuna	Boston, Dalian,
Coral Exports		Havre, Sharjah,
Crescent Sea Food P Ltd	Frozen	Sousse, Safax,
Daan Exports	cuttlefish	Savannah, Tunis,
Delsea Exports P Ltd		Valeneia, Vigo,
Dolphin Wines Pvt Ltd	Frozen	Yantian, Algeciras,
El Te Marine Products	mackerel	Barcelona, Bari,
Emerald Marne Food Exports		Miami, Bander
Eminent Sea Foods P Ltd	Frozen prawn	Abbas, Baltimore,
Esmario Export Enterprises		Boston, Bahrain,
Evergreen Foods	Dried prawn	Bremerhaven,
Evergreen Exports		Colombo, Doha,
Febin Marine Foods	Dried shark	Nausha, Napoli,
Freeze Engineering Industries P Ltd		Felixstowe, Norfolk,
Freeze Exim		Oran Okland,
Friends Marine Industries		Patport, For Surmer,
Frontline Exporter P Ltd		Pusan, Housten,
Gks Business Associates		Hongkong, Genoa,
Geo Aquatic Products		Gemlik, Jebel Ali,
Geo Seafoods		Jiuzhou,
Global Frozen Food P Ltd		Jacksonville, Pat
Gland Marine Foods		Bangkok, Piraeus,
Grand Pearl Exports		Port Louis, Rades,
Great Win Exports		Khalifa Bin Salman,
Ht Foods P Ltd		Klaipeda,
Heiploeg Seafood India P Ltd		Lianyungang,
Hc-Abf Special Foods P Ltd		Lisboa, Lisbon,
High Sea Exim		Laspezia, Long
Indo Agro Exports P Ltd		Beach, Lome,
Indian Aquatic Products		Liverpool, Livorno,
Indian Marine Industries		Gioiatauro, Penang,
Innovative Foods Ltd		Limassol, St.
International Freeze Fish Exports		Petersburg, Sines,
Interseas		Keelung, Bangpoo,
		Napoli, Algeciras,

Jas Exports	Reunion Islands, New York, Helsinki, Tampa, Ancona, Aledandra, Lat Karabang, Limassol, Taragonna, Songkhla, Fremantle, Thesseloniki, Calgary, Algeciras, Atlanta, Antalya, Naples, Ambarli, Jakarta, Vancouver, Perth, Kaohsiung, Immingham, Turkey, Bandar Abbas, Huangpu, Behai, Part Said, Patport, St. Louis, Sangkhla, Kuwait, Lisboa, Aarhus, Ar Rass, Chicago, Gemlik, Odessa, Durrer, Ancona, Aarhus, Fos, Busan, Rijeka, Szczecin, Melbourne
Jis International Exports P Ltd	
Jmj Exports	
Jng Exports	
K M Fisheries	
K.S.Co.F. For Fisheries Devpt. Ltd	
Kay Kay Exports	
Kerala Sea Foods	
Keshodwala Foods	
King Fisheries	
Kings Marine Exports	
Kings Seafoods	
Lords Exports	
Manra Healthcare P Ltd	
Mangala Marine Exim India P Ltd	
Manna Marine Products	
Marwa Seafoods	
Miraz Marine Foods	
Monsun Foods P Ltd	
N.G. Exports International	
Nas Fisheries P Ltd	
Nas Food Exim	
Nas Marine Products	
Nas Seafoods	
National Seafoods Co.	
Notel Exports	
Npm Aquatic Fish Links P Ltd	
Ocean Aquatic Products	
Ocean Exports	
Ocean Gems Exports	
Ocean Pearl Fiseries	
Ocean Wealth Exports	
Orchid Marine	
Paragon Seafoods	
Paramount Seafoods	
Pearl Coast Marine Foods	
Pearl Marine Exports	
Penver Products P Ltd	
Penver Seafoods Exim P Ltd	

Pioneer Impex		
Pothan & Co		
Poyilakada Fisheries		
Prayag Exports		
Premier Enterprises		
Premier Exports International		
Premier Marine Enterprises		
Premier Marine Exports		
Premier Marine Foods		
Premier Seafoods Exims Ltd		
Prima Exports		
Profand Vayalat Marine Exports		
Qfroz Trades P Ltd		
R.F.Exports		
Rsa Marines		
Rabia Sea Foods		
Roshan Food Exports P Ltd		
Royal Marine		
Royal Oceans		
S.H.Marine Exim		
S.L.S. Exports P Ltd		
Safera Food International		
San Marine Exports		
Sandhya Aqua Exports P Ltd		
Sea Bay Exports P Ltd		
Sea Harvest Exports		
Seaboy Fisheries P Ltd		
Seafood Innovations		
Seafresh Exports		
Seamen India Foods		
Sharkline Industries		
Star Agro Marine Exporters P Ltd		
Starfish Exports		
Sun Agro Exim		
Tara Farm		
Three Star Marine Exports		
Tory Haris Seafoods Ltd		
U & Co Marine Exports Ltd		
Upasanaexports		

Veronica Marine Exports P Ltd		
Viceroy Exports (I) P Ltd.		
Source : Cochin chamber of Commerce and industry; container movement – export – sea food		



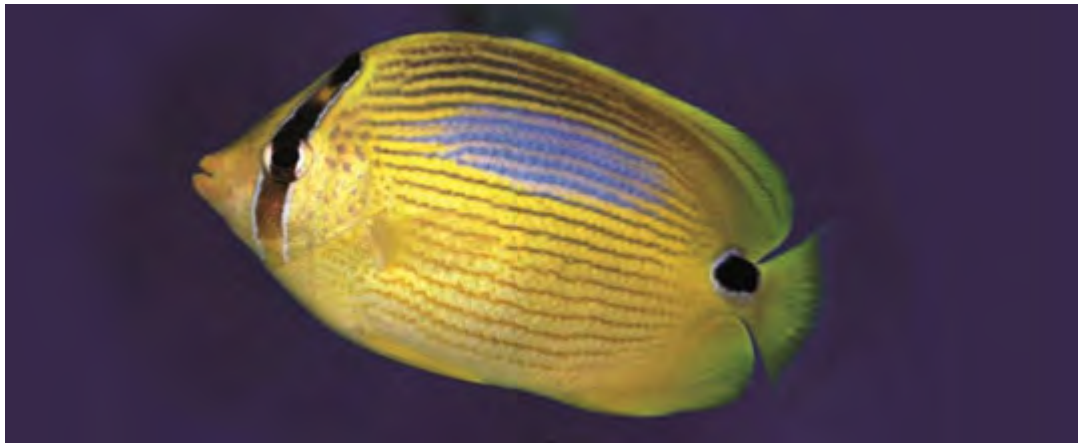
SUGGESTED POLICY INTERVENTIONS IN AQUATIC SECTOR

Total fish production in Kerala, which had been declining since 2015-16, witnessed a significant increase in 2018-19. However, there is a decline in fish production in 2019-20, mainly due to decline in marine fish production. Stagnation in marine fish production and increasing demand for fish and fish products in national and international markets necessitated developing inland fish production. However, the inland fish production sector is weak, contributing 28 % of the total fish produced during 2017-18 whereas it is about 66% in India.

7.1 INLAND FISHERIES DEVELOPMENT

The inland water bodies of 117,122 ha and coastal wetlands of 40,876 ha (Wetland Atlas of Kerala, 2011) offer immense scope for production of fish and shellfish. The potential of inland water resources for fish production is yet to be utilized optimally in Kerala. The State has made conscious efforts in increasing the inland fish production through projects like '**Subhiksha keralam**'. Inland fish production is an area which holds promise for future in Kerala and insufficient availability of good quality fish seeds has been identified as a major problem. To increase the production of good quality fish seeds, the department made efforts to strengthen the existing hatcheries, nurseries, fish farms and construct new units with the existing infrastructure. The area utilized for fish farming in ponds has increased from 5325 ha to 5700 ha in the year 2019-20, cage culture units established have increased from 80 to 1800 units, mussel farming units have increased from 2000 to 3500 units, Recirculatory Aquaculture System/ Aquaponics units have increased from 100 to 500 units and zero water exchange shrimp farming was carried out in 200 ha area. One paddy one fish farming in Kule lands of Thrissur and Malappuram Districts have increased from 1600 ha to 4500 ha and in Kuttanad area from 2100 ha to 5350 ha. New hatcheries were established in Neyyar, Peechi, West Kallada, Kulathupuzha, Kallanodu, Thalipuzha and Karapuzha. Cage culture in reservoirs was implemented in Malampuzha, Kannur, Ernakulam and Cage farming initiated in Pothundi reservoir of Palakkad District and

Banasurasagar reservoir. To ensure species diversification, two new GIFT hatcheries were established in Pannevelichira-Pathanamthitta and Neyyar-Thiruvananthapuram. As part of conservation of inland fishery resources, fish stock enhancement programme was implemented and 217.87 lakh fish seeds have been stocked in various public water bodies. Through aquaculture development project, area of 8300 ha was utilized for shrimp farming and 9800 ha for fish farming. A total of 6.31 crore fish seed production was achieved through Department hatcheries in 2019-20.



To ensure sustainable fisheries production, following suggestions may be helpful:

1. Biodiversity of inland aquatic systems and inland fish catch data are poorly recorded and urgent measures are necessary to document the same. Aquatic fauna within the forest is poorly known and it is necessary to document the fauna with the help of forest officers and scientific staff. Scientific studies on subterranean / troglobitic/ stenobitic species has to be taken up. The research to develop breeding protocols of highly sought after aquatic species may be given high priority.
2. Dwindling area of wetlands (including rice fields), both freshwater and brackish water is a major concern. It is suggested that at least 40-50% of the total

wetland area should be kept as such as sanctuaries for conservation of the diverse aquatic life.

3. Unsustainable and illegal fishing methods, catching of brooder fishes and other organisms is a very serious problem.
4. The migratory pathways (normally small canals connecting the breeding ground and the rivers) of the fishes should be kept intact for the breeding/feeding migration of the fishes.
5. Introduction of exotic fishes like tilapia in reservoirs for purpose of aquaculture creates problems need to be regulated. Fish/scampi farming in reservoirs in Wildlife Sanctuaries/National Parks should be avoided.
6. Cage culture in reservoirs should be encouraged with native high range fishes and prawns with good growth traits. Aquaculture without crop rotation and crop holidays is practised. The provisions of Kerala Inland Fisheries and Aquaculture Act, 2010 and its Rules 2013, Kerala Fish Seed Act, 2014 and its Rules, 2016, Guidelines for import of ornamental fishes (NFDB, 2015) and other Gol regulations are to be enforced to protect our water bodies from invasion of non native species.

The entire aquaculture in the State should necessarily follow organic and integrated farming technologies. New candidate species for aquaculture is the most advantageous and eco-friendly method and is to be encouraged. *Barbedos carnaticus*, *Channa striatus*, *Labeo dussumieri*, *Clarius dussiumieri*, *Heteropneustes fossilis*, *Horabagrus brachysoma*, *Chanos chanos*, *Lates calcarifer*, *Mugil cephalus*, *Etroplus suratensis*, *Lutjanus argentimaculatus* and many others in inland waters are suggested. Immediate programmes of R & D for breeding of this bigger sized fishes native to western ghats and 50% of seeds produced may be release to the site of collection of the species and 50% may be utilized for cage culture. The research to develop breeding protocols of highly sought after aquatic species may be given high priority.

7. Pollution of wetlands is steadily increasing. It is causing damage to biota, polluting the open water source, aquifers and ground water. Brackish water aquaculture mainly concentrating on shrimps, high stocking density, heavy feeding lead to increased ammonia in water, ultimately resulting in pollution and degradation of inland wetlands.
8. Concreting river banks and removal of riverine canopy should be strictly prohibited. The permission for resorts, polluting industries, and other constructions on the river side shall be granted under strict observance of regulations.

A database on the pet traders and status of aquarium business is scanty and hence action may be taken urgently in this regard. A list of fish species to be exported and imported shall be prepared with the help of experts and adhered to. Import of exotic species, especially prolific breeders in our natural settings especially carnivorous species should be restricted

9. The species enlisted as Endangered, Critically Endangered, Near Threatened should be excluded from trading. Suggested species for conservation has been provided in Chapter 8. Measures for controlling these activities and law should be framed to monitor such activities, including penal provisions.
10. Encouraging value added product development and marketing is needed. At present storage facilities for storing produce in the inland sectors is limited. Government owned storage facilities will help to control adulteration of fish and fishery products. Promotion of floor price for the produce, procurement and storage in such facilities is needed.

11. The provisions of Kerala Inland Fisheries and Aquaculture Act, 2010 and its Rules 2013, Kerala Fish Seed Act, 2014 and its Rules, 2016, Guidelines for import of ornamental fishes (NFDB, 2015) and other Gol regulations are to be enforced to protect our water bodies from invasion of non native species.



7.2 MARINE FISHERIES SECTOR

Among the Maritime states in India, Kerala occupies an important position in fish production accounting for about 15 % of the total landings. The well-known Wadge Bank is situated within the exploitable limit of Kerala. The mud banks (*Chakara*) between Alappuzha and Kannur are associated with the seasonal capture of certain species of fish. Capture fisheries face multiple pressures as a result of overfishing, habitat modification and pollution.

Major issues in the marine sector include increased fishing pressure in the coastal areas- stocks decline, overcapitalization and unwarranted capacity overload – more vessels, more powered and over exploitation of resources in the inshore waters. Discards/indiscriminate exploitation of juveniles/sub adults mainly by trawlers, biodiversity decline due to habitat destruction and damage to the benthos and benthic ecosystem, often destroying the food web of commercial species – mainly by bottom trawling, ornamental fish trade are also some of the issues flagged. The sector is also burdened by increasing fishing cost and diminishing returns and

inefficient domestic marketing system. Lack of proper fishery management system (Participatory Fisheries Management) and their timely implementation is another issues flagged. There is a need to fix floor price and development of storage facilities under government as the product is highly perishable, this will also address the issues of adulteration. Nutraceutical, probiotic, bioactive compound production at industrial levels are still in its infancy stage. The higher diversity of fish and shellfish resources available in Kerala coast offers better prospects for diversification, especially with regard to development of new products and value addition.

Adoption of code of conduct for Responsible Fisheries (CCRF) is necessary and this includes taking measures to control open access by strict enforcement of a system of licenses (authorization to fish) in traditional, motorized and mechanized sectors.



Responsible fishing methods and practices relevant to Kerala

Guidelines associated with use and development of fishing gear and practices delineated in the Code of Conduct for Responsible Fishing (CCRF) focus on:

- (i) selective fishing gear and practices,
- (ii) environment- friendly fishing gears
- (iii) energy conservation in harvesting and
- (iv) enhancement of resources (FAO, 1995).

Specific pointers from CCRF, in responsible fishing and practices, adaptable to Kerala include the following:

1. Evolve regionalized consensus Code of Conduct for Responsible Fishing, in close participation with all stake holders (traditional, motorized and

mechanized fishermen organizations), fisheries research organizations and fisheries managers.

2. Take measures to control open access by strict enforcement of a system of licenses (authorization to fish) in traditional, motorized and mechanized sectors.

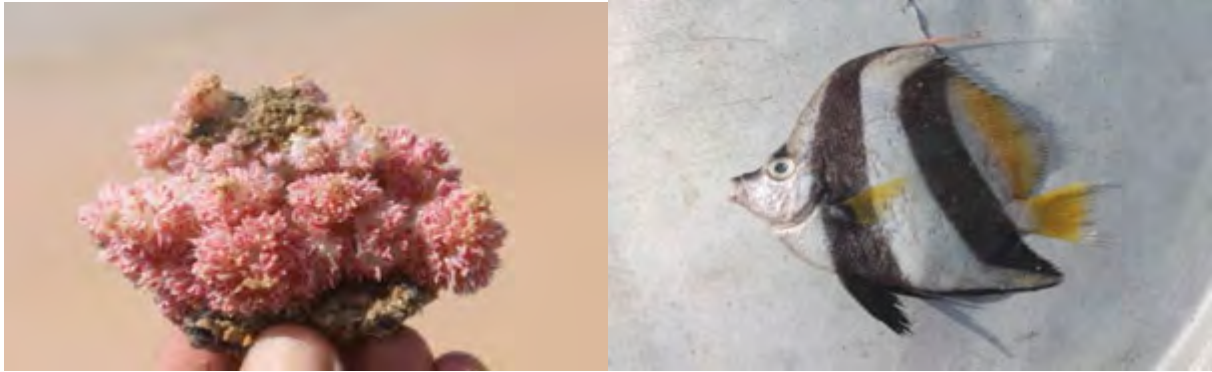
Ecosystem- Based Fisheries Management (EBFM)

The living aquatic resources are an integral part of their ecosystem and, management of the ecosystem is a pre-requisite for the well-being of fisheries resources. It has been widely recognized that fisheries management should adopt a broad-based spatial management strategy with the management of living resources and temporal restrictions such as closed fishing season appropriately integrated into the management regime depending upon the conservation needs of the ecosystem in question.

To date, the best-known tool for EBFM is a network of fully protected marine reserves. Considering that the concept of no-fishing zone is a good strategic tool, fisheries managers in India should start working on the questions about how much of the fishing grounds should be placed in reserves, how many are needed, and where should they be.

There seem to be three principles, which govern no-fishing zones:

- i. Both biological and economic benefits can be maximized through closures ranging between 20 and 40 % of fishing grounds.
- ii. Based on the expectation of maximization and equitable distribution of benefits through subdivision of the 20% reserve area to represent both biogeographic and ecological diversities within the reserves.



Biodiversity Conservation and Sustainable Use

1. One of the pre-requisites for conservation is a strong quantitative and qualitative data base on the living marine resources of Kerala coast in order to frame conservation and management plans. Data base on coastal and marine biodiversity should be prepared with the help of researchers and made available in the public domain.
2. **The maximum sustainable yield of the commercially exploited species should be determined in coastal and brackish water habitats and harvesting should be regulated accordingly.** Sustainable harvesting of resources should be ensured by strictly adhering to the existing rules such as Kerala Marine Fishing Regulation Act (1985) and by assessing the maximum permissible limit of mechanised fishing vessels.
3. A major portion of the coastal areas of Kerala are protected by construction of sea wall. Alternate bio-engineering technologies need to be explored. Restoration of beaches and protection of sea shore through natural shields such as mangroves and typical coastal vegetation have to be promoted with the participation of coastal communities. In addition to mangroves, cultivation of economically valuable plants such as various species of *Pandanus*, *Calophyllum inophyllum* (beach touriga/ Indian doomba oil tree Punna/ Avanakku) and *Morinda citrifolia* (Indian mulberry/ noni) can be promoted in the littoral zone of coastal areas of the State. Coastal tree shield with indigenous coastal vegetation of a minimum of 30 m width should be

promoted in areas of human settlements, with the participation of local communities. Planting of vegetation and deriving benefits from these resources should also be promoted as an alternate employment opportunity to the local population. Since coastal zone has a dense population in the State and local communities are least adapted for facing the climate vagaries, there is an urgent need for strengthening coastal protection methods with the participation of local communities, especially by promoting coastal bio-shields wherever ecologically feasible.

4. Mandatory registration and licensing of all motorized and mechanized boats, review of licensing every year, cancellation of registration of vessels violating fishing regulations, and temporary moratorium for further sanction of mechanized vessels for inshore waters should also be considered to reduce fishing pressure. Registration of traditional fishing vessels can be limited to traditional fishermen, fishermen groups and their societies only.
5. Multiday trawling should be permitted strictly beyond territorial sea. Restriction of multiday fishing by fixing upper limit and fixing and capping the size and power of the boats in each sector by imposing upper limits for the length and horsepower, especially the large ring seines mainly for controlling mass destruction of juveniles may be adopted.

Minimum legal size should be imposed on all commercially exploited fishery items of Kerala coast. Promotion of selective fishing gear and practices, which include (i) Optimum mesh size in trawl cod ends, (ii) Optimum hook size and shape for lines, (iii) Square mesh windows in trawls, (iv) By-catch reduction devices in trawls, (v) Turtle Excluder Devices in trawls, (vi) Juvenile Excluder Devices in trawls, (vii) Trawl designs with improved resource specificity, (viii) Optimum mesh size for gill nets, (ix) Optimum mesh size for purse seines, and (x) Escape windows in fish and lobster traps will enable to conserve biodiversity to a large extent and promote its sustainable use.

6. Monsoon trawl ban has helped in better fishery production and, therefore, this should be continued in the forthcoming years as well. Only non-motorized and low horse-powered (up to 10 HP) OBM/IBM vessels should be allowed to operate during the closed season. Current trawl ban can also be reviewed and if necessary new schedule can be proposed.
7. Stake nets are found to be highly destructive in the sustenance of brackish water fishery resources of the State and therefore, may be removed in a phased manner.
8. Appropriate areas in the estuarine and sea coast of the State for mangrove afforestation should be identified and mangrove planting through community participation implemented. Science clubs in educational institutions should be given training and funding for adopting mangrove plantations and their maintenance.
9. The higher diversity of fish and shellfish resources available in Kerala coast offers better prospects for diversification, especially with regard to development of new products and value addition. Better and effective transfer

of technology from the research and academic institutions to the stakeholders by winning their confidence and working with and for them.

10. Declaration of certain coastal areas closed for trawling would also help in reducing over-exploitation of resources as well as conservation of marine organisms. Establish community-owned systems of marine protected areas that are consistent with the social, economic, political and cultural characteristics of the region, with active community participation supported by local NGOs and government agencies.
11. Implementation of an integrated national conservation strategy involving *in situ* and *ex situ* and *in vitro* and *in vivo* methods for all marine Rare, Endangered and Threatened (RET) species has also become imperative. The sea ranching programme needs to be strengthened in order to replenish stocks, especially that of overexploited and threatened species.
12. At present there is no concerted effort to make the coastal communities aware of the present ecological status of the ocean ecosystem and impacts due to the depletion of biodiversity. Fishery co-operatives, self-help groups in coastal areas, NGOs and religious institutions should be networked along with government systems for this purpose.
13. Similarly, conservation efforts should be strengthened taking clues from the rich traditional knowledge of the local fishing communities. Such technological knowledge of the local fisher folk remains to be documented.
14. Protect all the remaining Pokkali, Kaipad, Kuttanad and Kol fields for sustainable integrated farming, as these are the areas used for eco-friendly rice fish culture.
15. The use of certification or catch document schemes should be encouraged to make fishing more ecofriendly.
16. The trend of developing Special Economic Zones in certain potential fishing areas and fishermen hamlets for complementing high-tech projects should not

be encouraged. Paradigm shift is needed to pursue the concept of sustainable development in these areas.

17. It is necessary to Identify and delimit Protected Areas in marine and inland water ecosystems.

18. Principles of Ecosystem Approach to Fisheries (EAF) and Code of Conduct for Responsible Fisheries (CCRF) should be adopted to manage marine fisheries of Kerala coast to sustain the productivity.



Coastal Zone protection

Since the Coastal Regulation Zone (CRZ) notification of February 1991 and Coastal Management Zone (CMZ) notification of 2011 are in vogue, 200 meter width of coastal areas are to be statutorily earmarked as no development zones, except for utilizing it for fishery related activities of the coastal fisher folk. In order to prevent human settlement within CRZ, separate fishing townships shall be established outside the No-Development Zone of the CRZ.

Mudflats, coastal wetlands, reefs, mangroves, sand dunes and shoals should be categorised as ecologically sensitive CRZ I areas. A Coastal Zone Monitoring Network should be established involving all coastal local bodies, with the participation of Civil Society Groups to ensure the progress of implementation of the Act.

1. Develop ecosystem based management and capacity reduction initiatives, in collaboration with adjoining states sharing confluent and overlapping ecosystems and fishing grounds.

2. Evolve an efficient Monitoring, Control and Surveillance (MCS) system. Effective use of Geographical Information System for fisheries management; monitoring and control of fishing effort and energy use. Develop a Fisheries Information Portal for providing easy access to authentic information and facilitating fisheries research, management and business.
3. Evolve a mandatory programme of training and certification for non-motorized, motorized and mechanized fishermen in safe navigation, responsible fishing, log keeping and reporting.
4. Ecosystem services of the critical coastal and marine habitats have to be analysed specifically through integrated inclusive research so as to prepare Integrated Coastal Zone Management Plans and for identifying hotspots for conservation and sustainable management.
5. Mining heavy mineral deposits should be done only after determining the sustainable limits of resources through sediment budgeting and, most importantly, mining should be limited to public sector, with proper monitoring done by a body involving civil society representatives. Strict guidelines shall be formulated to control mining of strategically important heavy minerals, namely black sand (such as ilmenite, monazite and rutile) and industrially important minerals, namely glass sand (white sand – silicates) and, the same may be enforced strictly.



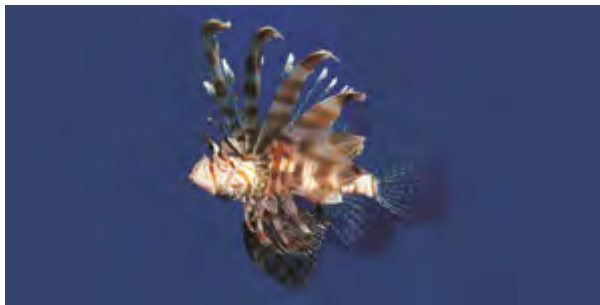
Combating climate change

1. In the marine fisheries sector there is a need to develop a database on the impact of climate change and marine fisheries. Projections should be made on the biodiversity changes in marine ecosystem under the influence of climate change through appropriate modelling studies. Micro level studies are required to develop models to assess and predict the impact of climate change in various coastal ecosystems and to assess erosion prone areas in the coast with the Digital Elevation model. Further, vulnerability assessment should also be done at micro-levels.
2. There is a need for flood mapping, flood forecasting, developing hydrological framework and downscaled climate change projections modelling.

3. Since coastal zone has a dense population in the State and local communities are least adapted for facing the climate vagaries, there is an urgent need for strengthening coastal protection methods with the participation of local communities, especially by promoting coastal bio-shields wherever ecologically feasible.
4. Considering the skills of marine fishers in Kerala, their services may be fully utilized in coastal biodiversity monitoring, climate change adaptation and for disaster management programmes of the State.
5. There is also a need for setting up an integrated training and capacity building protocol.
6. Energy audit should be done to identify how to reduce the use of fuel for routine fishing operations, followed by energy efficient programmes to implement these savings.
7. The traditional method of integrated farming system practiced in Kuttanad, with salt and flood tolerant rice varieties at below sea level would serve as a model to plan adaptation strategies elsewhere.
8. Integrated coastal area development programme should cover activities of improvement of socio-economic conditions of fisher folks in coastal areas.
9. Adaptation measures for the communities' reliance on fisheries for food and income should also consider options such as education, entrepreneurial training, training in tourism and aquaculture to prevent potential deterioration of social conditions in fisher communities associated with climate change.
10. Value-addition to products and improved market access through eco-certification and other mechanisms should support not only better utilization of resources, but also ensure its effective management and responsible handling of resources
11. The fish processing sector in Kerala is managed predominantly by the women workforce and the efficiency and productivity are likely to be improved by

ensuring that the rights and responsibilities of women are recognised in their employment conditions and their sustainable income is ensured.

12. Capture fisheries also face multiple pressures as a result of overfishing, habitat modification and pollution. To build resilience to the effects of climate change and derive sustainable benefits, fisheries and aquaculture managers need to adopt and adhere to best practices such as those described in the FAO Code of Conduct for Responsible Fisheries.
13. Package of practices for organisms under mariculture should be prepared
14. Considering the impending sea level rise, adaptation strategies including a proper rehabilitation programme for those who will be displaced shall be worked out and put in place sufficiently in advance.
15. Knowledge base has to be strengthened for better understanding of the impact of climate change on fish stocks in our coastal waters with proper modelling studies as the first step towards planning and framing better management strategies.
16. Acidification problems currently facing is very serious and adequate planning on a multi layer model has to be adopted.



Pollution Control

1. Fishermen should be given awareness to bring plastics along with their fish catch. Incentives must be given in such cases. At the same time the people must also be cautioned of the problems of plastic pollution on land, water and sea. Considering the unabated increase in the quantity of marine

debris, especially plastics in the coastal waters along Kerala coast, urgent interventions are required to manage plastic wastes in oceans and strengthen monitoring plastic debris. 'Suchitva Sagaram' (clean ocean) project launched by the fisheries department of Kerala in Kollam to remove plastic waste from the ocean with the help of fishers (and use the plastics collected for the construction of roads) should be extended throughout Kerala.

2. Industrial effluent disposal in the coastal water bodies has been regulated through the Water (Prevention and Control of Pollution) Act, 1974 and CRZ regulations, the treatment plants shall be made mandatory for the industries which generate effluents.
3. Following the principle of "Polluter pays", industries may be levied the cost of environmental damages and the amount so generated shall be fully utilized for environmental management programmes.
4. There is no proper or adequate facility for collection, treatment and disposal of sewage in the coastal cities and towns of the State. Urbanization along water bodies is the undisputed reality. Plan sewage collection, treatment and treated water disposal by fixing target for 2050.
5. Local bodies should take urgent measures to control the solid waste generation and take eco-friendly measures for proper recycling or disposal of the wastes. Segregation at source and using the organic waste for biogas or compost are the best options.
6. Specific standards for cleanliness should be adopted and monitoring mechanisms implemented in ports and harbours. Fishing harbours have to be upgraded with sanitation facilities, boat fuelling area and better drainage systems.
7. Efforts should be made to reduce the ill effects of coconut husk retting by adopting modern environment-friendly methods. The present practice of

discharging waste pith into water should not be allowed. Modern techniques shall be made available for husk retting at controlled places.

8. Specific programmes should be launched for the effective awareness on marine debris issue in Kerala coast, monitoring and management by the Department of Environment and Climate Change, Kerala State Council for Science, Technology and Environment, and Kerala State Biodiversity Board, with the involvement of local communities and citizen scientists.



Responsible Tourism

1. The responsible tourism guidelines should be followed for all the tourism initiatives in the coastal and marine areas.
2. Number of houseboats in backwaters should be strictly limited, based on carrying capacity studies.
3. Strict rules and regulations for waste management, especially in backwater tourism using house boats, shall be formulated and enforced. Sewage collection and treatment mechanisms have to be made mandatory for house boats operating in the backwaters.
4. All house boats shall run on non-conventional energy sources such as solar and be fitted with green toilets/safe disposal of the wastes.

5. Floating restaurants with safe waste disposal mechanisms has to be implemented



Socio-economics of fishers and the need for enhancement of their Livelihoods.

Fishermen community with their own socio-economic and livelihood issues, high debt, lack of educational attainment and health as well as worse poverty indicators compared to the mainstream society. The seasonal nature of employment and lack of predictability in catch makes their problem worse with fluctuating earnings. Lack of skills, alternate employment and sticky labour make the things worse. In fact, during lean seasons as well as trawl ban period, their earnings are negligible. Another issue is the depletion of marine resources due to unsustainable fishing and other environment problems which is impacting their earnings. Prices of fish and fishery products are high but it is benefitting the outsiders, middle men and exporters and fishermen's share in this is miniscule. To overcome these perils an alternative is to set up of fishermen cooperative societies under the aegis of Matsyafed in each fishermen village.

1. The catch of fishermen should be procured by government by fixing floor price and the money should be released to them on the spot at landing centres. Such procured fish has to be immediately stored in establishing cold storages under government control
2. Educating and skill development is the only panacea to equip the future fishers to find alternate vocation.

3. Due to sea erosion and climate changes the fishermen lose their earnings. Hence adequate coping up strategies need to overcome the fishing days and loss of fishing equipment's.
4. Seasonal unemployment during trawl ban period needs special attention like employment schemes like that of SHGs or MGNREGS are to be addressed by providing alternate livelihood options through SHGs.

For getting better price for catch, fish vending in prime locations in towns and cities should be promoted through the fishermen SHGs. Also catching/producing export-oriented species will also help them to earn better price for their catch.

Value addition and better storage facilities are yet other ways through which fishermen can get better price for their catch. Boats and landing centres need to be equipped with storage facilities which can be used to store when there is excess supply or when fishermen feel that they are not getting better price for their catch.

5. To get remunerative price for the poor traditional fishers either in the coastal or riverine species is to connect the coastal roads, riverine roads and National Highways as selling points of their catch.
6. Promote alternate livelihood options to the fisher folk and involve them in ancillary industries which would not only reduce pressure on resources but also provide better living conditions for them. Empower fisher women by organizing Self Help Groups (SHGs) in coastal panchayaths for conservation and sustainable use of biodiversity. Educated youth are deviating from fishing is a major concern. Proper planning has to be made to have trained people for fishing activities.

SUGGESTED SPECIES FOR REGULATION OF TRADE & CONSERVATION

The Biological Diversity Act has provision to notify threatened species for regulation of trade under Section 38.

38. Power of Central Government to notify threatened species.— Without prejudice to the provisions of any other law for the time being in force, the Central Government, in consultation with the concerned State Government, may from time to time notify any species which is on the verge of extinction or likely to become extinct in the near future as a threatened species and prohibit or regulate collection thereof for any purpose and take appropriate steps to rehabilitate and preserve those species.

The details of species suggested for inclusion under Section 38 are included in Table 8.1.

Table 8.1 : Species suggested for inclusion under 38 of BD Act from Inland waters of Kerala

Sl No	Scientific name	Common name	Distribution	Threat status and justification	Source
Reptiles					
1	<i>Melanochelys trijuga</i>	Indian pond terrapin	EN	CR, hunted for meat	ZSI
2	<i>Crocodylus palustris</i>	Mugger March Crocodile	VU	Sch.I	ZSI
3	<i>Vijayachelys silvatica</i>	Cochin Forest Cane turtle	EN	Sch. I	ZSI
4	<i>Pelochelys cantorii</i>	Asian giant Soft Shell Turtle	EN	Sch.I	ZSI
5	<i>Chitra indica</i>	Indian narrow headed softshell turtle	EN	Sch.I	ZSI
Frogs					
6	<i>Euphlyctis karavaali</i> Pritiet al., 2016	Kaaravali skittering frog		local meat consumption. Threat of habitat destruction and pollution	ZSI

7	<i>Hoplobatrachus tigerinus</i> (Daudin, 1802)	Indian bull frog		local meat consumption. Threat of habitat destruction and pollution	ZSi
8	<i>Hoplobatrachus crassus</i> Jerdon, 1853	Carnaticus bull frog		local meat consumption. Threat of habitat destruction and pollution	ZSi
	Fishes				
9	<i>Tor remadevii</i> Kurup & Radhakrishnan,	Hump-backed mahseer		Threat due to indiscriminate fishing by local communities	ZSi
10	<i>Aenigmachanna gollum</i> Britzet al.,			High demand in aquarium trade	ZSi
11	<i>Kryptoglanis shajii</i> Vincent & Thomas,			Water extraction from laterite aquifers. Species unique evolutionary	ZSi
12	<i>Horaglanis abdukalami</i> Babu			Water extraction from laterite aquifers.	ZSi
13	<i>Horaglanis alikunhi</i> SubhashBabu&Nayar,			Water extraction from laterite aquifers.	
14	<i>Horaglanis krishnai</i> Menon			Water extraction from laterite aquifers.	ZSi
15	<i>Rakthamichthys digressus</i>			Water extraction from laterite aquifers.	ZSi
16	<i>Rakthamichthys indicus</i>			Water extraction from laterite aquifers.	ZSi
17	<i>Rakthamichthys roseni</i>			Water extraction from laterite aquifers.	ZSi
	Odonata (Insecta)				
18	<i>Calocypha laidlawi</i> (Fraser, 1924)		END (WG)	Mostly restricted to Western Ghats	ZSi
19	<i>Disparoneura apicalis</i> (Fraser, 1924)		DD (WG)	Riparian habitat only from Wynad	ZSi
	Freshwater Crabs				
20	<i>Arcithelphus atumpikkai</i> Pati, Sujila & Sudha Devi, 2019		END (WG)	Fairly threatened due to habitat destruction and agrarian development, more likely to become	ZSi

				extinct	
21	<i>Cylindrotelphus abbreviphallus</i> Pati et al., 2017		END (WG)	Fairly threatened due to habitat destruction and agrarian development, more likely to become extinct	ZSI
22	<i>Cylindrotelphus agranolata</i> (Pillai, 1951)		END (WG)	Fairly threatened due to habitat destruction and agrarian development, more likely to become extinct	ZSI
23	<i>Vela virupa</i> Bahir & Yeo, 2007		END (WG)	Fairly threatened due to habitat destruction and agrarian development, more likely to become extinct	ZSI
	Freshwater prawns				
24	<i>Macrobrachium elatum</i> Jayachandran, 1987	Ashtamudi prawn	EN	not reported subsequent to original description, Ashtamudi backwater	Present report
25	<i>Macrobrachium veliense</i> Jayachandran & Joseph, 1985	Veli prawn		not reported subsequent to original description, Veli lake and Chandragiri River	Present report
26	<i>Macrobrachium idea</i> (Heller, 1862)			rarely reported from Kerala, Cochin backwater	Present report
27	<i>Macrobrachium aemulum</i> (Nobili, 1906)			not reported subsequent to report from Kerala, great evolutionary significance (Gondwana evidence), Neyyar river	Present report
28	<i>Macrobrachium novaehollandiae</i> (de Man, 1908)			rarely reported from Kerala and has great evolutionary significance (Gondwana evidence), Paravur lake	Present report

29	<i>Macrobrachium rude</i> (Heller, 1862)			rarely reported from Kerala, Cochin backwater	Present report
30	<i>Leptocarpus kempfi</i> Jayachandran, 1992			not reported subsequent to original description. Cochin backwater	Present report

Table 8.2 : Threatened freshwater fishes of Kerala based on the IUCN Red List, 2011

Sl. No.	Species	Status of global IUCN Red List of Threatened Species	Status of present regional IUCN Red List Assessment
1	<i>Garra arunachalami</i>	CR	CR
2	<i>Hemibagrus punctatus</i>	CR	Likely to trigger EN
3	<i>Hypselobarbus thomassi</i>	CR	Likely to trigger VU
4	<i>Mesonoemacheillus herrei</i>	CR	Likely to trigger EN
5	<i>Neolissochilus wynaadensis</i>	CR	Likely to trigger EN
6	<i>Pethia pookodensis</i>	CR	Possibly meeting LC
7	<i>Tor remadevii</i>	CR	CR
8	<i>Dawkinsia arulius</i>	EN	EN
9	<i>Dawkinsia exclamation</i>	EN	EN
10	<i>Devario neilgherriensis</i>	EN	EN
11	<i>Echathalakenda ophicephalus</i>	EN	EN
12	<i>Garra hughi</i>	EN	EN
13	<i>Garra surendranathanni</i>	EN	EN
14	<i>Ghatsa montana</i>	EN	EN
15	<i>Gharsa santhamparaiensis</i>	EN	EN
16	<i>Glyptothorax anamalaiensis</i>	EN	EN
17	<i>Glyptothorax davissinghi</i>	EN	EN
18	<i>Glyptothorax housei</i>	EN	EN

19	<i>Glyptothorax madraspatanus</i>	EN	EN
20	<i>Snaha aruna</i>	EN	EN
21	<i>Horabagrus nigricollaris</i>	EN	EN
22	<i>Hypselobarbus dubius</i>	EN	EN
23	<i>Hypselobarbus micropogon</i>	EN	EN
24	<i>Hypselobarbus periyarensis</i>	EN	EN
25	<i>Lepidopygopsis typus</i>	EN	EN
26	<i>Mesonoemacheilus pulchellus</i>	EN	EN
27	<i>Ophichthys fossorius</i>	EN	EN
28	<i>Opsarius canarensis</i>	EN	EN
29	<i>Osteochilichthys longidorsalis</i>	EN	EN
30	<i>Pseudeutropius mitchelli</i>	EN	EN
31	<i>Pterocryptis wynaadensis</i>	EN	EN
32	<i>Puntius cauveriensis</i>	EN	EN
33	<i>Sahyadria denisonii</i>	EN	EN
34	<i>Sahyadria chalakkudiensis</i>	EN	EN
35	<i>Schistura striata</i>	EN	EN
36	<i>Tariqilabeo periyarensis</i>	EN	EN
37	<i>Tor malabaricus</i>	EN	EN
38	<i>Travancoria elongata</i>	EN	EN
39	<i>Trarancoria jonesi</i>	EN	EN
40	<i>Batasio travancoria</i>	VU	VU
41	<i>Balitora mysorensis</i>	VU	VU
42	<i>Channa diplogramma</i>	VU	VU
43	<i>Carinotetraodon travancoricus</i>	VU	VU
44	<i>Garra menoni</i>	VU	VU
45	<i>Garra periyarensis</i>	VU	VU
46	<i>Horabagrus brachysoma</i>	VU	VU
47	<i>Hyporhamphus xanthopterus</i>	VU	VU

48	<i>Lndoreonectes keralensis</i>	VU	VU
49	<i>Laubuka fasciata</i>	VU	VU
50	<i>Mesonoemacheilus menoni</i>	VU	VU
51	<i>Mesonoemacheilus</i>	VU	VU
52	<i>Mesonoemacheilus</i>	VU	VU
53	<i>Pseudosphromenus davi</i>	VU	VU

Table 8.3: Threatened freshwater crabs of Kerala (IUCN)

Sl No	Species	Status of global IUCN Red List of Threatened Species	Status of present regional IUCN Red List Assessment
1	<i>Arcithelphusa cochleariformis</i> Pati & Sudha Devi, 2015 *	NE	VU Blab(iii)+2ab(iii)
2	<i>Arcithelphusa tumpikkai</i> Pati, Sujila & Sudha Devi, 2019	NE	EN Blab(iii)+2ab(iii)
3	<i>Baratha peena</i> Bahir& Yeo, 2007 *	DD	DD
4	<i>Baratha pushta</i> Bahir& Yeo, 2007 *	DD	DD
5	<i>Barytelphusa cunicularis</i> (Westwood in Sykes, 1836)	LC	LC
6	<i>Cylindrotelphusa breviphallus</i> Pati, Rajesh, Raj, Sheeja, Kumar & Sureshan, 2017 *	NE	CR B2ab(iii)
7	<i>Cylindrotelphusa granulata</i> (Pillai, 1951) *	NE	CR (Possibly Extinct) Blab(iii)+2ab(iii)
8	<i>Cylindrotelphusa longiphallus</i> Pati, Rajesh, Raj, Sheeja, Kumar &Sureshan, 2017	NE	CR B2ab(ii)
9	<i>Cylindrotelphusa steniops</i> (Alcock, 1909)	LC	NT, nearly meeting VU B1b(iii)+2b(iii)
10	<i>Kani maranjandu</i> Kumar, Raj & Ng, 2017 *	NE	DD
11	<i>Karkata ghanarakta</i> Pati, Rajesh, Raj, Sheeja, Kumar & Sureshan, 2017 *	NE	DD
12	<i>Karkata kusumbha</i> Pati, Rajesh, Raj, Sheeja, Kumar &Sureshan, 2017 *	NE	DD
13	<i>Lamella lamellijrons</i> (Alcock, 1909)	LC	VU B2b(iii)
14	<i>Oziotelphusa biloba</i> Bahir&Yeo, 2005	vu	VU
15	<i>Oziotelphusa kerala</i> Bahir&Yeo, 2005	DD	DD

16	<i>Oziotelphusa wagrakarowensis</i> (Rathbun, 1904)	vu	CR B2ab(iii)
17	<i>Pilarta anuka</i>	DD	DD
18	<i>Pilarta aroma</i> Pati, Rajesh, Raj, Sheeja, Kumar & Sureshan, 2017	NE	DD
19	<i>Pilarta punctatissima</i> Pati, Rajesh, Raj, Sheeja, Kumar & Surcshan, 2017	NE	DD
20	<i>Snaha aruna</i> Bahir & Yeo, 2007	DD	DD
21	<i>Spiralothelphusa gibberosa</i> Pati & Sudha Devi, 2015	NE	CR B2ab(iii)
22	<i>Travancoriana charu</i> Bahir & Yeo, 2007	DD	DD
23	<i>Travancoriana convexa</i> (Roux, 1931)	LC	vu
			Blab(iii)+2ab(ii)
24	<i>Travancoriana granulate</i> Pati & Sharma, 2013	NE	DD
25	<i>Travancoriana kuleera</i> Bahir & Yeo, 2007	DD	DD
26	<i>Travancoriana pollicaris</i> (Alcock, 1909)	DD	DD
27	<i>Travancoriana schrimerae</i> Bon, 1969	LC	DD
28	<i>Vanni ashini</i> Bahir & Yeo, 2007	DD	DD
29	<i>Vanni deepta</i> Bahir & Yeo, 2007	DD	DD
30	<i>Vanni giri</i> Bahir & Yeo, 2007	DD	DD
31	<i>Vanni malabarica</i> (Henderson, 1912)	DD	VU BI
32	<i>Vanni nilgiriensis</i> (Roux, 1931)	DD	EN
33	<i>Vanni travancorica</i> (Henderson, 1913)	DD	DD
34	<i>Vela carli</i> (Roux, 1931)	DD	EN
35	<i>Vela virupa</i> Bahir & Yeo, 2007	DD	EN

Table 8.4: Threatened freshwater prawns of Kerala

SI No	Scientific name	Status	Remarks
1.	<i>Macrobrachium sulcatus</i> (Henderson & Matthai, 1910)	DD	Distribution in backwaters and appear in good numbers during breeding season and are captured
2.	<i>Macrobrachium indicus</i> Jayachandran & Joseph, 1985	DD	Isolated distribution, rare

3.	<i>Macrobrachium latimanus</i> (von Martens, 1865)	DD	Discontinuously distributed in Western Ghats, population declined
4.	<i>Palaemon concinnus</i> Dana, 1852	DD	Isolated distribution, rare

Table 8.5: Marine fishes and reptiles listed under Wild life (Protection) Act, 1972

SI No	Scientific name	Common name	Schedule
5.	Fishes		
6.	<i>Rhincodon typus</i>	Whale shark	1
7.	<i>Anoxypristis cuspidata</i>	Knifetooth sawfish	1
8.	<i>Carcharhinus hemiodon</i>	Pondicherry shark	1
9.	<i>Glyphis gangeticus</i>	Gangetic shark	1
10.	<i>Glyphis glyphis</i>	Speartooth shark	1
11.	<i>Himantura fluviatilis</i>	Ganges stingray	1
12.	<i>Pristis microdon</i>	Freshwater sawfish	1
13.	<i>Pristis zijsron</i>	Green sawfish	1
14.	<i>Rhynchobatus djiddensis</i>	Giant guitarfish	1
15.	<i>Urogymnus asperrimus</i>	Porcupine ray	1
16.	Sea Horse/ Pipe fishes	All sygnathidians	1
17.	<i>Epinephelus lanceolatus</i>	Giant grouper	1
18.	<i>Hippocampus trimaculatus</i>	Sea horse, VU	1, Appendix II
19.	<i>Hippocampus kuda</i>	Sea horse, VU	1, Appendix II
20.	<i>Hippocampus spinosissimus</i>	Sea horse, VU	1, Appendix II
21.	<i>Hippocampus kelloggi</i>	Sea horse, VU	1, Appendix II
22.	<i>Hippocampus mohnikei</i>	Sea horse, VU	1, Appendix II
23.	<i>Hippocampus camelopardalis</i>	Sea horse, VU	1, Appendix II
24.	Reptiles		1
25.	<i>Crocodylus porosus</i>	Saltwater Crocodile	1
26.	<i>Crocodylus palustris</i>	Estuarine Crocodile	1
27.	<i>Gravialis gangeticus</i>	Gharial	1
28.	<i>Dermochelys coriacea</i>	Leatherback Sea Turtle	1
29.	<i>Caretta caretta</i>	Loggerhead Sea	1
30.	<i>Lepido chelysolivacea</i>	Olive Ridley Sea Turtle	1
31.	<i>Eretmochelys imbricata</i>	Hawksbill Sea Turtle	1
32.	<i>Chelonia mydas</i>	Green Sea Turtle	1
33.	Echinodermata		
34.	<i>Holothuria scabra</i>	Sandfish, EN	
35.	<i>Holothuria spinifera</i>	Brown sandfish, DD	
36.	<i>Holothuria atra</i>	Black sea cucumber, LC	

37.	<i>Holothuria leucospilota</i>	Black tarzan,LC	
38.	<i>Holothuria edulis</i>	Edible sea cucumber, LC	
39.	<i>Stichopus horrens</i>	Grey sea cucumber, DD	
40.	<i>Bohadschia marmorata</i>	Brown sandfish, DD	
41.	<i>Bohadschia argus</i>	Leopard sea cucumber , LC	
42.	<i>Colochirus quadrangularis</i>	Thorny sea cucumber, NE	
43.	Molluscs		
44.	<i>Cassis cornuta</i>	Horned Helmet	I; Part IVb
45.	<i>Cyprae cassisrufa</i>	Bull mouth Helmet	I; Part IVb
46.	<i>Charoniatritonis</i>	Trumpet Triton	I; Part IVb 4
47.	<i>Tudiclaspirallus</i>	Spiral Vase	I; Part IVb
48.	<i>Conus milneedwardsi</i>	Glory of India	I; Part IVb
49.	<i>Nautilus pompilius</i>	Chambered Nautilus	I; Part IVb
50.	<i>Tridacna maxima</i>	Elongate Giant Clam	I; Part IVb
51.	<i>Tridacna squamosa</i>	Fluted Giant Clam	I; Part IVb
52.	<i>Hippopus hippopus</i>	Bear Paw Clam	I; Part IVb
53.	<i>Lambis chiragra</i>	Chiragra Spider Conch	IV; Part 19
54.	<i>Trochus niloticus</i>	Commercial Trochus	IV; Part 19
55.	<i>Turbo marmoratus</i>	Great Green Turban	IV; Part 19
56.	<i>Strombus plicatussibbaldii</i>	Sibbald's Conch	IV; Part 19
57.	<i>Lambis crocea</i>	Orange Spider	IV; Part 19
58.	<i>Lambis truncata</i>	Truncate Spider Conch	IV; Part 19
59.	<i>Lambis millepeda</i>	Millipede Spider Conch	IV; Part 19
60.	<i>Lambis scorpius</i>	Scorpio Conch	IV; Part 19
61.	<i>CypraealamacinaLimacina</i>	Cowrie	IV; Part 19
62.	<i>Cypraea mappa</i>	Map Cowrie	IV; Part 19
63.	<i>Cypraea talpa</i>	Mole Cowrie	IV; Part 19
64.	<i>Fasciolaria trapezium</i>	Trapezium Horse Conch	IV; Part 19
65.	<i>Harpulina arausiaca</i>	Vaxillate Volute	IV; Part 19
66.	<i>Placenta placenta</i>	Windowpane Oyster	IV; Part 19
67.	Coelenterates		
68.	All <i>Scleractinians</i>	Reef Building Coral	I; Part IVA
69.	All <i>Antipatharians</i>	Black Coral Schedule I; Part IVA	I; Part IVA
70.	<i>Tubipora musica</i>	Organ Pipe Coral	I; Part IVA
71.	All <i>Millepora</i> species	Fire Coral Schedule I; Part IVA	I; Part IVA
72.	All <i>Gorgonians</i>	Sea Fan	I; Part IVA

Table 8.6: List of marine fishes categorized under critically endangered category (IUCN)

SI No	Scientific name	Common name	SI No.	Scientific name	Common name
1	<i>Carcharhinus longimanus</i>	Oceanic shark	6	<i>Sphyrna mokarran</i>	Great Hammerhead
2	<i>Carcharhinus hemiodon</i>	Pondicherry shark	7	<i>Glaucostegus granulatus</i>	Granulated shovel-nose-ray
3	<i>Glaucostegus typus</i>	Giant Shovelnose Ray	8	<i>Rhina ancylostoma</i>	Bowmouth Guitarfish
4	<i>Rhynchobatus djiddensis</i>	White spotted Shovel-nose-ray	9	<i>Glaucostegus obtusus</i>	Widenose Guitar Fish
5	<i>Pristis microdon</i>	Largetooth Sawfish	10	<i>Pristis zijsron</i>	Longcomb sawfish

Table 8.7 : List of fishes belonging to Endangered categories of IUCN occurring in Kerala

SI No	Scientific name	Common name	SI No.	Scientific name	Common name
1	<i>Isurus oxyrinchus</i>	ShortfinMako Shark	10	<i>Rhino dontypus</i>	Whale shark
2	<i>Stegostoma tigrinum</i>	Zebra shark	11	<i>Alopias pelagicus</i>	Pelagic Thresher Shark
3	<i>Carcharhinus dussumieri</i>	White cheek Shark	12	<i>Carcharhinus amblyrhynchos</i>	Requiem shark
4	<i>Lamiopsistem minckii</i>	Broadfin Shark	13	<i>Sphyrna lewini</i>	Scalloped Hammerhead
5	<i>Eusphyrna blochii</i>	hammer-head shark	14	<i>Echinorhinus brucus</i>	Bramble Shark
6	<i>Raja ocellifera</i>	Twineye Skate	15	<i>Rostroraja alba</i>	White Skate
7	<i>Pateobatis bleekeri</i>	Bleeker's Whip Ray	16	<i>Aetomylaeus maculates</i>	Mottled eagle-ray
8	<i>Aetomylaeus vespertilio</i>	Ornate Eagle Ray	17	<i>Mobulahypostoma</i>	Lesser devil-ray
9	<i>Mobula eregoodoo</i>	Long horned Mobula			

START UP INITIATIVES IN THE AQUATIC BIO-RESOURCES SECTOR

The opportunities for starting up of new enterprises in fisheries sector are immense and will create a large number of employment opportunities. Entrepreneur Models in Fisheries and Aquaculture under the Pradhan Mantri Matsya Sampada Yojana (PMMSY) of Government of India will provide support in startup endeavours. For effective functioning incubation centres are to be established to provide hand holding such as training, converting entrepreneurial ideas into business models and doling out seed money to the new as well as existing business entrepreneurs keen to make big in the segment.

Existing storage and processing facilities (chilled storage, dry storage and other storage) stood at 76,874 MT in 2018-19, which is significantly low as the fish production in the state stood at 8.01 lakh tonnes in 2018-19, of which an estimated 1.87 lakh tonnes was intended for the exports market necessitating state-of-the-art cold storage facilities.

Seafood processing units in the state have a capacity to process nearly 4,352 tonnes of seafood, which is also much lower and the average annual capacity utilization is around 25-30 percent. The state should leverage these processing units for realizing greater value from exports of marine products.

The state could encourage start-ups that deal in farm-to-port services to facilitate harvesting, storage and marketing, with the global market requirement, for reducing losses and optimising the supply chain.

Table 9.1 Existing Storage and Processing Infrastructure for Marine Products in Kerala

Sl. no	Existing Facilities	Number	Capacity (MT)
1	Cold Storage	139	73,377.4
2	Chilled Storage	1	861.0
3	Dry Fish Storage	3	22.7
4	Other Storage Capacity	8	2,612.9
5	EU-Approved Marine Processing Plants	76	3,039.9
6	Marine Processing Plants not holding EU approval	31	893.3
7	Ice Plants	19	419.3
8	Pre-Processing Plants		252 1,759.9

Note: Processing plants capacity is with reference to per day capacity
Source: MPEDA, Ministry of Commerce and Industries, GoI; Exim Bank Research

Some of the suggestions for start-ups in this sector are given below

1. Fish storage facilities, marketing (door to door delivery system on internet booking facility).
2. Fish seed production units (hatcheries)
3. Facilities for advanced rearing of fish seed units
4. Integrated, composite, mono-species aquaculture programmes
5. Aquaculture and disease management analyzing systems
6. Live feed culture centres

7. Brood stock centres for candidate species for aquaculture
8. Ornamental fish seed production units
9. Aquarium trade and accessories
10. Consultancies for aquaculture and ornamental fish seed management
11. Net production units
12. Fish processing units
13. Processed fish food marketing units
14. Fish Pre-Processing line ▪ Retort Pouch Processing unit ▪ Fish Canning line ▪ Fish Sausage production line ▪ Fish extruded product line ▪ Fish Curing and Drying line ▪ Fish battering and breading line ▪ Fish product packing system line
15. Health food from bio-resources from sea and inland waters (non-contaminated)
16. Fish Feed mill/Feed plant
17. Fish Value Add Enterprise units
18. Manure plants
19. Chitin & Chitosan Production line
20. Fish oil production units
21. Fish meal production units
22. Wealth from waste units
23. Nutraceutical units
24. Bioactive compound production at industry level
25. Tourism related activities
26. Broodstock centres for cobia, pompano and seabass , grouper, Pearl spot, red snapper
27. Hatcheries for production of seed of cobia, pompano, grouper , Pearl spot and seabass
28. Nursery rearing centres for production of ready to stock fingerlings of cobia, pompano, Pearl spot and sea bass

29. Development of cage/pond farms for cobia, pompano, grouper, pearl spot and seabass
30. Production of grow out feeds for cobia, pompano, grouper, pearl spot and seabass
31. Fabrication of site specific and cost effective cages and mooring systems
32. Establishment of hatcheries for green mussel, edible oyster and pearl oyster
33. Farming systems for green mussel, edible oyster and pearl oyster
34. Hatcheries for marine ornamental species
35. Conditioning centres for green certified wild collected ornamental species trade
36. Production of seaweeds through farming
37. Commercial level production of designer pearls
38. Development of commercial level Integrated Multi-trophic Aquaculture (IMTA) systems
39. Grow out Production through Recirculation Aquaculture Systems
40. Freshwater pearl production units
41. Curio trade centers with seashells
- 42. Training centers for HR development**

Annexure 1 Economically important Sea weed resources of Kerala

No	Scientific name	Economic importance	Trade at present	Possibility for trade	Possibility of start up
1.	<i>Enteromorpha compressa</i> (L.) Nees	Edible, Fodder, Medicinal	√	√	√
2.	<i>Ulva fasciata</i> Delile	Edible, Fodder, Medicinal	√	√	√
3.	<i>Ulva lactuca</i> L.	Edible, Fodder, Medicinal, Manure	√	√	√
4.	<i>Ulva reticulata</i> Forssk.	Edible	√	√	√
5.	<i>Ulva rigida</i> C. Agardh	Edible	√	√	√
6.	<i>Ulva quilonensis</i> Sindhu & Panikkar	Edible, Fodder, Medicinal	√	√	√
7.	<i>Acrosiphonia orientalis</i> (J. Agardh) P.C. Silva	Medicinal	√	√	√
8.	<i>Cladophora prolifera</i> (Roth) Kutz.	Edible, Fodder	√	√	√
9.	<i>Cladophora fascicularis</i> (G. Mertens ex C.Agardh) Kutz	Edible, Fodder	√	√	√
10.	<i>Bryopsis plumosa</i> (Huds.) C. Agardh	Edible, Fodder, Manure	√	√	√
11.	<i>Caulerpa peltata</i> J.V. Lamour.	Edible, Fodder, Manure	√	√	√
12.	<i>Caulerpa racemosa</i> (Forssk.) J. Agardh	Edible	√	√	√
13.	<i>Caulerpa sertularioides</i> (S.G. Gmel.) M. Howe	Edible, Fodder, Manure	√	√	√
14.	<i>Caulerpa taxifolia</i> (Vahl) C. Agardh	Edible, Fodder, Manure	√	√	√
15.	<i>Dictyopteris bartayresiana</i> J.V. Lamour.	Edible, Fodder, Medicinal, Manure	√	√	√
16.	<i>Lobophora variegata</i> (J.V. Lamour.) Womersley ex E.C. Oliveira	Industrial	√	√	√
17.	<i>Padina gymnospora</i> (Kutz.) Sond.	Edible, Fodder, Industrial, Manure	√	√	√

18.	<i>Padina tetrastromatica</i> Hauck	Edible, Fodder, Industrial, Manure	√	√	√
19.	<i>Sargassum myriocystum</i> J. Agardh	Edible, Manure, Industrial (Algin)	√	√	√
20.	<i>Sargassum tenerrimum</i> J. Agardh	Edible, Manure, Industrial (Agaroid)	√	√	√
21.	<i>Sargassum wightii</i> Grev.	Edible, Fodder, Industrial (Algin)	√	√	√
22.	<i>Turbinaria conoides</i> (J. Agardh) Kutz.	Industrial (Algin)	√	√	√
23.	<i>Turbinaria ornata</i> (Turner) J. Agardh	Edible, Industrial (Agaroid)	√	√	√
24.	<i>Porphyra indica</i> V. Krishnam & Baluswami	Edible	√	√	√
25.	<i>Porphyra kanyakumariensis</i> V. Krishnam. & Baluswami	Edible	√	√	√
26.	<i>Gelidium micropterum</i> Kutz.	Edible, Industrial (Agar)	√	√	√
27.	<i>Gelidium pusillum</i> (Stackhouse) Le Jolis	Industrial (Agar)	√	√	√
28.	<i>Gelidiella acerosa</i> (Forssk.) J. Feldmann & G. Hamel	Industrial (Agar)	√	√	√
29.	<i>Gracilaria corticata</i> (J. Agardh) J. Agardh	Industrial (Agar)	√	√	√
30.	<i>Gracilaria corticata</i> (J. Agardh) J. Agardh var. <i>cylindrica</i> M.U. Rao	Industrial (Agar)	√	√	√
31.	<i>Gracilaria edulis</i> (S.G.Gmel.) P.C. Silva	Edible, Industrial (Agar)	√	√	√
32.	<i>Gracilaria foliifera</i> (Forssk.)	Industrial	√	√	√

	Borgesen				
33.	<i>Gracilaria verrucosa</i> (Hudson) Papenf.	Manure, Industrial (Agar)	√	√	√
34.	<i>Asparagopsis taxiformis</i> (Delile) Trevis.	Edible, Industrial (Antifouling agent)	√	√	√
35.	<i>Grateloupia filicina</i> (J.V. Lamour.) C.Agardh	Edible, Industrial (Carageenan)	√	√	√
36.	<i>Corallina elongata</i> J. Ellis & Sol.	Medicinal	√	√	√
37.	<i>Jania adherens</i> J.V. Lamour	Industrial	√	√	√
38.	<i>Hypnea musciformis</i> (Wulfen) J.V. Lamour.	Edible, Medicinal, Industrial (Carageenan)	√	√	√
39.	<i>Hypnea valentiae</i> (Turner) Mont.	Edible, Medicinal, Industrial	√	√	√
40.	<i>Gelidiopsis intricata</i> (C. Agardh) Vickers	Industrial	√	√	√
41.	<i>Spyridia hypnoides</i> (Bory) Papenf.	Industrial (Agaroid)	√	√	√
42.	<i>Acanthophora spicifera</i> (Vahl) Borgesen	Edible, Industrial (Agaroid)	√	√	√

Source : website of ENVIS, compiled by Dr. K. V. Jayachandran

Annexure 2 : Marine floral bio-resources of Kerala

SI No	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Start up possibility
Diatoms (Pennales)								
Family : Fragilarioidea								
1	<i>Amphiphora sp.</i>		DD	K	Ecological			
2	<i>Asterionella japonica</i>		DD	K	Ecological			
3	<i>Climacos phenia sp.</i>		DD	K	Ecological			
4	<i>Diploneis puella</i>		DD	K	Ecological			
5	<i>Diploneis splendida</i>		DD	K	Ecological			
Family : Naviculoideae								
6	<i>Fragilaria oceanica</i>		DD	K	Ecological			
7	<i>Grammatophora undulata</i>		DD	K	Ecological			
8	<i>Gyrosigma sp.</i>		DD	K	Ecological			
9	<i>Navicula lcanceolata</i>		DD	K	Ecological			
10	<i>Navicula sp.</i>		DD	K	Ecological			
11	<i>Pleurosigma directum</i>		DD	K	Ecological			
12	<i>Pleurosigma nitzchioides</i>		DD	K	Ecological			
13	<i>Raphoneis sp.</i>		DD	K	Ecological			
14	<i>Rhabdonema sp</i>		DD	K	Ecological			
15	<i>Synedra formosa</i>		DD	K	Ecological			
16	<i>Thallassionema nitzchioides</i>		DD	K	Ecological			
17	<i>Thallassiothrix longata</i>		DD	K	Ecological			
18	<i>Thallassiothrix longissima</i>		DD	K	Ecological			
Family : Nitzschiaceae								

19	<i>Bacillaria paradoxa</i>		DD	K	Ecological			
20	<i>Nitzschia pungens</i>		DD	K	Ecological			
21	<i>Nitzschia frigida</i>		DD	K	Ecological			
	Family : Achanthoideae							
22	<i>Coconeis littoralis</i>		DD	K	Ecological			
	Diatoms (Centrales)							
	Family : Biddulphieae							
23	<i>Biddulphia mobilensis</i>		DD	K	Ecological			
24	<i>Biddulphia pulchella</i>		DD	K	Ecological			
25	<i>Biddulphia sinensis</i>		DD	K	Ecological			
26	<i>Climacodium frauenfeldianum</i>		DD	K	Ecological			
27	<i>Ditylum brightwelli</i> (T. West) Grunow		DD	K	Ecological			
28	<i>Eucampiasp.</i>		DD	K	Ecological			
29	<i>Triceratiumsp.</i>		DD	K	Ecological			
	Family: Cheatoceraceae							
30	<i>Chaetoceros affinis</i>		DD	K	Ecological			
31	<i>Chaetoceros lorenzianus</i>		DD	K	Ecological			
	Family: Hemiaulineae							
32	<i>Ceratulinasp.</i>		DD	K	Ecological			
33	<i>Hemiaulusp.</i>		DD	K	Ecological			
	Family: Actinodisceae							
34	<i>Aulacodiscussp.</i>		DD	K	Ecological			
	Family: Coscinodisceae							
35	<i>Coscinodiscus rothi</i>		DD	K	Ecological			
36	<i>Cyclotella meneghinians</i>		DD	K	Ecological			
37	<i>Melosira striata</i>		DD	K	Ecological			

38	<i>Skeletonem acostatum</i>		DD	K	Ecological			
39	<i>Stephano phyxissp.</i>		DD	K	Ecological			
40	<i>Thalassiosira subtilis</i>		DD	K	Ecological			
	Family : Solenieae							
41	<i>Corytheronhystix</i>		DD	K	Ecological			
42	<i>Lauderia annulata</i>		DD	K	Ecological			
43	<i>Leptocylindrus danicus</i>		DD	K	Ecological			
44	<i>Rhizosolenia alata</i>		DD	K	Ecological			
45	<i>Rhizosolenia robusta</i>		DD	K	Ecological			
46	<i>Rhizosolenia setigra</i>		DD	K	Ecological			
47	<i>Rhizosolenia stoleteforthii</i>		DD	K	Ecological			
48	<i>Rhizosolenia striata</i>		DD	K	Ecological			
	Dinoflagellata							
	Family Gonyaulacaceae							
49	<i>Gonyaulaxsp.</i>		DD	K	Ecological			
	Family : Gymodiniaceae							
50	<i>Gymnodinium breve</i>		DD	K	Ecological			
	Family : Peridinaceae							
51	<i>Peridiniumdirectum</i>		DD	K	Ecological			
	Family Podolampaceae							
52	<i>Podolampussp.</i>		DD	K	Ecological			
	Family Dinophysiaceae							
53	<i>Ornithocercusmagnificus</i>		DD	K	Ecological			
	Family Porocentraceae							

54	<i>Porocentrummicans</i>		DD	K	Ecological			
	Family : Noctiluaceae							
55	<i>Noctiluca scintillans</i>		DD	K	Ecological			
	Checklist on Sea weeds (refer section on Aquatic flora)							
	Sea grasses							
56	<i>Cymodocea rotundata</i> Ehrenb. & Hempr.		Common	K	Ecological			
57	<i>Cymodocea serrulata</i> (R. Br.)		LC	K	Ecological			
58	<i>Enhalusacoroides</i> (L.F.)		Common	K	Ecological			
59	<i>Halodulepinifolia</i> (Miki) Hartog.		Common	K	Ecological			
60	<i>Halodule uninervis</i> (Forssk.)		Common	K	Ecological			
61	<i>Halophila decipiens</i> Ostenf.		LC	K	Ecological			
62	<i>Halophila stipulacea</i>		common	K	Ecological		Yes	Yes
63	<i>Halophila beccarii</i> Asch.		Common	K	Ecological			
64	<i>Halophila ovalis</i> (R.Br.)		LC	K	Ecological		Yes	yes
65	<i>Halophila ovata</i> Gaud.		Common	K	Ecological			
66	<i>Syringodiumisoetifolium</i> (Asch.)		Common	K	Ecological			
67	<i>Thalassia ahemprichii</i> (Ehrenb.)		LC	K	Ecological		Yes	Yes
	Seaweed Resources of Kerala							
	Family : Chlorophyceae							
68	<i>Bryopsis plumosa</i> ,			K	Ecological			

	C.Agardh.							
69	<i>Caulerpa sertularioides</i> , F.Brevioes			K	Ecological			
70	<i>Caulerpa cupressoides</i> , C.Agardh.			K	Ecological			
71	<i>Caulerpa peltata</i> , Lamour.			K	Ecological			
72	<i>Caulerpa racemosa</i> , Forsskal			K	Ecological			
73	<i>Chaetomorpha antennina</i> , (Borey.) Kuetz.			K	Ecological			
74	<i>Chaetomorpha linum</i> (O.F.Muller) Kuetz.			K	Ecological			
75	<i>Cladophora fascicularis</i> , (Merteos) Kuetz.			K	Ecological			
76	<i>Dictyota dichotoma</i> (Huds.) Lamour, 1809			K	Ecological			
77	<i>Enteromorpha compressa</i> , (Linn.)Grev.			K	Ecological			
78	<i>Enteromorpha intestinalis</i> , Kuetzing			K	Ecological			
79	<i>Padina gymnospora</i> , (Kuetz.) Vickers			K	Ecological			
80	<i>Padina tetrastratica</i> , Hauck.			K	Ecological			
81	<i>Sargassum tenerimum</i> , J.Agardh.			K	Ecological	Yes	Yes	Yes
82	<i>Sargassum duplicatum</i> ,			K	Ecological			

	J.Agardh.							
83	<i>Sargassum wightii</i> , Grev.			K	Ecological			
84	<i>Stoechospermum marginatum</i> , (C.Agardh.) Kuetz.			K	Ecological			
85	<i>Ulva fasciata</i> Delila			K	Ecological			
86	<i>Ulva lactuca</i> Linn.			K	Ecological	Yes	Yes	Yes
87	<i>Ulva reticulata</i> , Forsskal				Ecological	Yes	Yes	Yes
	Family :							
	Rhodophyceae							
88	<i>Acanthophoras picifera</i> , (Vahl.) Boergesen			K	Ecological			
89	<i>Amphiroa anceps</i> , (Lamk.) Decsne.			K	Ecological			
90	<i>Asparagopsis taxifomis</i> , Delila			K	Ecological	Yes	Yes	Yes
91	<i>Centroceros clavulatum</i> , C.Agardh.			K	Ecological			
92	<i>Chondrus sp.</i>			K	Ecological			
93	<i>Gelidium pusillum</i> , Stackhouse			K	Ecological			
94	<i>Gelidiopsis variabilis</i> , (Grev.) Schmitz			K	Ecological			
95	<i>Gracilaria corticata</i> , J.Agardh.			K	Ecological	Yes	Yes	Yes
96	<i>Gracilaria foliifera</i> , (Forsskal) Boergesen			K	Ecological			
97	<i>Gracilaria riopsis</i>			K	Ecological			

	<i>lemaniformis</i> , (Borey) Dawson							
98	<i>Grateloupia filicina</i> , J.Agardh.			K	Ecological			
99	<i>Grateloupia lithophila</i> , Boergesen			K	Ecological			
100	<i>Hypneamus ciformis</i> , (Wulf.)Lamour.			K	Ecological			
101	<i>Hypnea valentiae</i> , Mont.			K	Ecological			
102	<i>Janiarubens</i> , (Linn.) Lamour.			K	Ecological			
103	<i>Laurencia paniculata</i> , J.Agardh.			K	Ecological			
104	<i>Pterocladia sp.</i>			K	Ecological			

Abbreviation: LC – Least Concern; DD - Data deficient, K- Kerala

Source: Various sources; Compiled by Dr. K. V. Jayachandran; Joshi, K. K., 2012, *Kerala Calling*, 32 (9) : 34-37.

Annexure 3. Inland floral resources of Kerala

No	Scientific name	IUCN/ Other status	Economic importance	Trade present	at	Possibility for trade	Possibility of start up
1.	<i>Isoetes panchganiensis</i>	EN	Used in aquariums	√			
2.	<i>Cryptocoryne cognata</i>	EN	Used in aquariums	√			

3.	<i>Murdannia lanceolata</i>	VU	Medicinal		√	
4.	<i>Fimbristylis crystallina</i>	EN	Medicinal		√	
5.	<i>Fimbristylis dauciformis</i>	EN				
6.	<i>Fimbristylis hirsutifolia</i>	CR	Ornamental		√	
7.	<i>Fuirena swamy</i>	VU				
8.	<i>Dimeria hohenackeri</i>	EN				
9.	<i>Hubbardia heptaneuron</i>	VU				
10.	<i>Isachne bicolor</i>	VU	Medicinal	√		
11.	<i>Isachne meeboldii</i>	CR				
12.	<i>Isachne swaminathanii</i>	EN				
13.	<i>Isachne veldkampii</i>	CR				
14.	<i>Ischaemum jayachandranii</i>	CR				
15.	<i>Ischaemum vembanadense</i>	EN				
16.	<i>Limnopoa meeboldii</i>	EN				
17.	<i>Eriocaulon anshiense</i>	EN	Ornamental		√	
18.	<i>Eriocaulon bolei</i>	CR	Ornamental		√	
19.	<i>Eriocaulon dalzellii</i>	EN				
20.	<i>Eriocaulon karnatakense</i>	VU				
21.	<i>Eriocaulon kolhapureense</i>	VU				
22.	<i>Eriocaulon konkanense</i>	VU				
23.	<i>Eriocaulon maharashtrense</i>	VU				
24.	<i>Eriocaulon pectinatum</i>	VU				
25.	<i>Eriocaulon ratnagiricum</i>	CR				
26.	<i>Eriocaulon richardianum</i>	EN				
27.	<i>Eriocaulon rouxianum</i>	CR				

28.	<i>Eriocaulon santapau</i>	CR				
29.	<i>Eriocaulon sharmae</i>	CR				
30.	<i>Eriocaulon sivarajanii</i>	CR				
31.	<i>Eriocaulon tuberiferum</i>	VU				
32.	<i>Aponogeton bruggenii</i>	VU	ornamental plants in aquariums or ponds.	√		
33.	<i>Aponogeton satarensis</i>	EN	ornamental plants in aquariums or ponds.		√	
34.	<i>Hydrocotyle conferta</i>	EN	a source of natural antioxidants, ornamental plants also in aquariums or ponds.	√		
35.	<i>Anaphalis beddomei</i>	VU	Medicinal, ornamental		√	
36.	<i>Anaphalis leptophylla</i>	VU	Medicinal, ornamental		√	
37.	<i>Anaphalis wightiana</i>	VU	Medicinal, ornamental		√	
38.	<i>Notonia shevaroyensis</i>	VU				
39.	<i>Ammannia nagpurensis</i>	EN				
40.	<i>Rotala cookii</i>	EN	ornamental plants in aquariums	√		
41.	<i>Rotala floribunda</i>	VU	Ornamental		√	
42.	<i>Rotala malabarica</i>	CR	Ornamental and medicinal		√	
43.	<i>Rotala ritchiei</i>	EN	ornamental plants in aquariums		√	
44.	<i>Farmeria indica</i>	EN	Aquatic herbs		√	
45.	<i>Farmeria metzgerioides</i>	EN	Aquatic herbs			
46.	<i>Podostemum munnarensense</i>	VU	ornamental plants in aquariums and ponds		√	

47.	<i>Polypleurum filifolium</i>	VU	Medicinal		√	
48.	<i>Willisia selaginoides</i>	VU				
49.	<i>Hygrophila madurensis</i>	CR	Medicinal		√	
50.	<i>Utricularia albocaerulea</i>	VU	ornamental plants in aquariums and ponds		√	
51.	<i>Utricularia cecillii</i>	EN	ornamental plants in aquariums and ponds		√	
52.	<i>Utricularia wightiana</i>	VU	ornamental plants in aquariums and ponds		√	
53.	<i>Lindernia manilaliana</i>	EN	ornamental plants in ponds		√	
54.	<i>Lindernia minima</i>	EN	ornamental plants in ponds		√	
55.	<i>Nelumbo mucifera</i>		Food	√		√
56.	<i>Nymphaea nouchali</i>		Food	√		√
57.	<i>Bacopa monnieri</i>		Medicine	√		√
58.	<i>Centella asiatica</i>		Medicine	√		√
59.	<i>Eclipta alba</i>		Medicine	√		√
60.	<i>Lagenandra toxicaria</i>		Water purifier	√		
61.	<i>Lagenandra mairi</i>	Endemic	Ornamental		√	
62.	<i>Nelumbo nucifera</i>		Worship	√		
63.	<i>Typha argustata</i>		Thantching	√		√
64.	<i>Pandanus fascicularis</i>		Mats & Baskets	√		√
65.	<i>Cyperus pangorei</i>		Mats & Baskets	√		√
66.	<i>Eichhornia crassipes</i>		Handicraft material	√		√
67.	<i>Hygrophiza aristata</i>		Free floating	√		√
68.	<i>Lemna perpusilla</i>		"	√		
69.	<i>Pistia stratiotes</i>		"	√		√

70.	<i>Spirodela polyrhiza</i>		"	√		√
71.	<i>Wolffia globosa</i>			√		√
72.	<i>Ceratophyllum demersum</i>		"	√		√
73.	<i>Eriocaulon setaceum</i>		"	√		
74.	<i>Hydrilla verticillata</i>		"	√		√
75.	<i>Utricularia aurea</i>		"	√		
76.	<i>Aponogeton appendiculatus</i>		Anchored below water		√	
77.	<i>Blyxa auberii</i>		"		√	
78.	<i>Cabomba caroliniana</i>		"	√		√
79.	<i>Ottelia alismoides</i>		"	√		√
80.	<i>Vallisneria natans</i>		"	√		√
81.	<i>Aponogeton natans</i>		Anchored with free floating leaves	√		
82.	<i>Nelumbo nucifera</i>		"	√		√
83.	<i>Potamogeton nodosus</i>		"	√		√
84.	<i>Sagittaria guayanensis</i>		"	√		√
85.	<i>Geissarpis cristata</i>		Anchored with flowing shoots		√	
86.	<i>Ipomoea aquatic</i>		"	√		√
87.	<i>Ludwigia adscendens</i>		"	√		√
88.	<i>Ludwigia sedoides</i>		"	√		√
89.	<i>Neptunia prostrate</i>		"		√	
90.	<i>Trapa maximowiczii</i>		"	√		√
91.	<i>Acorus calamus</i>		Emergent anchored in shallow water	√		√
92.	<i>Aeschynomene aspera</i>		"		√	

93.	<i>Bacopa monnieri</i>		"	√		√
94.	<i>Eleocharis spiralis</i>		"	√		√
95.	<i>Hydrocera triflora</i>		"	√		√
96.	<i>Limnocharis flava</i>		"	√		√
97.	<i>Limnophila aromatic</i>		"	√		√
98.	<i>Limnophila heterophylla</i>		"	√		√
99.	<i>Monochoria vaginalis</i>	Endemic to South India	"	√		√
100.	<i>Bruguiera gymnorhiza</i>	Endemic to south India	"	√		√
101.	<i>Trapa natans</i> vr. <i>bispinosa</i>		Photosynthetic roots	√		√
102.	<i>Neptunia prostrata</i>		Shoots edible	√		√
103.	<i>Neptunia</i> sp.		Spongy tissue		√	
104.	<i>Offelia alismoides</i>		Eaten in South East Asia	√		√
105.	<i>Hydrophylla diformis</i>		Aquarium	√		√
106.	<i>Lagenandra toxicaria</i>	Endemic	Medicines	√		√
107.	<i>Pistia stratiotes</i> L		Fed to ducks and pigs	√		√
108.	<i>Ipomoea aquatic</i>		Shoots are edible	√		√
109.	<i>Utricularia aurea</i>		Carnivorous plant		√	
110.	<i>Rotala malampuzhaensis</i>	Endemic	Ornamental in ponds and aquariums	√		√
111.	<i>Nuphar lutea</i>		Garden plant	√		√
112.	<i>Pimpinella heyneana</i>	Rare	Ornamental & medicinal		√	
113.	<i>Myriopyllum indicum</i>		In ponds and low marshes		√	
114.	<i>Lemna minor</i>		Clean organic impurities	√		
115.	<i>Equisetum ramosissimum</i>	Rare	Aquatic fern	√		

116.	<i>Equisetum cone</i>		Ornamental	√		
117.	<i>Hydrocera triflora</i>		Perennial herb	√		
118.	<i>Wolffia globosa</i>		Smallest angiosperm	√		
119.	<i>Limnopoa meeboldii</i>	Endemic				
120.	<i>Eriocaulus heterolepis</i>	Endemic	Seeds, fruits and rhizome eaten			
121.	<i>Euryale ferox</i>		Ornamental	√		√

Source: <https://www.researchgate.net/publication/234061265> - The status and distribution of aquatic plants of the Western Ghats compiled by Dr. K. V. Jayachandran

Annexure 4. Riparian vegetation along freshwater bodies of Kerala

	Scientific name	IUCN/ other Status	Distribut ion in Kerala	Economi c Importa n-ce	Trade	Possibi lity of trade	Possibil ity of start up
1.	<i>Acanthus ilicifolius</i> L.	NA	T, K, A, E, Tr, M, C, Kn, Ks	Importan t	Nil	Nil	Nil
2.	<i>Acorus calamus</i> L.	NA	All districts	Importan t	√	√	√
3.	<i>Aeschynomene aspera</i> L.	Endemic	T, Ko, A, I, C, W, Tr, E, Pa, M	Importan t		√	√
4.	<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	NA	All districts	Importan t	√	√	√
5.	<i>Aponogeton appendiculatus</i> H.Bruggen	Endemic	Alappuzh a, Wayanad, Thrissur	Importan t			
6.	<i>Aponogeton natans</i> (L.) Engl. & K. Krause	Least Concern	Kozh,mal, ernklm,k o,alap, kollam,tv m	Importan t			
7.	<i>Azolla pinnata</i> (Water velvet)		All districts	Importan t		√	√
8.	<i>Abelmoschus angulosus</i> Wall. ex Wight & Arn.	Data deficient	All districts				

9.	<i>Abrus pulchellus</i> Wall. ex Thw.	Data deficient	All districts				
10.	<i>Acacia caesia</i> (L.) Willd.	Data deficient	All districts			√	√
11.	<i>Acalypha brachystachya</i> Hornem.	Data deficient	All districts				
12.	<i>Achyranthes aspera</i> L.	Data deficient	All districts		√	√	√
13.	<i>Acmella paniculata</i> (Wall. ex DC.) R.K. Jansen	Data deficient	All districts				
14.	<i>Acroceras munroanum</i> (Balansa) Henrard,	Data deficient	All districts				
15.	<i>Ageratum conyzoides</i> L.	Data deficient	All districts				
16.	<i>Ageratina adenophora</i> (Spreng.) King & Robins.	Data deficient	All districts				
17.	<i>Alangium salviifolium</i> (L.f.) Wang. ssp. hexapetalum	DD	All Districts		√	√	√
18.	<i>Alloteropsis cimicina</i> L.	Data deficient	All districts				
19.	<i>Alloteropsis semialata</i> (R.Br.) Hitch.	Data deficient	All districts				
20.	<i>Alpinia galanga</i> (L.) Sw.	Data deficient	All districts		√	√	√
21.	<i>Alternanthera bettzickiana</i> (Regel)	Data deficient	All districts				
22.	<i>Alternanthera brasiliana</i> (L.) Kuntze, Rev.	Data deficient	All districts		√	√	√

23.	<i>Alysicarpus monilifer</i> (L.) DC	Data deficient	All districts				
24.	<i>Amomum fulviceps</i> Thw.	Data deficient	All districts				
25.	<i>Anacardium occidentale</i> L.	Data deficient	All districts		√	√	√
26.	<i>Anamirta cocculus</i> (L.) Wight & Arn.	Data deficient	All districts		√	√	√
27.	<i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees.	Data deficient	All districts		√	√	√
28.	<i>Antidesma acidum</i> Retz.	Data deficient	All districts			√	√
29.	<i>Apluda mutica</i> L.	Data deficient	All districts				
30.	<i>Arachis pintoii</i> Krapov. & W.C.Gregory	Data deficient	All districts			√	
31.	<i>Arisaema tortuosum</i> (Wall.) Schott in Schott & Endl	Data deficient	All districts				
32.	<i>Aristida setacea</i> Retz.	Data deficient	All districts				
33.	<i>Aristolochia indica</i> L.	Data deficient	All districts		√	√	√
34.	<i>Artocarpus gomezianus</i> Wall. ex Trecul ssp. zeylanicus	DD	All districts				
35.	<i>Artocarpus incisus</i> (Thunb.) L.f.	Data deficient	All districts			√	√
36.	<i>Artocarpus hirsutus</i> Lam.	Data	All		√	√	√

		deficient	districts				
37.	<i>Arundinella ciliata</i> (Roxb.) Nees ex Miq.	Data deficient	All districts				
38.	<i>Asparagus racemosus</i> Willd.	Data deficient	All districts		√	√	√
39.	<i>Asystasia crispata</i> Benth.	Data deficient	All districts				
40.	<i>Asystasia dalzelliana</i> Sant.	Data deficient	All districts				
41.	<i>Atalantia wightii</i> Tanaka	Data deficient	All districts				
42.	<i>Artocarpus heterophyllus</i> Lam.	Data deficient	All districts		√	√	√
43.	<i>Amomum muricatum</i> Bedd.	Data deficient	All districts				
44.	c (L.) Wight & Arn.	Data deficient	All districts				
45.	<i>Annona reticulata</i> L.	Data deficient	All districts		√	√	√
46.	<i>Antidesma montanum</i> Blume, Bijdr.	Data deficient	All districts				
47.	<i>Ariopsis peltata</i> Nimmo	Data deficient	All districts				
48.	<i>Bacopa monnieri</i> (L.) Pennell		All districts	Importan t			
49.	<i>Bauhinia acuminata</i> L.	Data deficient	All districts		√	√	√

50.	<i>Benkara malabarica</i> (Lam.) Tirveng.	Data deficient	All districts				
51.	<i>Biophytum congestiflorum</i> Govind.	Data deficient	All districts				
52.	<i>Blumea belangeriana</i> DC.	Data deficient	All districts				
53.	<i>Blumea clarkei</i> Hook. f.	Data deficient	All districts				
54.	<i>Blumea laevis</i> (Lour.) Merr.	Data deficient	All districts				
55.	<i>Blumea lanceolaria</i> (Roxb.) Druce, Bot.	Data deficient	All districts				
56.	<i>Bombax ceiba</i> L.	Data deficient	All districts				
57.	<i>Boerhavia diffusa</i> L.	Data deficient	All districts				
58.	<i>Brachiaria ramosa</i> (L.) Stapf .	Data deficient	All districts				
59.	<i>Breynia disticha</i> J.R. Forst. & G. Forst.	Data deficient	All districts				
60.	<i>Breynia retusa</i> (Dennst.) Alston, Ann.	Data deficient	All districts				
61.	<i>Briedelia stipularis</i> (L.) Blume, Bijdr.	Data deficient	All districts				
62.	<i>Briedelia retusa</i> (L.) A. Juss.	Data deficient	All districts			√	√
63.	<i>Bryophyllum pinnatum</i> (Lam.) Kurz, J.	Data deficient	All districts		√	√	√

64.	<i>Bupleurum mucronatum</i> Wight & Arn.	Data deficient	All districts				
65.	<i>Byttneria herbacea</i> Roxb.	Data deficient	All districts				
66.	<i>Bruguiera gymnorhiza</i> (L.) Lam.		All districts	Important			
67.	<i>Cabomba caroliniana</i> A. Gray	NA	All district	Important			
68.	<i>Caesalpinia pulcherrima</i> (L.) Swartz, Obs.	Data deficient	All districts		√	√	√
69.	<i>Cajanus heynei</i> (Wight & Arn.) van der Maesen.	Data deficient	All districts				
70.	<i>Cajanus scarabaeoides</i> (L.) Thouars, Dict.	Endemic	All districts				
71.	<i>Caladium bicolor</i> (Ait. ex Dryand.) Vent.	Data deficient	All districts		√	√	√
72.	<i>Calophyllum inophyllum</i> L.	Data deficient	All districts				
73.	<i>Calopogonium mucunoides</i> Desv.	Data deficient	All districts		√	√	√
74.	<i>Calotropis gigantea</i> (L.) R. Br.	Data deficient	All districts		√	√	√
75.	<i>Calycopteris floribunda</i> Lam.	Data deficient	All districts				
76.	<i>Canscora pauciflora</i> Dalz.	Data deficient	All districts				
77.	<i>Canthium coromandelicum</i> (Burm. f.) Alston	Data deficient	All districts				

78.	<i>Canthium travancoricum</i> (Bedd.) Hook.	Data deficient	All districts				
79.	<i>Carallia brachiata</i> (Lour.) Merr.	Data deficient	All districts		√	√	√
80.	<i>Cardiospermum halicacabum</i> L.	Data deficient	All districts		√	√	√
81.	<i>Careya arborea</i> Roxb.	Data deficient	All districts		√	√	√
82.	<i>Cayratia trifolia</i> (L.) Domin, Biblioth.	Data deficient	All districts				
83.	<i>Chassalia curviflora</i> (Wall. ex Kurz) Thw.	Data deficient	All districts			√	√
84.	<i>Cinnamomum macrocarpum</i> Hook.	Data deficient	All districts		√	√	√
85.	<i>Cinnamomum malabatum</i> (Burm. f.) Blume,	Data deficient	All districts		√	√	√
86.	<i>Cissus discolor</i> Blume.	Data deficient	All districts		√	√	√
87.	<i>Cissus latifolia</i> Lam.	Data deficient	All districts				
88.	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.	Data deficient	All districts				
89.	<i>Cleome viscosa</i> L.	Data deficient	All districts				
90.	<i>Clerodendrum infortunatum</i> L.	Data deficient	All districts		√	√	√
91.	<i>Clerodendrum phlomidis</i> L.f.	Data deficient	All districts		√	√	√

92.	<i>Clidemia hirta</i> (L.) D. Don, Mem.	Data deficient	All districts		√	√	√
93.	<i>Clitoria ternatea</i> L.	Data deficient	All districts			√	√
94.	<i>Commelina benghalensis</i> L.	Data deficient	All districts				
95.	<i>Commelina ensifolia</i> R. Br	Data deficient	All districts				
96.	<i>Commelina erecta</i> L.	Data deficient	All districts				
97.	<i>Commelina maculata</i> Edgew.	Data deficient	All districts				
98.	<i>Commelina paludosa</i> Blume.	Data deficient	All districts				
99.	<i>Connarus wightii</i> Hook. f.	Data deficient	All districts				
100.	<i>Corchorus aestuans</i> L.	Data deficient	All districts				
101.	<i>Corchorus olitorius</i> L.		All districts			√	√
102.	<i>Costus speciosus</i> (Koenig) J.E. Smith	Data deficient	All districts		√	√	√
103.	<i>Crassocephalum crepidioides</i> (Benth.) S.	Data deficient	All districts				
104.	<i>Crotalaria albida</i> Heyne ex Roth,	Data deficient	All districts				
105.	<i>Crotalaria evolvuloides</i> Wight ex Wight & Arn	Data deficient	All districts				

106.	<i>Crotalaria scabrella</i> Wight & Arn.	Data deficient	All districts				
107.	<i>Crotalaria grahamiana</i> Wight & Arn.	Data deficient	All districts				
108.	<i>Crotalaria humifusa</i> Graham ex Benth.	Data deficient	All districts				
109.	<i>Crotalaria nana</i> Burm. f. var. <i>umbellata</i>	Data deficient	All districts				
110.	<i>Crotalaria pallida</i> Dryand.	Data deficient	All districts				
111.	<i>Croton hirtus</i> L'Herit.	Data deficient	All districts				
112.	<i>Cucumis sativus</i> L. f. <i>hardwickii</i>	Data deficient	All districts		√	√	√
113.	<i>Curcuma aeruginosa</i> Roxb.	Data deficient	All districts		√	√	√
114.	<i>Curcuma aromatica</i> Salisb.	Data deficient	All districts		√	√	√
115.	<i>Curcuma neilgherrensis</i> Wight, Ic.	Data deficient	All districts			√	√
116.	<i>Cyanotis arachnoidea</i> Clarke in A. & C. DC	Data deficient	All districts			√	√
117.	<i>Cyanotis obtusa</i> (Trim.) Trim.	Data deficient	All districts				
118.	<i>Cyclea peltata</i> (Lam.) Hook. f. & Thoms.	Data deficient	All districts		√	√	√
119.	<i>Cymbopogon citratus</i> (DC.) Stapf, Bull.	Data deficient	All districts		√	√	√

120.	<i>Cynodon dactylon</i> (L.) Pers.	Data deficient	All districts		√	√	√
121.	<i>Cyperus compressus</i> L.	Data deficient	All districts				
122.	<i>Cyperus cyperinus</i> (Retz.) Sur.	Data deficient	All districts				
123.	<i>Cyperus diffusus</i> Vahl,	Data deficient	All districts				
124.	<i>Cyperus haspan</i> L.	Data deficient	All districts				
125.	<i>Chromolaena odorata</i> (L.) King & Robins.	Data deficient	All districts				
126.	<i>Cleome viscosa</i> L.	Data deficient	All districts				
127.	<i>Clerodendrum infortunatum</i> L.	Data deficient	All districts			√	√
128.	<i>Cucumis sativus</i> L. f. hardwickii	Data deficient	All districts		√	√	√
129.	<i>Cyanotic axillaris</i> (L.) D.	Data deficient	All districts				
130.	<i>Cycas circinalis</i> L.	Data deficient	All districts				
131.	<i>Cyperus castaneus</i> Willd.	Data deficient	All districts				
132.	<i>Cyperus diffusus</i> Vahl, Enum.	Data deficient	All districts				
133.	<i>Cyperus dubius</i> Rottb.	Data	All				

		deficient	districts				
134.	<i>Dalbergia latifolia</i> Roxb.	Data deficient	All districts		√	√	√
135.	<i>Dioscorea alata</i> L.	Data deficient	All districts		√	√	√
136.	<i>Dendrobium aphyllum</i> (Roxb.) Fischer	Data deficient	All districts				
137.	<i>Digitaria longiflora</i> (Retz.) Pers.	Data deficient	All districts				
138.	<i>Duranta erecta</i> L.	Data deficient	All districts				
139.	<i>Diploclisia glaucescens</i> (Blume) Diels in Engl.	Data deficient	All districts				
140.	<i>Didymocarpus humboldtiana</i> Gard.	Data deficient	All districts				
141.	<i>Derris canarensis</i> Dalz.	Data deficient	All districts				
142.	<i>Desmodium triquetrum</i> (L.) DC.	Data deficient	All districts				
143.	<i>Desmodium triflorum</i> (L.) DC.	Data deficient	All districts				
144.	<i>Elephantopus scaber</i> L.	Data deficient	All districts				
145.	<i>Eragrostis gangetica</i> (Roxb.) Steud.	Data deficient	All districts				
146.	<i>Eragrostis nigra</i> Nees ex Steud.	Data deficient	All districts				

147.	<i>Eria mysorensis</i> Lindl.	Data deficient	All districts				
148.	<i>Eriocaulon heterolepis</i> Steud.	Data deficient	All districts				
149.	<i>Erycibe paniculata</i> Roxb.	Data deficient	All districts				
150.	<i>Eugenia uniflora</i> L.	Data deficient	All districts				
151.	<i>Eugenia mabaeoides</i> Wight	Data deficient	All districts			√	√
152.	<i>Euphorbia deccanensis</i> V.S.Raju	Data deficient	All districts				
153.	<i>Euphorbia heterophylla</i> L.	Data deficient	All districts				
154.	<i>Euphorbia hirta</i> L.	Data deficient	All districts		√	√	√
155.	<i>Evolvulus alsinoides</i> (L.) L.	Data deficient	All districts				
156.	<i>Evolvulus nummularius</i> (L.) L.	Data deficient	All districts				
157.	<i>Fimbristylis acuminata</i> Vahl,	Data deficient	All districts				
158.	<i>Fagraea ceilanica</i> Thunb.		All districts				
159.	<i>Ficus amplissima</i> J. E. Smith	Data deficient	All districts				
160.	<i>Ficus arnottiana</i> (Miq.) Miq.	Data deficient	All districts				

161.	<i>Ficus heterophylla</i>	Data deficient	All districts				
162.	<i>Ficus hispida</i> L.	Data deficient	All districts				
163.	<i>Ficus racemosa</i> L.	Data deficient	All districts		√	√	√
164.	<i>Fimbristylis argentea</i> (Rottb.) Vahl,	Data deficient	All districts				
165.	<i>Flacourtia indica</i> (Burm. f.) Merr.	Data deficient	All districts			√	√
166.	<i>Gardenia resinifera</i> Roth, Nov.	Data deficient	All districts				
167.	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Data deficient	All districts		√	√	√
168.	<i>Gloriosa superba</i> L.	Data deficient	All districts		√	√	√
169.	<i>Glycosmis mauritiana</i> (Lam.) Tanaka,	Data deficient	All districts				
170.	<i>Glycosmis pentaphylla</i> (Retz.) DC.	Data deficient	All districts				
171.	<i>Grewia abutilifolia</i> Vent.	Data deficient	All districts				
172.	<i>Grewia flavescens</i> Juss.	Data deficient	All districts				
173.	<i>Grewia hirsuta</i> Vahl, Symb.	Data deficient	All districts				
174.	<i>Grewia nervosa</i> (Lour.) Panigrahi,	Data deficient	All districts				

175.	<i>Gymnacranthera farquhariana</i> (Hook.f. & Thoms.) Warb.	DD	All districts				
176.	<i>Habenaria diphylla</i> (Nimmo) Dalz.	Data deficient	All districts				
177.	<i>Hedyotis membranacea</i> Thw.	Data deficient	All districts				
178.	<i>Helicteres isora</i> L.	Data deficient	All districts				
179.	<i>Heliotropium indicum</i> L.	Data deficient	All districts			√	√
180.	<i>Heliotropium marifolium</i> Retz.	Data deficient	All districts				
181.	<i>Hemidesmus indicus</i> (L.) R. Br. var. pubescens	Data deficient	All districts				
182.	<i>Hevea braziliensis</i> (Willd. ex A. Juss.) Muell.-Arg.	Data deficient	All districts		√	√	√
183.	<i>Hewittia malabarica</i> (L.)	Data deficient	All districts				
184.	<i>Hibiscus canescens</i> Heyne ex Wight & Arn.	Data deficient	All districts		√	√	√
185.	<i>Hibiscus hirtus</i> L.	Data deficient	All districts		√	√	√
186.	<i>Hibiscus hispidissimus</i> Griff.	Data deficient	All districts		√	√	√
187.	<i>Hibiscus lunariifolius</i> Willd.	Data deficient	All districts				
188.	<i>Hibiscus sabdariffa</i> L.	Data	All		√	√	√

		deficient	districts				
189.	<i>Hippocratea arnottiana</i> Wight, Illustr.	Data deficient	All districts				
190.	<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G. Don	DD	All districts		√	√	√
191.	<i>Holigarna arnottiana</i> Hook. f.	Data deficient	All districts				
192.	<i>Hopea ponga</i> (Dennst.) Mabb.	Data deficient	All districts				
193.	<i>Hydnocarpus pentandra</i> (Bedd.) Warb.	Data deficient	All districts		√	√	√
194.	<i>Hydrocotyle sibthorpioides</i> Lam.	Data deficient	All districts			√	√
195.	<i>Hyptis suaveolens</i> (L.) Poit.	Data deficient	All districts				
196.	<i>Indobanalia thyrsoflora</i> (Moq.) Henry & Roy,	Data deficient	All districts				
197.	<i>Ipomoea barlerioides</i> (Choisy) Benth. ex Clarke	Data deficient	All districts				
198.	<i>Ipomoea hederifolia</i> L.	Data deficient	All districts				
199.	<i>Ipomoea pes-caprae</i> (L.) R. Br.	Data deficient	All districts				
200.	<i>Isachne miliacea</i> Roth,	Data deficient	All districts				
201.	<i>Ischaemum timorense</i> Kunth, Rev.	DD	All districts				

202.	<i>Ixora coccinea</i> L.	Data deficient	All districts		√	√	√
203.	<i>Jatropha curcas</i> L.	Data deficient	All districts		√	√	√
204.	<i>Jatropha gossypifolia</i> L.	Data deficient	All districts		√	√	√
205.	<i>Jasminum malabaricum</i> Wight, Ic. t.	Data deficient	All districts			√	√
206.	<i>Knoxia sumatrensis</i> (Retz.) DC.	Data deficient	All districts				
207.	<i>Kyllinga brevifolia</i> Rottb.	Data deficient	All districts				
208.	<i>Kyllinga nemoralis</i> (J. R & G. Forst.) Dandy ex Hutch. & Dalz	DD	All districts				
209.	<i>Kyllinga polyphylla</i> Willd. ex Kunth,	Data deficient	All districts				
210.	<i>Limnophila aromatica</i> (Lam.) Merrill	Data deficient	All districts				
211.	<i>Limnophila indica</i> (L.) Druce	Data deficient		Important	√	√	√
212.	<i>Limnopoda meeboldii</i> (C.E.C.Fisch.) C.E.Hubb.	Data deficient	All districts	-			

213.	<i>Ludwegia sedoides</i> (Humb. & Bonpl.) H.Hara	Data deficient	All districts	Important			
214.	<i>Ludwigia adscendens</i> (L.) Hara	Endemic	All districts	Important			
215.	<i>Ludwigia hyssopifolia</i> (G. Don) Exell.	Data deficient	All districts				
216.	<i>Lantana camara</i> L.	Data deficient	All districts		√	√	√
217.	<i>Leptonychia caudata</i> (Wall. ex G. Don) Burrett,		All districts				
218.	<i>Leucas aspera</i> (Willd.) Link, Enum.	Data deficient	All districts		√	√	√
219.	<i>Leucas ciliata</i> Benth. ex Wall.	Data deficient	All districts				
220.	<i>Lindernia antipoda</i> (L.) Alston.	Data deficient	All districts				
221.	<i>Lindernia ciliata</i> (Colsm.) Pennell.	Data deficient	All districts				
222.	<i>Litsea deccanensis</i> Gamble,	Data deficient	All districts				
223.	<i>Litsea ghatica</i> Saldanha,	Data deficient	All districts				
224.	<i>Litsea venulosa</i> (Meisner) Hook	Data deficient	All districts		√	√	√

225.		Data deficient	All districts				
226.		Data deficient	All districts				
227.							
228.	<i>Macaranga peltata</i> (Roxb.) Muell.-Arg.	Data deficient	All districts				
229.	<i>Murdania loriformis</i> (Hassk.) R.S.Rao & Kammathy	Data deficient	All districts				
230.	<i>Monochoria vaginalis</i> (Burm.f.) C.Presl	Data deficient	All district	Important			
231.	<i>Macaranga peltata</i> (Roxb.) Muell.-Arg. in DC.	Data deficient	All districts				
232.	<i>Malaxis purpurea</i> (Lindl.) O. Ktze.	Data deficient	All districts				
233.	<i>Mallotus philippensis</i> (Lam.) Muell.-Arg	Data deficient	All districts			√	√
234.	<i>Mallotus repandus</i> (Willd.) Muell.-Arg.	Data deficient	All districts				
235.	<i>Mallotus tetracoccus</i> (Roxb.) Kurz, J.	Data deficient	All districts				
236.	<i>Mangifera indica</i> L.	Data deficient	All districts		√	√	√
237.	<i>Manilkara zapota</i> (L.) P.Royen	Data deficient	All districts		√	√	√
238.	<i>Meineckia parvifolia</i> (Wight) Webster	Data deficient	All districts				

239.	<i>Melastoma malabathricum</i> L.	Data deficient	All districts			√	√
240.	<i>Melochia corchorifolia</i> L.	Data deficient	All districts				
241.	<i>Memecylon randerianum</i> SM & MR Almeida	Data deficient	All districts				
242.	<i>Memecylon umbellatum</i> Burm.f.	Data deficient	All districts				
243.	<i>Merremia aegyptia</i> (L.) Urban, Symb.	Data deficient	All districts				
244.	<i>Microstachys chamaelea</i> (L.) Muell.-Arg.	Data deficient	All districts				
245.	<i>Mimosa pudica</i> L.	Data deficient	All districts		√	√	√
246.	<i>Mitracarpus hirtus</i> (L.) DC.	Data deficient	All districts				
247.	<i>Mollugo pentaphylla</i> L.	Data deficient	All districts		√	√	√
248.	<i>Mucuna atropurpurea</i> DC.	Data deficient	All districts				
249.	<i>Murdannia dimorpha</i> (Dalz.) Brueck.	Data deficient	All districts				
250.	<i>Murdannia loriformis</i> (Hassk.) Rao et Kammathy,	Data deficient	All districts				
251.	<i>Murdannia semiteres</i> (Dalz.) Sant.	Data deficient	All districts				

252.	<i>Micrococca mercurialis</i> (L.) Benth. in Hook.	Data deficient	All districts				
253.	<i>Mikania micrantha</i> Kunth.	Data deficient	All districts				
254.	<i>Mukia madraspatana</i> (L.) Roem.	Data deficient	All districts				
255.	<i>Mycetia acuminata</i> (Wight) O. Ktze.	Data deficient	All districts				
256.	<i>Neptunia prostate</i> Loureiro	Data deficient	All districts				
257.	<i>Nymphaea alba</i> L.	Data deficient	All districts		√	√	√
258.	<i>Nymphaea nouchali</i> Burm. f.	Data deficient	All districts		√	√	√
259.	<i>Nymphaea caerulea</i>	Data deficient	All districts		√	√	√
260.	<i>Nymphaea malabarica</i> Poir.	Data deficie nt			√	√	√
261.	<i>Nymphaea micrantha</i> Guill. & Perr.	Data deficient	All districts		√	√	√
262.	<i>Nymphaea pubescens</i> Wild.	Data deficient	All districts		√	√	√
263.	<i>Nymphoides indica</i> (L.) Kuntze	Data deficient	T, K, A, E, Tr, M, C, Kn, Ks		√	√	√
264.	<i>Nymphoides krishnakesara</i> K.T. Joseph & V.V.	Data deficient	All districts		√	√	√

	Sivarajan						
265.	<i>Naravelia zeylanica</i> (L.) DC.	Data deficient	All districts				
266.	<i>Naregamia alata</i> Wight & Arn.	Data deficient	All districts		√	√	√
267.	<i>Nervilia aragoana</i> Gaud.	Data deficient	All districts				
268.	<i>Ottelia alismoides</i> (L.) Pers.	Data deficient	All districts				
269.	<i>Oldenlandia auricularia</i> (L.) K.	Data deficient	All districts				
270.	<i>Oldenlandia biflora</i> L.		All districts				
271.	<i>Oldenlandia corymbosa</i> L.var. <i>corymbosa</i> Hook.	Data deficient	All districts		√	√	√
272.	<i>Olea dioica</i> Roxb.	Vulnerable	All districts			√	√
273.	<i>Olea paniculata</i> R. Br.	Data deficient	All districts				
274.	<i>Osbeckia aspera</i> (L.) Blume var. <i>aspera</i>	Endemic	All districts			√	√
275.	<i>Osbeckia muralis</i> Naud.	Data deficient	All districts			√	√
276.	<i>Paspalum scrobiculatum</i> L.	Data deficient	All districts		√	√	√
277.	<i>Parasopubia delphiniifolia</i>	DD	All				

	(L.) H.-P. Hofm. & Eb. Fisch.		districts				
278.	<i>Passiflora foetida</i> L.	Data deficient	All districts		√	√	√
279.	<i>Pavetta indica</i> L.	Data deficient	All districts				
280.	<i>Pavetta zeylanica</i> Hook. f.	Data deficient	All districts				
281.	<i>Pennisetum polystachyon</i> (L.) Schult.	Data deficient	All districts				
282.	<i>Pennisetum purpureum</i> Schum.	Data deficient	All districts		√	√	√
283.	<i>Phyla nodiflora</i> (L.) Greene,	Data deficient	All districts		√	√	√
284.	<i>Pilea kingii</i> C.E.C. Fisch.	Data deficient	All districts				
285.	<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Data deficient	All districts		√	√	√
286.	<i>Plectranthus barbatus</i> Andr.	Data deficient	All districts		√	√	√
287.	<i>Plectranthus glabratus</i> (Benth.) Alston	Data deficient	All districts				
288.	<i>Pollia secundiflora</i> (Blume) Bakh.f	Data deficient	All districts				
289.	<i>Polyalthia korintii</i> (Dunal) Benth. & Hook.f. ex Hook.f. & Thoms.	DD	All districts				
290.	<i>Pongamia pinnata</i> (L.) Pierre	Data deficient	All districts		√	√	√

291.	<i>Potentilla leschenaultiana</i> Ser.	Data deficient	All districts				
292.	<i>Pothos scandens</i> L.	Data deficient	All districts				
293.	<i>Premna glaberrima</i> Wight.	Data deficient	All districts				
294.	<i>Premna mollissima</i> Roth, Nov.	Data deficient	All districts				
295.	<i>Psidium guajava</i> L.	Data deficient	All districts		√	√	√
296.	<i>Pterocarpus marsupium</i> Roxb.	Data deficient	All districts		√	√	√
297.	<i>Pterygota alata</i> (Roxb.) R. Br.	Data deficient	All districts				
298.	<i>Phyllanthus acidus</i> (L.) Skeels	Data deficient	All districts		√	√	√
299.	<i>Phyllanthus airyshawii</i> Brunel & Roux,	Data deficient	All districts				
300.	<i>Phyllanthus amarus</i> Schum. & Thonn.	Data deficient	All districts		√	√	√
301.	<i>Phyllanthus indofischeri</i> Bennet.	Data deficient	All districts		√	√	√
302.	<i>Phyllanthus emblica</i> L.	Data deficient	All districts		√	√	√
303.	<i>Phyllanthus leschenaultii</i> Müll.-Arg.	Data deficient	All districts				
304.	<i>Phyllanthus maderaspatensis</i> L.	Data deficient	All districts				

305.	<i>Phyllanthus rheedei</i> Wight, Ic. t.	Data deficient	All districts				
306.	<i>Pongamia pinnata</i> (L.) Pierre.	Data deficient	All districts		√	√	√
307.	<i>Pterospermum acerifolium</i> (L.) Willd.	Data deficient	All districts				
308.	<i>Pterospermum reticulatum</i> Wight & Arn.	Data deficient	All districts				
309.	<i>Pterospermum rubiginosum</i> Heyne ex Wight & Arn.	Data deficient	All districts		√	√	√
310.	<i>Pseuderanthemum malabaricum</i> (Clarke) Gamble	Data deficient	All districts				
311.	<i>Pycnospora lutescens</i> (Poir.) Schind.	Data deficient	All districts				
312.	<i>Quassia indica</i> (Gaertn.) Nooteb.	Data deficient	All districts		√	√	√
313.	<i>Racosperma auriculiforme</i> (Benth.) Pedley.	Data deficient	All districts		√	√	√
314.	<i>Rotala malampuzhense</i> R.V. Nair ex C.D.K. Cook	Data deficient					
315.	<i>Rotala aquatica</i> Lour.	Endemic	All districts				
316.	<i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz	Data deficient	All districts		√	√	√
317.	<i>Rauwolfia tetraphylla</i> L.	Data deficient	All districts		√	√	√

318.	<i>Rungia longifolia</i> Nees & Arn.	Data deficient	All districts				
319.	<i>Ricinus communis</i> L.	Data deficient	All districts		√	√	√
320.	<i>Rothea serrata</i> (L.) Steane & Mabb.	Data deficient	All districts				
321.	<i>Santalum album</i> L.	Data deficient	All districts		√	√	√
322.	<i>Salvinia molesta</i> Mitch.	Data deficient	T, K, A, E, Tr, M, C, Kn, Ks Thrissur				
323.	<i>Seidenfia rheedei</i> (Sw.) Szlach.	Data deficient	All districts				
324.	<i>Spirodela polyrhiza</i> (L.) Schleid.	Data deficient	All districts		√	√	√
325.	<i>Scoparia dulcis</i> L.	Data deficient	All districts		√	√	√
326.	<i>Sesamum orientale</i> L.	Data deficient	All districts		√	√	√
327.	<i>Sida cordifolia</i> L.	Data deficient	All districts		√	√	√
328.	<i>Sida rhombifolia</i> L.	Data deficient	All districts		√	√	√
329.	<i>Smilax zeylanica</i> L.,	Data deficient	All districts			√	√
330.	<i>Solena amplexicaulis</i> (Lam.) Gandhi.	Data deficient	All districts				

331.	<i>Spathoglottis plicata</i> Blume, Bijdr.	Data deficient	All districts		√	√	√
332.	<i>Spermacoce latifolia</i> Aubl.	Data deficient	All districts				
333.	<i>Stachytarpheta jamaicensis</i> (L.) Vahl, Enum. Pl.	Data deficient	All districts			√	√
334.	<i>Streblus asper</i> Lour.	Data deficient	All districts		√	√	√
335.	<i>Sterculia guttata</i> Roxb. ex DC.	Data deficient	All districts		√	√	√
336.	<i>Strychnos nuxvomica</i> L.	Data deficient	All districts		√	√	√
337.	<i>Swertia angustifolia</i> Buch.-Ham.	Data deficient	All districts		√	√	√
338.	<i>Syzygium aqueum</i> (Burm.f.) Alston,	Data deficient	All districts				
339.	<i>Syzygium cumini</i> var. <i>cumini</i> (L.) Skeels.	Data deficient	All districts		√	√	√
340.	<i>Syzygium hemisphericum</i> (Wight)	Data deficient	All districts				
341.	<i>Syzygium jambos</i> (L.) Alston	Data deficient	All districts		√	√	√
342.	<i>Syzygium zeylanicum</i> (L.) DC.	Data deficient	All districts		√	√	√
343.	<i>Tabernaemontana</i> <i>alternifolia</i> L.	Data deficient	All districts				
344.	<i>Tabernaemontana</i> <i>divaricata</i> (L.) R. Br.	Data deficient	All districts		√	√	√

345.	<i>Tectona grandis</i> L. f.	Data deficient	All districts		√	√	√
346.	<i>Tectona hamiltoniana</i> Wall.	Data deficient	All districts		√	√	√
347.	<i>Terminalia catappa</i> L.	Data deficient	All districts		√	√	√
348.	<i>Terminalia chebula</i> Retz.	Data deficient	All districts		√	√	√
349.	<i>Terminalia paniculata</i> Rot.	Data deficient	All districts		√	√	√
350.	<i>Theobroma cacao</i> L.	Data deficient	All districts		√	√	√
351.	<i>Thunbergia alata</i> Boj. ex Sins	Data deficient	All districts		√	√	√
352.	<i>Tragia involucrata</i> L.	Data deficient	All districts				
353.	<i>Trema orientalis</i> (L.) Blume, Mus.	Data deficient	All districts				
354.	<i>Tridax procumbens</i> L.	Data deficient	All districts		√	√	√
355.	<i>Trapa natans</i> L.	Data deficient	All districts				
356.	<i>Trichosanthes nervifolia</i> L.	Data deficient	All districts			√	√
357.	<i>Utricularia aurea</i> Lour.	Data deficient	T, K, A, E, Tr, M, C, Kn, Ks				

358.	<i>Urena lobata</i> L.	Data deficient	All districts				
359.	<i>Vallisnaria natans</i> (Lour.) H. Hara	Data deficient	All districts		√	√	√
360.	<i>Victoria amazonica</i> (Poepp.) Sowerby	Data deficient	All districts		√	√	√
361.	<i>Vernonia cinerea</i> (L.) Less.	Data deficient	All districts			√	√
362.	<i>Vigna adenantha</i> (Meyer) Marechal, Mascherpa & Stainier	DD	All districts				
363.	<i>Vigna dalzelliana</i> (O. Kzte.) Verdc.	Data deficient	All districts				
364.	<i>Vigna mungo</i> (L.) Hepper	Data deficient	All districts		√	√	√
365.	<i>Vigna pilosa</i> (Roxb.) Baker.	Data deficient	All districts				
366.	<i>Vigna umbellata</i> (Thunb.) Ohwi & Ohashi	Data deficient	All districts		√	√	√
367.	<i>Vigna vexillata</i> (L.) A. Rich.	Data deficient	All districts				
368.	<i>Vitex altissima</i> L. f.	Data deficient	All districts				
369.	<i>Vitex negundo</i> L.	Data deficient	All districts		√	√	√

370.	<i>Wolffia globosa</i> (Roxb.) Hartog & Plas	Data deficient	All districts		√	√	√
371.	<i>Xenostegia tridentata</i> (L.) Austin & Staples.	Data deficient	All districts				
372.	<i>Xylia xylocarpa</i> (Roxb.) Taub.	Data deficient	All districts		√	√	√
373.	<i>Ziziphus oenoplia</i> (L.) Mill.	Data deficient	All districts		√	√	√
374.	<i>Zanthoxylum rhetza</i>	Data deficient	All districts		√	√	√

Source: various sources, compiled by Dr. K. V. Jayachandran

Annexure 5. Typical mangrove plant bioresource of Kerala

Sl. No.	Scientific Name	Common Name	IUCN Status/ Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
1	<i>Acanthus ebracteatus</i> Vahl	Sea holly	LC	A	Antioxidant properties			
2	<i>Acanthus ilicifolius</i> L.	Holly-leaved acanthus	LC	Ko,A, Kg,K,Ka,T,M. Kd,E,Tc	Medicine			
3	<i>Aegiceras corniculatum</i> (L.) Blanco	Black mangrove	LC	A,Kg,M,K,M, Kd, Tc, Ka	Analgesic properties			
4	<i>Acrostichum aureum</i> L.	Golden leather fern	LC	All districts	Leaves eaten			
5	<i>Avicennia marina</i> (Forsk.) Vierh.	Grey mangrove	LC	A,K,Kd,M,Tc, Ka,Kg,Ko,E	Medicinal	T		yes
6	<i>Avicennia officinalis</i> L.	Indian mangrove	LC	A,K,Kd,M,Tc, Ka,Kg,Ko,E,T	Medicinal	T		yes
7	<i>Bruguiera cylindrica</i> (L.) Bl.	White Burma Mangrove	LC	A,K,E,Kd,Ka Kg,T,Tc,M	Used as vegetables, medicine			
8	<i>Bruguiera gymnorrhiza</i> (L.) Savigny	Large-leaved orange mangrove	NE	Ko,A,K,T,E, Tc	Fire wood, medicinal			
9	<i>Bruguiera sexangula</i> (Lour.) Poir.	Upriver orange mangrove	LC	Ko,A,K,Tc,T, E	medicinal			

10	<i>Ceriops tagal</i> (Perr.) C.B. Rob.	spurred mangrove	LC	K	wood and leather			
11	<i>Dolichandrone spathacea</i> (L.f) Schum.	mangrove trumpet tree ^l		A,Kg,M,Kd,Ka, Tc,E	Flower edible			
12	<i>Excoecaria agallocha</i> L.	blinding tree	LC	A,Kg,K,T,M,Kd Tc,E,Ka	Medicinal			
13	<i>Excoecaria dallachyana</i> (Bail.) Benth.	Scrub poison tree	NE	A,Kg,K,T,M,Kd,Tc,E,Ka	Preparation of dyes			
14	<i>Shirakiopsis indica</i> (Willd.) Esser	Swamp willow Karimatti	LC	A,K,E	Durable wood, tannin production			
15	<i>Kandelia candel</i> (L.) Druce	Narrow- Leaved Kandelia	LC	Ko,A,K,Kd,M,Kd,E,Ka, Tc	Timber and tannin			
16	<i>Lumnitzera racemosa</i> Willd.	white-flowered black mangrove	LC	A,K,Ka,T	Tannin			
17	<i>Rhizophora apiculata</i> Bl.	Tall-Stilt Mangrove	LC	A,K,E,Kd,Ka,Kg,T,Ko,T c	Medicinal			
18	<i>Rhizophora mucronata</i> Poir.	red mangrove	LC	A,T,E,K,Ko,Tc,M,Kd,Kg ,Ka	Medicinal			
19	<i>Sonneratia alba</i> J. Smith	apple mangrove	LC	Ka,Kg,E,Kd	Medicinal			
20	<i>Sonneratia caseolaris</i> (L.) Engl.	<i>Sonneratia caseolaris</i>	LC	A,Kd,K,T,Ko,E,Kd,Ka	medicinal			

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; T-Thiruvananthapuram, K-Kollam, P- Pathanamthitta, A- Alappuzha, Ko- Kottayam, E- Ernakulam, I-Idukki, Tc- Thrissur, Pd- Palakkad, M-Malappuram, Kd- Kozhikode, W- Wayanad, Ka- Kannur, Kg- Kasaragod

Source : Various sources : Compiled by Dr. K. V. Jayachandran; Chandra, K., Gopi, K.C., Mishra, S.S. and Raghunathan, C. 2019. *Faunal Diversity of Mangrove Ecosystem in India*: 1-736. (Published by the Director, Zool. Surv. India, Kolkata); <http://tropical.theferns.info> (The tropical useful plants)

Annexure 6 Marine sponge bioresources of Kerala

Sl. No	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Startup possibility
Family: Spongiidae Gray, 1867								
1	<i>Hyattella intestinalis</i> (Lamarck, 1814)	----	NA	---	Bromotyrosine	Nil	Yes	Yes
2	<i>Hyattella sinuosa</i> (Pallas, 1776)	----	NA	---	Bromotyrosine	Nil	Yes	Yes
3	<i>Hyattella tubaria</i> (Lendenfeld, 1889)	----	NA	---	Bromotyrosine	Nil	Yes	Yes
4	<i>Spongia officinalis</i> (Linnaeus, 1759)	Bath sponge	NA	Vizhinjam	Diterpenes	Nil	Yes	Yes
Family: Callyspongiidae Laubenfels, 1936								
5	<i>Callyspongia fibrosa</i> (Ridley & Dendi, 1886)	Branching vase sponge	NA	Vizhinjam, Adimalathura	Pyridinium (alkaloid), Callystanin, Callyspongiolide	Nil	Yes	Yes
6	<i>Callyspongia reticulata</i> (Dendy, 1905)	Branching vase sponge	NA	---	Pyridinium (alkaloid) Callystanin, Callyspongiolide	Nil	Yes	Yes
7	<i>Callyspongia diffusa</i> (Ridley, 1884)	Branching vase sponge	NA	---	Pyridinium (alkaloid) Callystanin, Callyspongiolide	Nil	Yes	Yes

8	<i>Callyspongiasubarmigera</i> (Ridley, 1884)	Branching vase sponge	NA	---	Pyridinium (alkaloid) Callystanin, Callyspongiolide	Nil	Yes	Yes
9	<i>Callyspongia bullata</i> (Lamarck, 1814)	Branching vase sponge	NA	---	Pyridinium (alkaloid) Callystanin, Callyspongiolide	Nil	Yes	Yes
Family: Clionidae Rafinesque, 1815								
10	<i>Cliona celata</i> (Grant, 1826)	Yellow boring sponge	NA	Vizhinjam, Neendakara	Nil	Nil	Nil	Nil
11	<i>Cliona lobata</i> (Hancock, 1849)	Lobate boring horny sponge	NA	Vizhinjam, Neendakara	Nil	Nil	Nil	Nil
12	<i>Pione carpenteri</i> (Hancock, 1867)		NA	Kerala				
13	<i>Pione indica</i> (Topsent, 1891)		NA	Kerala				
14	<i>Pione margaritifera</i> (Topsent, 1932)	-----	NA	Vizhinjam, Neendakara	Nil	Nil	Nil	Nil
15	<i>Pione vastifica</i> (Hancock, 1849)	Red boring sponge	NA	Vizhinjam, Neendakara	Nil	Nil	Nil	Nil
Family: Halichondriidae Gray, 1867								
16	<i>Amorphinopsis fetida</i> (Dendy, 1889)	-----	NA	---	Nil	Nil	Nil	Nil

17	<i>Halichon driafetida</i> (Wilson, 1894)	Bread crumb sponge		---	Halichondrin B	Nil	Nil	Nil
Family: Microcionidae								
18	<i>Clathria vulpina</i> (Lamarck, 1814)	Orange finger sponge	NA	---	Pyrrolo 2 aminomidazole	Nil	Yes	Yes
19	<i>Clathria arborescens</i> (Ridley, 1884)	Orange finger sponge	NA	---	Pyrrolo 2 aminomidazole	Nil	Yes	Yes
20	<i>Clathria procera</i> (Ridley, 1884)	Orange finger sponge	NA	Adimalathura	Pyrrolo 2 aminomidazole	Nil	Yes	Yes
Family: Raspailiidae Nardo, 1833								
21	<i>Endectyon fruticosum</i> (Dendy,1887)	Bush sponge	NA	Varkala	Metronidazole	Nil	Yes	Yes
Family: Axinellidae Carter, 1875								
22	<i>Auletta lyrata</i> (Esper, 1794)	-----	NA	---	Milnamide A	Nil	Yes	Yes
23	<i>Auletta elongate</i> (Dendy,1905)	-----	NA	---	Milnamide A	Nil	Yes	Yes
24	<i>Axinella donnani</i> (Bowerbank, 1873)	Common antlers sponge	NA	Varkala, Paravoor	Pyrrole- imidazole alkaloid	Nil	Yes	Yes
Family: Dysideidae Gray, 1867								
25	<i>Dysidea crassa</i> (Dendy,1905)	Horny sponge	NA	---	Sesquiterpenoid	Nil	Yes	Yes
Family: Iricinidae Gray, 1867								

26	<i>Ircinia vallata</i> (Dendy,1887)	Black ball stinker sponge	NA	---	Furanosesterpen e	Nil	Yes	Yes
Family: Thorectidae Bergquist, 1978								
27	<i>Hyrtioserectus</i> (Keller,1889)	Red sea sponge	NA	---	Sesterterpenoids	Nil	Yes	Yes
28	<i>Luffariella variabilis</i> (Polejaeff,1884)	----	NA	---	Plakoridine A, Monalide	Nil	Yes	Yes
Family: Niphatidae Van Soest, 1980								
29	<i>Gelliodes incrustans</i> (Dendy,1905)	Grey encrustin g sponge	NA	---	Aplhapyrons	Nil	Yes	Yes
Family : Dictyolnelliidae Van Soest, 1980								
30	<i>Stylissa carteri</i> (Dendy,1889)	Elephant ear sponge	NA	---	Bromopyrrole	Nil	Yes	Yes
Family: Chalinidae Gray 1867								
31	<i>Haliclona sp</i>		NA	Kerala	Bioactive compounds		Yes	
Darwinelliidae Merejkowsky, 1879								
32	<i>Dendrilla nigra</i> (Dendy, 1889)		NA	Kerala	Bioactive studies in controlling shrimp pathogen			
Pseudoceratinidae Carter, 1885								
33	<i>Pseudoceratina purpurea</i> (Carter,1880)		NA	Kerala				
Mycalidae Lundbeck, 1905								
34	<i>Mycale (Zygomycale)</i>		NA	Kerala				

angulosa							
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Abbreviations: NA: Not assessed (Trade & Start up possibility: Bioactive compounds have been isolated from the species numbered 1-9, 16-30 and hence presume to have trade and startup possibility). Sponges are categorized under schedule III of Wild Life Protection Act, 1972

Source: Compiled by Dr. Sunil Kumar, P., Kerala Verma College, Trichur; Annandale, N., 1915a. Indian boring sponges of the family Clionidae. *Records of the Indian Museum, Calcutta*, 11: 1-24; Annadale, N., 1915b. Some sponges parasitic on Clionidae with further notes on that family. *Records of the Indian Museum, Calcutta*, 11: 457-478; Bowerbank, J.S. 1873. Report on a Collection of Sponges found at Ceylon by E.W.H. Holdsorth, Esq. *Proceedings of the Zoological Society of London*, 1873: 25-32, pis V-VII.; Dendy, A., 1887. The sponge fauna of Madras. A report on a collection of sponges obtained in the neighborhood of Madras by Edgar Thurston Esq. *Annals and Magazine of Natural History, London*, ser. 5, 20: 153-165, pls. 9-12; Dendy, A., 1889. Report on a second collection of sponges from the Gulf of Mannar. *Annals and Magazine of Natural History, London*, ser. 6, 3: 73-99, pls. 35; Dendy, A., 1905. Report on the sponges collected by Prof. Herdman, at Ceylon, in 1902. Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Mannar, Royal Society, London, sup pl. 3(18): 57-246; Lamarck, J .B.P. de Monet. 1814. Sur les polypiers empates. *Annales du Museum d'Histoire naturelle, Paris*, 20: 294-312, 370-386, 432-458; Ridley, S.O. 1884b. Notes on Sponges, with Description of a new Species. *Annals and Magazine of Natural History*, (5) 14(81): 183-187; Sunil Kumar, P., 2005. Boring sponge infestation on the mussel *Perna indica* Kuriakose and Nair 1976 from the south west coast of India. Ph.D thesis, CIFE, Mumbai; Sunil Kumar, P. & Thomas, P. A., 2015. Systematics, zoogeography and affinity of boring sponges infesting the brown mussel, *Perna indica* Kuriakose and Nair from the south west coast of India, *J. mar. biol. Ass. India.*, 57 (1):1-9. ISSN-0025-3146; Thomas, P.A. 1973. The sponge resources of India. *Proc. Symp. Living Resources, J. mar. boil. Ass. India*, India, pp. 693-699; Topsent, E. 1932. Epo~ges de Lamarck conservees au Museum de Paris. Deuxiemepartie (I). *Archives du Museum National d' His to ire Naturelle*, (6)8: 61-

124. <http://www.keralamarinelife.in/Results.aspx?search=sponges&field=4&mode=1file:///C:/Users/user/Downloads/Duckworth2009FarmingSpongestoSupplyBioactiveMetabolitesandBathSponges-areview.Pdf>

Annexure 7 : Coral bio-resources of Kerala

Sl. No	Scientific name	Common name	IUCN / WPA status	Distribution	Economic Importance	Present Trade	Trade Possibility	Start-up possibility
Deep water corals from off Travancore								
Family: Caryophyllidae Dana, 1846								
1	<i>Caryophyllia communis</i> (Seguenza, 1863)	Cup corals	Sch 1 (Part IVA)	Deep sea, off Travancore coast	Nil	Nil	Nil	Nil
2	<i>Caryophyllia paradoxus</i> Alcock, 1898	Cup corals	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
3	<i>Desmophyllum vitreum</i> Alcock, 1898	Caillet's stony coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
4	<i>Lophohelia investigatoris</i> Alcock, 1898	Zigzag coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
5	<i>Solenos miliajeffreyi</i> Alcock, 1898	Maculate stony coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
Deep water corals from off								

	Kollam							
	Family: Rhizangiidaed'Orbigny, 1851							
6	<i>Cladangia exusta</i> Lütken, 1873	-	Sch 1 (Part IVA)	Deep sea, off Kollam coast	Nil	Nil	Nil	Nil
	Family: CaryophyllidaeDana, 1846							
7	<i>Para cyathus stokesi</i> Milne Edwards &Haime, 1848	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
8	<i>Para cyathus profundus</i> Duncan, 1889	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
9	<i>Caryophyllia paradoxus</i> Alcock, 1898	Cup corals	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
10	<i>Caryophylliaclavus</i> Scacchi, 1835	Cup corals	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
11	<i>Caryophyllia arcuate</i> (Milne Edwards &Haime, 1848)	Cup corals	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
12	<i>Heterocyathus aequico status</i> Milne-Edwards and Haime, 1848	Striped bum coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
13	<i>Solenosmilia variabilis</i> Duncan, 1873	Maculate stony	Sch 1 (Part		Nil	Nil	Nil	Nil

		coral	IVA)				
	Family: Flabellidae Bourne, 1905						
14	<i>Flabellum stokesi</i> Milne Edwards & Haime, 1848	-	Sch 1 (Part IVA)		Nil	Nil	Nil
	Family: Dendrophylliidae Gray, 1847						
15	<i>Balanophyllia gumingii</i> Milne Edwards & Haime, 1848	-	Sch 1 (Part IVA)		Nil	Nil	Nil
16	<i>Endopachys grayi</i> Milne Edwards & Haime, 1848	-	Sch (Part IVA)		Nil	Nil	Nil
17	<i>Heterops ammiacochlea</i> (Spengler, 1781)	Smooth bum coral	Sch (Part IVA)		Nil	Nil	Nil
18	<i>Tubastraea aurea</i> (Quoy & Gaimard, 1833)	Sun coral	Sch 1 (Part IVA)		Nil	Nil	Nil
19	<i>Dendrophyllia indica</i> Pillai, 1969	-	Sch 1 (Part IVA)		Nil	Nil	Nil
20	<i>Dendrophyllia cornigera</i> (Lamarck, 1816)	Yellow tree coral	Sch 1 (Part IVA)		Nil	Nil	Nil
21	<i>Dendrophyllia minuscula</i> Bourne, 1905	-	Sch 1 (Part		Nil	Nil	Nil

			IVA)					
Hard coral species recorded from patch coral reefs of Enayam and Vizhinjam								
Family: Pocilloporidae Gray, 1840								
22	<i>Pocilloporada micornis</i> (Linnaeus, 1758)	Lace coral	Sch 1 (Part IVA)	Near shore patch reefs	Nil	Nil	Nil	Nil
23	<i>Pocillopora verrucosa</i> (Ellis & Solander, 1786)	Rasp coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
24	<i>Pocillopora meandrina</i> Dana, 1846	Cauliflowe r coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
25	<i>Pocillopora ligulate</i> Dana, 1846	Thin cauliflowe r coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
26	<i>Pocillopora woodjonesi</i> Vaughan, 1918.	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
27	<i>Pocillopora eydouxi</i> Milne Edwards, 1860	Antler coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
Family: AcroporidaeVerrill, 1901								
28	<i>Acropora efflorescens</i> (Dana, 1846)	Table coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
29	<i>Acropora hyacinthus</i> (Dana, 1846)	Hyacinth table coral	Sch 1 (Part		Nil	Nil	Nil	Nil

			IVA)					
30	<i>Acropora variabilis</i> (Klunzinger, 1879)	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
31	<i>Montipora equitum berculata</i> Bernard, 1897	Pore coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
32	<i>Montipora foliosa</i> (Pallas, 1766)	Leaf coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
33	<i>Montipora Verrilli</i> Vaughan, 1907	Pore coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
34	<i>Montipora turgescens</i> Bernard, 1897	Pore coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
35	<i>Montipora hispida</i> (Dana, 1846)	Pore coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
36	<i>Montipora millepora</i> Crossland, 1952	Pore coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
	Family: Poritidae Gray, 1840							
37	<i>Porites lutea</i> Edwards & Haime, 1851	Hump coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
38	<i>Porites lichen</i> (Dana, 1846)	Hump coral	Sch 1 (Part		Nil	Nil	Nil	Nil

			IVA)				
	Family: Merulinidae Verrill, 1865						
39	<i>Goniastrea pectinata</i> (Ehrenberg, 1834)	Lesser star coral	Sch 1 (Part IVA)		Nil	Nil	Nil
40	<i>Favitesa bdata</i> (Ellis & Solander, 1786)	Larger star coral	Sch 1 (Part IVA)		Nil	Nil	Nil
	Family: Siderastreidae Vaughan & Wells, 1943						
41	<i>Pseudosidera streatayami</i> Yabe & Sugiyama, 1935	False pillow coral	Sch 1 (Part IVA)		Nil	Nil	Nil
	Family: Dendrophylliidae Gray, 1847						
42	<i>Turbinaria mesenterina</i> (Lamarck, 1816)	Disc coral	Sch 1 (Part IVA)		Nil	Nil	Nil
43	<i>Tubastraea aurea</i> (Quoy & Gaimard, 1833)	-	Sch 1 (Part IVA)		Nil	Nil	Nil
44	<i>Dendrophyllia indica</i> Pillai, 1969	-	Sch 1 (Part IVA)		Nil	Nil	Nil
45	<i>Dendrophyllia cornigera</i> (Lamarck, 1816)	Yellow tree coral	Sch 1 (Part IVA)		Nil	Nil	Nil

46	<i>Dendrophyllia minuscula</i> Bourne, 1905	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
47	<i>Endopachy sgrayi</i> Milne Edwards &Haime, 1848	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
48	<i>Heterops ammia cochlea</i> (Spengler, 1781)	Smooth bum coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
	Family: Flabellidae Bourne, 1905							
49	<i>Flabellum stokesi</i> Milne Edwards &Haime, 1848	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
	Family: Caryophylliidae Dana, 1846							
50	<i>Solenosmilia variabilis</i> Duncan, 1873	Maculate stony coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
51	<i>Heterocyathus aequico status</i> Milne Edwards &Haime, 1848	Striped bum coral	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
52	<i>Paracyathus stokesii</i> Milne Edwards &Haime, 1848	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
53	<i>Paracyathus profundus</i> Duncan, 1889	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil

54	<i>Caryophyllia arcuate</i> (Milne Edwards & Haime, 1848)	Cup corals	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
	Family: Rhizangiidae Orbigny, 1851							
55	<i>Cladangia exusta</i> Lütken, 1873	-	Sch 1 (Part IVA)		Nil	Nil	Nil	Nil
Soft coral species recorded from South west coast including Kerala coast								
Family: Ellisellidae Gray, 1859								
56	<i>Ellisella maculate</i> Studer, 1878	Sea whip	Sch 1 (Part IVA)	Off Quilon coast and Between Vizhinjam and Kanyakumari coast	Ecological	Nil	Nil	Nil
57	<i>Ellisella andamanensis</i> (Simpson, 1910)	Sea whip	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecological	Nil	Nil	Nil
58	<i>Gorgonella rubra</i> (Thompson & Henderson, 1906)	-	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecological	Nil	Nil	Nil
59	<i>Gorgonella umbrachulum</i> (Ellis & Solander, 1786)	-	Sch 1 (Part IVA)	Vizhinjam coast, off Quilon coast and South west coast of India	Ecological	Nil	Nil	Nil

60	<i>Junceella juncea</i> (Pallas, 1766)	Sea whip	Sch 1 (Part IVA)	Vizhinjam coast, South west coast of India	Ecologica I	Nil	Nil	Nil
61	<i>Scirpearia filiformis</i> Toeplitz in Kükenthal, 1919	-	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecologica I	Nil	Nil	Nil
Family: Paramuriceidae Bayer, 1956								
62	<i>Acanthogorgia ceylonensis</i> Thomson & Henderson, 1905.	Armoured sea fan coral	Sch 1 (Part IVA)	Off Quilon coast	Ecologica I	Nil	Nil	Nil
63	<i>Acanthogorgia turgida</i> Nutting, 1911.	Armoured sea fan coral	Sch 1 (Part IVA)	Off Quilon coast	Ecologica I	Nil	Nil	Nil
64	<i>Carijoariisei</i> (Duchassaing & Michelotti, 1860)	Snowflake coral	Sch 1 (Part IVA)	Kovalam coast	Ecologica I	Nil	Nil	Nil
65	<i>Echinogorgia complexa</i> Nutting, 1910	-	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecologica I	Nil	Nil	Nil
66	<i>Echinogorgia flabellum</i> (Pallas, 1766)	-	Sch 1	from Vizhinjam to Kanyakumari	Ecologica I	Nil	Nil	Nil

			(Part IVA)	coast, Off Quilon coast and Southwest coast of India				
67	<i>Echinogorgiaflora</i> Nutting, 1910	-	Sch 1 (Part IVA)	from Vizhinjam to Kanyakumari coast	Ecologica I	Nil	Nil	Nil
68	<i>Echinogorgia reticulata</i> (Esper, 1791)	-	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecologica I	Nil	Nil	Nil
69	<i>Echinomuricea andamanensis</i> Thomson & Simpson, 1909.	-	Sch 1 (Part IVA)	Off Quilon coast	Ecologica I	Nil	Nil	Nil
70	<i>Echinomuricea indica</i> Thomson & Simpson, 1909	-	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecologica I	Nil	Nil	Nil
	Family: Acanthogorgiidae Gray, 1859				Ecologica I			
	Family: Clavulariidae Hickson, 1894							
	Family: Parisididae Aurivillius, 1931				Ecologica I			
71	<i>Leptogorgia australiensis</i> Ridley, 1884	-	Sch 1	Vizhinjam coast, South west	Ecologica I	Nil	Nil	Nil

			(Part IVA)	coast of India				
72	<i>Muricella complanate</i> Wright & Studer, 1889.	-	Sch 1 (Part IVA)	Between Vizhinjam and Kanyakumari coast	Ecological	Nil	Nil	Nil
73	<i>Muricelladubia</i> Nutting, 1910	-	Sch 1 (Part IVA)	Off Quilon coast	Ecological	Nil	Nil	Nil
74	<i>Parisis fruticose</i> Verrill, 1864	-	Sch 1 (Part IVA)	Off Quilon coast	Ecological	Nil	Nil	Nil

Abbreviations: WPA- Wildlife Protection Act 1972 - Sch: Schedule

Source: Various sources : Compiled by Dr. Jasmine, S. Principal Scientist & Dr. DivyaViswambharan, Senior scientist, CMFRI& Dr. K. V. Jayachandran, Subject Expert, KSBB; Alcock, A. 1898. An account of the Madreporaria collected by the royal Indian Marine Survey Ship 'Investigator'. Investigator Reports, Indian Museum Calcutta: 1-29; George, R.M., Jasmine, S., Kingsly, J. H. and Ajithkumar, T. T. 2019. Systematic account of scleractinian corals. In: K. Vinod, K. S. Sobhana, S. Jasmine, K. K. Joshi and Rani Mary George (Eds.). Stony corals, sponges and reef fishes off Enayam to Kollam, south-west coast of India, CMFRI Special Publication No.119: 7-35; Jasmine, S., George, R.M., Manisseri, M.K., Kingsly, J., 2009. Hard coral diversity along southwest coast of India. *J. Mar. Biol. Ass. India*. 51,189-193; Nair R.R., Qasim S.Z. Occurrence of a bank with living corals off the south west coast of India. *Indian J. Mar. Sci.*, 7 (1978), pp. 55-58; Padmakumar, K. and R. Chandran. 2012. Biodiversity of Octocorals, In: Coral reefs in India - status, threats and conservation measures (eds. by Bhatt, J.R.,

Patterson Edward, J.K., Macintosh D.J. and Nilaratna, B.P.), IUCN India. p. 53-70; Pillai, C.S.G., Jasmine, S., 1995. Scleractinian corals of the erstwhile Travancore coast (south-west of India). *J. mar. biol. Ass. India.* 37, 109 – 125; World Register of Marine Species. Available from <https://www.marinespecies.org> at VLIZ. Accessed 2021-10-21. doi:10.14284/170

Annexure 8 : Crustaceans (except prawns and shrimps, crabs, anomurans and lobsters) from marine ecosystems of Kerala

Sl. No.	Scientific Name	Common Name	IUCN Status / Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of start up
1	<i>Arcania cornuta</i> (Mac Gilchrist, 1905)		NE	K	Ecological			
2	<i>Arcania gracilis</i> (Hederson, 1893)		NE	K	Ecological			
3	<i>Arnoda ctylus</i> Sp.		NE	K	Ecological			
4	<i>Balanus Amphitrite</i> Darwin, 1854		NE	K	Ecological			
5	<i>Dorippoides facchino</i> (Herbst, 1785)		NE	K	Ecological			
6	<i>Erugosquilla woodma soni</i> (Kemp, 1911)	Mantis shrimp	NE	K	Ecological	Feed for duck		Yes
7	<i>Euclosiana obtusi frons</i> (De Haan, 1841)		NE	K	Ecological			
8	<i>Harpiosquilla harpax</i> (de Haan, 1844)	Mantis shrimp	NE	K	Ecological	Feed for duck		Yes
9	<i>Harpiosquilla indica</i> Manning, 1969	Mantis shrimp	NE	K	Ecological	Feed for duck		Yes
10	<i>Lauridromi adehaani</i> (Rathbun, 1923)		NE	K	Ecological	Feed for duck		Yes
11	<i>Lepas anatifera</i> Linnaeus, 1758	Goose Barnacles	NE	K	Ecological			

12	<i>Lysiosquillatre dicimdentata</i> Holthuis,1941	Mantis shrimp	NE	K	Ecological	Feed for dcuk		Yes
13	<i>Miyakeanepa</i> (Latreille in Latreille, Le Peletier, Serville& Guerin,1828)		NE	K	Ecological	Feed for duck		Yes
14	<i>Myra fugax</i> (Fabricius,1798)		NE	K	Ecological			
15	<i>Notopus dorsipes</i> (Linnaeus,1758)		NE	K	Ecological			
16	<i>Nymphopsis acinacispinatus</i>		NE	K	Ecological			
17	<i>Octolas miscor</i> (Aurivillius,1892)		NE	K	Ecological			
18	<i>Oratos quillaperpensa</i> (Kemp,1911)	Mantish shrimp	NE	K	Ecological	Feed for duck		Yes
19	<i>Pachycheles natalensis</i> (Krauss,1843)		NE	K	Ecological			
20	<i>Pallenopsis</i> Sp.		NE	K	Ecological			
21	<i>Petrolisthes boscii</i> (Audouin,1826)		NE		Ecological			
22	<i>Philyrasca briuscula</i> (Fabricius,1798)		NE	K	Ecological			
23	<i>Philyrasyn dactyla</i> (Ortmann,1892)		NE	K	Ecological			
24	<i>Seulociapu bescens</i> (Miers,1877)		NE	K	Ecological			
25	<i>Squilloides leptos quilla</i> (Brooks,1886)	Mantis shrimp	NE	K	Ecological	Feed for duck		Yes
26	<i>Tumidodromia dormia</i> (Linnaeus,1763)		NE	K	Ecological			
27	<i>Xenobalanus globicipitis</i> Steenstrup,1852		NE	K	Ecological			

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated

Districts; T-Thiruvananthapuram, K-Kollam, P- Pathanamthitta, A- Alappuzha, Ko- Kottayam, E- Ernakulam, I-Idukki, Tc- Thrissur, Pd- Palakkad, M-Malappuram, Kd- Kozhikode, W- Wayanad, Ka- Kannur, Kg- Kasaragod

Annexure 9 : Prawns and shrimps bio-resources of marine ecosystem of Kerala

Sl. No	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Startup possibility
Family : Penaeidae Rafinesque, 1815								
1	<i>Fenneropenaeus indicus</i> (H. Milne Edwards, 1837)	Indian White Prawn	LC	A	Food prawn	√	√	
2	<i>Fenner openaeus merguensis</i> (De Man, 1888a)	Banana Prawn	LC	A	Food prawn	√	√	
3	<i>Funch aliadanae</i> Burkenroad, 1940		NA	A	Food prawn	√	√	√
4	<i>Funch aliavillosa</i> (Bouvier, 1905)		NA	A	Food prawn	√	√	
5	<i>Ganja mpenaeopsisuncta</i> (Alcock,1905)		NA	A	Food prawn	√	√	√
6	<i>Kishin ouyepenaeopsis maxillipedo</i> (Alcock,1905)		NA	A	Food prawn	√	√	√
7	<i>Marsupenaeus japonicus</i> (Spence Bate, 1888	Kuruma Prawn	NA	A	Food prawn	√	√	√
8	<i>Megokrispesca doreensis</i> (Schmitt, 1931)	Bighead Sand Prawn	NA	A	Food prawn	√	√	
9	<i>Megokris sedili</i> (Hall, 1961	Malayan	NA	A	Food prawn	√	√	

		Rough Shrim						
10	<i>Melicertus canaliculatus</i> (Olivier, 1811)	Witch prawn	NA	A	Food prawn	√	√	√
11	<i>Melicertus latisulcatus</i> (Kishinouye, 1896)	Western King Prawn	NA	A	Food prawn	√	√	√
12	<i>Metapenaeopsis andamanensis</i> (Wood-Mason)		NA	A	Edible	√	√	
13	<i>Metapenaeopsis coniger</i> (Wood-Mason)		NA	A	Edible	√	√	
14	<i>Metapenaeopsis gaillardi</i> Crosnier, 1991		NA	A	Edible	√	√	
15	<i>Metapenaeopsis philippi</i> (Spence Bate, 1881)	Philip Velvet Shrimp	NA	A	Food prawn	√	√	
16	<i>Metapenaeus affinis</i> (H. Milne Edwards, 1837)	Jinga prawn	NA	A	Food prawn	√	√	√
17	<i>Metapenaeus brevicornis</i> (H. Milne Edwards, 1837)	Yellow shrimp	NA	A	Food prawn	√	√	
18	<i>Metapenaeus dobsoni</i> (Miers, 1878)	Kadal shrimp	NA	A	Food prawn	√	√	√
19	<i>Metapenaeus ensis</i> (De Haan, 1844) Greasyback Shrimp	Greasy back shrimp	NA	A	Food prawn	√	√	
20	<i>Metapenaeus monoceros</i> (Fabricius, 1798)	Speckled shrimp	NA	A	Food prawn	√	√	√

21	<i>Metapenaeus moyebi</i> (Kishinouye, 1896)	Moyebi shrimp	NA	A	Edible	√	√	
22	<i>Parapenaeopsis acclivirostris</i> Alcock, 1905	Hawknose Shrimp	NA	A	Edible	√	√	
23	<i>Parapenaeopsiss tylifera</i> (H. Milne Edwards, 1837)	Kiddy Shrimp	NA	A	Food prawn	√	√	√
24	<i>Parapenaeusfiss uroides</i> <i>indicus</i> Crosnier, 1986	False Rose Shrimp	NA	A	Edible	√	√	
25	<i>Parapenaeus investigatoris</i> Alcock& Anderson, 1899	Explor er Rose Shrimp	NA	A	Edible	√	√	
26	<i>Pelagopenaeus balboae</i> (Faxon, 1893)		NA	A	Edible	√	√	
27	<i>Penaeopsis jerryi</i> Pérez Farfante, 1979	Gond wana Shrimp	NA	A	Edible	√	√	
28	<i>Penaeopsis rectacuta</i> (Spence Bate, 1881	Needl e shrimp	NA	A	Edible	√	√	
28	<i>Penaeus monodon</i> Fabricius, 1798	Jumbo Tiger	NA	A	Edible	√	√	√
30	<i>Penaeus semisulcatus</i> De Haan, 1844	Green Tiger Prawn	NA	A	Edible	√	√	√

31	<i>Sicyonia lancifer</i> (Olivier, 1811)	Knight Rock Shrimp	NA	A	Edible	√	√	√
32	<i>Sicyoniapara japonica</i> Crosnier, 2003		NA	A	Edible			√
33	<i>Trachysalambria curvirostris</i> (Stimpson, 1860)	Southern Rough Shrimp	NA	A	Edible	√	√	
Family : Solenoceridae Wood-Mason, 1891								
34	<i>Haliporustapro banensis</i> Alcock& Anderson, 1899	Redbacked Coral Prawn	NA	A	Edible	√	√	
35	<i>Hymenopenaeus equalis</i> (Spence Bate, 1888)	Veiled Shrimp	NA	A	Edible	√	√	
36	<i>Solenocera choprai</i> Nataraj, 1945	Ridgeback Shrimp	NA	A	Food prawn	√	√	√
37	<i>Solenocera crassicornis</i> (H. Milne Edwards, 1837)	Coastal Mud Shrimp	NA	A	Food prawn	√	√	√
38	<i>Solenocera halli</i> Starobogatov, 1972,		NA	A	Food prawn	√	√	√
39	<i>Solenocera hextii</i> Wood-Mason and Alcock, 1891	Deepsea Mud Shrimp	NA	A	Food prawn	√	√	√

40	<i>Solenocera koelbeli</i> De Man, 1911	Chinese Mud Shrimp	NA	A	Edible	√	√	√
41	<i>Solenocera melantho</i> De Man, 1907	Razor Mud Shrimp	NA	A	Edible	√	√	
42	<i>Solenocera pectinata</i> (Spence Bate, 1888)	Comb Shrimp	NA	A	Edible	√	√	
43	<i>Solenocera pectinulata</i> (Kubo, 1949)		NA	A	Edible	√	√	
Family : Aristeidae Wood-Mason, 1897								
44	<i>Aristaeomorpha foliacea</i> (Risso, 1826)	Giant Gamba Prawn	NA	A	Edible	√	√	
45	<i>Aristaeomorpha woodmasoni</i> Calman, 1925	Indian Red Shrimp	NA	A	Edible	√	√	
46	<i>Aristaeopsis edwardsiana</i> (Johnson, 1867)	Scarlet Shrimp	NA	A	Edible	√	√	
47	<i>Aristeusa lcocki</i> Ramadan, 1938	Arabian Red Shrimp	NA	A	Food prawn	√	√	√
48	<i>Aristeuss emidentatus</i> Spence Bate, 1881	Smooth Red Shrimp	NA	A	Edible	√	√	√
49	<i>Pseudaristeus crassipes</i> (Wood-Mason 1891)		NA	A	Edible	√	√	

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Family : Benthesicymidae Wood-Mason, 1891							
50	<i>Gennadas propinquus</i> Rathbun, 1906		NA	A	Edible	√	√
51	<i>Gennadas scutatus</i> Bouvier, 1906		NA	A	Edible	√	√
52	<i>Gennadas sordidus</i> Kemp, 1910		NA	A	Edible		
Family : Sergestidae Dana, 1852							
53	<i>Acetes indicus</i> H. Milne Edwards, 1830	Jawala Paste Shrimp	NA	A	Food prawn	√	√
54	<i>Acetes sibogaesibogae</i> Hansen, 1919	Alama ng Shrimp	NA	A	Food prawn	√	√
55	<i>Acetes johni</i> Nataraj, 1947		NA	A	Food prawn	√	√
56	<i>Acetes japonicus</i> Kishinouye, 1905	Akiami Paste Shrimp s	NA	A	Food prawn	√	√
57	<i>Acetes erythraeus</i> Nobili, 1905	Tsivaki hini Paste Shrimp	NA	A	Food prawn		√
58	<i>Sergesteshamifer</i> Alcock & Anderson, 1894		NA	A	Edible		
Family : Alpheidae Rafinesque, 1815							
59	<i>Alpheus malabaricus</i>		NA	A	Edible		

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	(Fabricius, 1775)							
Family : Hippolytidae Spence Bate, 1888								
60	<i>Exhip polysmata punctata</i> (Kemp,1947);		NA	A	Edible	√	√	
61	<i>Exhip poly smataens irostrisensirostris</i> (Kemp,1914)		NA	A	Food prawn	√	√	
62	<i>Latreutes mucronatus</i> (Stimpson, 1860)		NA	A	Edible			
63	<i>Merhip poly tecalmani</i> Kemp & Sewell, 1912		NA	A	Edible			
Family : Glyphocrangonidae Smith, 1884								
64	<i>Glyphocrangon regalis</i> Spence Bate, 1888	Armoured shrimp	NA	A	Edible			
65	<i>Glyphocrangon unguiculata</i> Wood-Mason & Alcock, 1891	Armoured shrimp	NA	A	Edible			
Family : Nematocarinidae Smith, 1884								
66	<i>Nematocarinustenuirostris</i> Spence Bate, 1888		NA	A	Edible	√	√	
Family : Pandalidae Haworth, 1825								
67	<i>Eupasiphae alatirostris</i> (Wood-Mason & Alcock,1891b)		NA	A	Edible	Nil	Nil	Nil
Family : Pasiphaeidae Dana, 1852								
Family: Thalassocarididae Spence Bate, 1888								
68	<i>Glyphus marsupialis</i> Filhol, 1884		NA	A	Edible	Nil	Nil	Nil

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69	<i>Heterocarpus ensifer</i> A. Milne Edwards, 1881	Armed Nylon Shrimp	NA	A	Edible	√	√	√
70	<i>Heterocarpus gibbosus</i> Spence Bate, 1888		NA	A	Food prawn	√	√	√
71	<i>Heterocarpus laevigatus</i> Spence Bate, 1888	Smooth Nylon shrimp	NA	A	Edible	√	√	
72	<i>Heterocarpus sibogae</i> De Man, 1917	Minion Nylon Shrimp	NA	A	Edible	√	√	
73	<i>Heterocarpus woodmasoni</i> Alcock, 1901	Indian Nylon Shrimp	NA	A	Food prawn	√	√	
74	<i>Heterocarpus tricarinatus</i> Alcock & Anderson, 1894	Scarred Nylon shrimp	NA	A	Edible	√	√	
75	<i>Leptochela (Leptochela) aculeocaudata</i> Paulson, 1875		NA	A	Edible	Nil	Nil	Nil
76	<i>Leptochela (Leptochela) robusta</i> Stimpson, 1860		NA	A	Edible	Nil	Nil	Nil
77	<i>Pasiphaea alcocki</i> Wood-Mason & Alcock, 1891		NA	A	Edible	Nil	Nil	Nil
78	<i>Plesionika alcocki</i> (Anderson, 1896)	Gondwana Stripe	NA	A	Edible	√	√	√

		d Shrimp						
79	<i>Plesionika ensis</i> (A. Milne-Edwards, 1881)	Gladiator Shrimp	NA	A	Food prawn	√	√	√
80	<i>Plesionik amartia</i> (A. Milne-Edwards, 1883)	Golden Shrimp	NA	A	Edible	√	√	√
81	<i>Plesionik aqua sigrandis</i> Chace, 1985	Oriental Narwal Shrimp	NA	A	Edible	√	√	
82	<i>Psathyro carisinfirma</i> Alcock & Anderson, 1894		NA	A	Edible	Nil	Nil	Nil
83	<i>Thalassocaris lucida</i> (Dana, 1852)		NA	A	Edible	Nil	Nil	Nil
84	<i>Thalassocaris obscura</i> Gopala Menon & Williamson, 1971		NA	A	Edible	Nil	Nil	Nil

Abbreviations: NA: Not assessed, LT- Local trade; T – trade; A - India

Source: Compiled by Prof. K. V. Jayachandran, Subject Expert, Kerala State Biodiversity Board; Jayachandran, K. V., 2008. Biodiversity of marine prawns of the family Penaeidae Rafinesque, 1815 of Indian Waters. *Glimpses of Biodiversity – Rajiv Gandhi Chair Spl. Pub.*, 7 : 207-220; Radhakrishnan, E V , V. D. Deshmukh G. Maheswarudu , Jose Josileen , A. P. Dineshbabu, K. K. Philipose, P. T. Sarada, S. Lakshmi Pillai, K. N. Saleela, Rekhadevi Chakraborty, Gyanaranjan Dash, C.K. Sajeev, P. Thirumilu, B. Sridhara, Y Muniyappa, A.D.Sawant, Narayan G Vaidya, R. Dias Johny, J. B. Verma, P.K.Baby, C. Unnikrishnan, N. P. Ramachandran, A. Vairamani, A.

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Annexure 10: Coastal crab bio-resources of Kerala

Sl. No.	Scientific Name	Common Name	IUCN Status/ Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
	Family: Calappidae De Haan, 1833							
1	<i>Calappa bilineata</i> Ng, Lai & Aungtonya, 2002	Box carab	DD	K	Ecological			Yes
2	<i>Calappa calappa</i> (Linnaeus, 1758)	Box crab	DD	K	Ecological			Yes
3	<i>Calappa capellonis</i> Laurie, 1906	Box crab	DD	K	Ecological			Yes
4	<i>Calappa exanthematos</i> Alcock & Anderson, 1894	Box crab	DD	K	Ecological			Yes
5	<i>Calappa gallus</i> (Herbst, 1803)	Box crab	DD	K	Ecological			Yes
6	<i>Calappa pustulosa</i> Alcock, 1896	Box crab	DD	K	Ecological			
7	<i>Cycloesmaris rubri</i> Galil & Clark, 1996		DD	K	Ecological			

8	<i>Mursia bicristimana</i> Alcock & Anderson, 1895		DD	K	Ecological			
9	<i>Mursia curtispina</i> Miers, 1886		DD	K	Ecological			
	Family: Carpiliidae Ortmann, 1893							
10	<i>Carpilius maculatus</i> (Linnaeus, 1758)		DD	K	Ecological			
	Family: Dorippidae MacLeay, 1838		DD					
11	<i>Doripp equadridens</i> (Fabricius, 1781)		DD	K	Ecological			
12	<i>Doripp oidesfacchino</i> (Herbst, 1785)		DD	K	Ecological			
13	<i>Doripp oidesnudipes</i> Manning & Holthuis, 1986		DD	K	Ecological			
	Family: Dotillidae Stimpson, 1858		DD					
14	<i>Dotilla intermedia</i> De Man, 1888		DD	K	Ecological			
15	<i>Dotilla malabarica</i> Nobili, 1903		DD	K	Ecological			
16	<i>Dotilla myctiroides</i> H. Milne-Edwards, 1852		DD	K	Ecological			
17	<i>Dotilla myctiroides</i> H. Milne-Edwards, 1852		DD	K	Ecological			
18	<i>Scopimer aproxima</i> Kemp, 1919		DD	K	Ecological			
	Family: Dromiidae De Haan, 1833		DD					
19	<i>Homalodromia coppingeri</i> Miers, 1884		DD	K	Ecological			
	Family: Epialtidae MacLeay, 1838		DD					
20	<i>Acanthonyx scutellatus</i> MacLeay, 1838		DD	K	Ecological			
21	<i>Doclea muricata</i> (Fabricius, 1788)		DD	K	Ecological			

22	<i>Doclea ovis</i> (Fabricius,1787)		DD	K	Ecological			
23	<i>Doclearis soni</i> Leach, 1815		DD	K	Ecological			
24	<i>Hyastenus planasius</i> (Adams & White, 1848)		DD	K	Ecological			
25	<i>Hyastenus pleione</i> (Herbst, 1803)		DD	K	Ecological			
26	<i>Menaethius monoceros</i> (Latreille, 1825)		DD	K	Ecological			
27	<i>Oxypleurodon aurorae</i> (Alcock, 1899)		DD	K	Ecological			
28	<i>Rochiniarivers andersoni</i> (Alcock,1895)		DD	K	Ecological			
29	<i>Simocarcinus camelus</i> Klunzinger, 1906		DD	K	Ecological			
30	<i>Simocarcinus simplex</i> (Dana, 1852)		DD	K	Ecological			
	Family: Ethusidae Guinot, 1977		DD					
31	<i>Ethusa indica</i> Alcock,1894		DD	K	Ecological			
	Family: Geryonidae Colosi, 1923		DD					
32	<i>Chaceon alcocki</i> Ghosh & Manning, 1993		DD	K	Ecological			
	Family: Goneplacidae MacLeay, 1838		DD					
33	<i>Carcinoplax fasciata</i> Ng & Kumar, 2016		DD	K	Ecological			
34	<i>Carcinoplax longipes</i> (Wood-Mason, in Wood-Mason & Alcock,1891)		DD	K	Ecological			
35	<i>Carcinoplax specularis</i> Rathbun, 1914		DD	K	Ecological			

	Family: Grapsidae MacLeay, 1838						
36	<i>Grapsus albolineatus</i> Latreille, in Milbert, 1812		DD	K	Ecological		
37	<i>Metopograpsus messor</i> (Forsk., 1775)		DD	K	Ecological		
	Family: Hexapodidae Miers, 1886		DD	K	Ecological		
38	<i>Hexapussexpes</i> (Fabricius, 1798)		DD	K	Ecological		
	Family: Homolidae De Haan, 1839		DD				
39	<i>Gordonopsis profundorum</i> (Alcock & Anderson, 1899)		DD	K	Ecological		
39	<i>Lamohalongipes</i> (Alcock & Anderson, 1899)		DD	K	Ecological		
40	<i>Molohatumida</i> Ng & Kumar, 2015		DD	K	Ecological		
41	<i>Paramolopsis boasi</i> Wood-Mason, in Wood-Mason & Alcock, 1891		DD	K	Ecological		
	Family: Homolodromiidae Alcock, 1899		DD				
42	<i>Dicranodromia baffini</i> (Alcock & Anderson, 1899)		DD	K	Ecological		
	Family: Hymenosomatidae MacLeay, 1838		DD				
43	<i>Rhynchoplax messor</i> Stimpson, 1858		DD	K	Ecological		
44	<i>Neorhynchoplax lcocki</i> (Kemp, 1917)		DD	K	Ecological		
45	<i>Neorhynchoplax ttenuipes</i>		DD	K	Ecological		

	(Chopra & Das, 1930)						
46	<i>Neorhynchopla xtuberculata</i> (Chopra & Das, 1930)		DD	K	Ecological		
47	<i>Rhynchoplax messor</i> (Stimpson, 1858)		DD	K	Ecological		
	Family: Inachidae MacLeay, 1838		DD				
48	<i>Achaeus curvirostris</i> (A. Milne- Edwards, 1873)		DD	K	Ecological		
49	<i>Achaeus lacertosus</i> Stimpson, 1858		DD	K	Ecological		
50	<i>Cyrtomaia suhmii</i> Miers, 1885		DD	K	Ecological		
51	<i>Encephaloi desriver sander soni</i> Alcock, 1899		DD	K	Ecological		
52	<i>Grypachae ushyalinus</i> Alcock & Anderson, 1899		DD	K	Ecological		
53	<i>Physachae usctenurus</i> Alcock, 1895		DD	K	Ecological		
	Family: Iphiculidae Alcock, 1896		DD				
54	<i>Pariphiculus coronatus</i> (Alcock & Anderson, 1894)		DD	K	Ecological		
55	<i>Pariphiculus mariannae</i> (Herklots, 1852)		DD	K	Ecological		
	Family: Leucosiidae Samouelle, 1819		DD	K	Ecological		
56	<i>Arcania brevifrons</i> Chen, 1989		DD	K	Ecological		
57	<i>Arcania cornuta</i> (MacGilchrist, 1905)		DD	K	Ecological		
58	<i>Arcania gracilis</i> Henderson, 1893		DD	K	Ecological		
59	<i>Euclosia nacroisneri</i> (Chen, 1989)		DD	K	Ecological		

60	<i>Euclosiana nitida</i> (Galil, 2003)		DD	K	Ecological			
61	<i>Euclosian aobtusifrons</i> (De Haan, 1841)		DD	K	Ecological			
62	<i>Ixainermis</i> Leach, 1817		DD	K	Ecological			
63	<i>Leucis carubifera</i> (Muller, 1887)		DD	K	Ecological			
64	<i>Lyphira heterograna</i> (Ortmann, 1892)		DD	K	Ecological			
65	<i>Lyphira perplexa</i> Galil, 2009		DD	K	Ecological			
66	<i>Myra fugax</i> (Fabricius, 1798)		DD	K	Ecological			
67	<i>Myra pernix</i> Galil, 2001		DD	K	Ecological			
68	<i>Nursiana suta</i> Alcock, 1896		DD	K	Ecological			
69	<i>Oreophorus reticulates</i> Adams & White, 1849		DD	K	Ecological			
70	<i>Paranursia abbreviate</i> (Bell, 1855)		DD	K	Ecological			
71	<i>Philyra corallicola</i> Alcock, 1896		DD	K	Ecological			
72	<i>Philyra globus</i> (Fabricius, 1775)		DD	K	Ecological			
73	<i>Philyra malefactrix</i> (Kemp, 1915)		DD	K	Ecological			
74	<i>Philyra scabriuscula</i> (Fabricius, 1798)		DD	K	Ecological			
75	<i>Philyra syndactyla</i> Ortmann, 1892		DD	K	Ecological			
76	<i>Seulocia pubescens</i> (Miers, 1877)		DD	K	Ecological			
77	<i>Seulocia marmoreal</i> (Bell, 1855)		DD	K	Ecological			
78	<i>Tanaoa granulosa</i> (Alcock & Anderson, 1894)		DD	K	Ecological			
79	<i>Tanaoa pustulosus</i> (Wood-Mason, in Wood-Mason & Alcock, 1891)		DD	K	Ecological			
80	<i>Urashima lamellidentatus</i> (Wood-Mason, 1892)		DD	K	Ecological			

81	<i>Urnanalanam argaritata</i> (A. Milne-Edwards, 1873)		DD	K	Ecological			
	Family: Lyreididae Guinot, 1993		DD					
82	<i>Lysirudech anneri</i> (Wood-Mason, 1885)		DD	K	Ecological			
	Family: Macrophthalmidae Dana, 1851		DD					
83	<i>Macrophthalmus (Macrophthalmus) brevis</i> (Herbst, 1804)		DD	K	Ecological			
84	<i>Macrophthalmus (Mareotis) pacificus</i> Dana, 1851		DD	K	Ecological			
	Family: Mathildellidae Karasawa & Kato, 2003		DD					
85	<i>Mathildella sinclairi</i> (Alcock & Anderson, 1899)		DD	K	Ecological			
	Family: Matutidae De Haan, 1835		DD					
86	<i>Ashtoret lunaris</i> (Forsk., 1775)	Eight oared swimming crab	DD	K	Ecological			
87	<i>Ashtoret miersi</i> (Henderson, 1887)	Eight oared swimming crab	DD	K	Ecological			
88	<i>Matutaplanipes</i> Fabricius, 1798	Eight oared swimming crab	DD	K	Ecological			
89	<i>Matuta victor</i> (Fabricius, 1781)	Eight oared swimming crab	DD	K	Ecological			
	Family: Menippidae Ortmaan, 1893		DD					

90	<i>Menippe rumphii</i> (Fabricius, 1798)		DD	K	Ecological			Yes
91	<i>Myomenippe hardwickii</i> (Gray, 1831)		DD	K	Ecological			
	Family: Ocypodidae Rafinesque, 1815		DD					
92	<i>Austruca annulipes</i> (H. Milne-Edwards, 1837)		DD	K	Ecological			
93	<i>Austruca lacteal</i> (De Haan, 1835)		DD	K	Ecological			
94	<i>Austruca perplexa</i> (H. Milne-Edwards, 1837)		DD	K	Ecological			
95	<i>Austruca sindensis</i> (Alcock, 1900)		DD	K	Ecological			
96	<i>Gelasimus vocans</i> (Linnaeus, 1758)		DD	K	Ecological			
97	<i>Ocypode brevicornis</i> H. Milne-Edwards, 1837	Ghost crab	DD	K	Ecological			
98	<i>Ocypode ceratophthalmus</i> (Pallas, 1772)	Ghost crab	DD	K	Ecological	food		yes
99	<i>Ocypode cordimana</i> Latreille, 1818	Ghost crab	DD	K	Ecological			
100	<i>Tubucadussumieri</i> (H. Milne-Edwards, 1852)		DD	K	Ecological			
	Family: Oziidae Dana, 1851		DD					
101	<i>Epixanthus frontalis</i> (H. Milne-Edwards, 1834)		DD	K	Ecological			
102	<i>Oziusrugulosus</i> Stimpson, 1858		DD	K	Ecological			
103	<i>Ozius tuberculosis</i> H. Milne-Edwards, 1834		DD	K	Ecological			
	Family: Parthenopidae MacLeay, 1838		DD					
104	<i>Cryptopodi aechinosa</i> Chiong& Ng,		DD	K	Ecological			

	1998						
105	<i>Parthenope longimanus</i> (Linnaeus, 1758)		DD	K	Ecological		
106	<i>Pseudolam bruscalappoides</i> (Linnaeus, 1764)		DD	K	Ecological		
	Family: Pilumnidae Samouelle, 1819		DD				
107	<i>Actumnus squamosus</i> (De Haan, 1835)		DD	K	Ecological		
108	<i>Benthopanope indica</i> (De Man, 1887)		DD	K	Ecological		
109	<i>Eurycarcinus orientalis</i> A. Milne-Edwards, 1867		DD	K	Ecological		
110	<i>Heteropanope glabra</i> Stimpson, 1858		DD	K	Ecological		
111	<i>Heteropilumnus ciliates</i> (Stimpson, 1858)		DD	K	Ecological		
112	<i>Pilumnus minutes</i> De Haan, 1895		DD	K	Ecological		
113	<i>Serenepilumnus pisifer</i> (MacLeay, 1838)		DD	K	Ecological		
114	<i>Typhlocarcinus kerala</i> Ng. Devi & Kumar, 2017		DD	K	Ecological		
115	<i>Zebrida adamsii</i> White, 1847		DD	K	Ecological		
	Family: Pinnotheridae De Haan, 1833		DD				
116	<i>Abyssotheresa byssicola</i> (Alcock & Anderson, 1899)		DD	K	Ecological		
117	<i>Afropinnothere sratnakara</i> Ng &		DD	K	Ecological		

	Kumar, 2015						
118	<i>Arcotheres casta</i> (Antony & Kuttyama, 1971)		DD	K	Ecological		
119	<i>Arcotheres ridgewayi</i> (Southwell, 1901)		DD	K	Ecological		
120	<i>Nepinnothere ssanguinolariae</i> (Pillai, 1951)		DD	K	Ecological		
	Family: Plagusiidae Dana, 1851		DD				
121	<i>Plagusia depressa</i> (Fabricius, 1775)		DD	K	Ecological		
122	<i>Plagusia squamosa</i> (Herbst, 1790)		DD	K	Ecological		
	Family: Portunidae Rafinesque, 1815		DD				
123	<i>Charybdis (Charybdis) amboinensis</i> Leene, 1938		DD	K	Ecological		
124	<i>Charybdis (Charybdis) annualata</i> Fabricius, 1798	Banded leg swimming crab	DD	K	Ecological	Trade	Yes
125	<i>Charybdis (Charybdis) brevispinosa</i> Leene, 1937		DD	K	Ecological		
126	<i>Charybdis (Charybdis) callianassa</i> (Herbst, 1798)		DD	K	Ecological		
127	<i>Charybdis (Charybdis) feriata</i> (Linnaeus, 1758)	Crucifix crab	DD	K	Ecological	Trade	Yes
128	<i>Charybdis (Charybdis) hellerii</i> (A. Milne-Edwards, 1867)		DD	K	Ecological		
129	<i>Charybdis (Charybdis) lucifera</i> (Fabricius, 1798)	Yellowish brown crab	DD	K	Ecological	Trade	Yes
130	<i>Charybdis (Charybdis) miles</i> (De Haan, 1835)		DD	K	Ecological		

131	<i>Charybdis (Charybdis) natator</i> (Herbst, 1794)	Ridged swimming crab	DD	K	Ecological	Trade		Yes
132	<i>Charybdis (Charybdis) riversandersoni</i> Alcock 1899		DD	K	Ecological			
133	<i>Charybdis (Charybdis) variegata</i> (Fabricius, 1798)		DD	K	Ecological			
134	<i>Charybdis (Goniohellenus) hoplites</i> (Wood-Mason, 1877)		DD	K	Ecological			
135	<i>Charybdis (Goniohellenus) omanensisomanensis</i> Leene, 1938		DD	K	Ecological			
136	<i>Charybdis (Goniohellenus) omanensisseptentrionalis</i> Turkay& Spiridonov 2006		DD	K	Ecological			
137	<i>Charybdis (Goniohellenus) smithii</i> MacLeay, 1838	Swimming crab	DD	K	Ecological	Trade		Yes
138	<i>Cycloachelous granulatus</i> (H. Milne-Edwards, 1834)		DD	K	Ecological			
139	<i>Lissocarcinus laevis</i> Miers, 1886		DD	K	Ecological			
140	<i>Lissocarcinus polybiodes</i> Adams & White, 1849		DD	K	Ecological			
141	<i>Monomia argentata argentata</i> (A. Milne-Edwards, 1861)		DD	K	Ecological			
142	<i>Monomia gladiator</i> (Fabricius, 1798)		DD	K	Ecological			
143	<i>Podophthalmus vigil</i> (Fabricius, 1798)	Sentinel crab	DD	K	Ecological	Trade		Yes
144	<i>Portunus reticulates</i> (Herbst, 1799)	Blue reticulate crab	DD	K	Ecological	Trade		Yes

145	<i>Portunus sanguinolentus</i> (Herbst, 1783)	Three spotted crab	DD	K	Ecological	Trade		Yes
146	<i>Portunus pelagicus</i> (Herbst, 1783)	Blue swimming crab	DD	K	Ecological	Trade		Yes
147	<i>Scylla olivacea</i> (Herbst, 1796)	Orange mud crab	DD	K	Ecological	Trade		Yes
148	<i>Scylla serrata</i> (Forsk., 1775)	Giant mud crab	DD	K	Ecological	Trade		Yes
149	<i>Thalamita crenata</i> (Latreille, 1829)		DD	K	Ecological			
150	<i>Thalamita taprobanica</i> Alcock, 1899		DD	K	Ecological			Yes
151	<i>Thalamita woodmasoni</i> Alcock, 1899		DD	K	Ecological			Yes
152	<i>Xiphonectes hastatoides</i> (Fabricius, 1798)		DD	K	Ecological			
	Family: Polybiidae Ortmann, 1893		DD					
153	<i>Parathranites orientalis</i> (Miers, 1886)		DD	K	Ecological			
	Family: Raninidae De Haan, 1839		DD					
154	<i>Notosceles serratifrons</i> (Henderson, 1893)		DD	K	Ecological			
	Family: Sedarmidae Dana, 1851		DD					
155	<i>Clistocoelom abalansae</i> (A. Milne-Edwards, 1873)		DD	K	Ecological			
156	<i>Clistocoelom alanatum</i> (Alcock, 1900)		DD	K	Ecological			
157	<i>Clistocoelom amerguense</i> De Man,		DD	K	Ecological			

	1888						
158	<i>Epises armamederi</i> (H. Milne-Edwards, 1854)		DD	K	Ecological		
159	<i>Metases armaobesum</i> (Dana, 1851)		DD	K	Ecological		
160	<i>Nanoses armaandersonii</i> (De Man, 1887)		DD	K	Ecological		
161	<i>Nanoses armabatavicum</i> (Moreira, 1903)		DD	K	Ecological		
162	<i>Neosarmatium indicum</i> (A. Milne-Edwards, 1868)		DD	K	Ecological		
163	<i>Neosarmatium malabaricum</i> (Henderson, 1893)		DD	K	Ecological		
164	<i>Neosarmatium punctatum</i> (A. Milne-Edwards, 1873)		DD	K	Ecological		
165	<i>Parases armapictum</i> (De Haan, 1835)		DD	K	Ecological		
166	<i>Parases armaplicatum</i> (Latreille, 1803)		DD	K	Ecological		
167	<i>Perisesa rmabidens</i> (De Haan, 1835)		DD	K	Ecological		
168	<i>Pseudoses armaedwardsii</i> (De Man, 1887)		DD	K	Ecological		
169	<i>Pseudoses armaglabrum</i> Ng, Rani & Bijoy Nandan, 2017		DD	K	Ecological		
170	<i>Selatium brockii</i> (De Man, 1887)		DD	K	Ecological		
	Family: Trapeziidae Miers, 1886		DD				
171	<i>Quadrella coronata</i> Dana, 1852		DD	K	Ecological		
	Family: Trichopeltariidae Tavares		DD		Ecological		

	&Cleva, 2010						
172	<i>Trichopeltarion glaucus</i> (Alcock & Anderson, 1899)		DD	K	Ecological		
	Family :Varunidae H. Milne Edwards, 1853		DD				
173	<i>Parapyxidognathus deianira</i> (De Man, 1888)		DD	K	Ecological		
174	<i>Varunalit terata</i> (Fabricius, 1798)		DD	K	Ecological		
	Family: Xanthidae MacLeay, 1838						
175	<i>Actiomeriaerythra</i> (Lanchester, 1902)		DD	K	Ecological		
176	<i>Atergatis laevigatus</i> A. Milne-Edwards, 1865		DD	K	Ecological		
177	<i>Atergati sreticulants</i> (De Haan, 1835)		DD	K	Ecological		
178	<i>Euxanthusexs culptus</i> (Herbst, 1790)		DD	K	Ecological		
178	<i>Nectopanoper hodobaphes</i> Wood-Mason, in Wood-Mason & Alcock, 1891		DD	K	Ecological		
180	<i>Sereniuspilosus</i> (A. Milne-Edwards, 1867)		DD	K	Ecological		
	Family: Xenophthalmidae Stimpson, 1858		DD				
181	<i>Neoxenophthalmus garthii</i> (Sankarankutty, 1969)		DD	K	Ecological		
	Family: Calappidae De Haan,		DD				

	1833						
182	<i>Neoxenophthalmus pinnotheroidesi</i> White, 1846		DD	K	Ecological		

Abbreviations :DD – Data Deficient; E- Ernakulam district, K – Kerala

Source :Various sources : Compiled by Dr.K. V. Jayachandran, Subject Expert, KSBB; Dr.Josileen Jose, CMFRI, lecture note submitted to KSBB

Annexure 11: Lobster bio-resources of marine water of Kerala

Sl. No.	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Startup possibility
1	<i>Metanephrops andamanicus</i> (Wood- Manson, 1892)	Indian ocean lobsterette	NE	K	√	√	√	√
2	<i>Nephropsis stewarti</i> (Wood- Manson,1872)	Indian Ocean Lobsterette	NE	K	√	√	√	√
3	<i>Palinustus waguensis</i> Kubo, 1963		NE	K	√	√	√	√
4	<i>Panuliru slongipeslongipes</i> (A. Milne-Edwards, 1868)		NE	K	√	√	√	√
5	<i>Panulirus penicillatus</i> (Olivier, 1794)		NE	K	√	√	√	√
6	<i>Panulirus homarushomarus</i> (Linnaeus, 1758)	Scalloped Spiny Lobster	NE	K	√	√	√	√
7	<i>Panulirus ornatus</i> (Fabricius,1798)	Ornate Rock Lobster	NE	K	√	√	√	√

8	<i>Panulirus polyphagus</i> (Herbst, 1793)	Spiny Lobster	NE	K	√	√	√	√
9	<i>Panulirus versicolor</i> (Latreille, 1804)	Painted Rock Lobster	NE	K	√	√	√	√
10	<i>Peurulus sewelli</i> Ramadaan, 1938		NE	K	√	√	√	√
11	<i>Thenusunim aculatus</i> Burton & Davie, 2007	Slipper Lobster	NE	K	√	√	√	√

Abbreviaton: N E – Not evaluated

Source: Various sources; Compiled by Dr. K. V. Jayachandran, Subject Expert Aquatic systems, RKI Project, KSBB

Annexure 12: Molluscan bioresources of marine ecosystems of Kerala

Table 5.3.7a: Consolidated checklist of molluscan bio-resources of marine ecosystems of Kerala								
Sl. No.	Scientific Name	Common Name	IUCN Status/Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of start up
1	<i>Agaronia gibbosa</i> (Born, 1778)		NE	K				
2	<i>Agaronia nebulosi</i> (Lamarck, 1822)		NE	K				
3	<i>Amphioctopus dolfusi</i> Robson, 1928	Marbled octopus	LC	K				

4	<i>Amphioctopus marginatus</i> (Taki,1964)	Coconut octopus/veined octopus	LC	K				
5	<i>Amphioctopus neglectus</i> (Nateewathana & Norman, 1999)	Neglectus octopus	LC	K				
6	<i>Amphioctopus rex</i> (Nateewathana& Norman, 1999)	Rex Octopus	LC	K				
7	<i>Anadarain equivalvis</i> (Bruguiere,1789)		NE	K	food	√	√	√
8	<i>Ancilla ampla</i> (Gmelin, 1791)		NE	K				
9	<i>Aplysia oculifera</i> (A. Adams & Reeve,1850)	Spotted sea Hare	NE	K				
10	<i>Architectonia perspectiva</i> (Linnaeus, 1758)		NE	K				
11	<i>Architectonica laevigata</i> (Lamarck,		NE	K				
12	<i>Armina sp.</i>		NE	K				
13	<i>Babylon zeylanica</i> (Bruguiere, 1789)	Indian/Perforated Babylon	NE	K	Food export	√	√	√
14	<i>Babylonia spirata</i> (Linnaeus,1758)	Spiral Babylon	NE	K	Food, export	√	√	√
15	<i>Berthellina sp.</i>		NE	K				
16	<i>Biplexperca</i> Perry, 1811	Winged Frog Shell	NE	K				
17	<i>Bufo naria crumena</i> (Lamark, 1816)	Friiled Frog Shell	NE	K				

18	<i>Bufo naria echinate</i> (Link ,1807)	Springy Frog Shell	NE	K				
19	<i>Bufo naria rana</i> (Linnaeus, 1758)	Common Frog Shell	NE	K				
20	<i>Bulla ampulla</i> (Linnaeus,1758)		NE	K				
21	<i>Bullia belangeri</i>		NE	K				
22	<i>Bullia vittate</i> (Linnaeus,1767)	Ribbon Bullia	NE	K				
23	<i>Callista erycina</i> (Linnaeus,1758)		NE	K				
24	<i>Callistoctopus lechenaultii</i> (d'Oribigny [in Ferussac&d'orbigny],1826)		DD	K				
25	<i>Cantharus melanostoma</i> (G.B Sowerby I,1825)		NE	K				
26	<i>Cantharus spiralis</i> (Gray,1839)	Ridged Goblet	NE	K				
27	<i>Cantharus tranquebaricus</i> (Gmelin,1791)	Tranquebar Goblet	NE	K				
28	<i>Cardites bicolor</i> (Lamarck,1819)		NE	K				
29	<i>Cellana radiata radiata</i> (Born ,1778)	Rayed Wheal Limpet	NE	K				
30	<i>Cerithiacea cingulate</i> (Gmelin, 1791)		NE	K				
31	<i>Chicoreus brunneus</i> (Link,1807)	Burnt/ Adjusta Murex	NE	K				
32	<i>Chicoreus ramosus</i> (Linnaeus, 1758)	Cosmopoliton Hairy Trilon	NE	K				
33	<i>Chione tiara</i>		NE	K				

34	<i>Circe scripta</i> (Linnaeus,1758)		NE	K				
35	<i>Cistopusincidus</i> Raap,1835	Pouched Octopus	LC	K	√	√		√
36	<i>Clypidinanotate</i> (Linnaeus, 1758)	Black-ribbed Limpets	NE	K				
37	<i>Conus amadis</i> Gmelin,1791	Amadis cone	NE	K				√
38	<i>Conus betulinus</i> (Linnaeus, 1758)	Beach cone	NE	K				√
39	<i>Conus geographus</i> (Linnaeus,1758)	Geographic cone	NE	K				√
40	<i>Conus inscriptus</i> (Indicus Rockel, 1979)	Inscriptus cone	NE	K				√
41	<i>Conusmilnee dwardsi</i> Jousseume,1894	Glory of India	NE, Sch I (IV B)	K				√
42	<i>Conus textile</i> (Linnaeus, 1758)	Cloth of Gold cone	NE	K				√
43	<i>Crassostrea madrasensis</i> (Preston, 1916)	Indian Backwater oyster	NE	K	√	√		√
45	<i>Cymatium perryil</i> Emerson & old, 1963	Perry's Triton	NE	K				
46	<i>Cymatium tripus</i> (Gmelin, 1791)	Tripus Triton	NE	K				
47	<i>Dentallium</i> sp.		NE	K				
48	<i>Distorsio reticularis</i> (Linnaeus, 1758)	Reticulate distortsio	NE	K				
49	<i>Donax faba</i> (Gmelin,1791)		NE	K				√
50	<i>Donax lubricus</i> (Hanley,1845)		NE	K				√
51	<i>Donax scrotum</i>		NE	K				√

	(Linnaeus,1758)							
52	<i>Doryteuthis singhalensis</i> (Ortmann,1891)	Long Barrel Squid	DD	K	√	√		√
53	<i>Dosinia cretacea</i> (Reeve,1850)		NE	K				
54	<i>Duplicaria duplicata</i> (Linnaeus,1758)		NE	K				
55	<i>Elysia sp.</i>		NE	K				
56	<i>Epitoniumla mellosum</i> (Lamarck, 1822)	Lamellose wentletrap	NE	K				
57	<i>Epitonium scalare</i> (Linnaeus,1758)	Precious Wentletrap	NE	K				
58	<i>Euprymna stenodactyla</i> (Grant,1833)	Bobtail squids	NE	K				
59	<i>Ficus ficus</i> (Linnaeus, 1758)	Paper Fig Shell	NE	K				
60	<i>Ficus gracilis</i> (G. B Sowerby I, 1825)	Elongate Fig Shell	NE	K				
61	<i>Ficus variegata</i> Roding, 1798	Common Fig Shell	NE	K				
62	<i>Fusinus nicobaricus</i> (Roding,1798)	Nicobar spindle	NE	K				
63	<i>Fusinus spindle</i> (Linnaeus, 1758)	Distaff spindle	NE	K				
64	<i>Gyrineum natator</i> (Roding 1798)	Tuberculara Gyre Triton	NE	K				
65	<i>Harpa major</i> (Roding 1798)	Major Harp	NE	K				
66	<i>Harpulina loroisi</i> (valenciennes 1863)	Lorois's volute	NE	K				
67	<i>Haustellum haustellum</i>	Snipe's Bill Murex	NE	K				

	(Linnaeus, 1758)							
68	<i>Hydatina zonata</i> (lightfoot,1786)		NE	K				
69	<i>Laevistrombus canarium</i> (Linnaeus, 1758)	Yellow conch/Dog conch	NE	K			√	
70	<i>Linatella caudata</i> (Gmelin, 1791)	Girdled Triton	NE	K				
71	<i>Littorina scabra</i> (Linnaeus, 1758)	Mangrove Periwinkle	NE	K				
72	<i>Littorina undulata</i> Gray, 1839	Undulate Periwinkle	NE	K				
73	<i>Lobige rviridis</i> Pease,1863	Tendrill slug	NE	K				
74	<i>Loligo duvauceii</i> (d'orbigny,1835)	Indian Squid	NE	K	√	√		√
75	<i>Lophioturris indica</i> (Deshayes, 1833)		NE	K				
76	<i>Lunarca ovalis</i> (Bruguier, 1789)		NE	K				
77	<i>Mactra antiquata</i> (Spengler,1802)		NE	K				
78	<i>Mactra violacea</i> (Gmelin,1791)		NE	K				
79	<i>Marcia opima</i> (Gmelin,1791)		NE	K	√	√		√
80	<i>Margistrombus marginatus</i> (Linnaeus, 1758)	Marginate conch	NE	K			√	
81	<i>Meretrix casta</i> (Gmelin,1791)		NE	K	√	√		√
82	<i>Meretrix meretrix</i> (Linnaeus,1758)		NE	K	√	√		√
83	<i>Mesocibotabistrigata</i>		NE	K				

	(Dunker,1866)							
84	<i>Mitra ambigua</i> (Swainson,1829)		NE	K				
85	<i>Mitra mitra</i> (Linnaeus, 1758)		NE	K				
86	<i>Monoplex aquaticus</i>	Hairy Triton	NE	K				
87	<i>Monoplexvespaceus</i> (Linnaeus, 1822)	Dwarf Hairy Triton	NE	K				
88	<i>Murex carbonnieri</i> (Linnaeus, 1758)	Carbonnier's Murex	NE	K				√
89	<i>Murex ternispina</i> (Lamark ,1822)	Triple-spihed/Black-spined Murex	NE	K			√	√
90	<i>Murex trapa</i> (Roding,1798)	Rare-spined Murex	NE	K			√	√
91	<i>Murex tribulus</i> (Linnaeus, 1758)	Caltrop Murex	NE	K			√	√
92	<i>Nassaria acuminata</i> (Reeve,1844)	Acuminate Phos	NE	K				
93	<i>Nassaria coromandelica</i> (E.A Smith,1894)	Indian Phos	NE	K				
94	<i>Nassaria pusilla</i> (Roding, 1798)	White Phos	NE	K				
95	<i>Nassarius conoidalis</i> (Deshayes,1833)	Cone-shaped Nassa Jewel Dog Whelk	NE	K				
96	<i>Nassariusluridus</i> (Gould,1850)		NE	K				
97	<i>Nassariusstolatus</i> (Gmelin,1791)		NE	K				

98	<i>Nerita (Linnerita) polital</i> Linnaeus, 1758	Polish Nerite	NE	K			√	√
99	<i>Nerita (Thelliostyla) textilis</i> Gmelin, 1791	Textile Nerite	NE	K				√
100	<i>Nerita albicilla</i> Linnaeus 1758	Blotched Nerite	NE	K			√	√
101	<i>Nerita violacea</i> Gmelin, 1791	Violet Nerite	NE	K			√	√
102	<i>Octopus cyanea</i> Gray, 1849	Common Reef Octopus	LC	K	√	√		√
104	<i>Octopus vulgaris</i> (Cuvier, 1797)	Common octopus	LC	K	√	√		√
105	<i>Oliva olive</i> (Linnaeus, 1758)		NE	K				
106	<i>Paphia malabarica</i> (Dillwyn, 1817)		NE	K	√	√		√
107	<i>Paphia textile</i> (Gmelin, 1791)		NE	K				√
108	<i>Pernaperna</i> (Linnaeus, 1758)	Brown mussel	NE	K	√	√		√
109	<i>Pernaviridis</i> (Linnaeus, 1758)	Asian Green Mussel	NE	K	√	√		√
110	<i>Phalium canaliculatum</i> Euthyme, 1885		NE	K				
111	<i>Phalium glaucum</i> (Linnaeus, 1758)	Grey Bonnet	NE	K				
112	<i>Phidiana militaris</i> (Alder & Hancock, 1864)	Fire Noodi	NE	K				
113	<i>Pinctada margaritifera</i> (Linnaeus 1758)	Black-lip pearl oyster	NE	K	√	√		√
114	<i>Pinctada sugillata</i> (Reeve, 1857)		NE	K		√		√
115	<i>Pinna bicolor</i> Gmelin, 1791		NE	K				√

116	<i>Plaxiphora tricolor</i> Thiele, 1909		NE	K				
117	<i>Pleuroploca trapezium</i> (Linnaeus,1758)	Trapezium Horse Conch	NE	K				
118	<i>Polliandosa</i> (Linnaeus,1758)	Waved Goblet	NE	K				
119	<i>Pteriaavricula</i> (sic)		NE	K		√		
120	<i>Pteroctopuskeralensis</i> (Oommen,1966)	Kerala octopus	NE	K				
121	<i>Pugilina cochlidium</i> (Linnaeus,1758)	Melon shell	NE	K				
122	<i>Purpura persica</i> (Linnaeus,1758)	Rulolph's Purpura	NE	K				
123	<i>Rapana bulbosa</i> (Dillwyn,1817)	Turnip shell	NE	K				
124	<i>Rapanarapi formis</i> (Born,1778)	Cantalope/ Turnip shell	NE	K				
125	<i>Rhinoclavis sinensis</i> (Gmelin, 1791)	Chinese Horn	NE	K				
126	<i>Rostellariell adelicatula</i> (G. Nevill, 1881)	Tibia	NE	K				
127	<i>Saccostrea cucullate</i> (Born,1778)	Rock oyster	NE	K	√	√		√
128	<i>Semicassis bisulcate</i> (Schubert & J.A Wagner, 1829)		NE	K				
129	<i>Sepia aculeate</i> Van Hasselt,1835	Needle Cuttle fish	NE	K	√	√		√
130	<i>Sepia Arabica</i> Massy,1916	Arabian Cuttle fish	NE	K	√	√		√

131	<i>Sepia kobiensis</i> Hoyle,1885	Kobi Cuttlefish	NE	K				
132	<i>Sepia pharaonic</i> Ehrenberg,1831		NE	K	√	√		√
133	<i>Sepia prabahari</i>	Small-striped cuttlefish	NE	K				
134	<i>Sepia prashadi</i> Winckworth,1936	Hooded cuttlefish	NE	K				√
135	<i>Sepiellainermis</i> (Van Hasselt,1835)	Spineless cuttlefish	NE	K	√	√		√
136	<i>Siliqua radiata</i> (Linnaeus,1758)		NE	K		√		√
137	<i>Solen lamarckii</i> Chenu,1843		NE	K				
138	<i>Strom busplica tussibbaidi</i>		NE	K				√
139	<i>Sunetta scripta</i> (Linnaeus, 1758)		NE	K				
140	<i>Sunetta solanderii</i> (Gray,1825)		NE	K				
141	<i>Tegillarca granosa</i> (Linnaeus,1758)		NE	K				
142	<i>Telescopium telescopium</i> (Linnaeus, 1758)		NE	K			√	
143	<i>Terebra babylonia</i> (Lamarck,1822)		NE	K				
144	<i>Thais bufo</i> (Linnaeus, 1822)	Toad Purpura	NE	K				√
145	<i>Thais lacera</i> (Born,1778)	Carinate rock shell	NE	K				
146	<i>Tibia</i> <i>insulaechorab</i> Roding,1798	Arabian Tibia	NE	K				
147	<i>Tonna dolium</i> (Linnaeus,		NE	K				

	1758)							
148	<i>Trachycardium angulatum</i> (Lamarck, 1819)		NE	K				
149	<i>Trigonostoma scalariformis</i> (Lamarck J.B.P.A de, 1822)	Scalariform Nutmeg	NE	K				
150	<i>Trisidos tortuosa</i> (Linnaeus, 1758)		NE	K				
151	<i>Trochus radiates</i> Gmelin, 1791	Banded Trochus/ Radiate Top shell	NE	K				
152	<i>Turbinella pyrum</i> (Linnaeus, 1767)		NE	K				√
153	<i>Turbo (Marmarostoma)</i> <i>bruneus</i> Roding, 1798	Brown Dwarf Turban	NE	K			√	
154	<i>Turbo (Marmarostoma)</i> <i>crassus</i> W. Wood, 1828	Heavy/Crass/Thic k Turban	NE	K			√	
155	<i>Turbo intercostalis</i> Menke, 1846	Ribbed/Beautiful Turban	NE	K			√	
156	<i>Turricula javana</i> (Linnaeus, 1767)		NE	K				
157	<i>Turricula tornata</i> (Dillwyn, 1817)		NE	K				
158	<i>Turrisun dosa</i> (Lamarck, 1816)		NE	K				
159	<i>Turritella attenuata</i> is Reeve, 1849		NE	K				
160	<i>Turritella columnaris</i> Kiener, 1843		NE	K				√

161	<i>Turritella duplicate</i> (Linnaeus, 1758)	Indian Purple Screw Shell	NE	K				
162	<i>Turritella duplicate</i> (Linnaeus,1758)		NE	K				√
163	<i>Tutufarubeta</i> (Linnaeus, 1758)	Red-Mouthed Frog Shell	NE	K				
164	<i>Umbonium vestiarius</i> (Linnaeus, 1758)	Vesta's Button Top Shell	NE	K				
165	<i>Uroteuthissibogae/Doryteuthis</i> Adam,1954	Sibogae Squid	DD	K	√	√		√
166	<i>Vepricardium asiaticum</i> (Bruguere,1789)		NE	K				
167	<i>Villorita cyprinoides</i> (Gray,1825)	Black clam	NE	K	√	√		√
168	<i>Vokesimurex malabaricus</i> (Smith F.A, 1894)	Malabar Murex	NE	K				√
169	<i>Volachlamy stranque baria</i> (Gmelin,1791)		NE	K				

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; K - Kerala

Source: Varioussources; compiled by Dr. K. V. Jayachandran, Subject Expert, RKI project, KSBB & Dr. Ranjith

Annexure 13. Ichthyofaunal bioresources of marine ecosystems of Kerala

Sl. No.	Scientific Name	Common Name	IUCN Status /	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
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			Other					
1.	<i>Hippocampus fuscus</i> Bleeker, 1852	Sea Pony (Chilka Seahorse)	VU		√		√	√
2.	<i>Hippocampus kuda</i> Leach, 1814	Spotted Seahorse (Yellow Seahorse)	VU		√		√	√
3.	<i>Hippocampus trimaculatus</i> (Hamilton, 1822)	Longnose Seahorse (Three-spot Seahorse)	NE		√		√	√
4.	<i>Ichthyocampuscarce</i> (Bloch, 1785)	Sudhajala Pipe Matsyam ¹	DD					
5.	<i>Syngnathoidesbiaculeatus</i> (Bleeker, 1857)	Alligator Pipe Fish	NE					
6.	<i>Trachyrhamphus bicoarctatus</i> Kaup, 1856	Double-ended Pipe Fish (Bentstick Pipefish)	NE					
7.	<i>Trachyrhamphus longirostris</i> Temminck& Schlegel, 1850)	Straightstick Pipe Fish	NE					
8.	<i>Trachyrhamphus serratus</i> Johnson, 1862	Saw Pipe Fish	NE					
9.	<i>Setarchesguentheri</i> (Richardson, 1846)	Channeled Rockfish (Deepwater Scorpionfish)	NE					
10.	<i>Brachypterois serrulata</i> Eschmeyer, Hallacher& Rama- Rao, 1979	Sawcheek Scorpionfish	LC					
11.	<i>Minousdem psterae</i> Alcock, 1889	Oblique banded Stingfish	NE					
12.	<i>Minousinermis</i>	Alcock's Scorpion	NE					

	(Bloch & Schneider, 1801)	Fish						
13.	<i>Minousmono dactylus</i> (Alcock, 1896)	Grey Goblin Fish (Grey Stingfish)	NE					
14.	<i>Parapterois macrura</i> (Bloch, 1787)	Black foot Firefish	NE					
15.	<i>Pterois antennata</i> (Bennett, 1831)	Broad barred Firefish	NE					
16.	<i>Pterois russelli</i> (Linnaeus, 1758)	Plain Tail Turkey Fish	NE					
17.	<i>Pterois volitans</i> (Quoy&Gaimard, 1824)	Red Lionfish (Winged Fire Fish)	NE					
18.	<i>Scorpaenodes guamensis</i> (Thunberg, 1793)	Guam Scorpion fish	NE					
19.	<i>Scorpaenopsis cirrhosa</i> Bloch & Schneider, 1801	Weedy Sting fish	NE					
20.	<i>Synanceia verrucosa</i> Bloch & Schneider, 1801)	Stone fish	NE					
21.	<i>Apistus carinatus</i> (Richardson, 1848)	Ocellated Wasp fish	NE					
22.	<i>Richard sonichthys leucogaster</i> Richardson, 1848	Whiteface Wasp fish	NE					
23.	<i>Choridactylus multibarbus</i> Kotthaus, 1970	Orange banded Stingfish	NE					
24.	<i>Synagrops adeni</i> (Bleeker, 1854)	Aden Splitfin	NE					
25.	<i>Dactyloptenam acracantha</i> (Cuvier, 1829)	Spotwing Flying Gurnard	NE					
26.	<i>Dactylopten aorientalis</i>	Oriental Flying	NE					

	(Nyström, 1887)	Gurnard						
27.	<i>Dactylopten apeterseni</i> Gilchrist & Thompson, 1914	Starry Flying Gurnard	NE					
28.	<i>Lepidotrigla faurei</i> Alcock, 1890	Scalybreast Gurnard	NE					
29.	<i>Lepidotrigla longipinnis</i> (Boulenger, 1888)	Sea Robin	NE					
30.	<i>Pterygotrigla arabica</i> (Lloyd, 1907)	Blackspotted Gurnard	NE					
31.	<i>Satyrichthys adeni</i> (Tilesius, 1812)	Armoured Sea Robin	NE					
32.	<i>Cociella crocodilus</i> (Linnaeus, 1758)	Crocodile Flathead (Spotted Flathead)	NE					
33.	<i>Grammoplites scaber</i> (Tilesius, 1812)	Rough Flathead	NE					
34.	<i>Inegocia japonica</i> (Cuvier, 1829)	Japanese Flathead	NE					
35.	<i>Kumococius rodericensis</i> (Linnaeus, 1758)	Spiny Flathead	DD					
36.	<i>Platycephalus indicus</i> (Cuvier, 1829)	Bartail Flathead	NE					
37.	<i>Sorsogona tuberculata</i> (Lacepède, 1802)	Tuberculated Flathead	NE					
38.	<i>Ambassis ambassis</i> Cuvier, 1828	Commerson's Glassy Perchlet ¹	NE		√	√		√
39.	<i>Ambassis dussumieri</i> (Lacepède, 1802)	Malabar Glassy Perchlet ¹	NE		√	√		√
40.	<i>Ambassis gymnocephalus</i>	Bald Glassy (Naked-	NE		√	√		√

	(Bleeker, 1874)	Head Glass Perchelet)						
41.	<i>Parambas sisdayi</i> (Bloch, 1790)	Day's Glassy Perchlet ¹	NE		√	√		√
42.	<i>Lates calcarifer</i> Bloch & Schneider, 1801	Barramundi (Giant Seaperch)	LC		√	√		√
43.	<i>Cephalopholis argus</i> (Valenciennes, 1828)	Peacock Hind (Peacock Grouper, Bluespotted Grouper)	DD		√			√
44.	<i>Cephalopholis aurantia</i> (Bloch, 1790)	Golden Hind (Golden Rock Cod)	NE					
45.	<i>Cephalopholis boenack</i> (Shaw, 1812)	Chocolate Hind	LC					
46.	<i>Cephalopholis formosa</i> (Lacepède, 1801)	Blue-Lined Hind (Blue-Lined Rockcod)	LC					
47.	<i>Cephalopholis leopardus</i> (Forsskål, 1775)	Leopard Hind	LC					
48.	<i>Cephalopholis miniata</i> (Rüppell, 1830)	Coral Hind	LC					
49.	<i>Cephalopholis sexmaculata</i> (Valenciennes, 1828)	Sixblotch Hind	LC					
50.	<i>Cephalopholis sonnerati</i> (Forster, 1801)	Tomato Hind	LC					
51.	<i>Cephalopholis urodeta</i> Bineesh & Akhilesh, 2013	Darkfin Hind	NE					
52.	<i>Chelidoperca maculicauda</i>	Indian Perchlet	NE					

	(Valenciennes, 1828)							
53.	<i>Cromileptes altivelis</i> (Forsskål, 1775)	Humpback Grouper	LC					
54.	<i>Epinephelus areolatus</i> (Vaillant, 1878)	Areolate Grouper	NT		√		√	√
55.	<i>Epinephelus bleekeri</i> (Bloch, 1790)	Duskytail Grouper	LC		√			√
56.	<i>Epinephelus caeruleopunctatus</i> (Castelnau, 1861)	White Spotted Reef Cod	DD		√	√		√
57.	<i>Epinephelus chabaudi</i> (Valenciennes, 1828)	Moustache Grouper	LC					
58.	<i>Epinephelus chlorostigma</i> (Valenciennes, 1828)	Brown spotted Grouper	NT		√	√		√
59.	<i>Epinephelus diacanthus</i> (Temminck & Schlegel, 1842)	Spiny cheek Grouper	DD		√	√		√
60.	<i>Epinephelus epistictus</i> (Forsskål, 1775)	Dotted Grouper	LC					
61.	<i>Epinephelus fasciatus</i> (Lacepède, 1802)	Black tip Grouper	LC					
62.	<i>Epinephelus flavocaeruleus</i> (Forsskål, 1775)	Blue and Yellow Grouper	NT					
63.	<i>Epinephelus fuscoguttatus</i> (Temminck & Schlegel, 1842)	Brown-Marbled Grouper	DD					
64.	<i>Epinephelus latifasciatus</i> (Kner, 1864)	Striped Grouper	LC					
65.	<i>Epinephelus longispinis</i> (Bloch, 1790)	Long spine Grouper	NE					

66.	<i>Epinephelus maculatus</i> Bloch & Schneider, 1801)	Spotted Rockcod	NT					
67.	<i>Epinephelus malabaricus</i> (Bloch, 1793)	Malabar Grouper	LC		√	√		√
68.	<i>Epinephelus merra</i> (Day, 1868)	Honeycomb Grouper (Wire- Netting Reef- Cod)	LC					
69.	<i>Epinephelus radiatus</i> (Forsk, 1775)	Oblique-Banded Grouper	DD					
70.	<i>Epinephelus tauvina</i> (Quoy&Gaimard, 1824)	Greasy Grouper	DD		√	√		√
71.	<i>Epinephelus undulosus</i> (Thunberg, 1792)	Wavy-Lined Grouper	NE					
72.	<i>Grammistessex lineatus</i> (Guichenot, 1863)	Sixstripe Soapfish	NE					
73.	<i>Liopropoma lunulatum</i> Akhilesh, Bineesh & White,2012	Basslet	NE					
74.	<i>Liopropomalandalli</i> Randall &Heemstra, 2008	Randall's Basslet	NE					
75.	<i>Meganthias filiferus</i> Bineesh, Akhilesh, Gopalakrishnan & Jena, 2014	Filamentous Anthiine	NE					
76.	<i>Plectranthiasa lcocki</i> (Lacepede, 1801)	Alcock's Deep-reef Basslet	VU					
77.	<i>Plectropomus laevis</i> (Bloch, 1790)	BlacksaddledCoralgr ouper	LC					
78.	<i>Plectropomus maculatus</i>	Spotted	NE					

	(Kamohara, 1955)	Coralgrouper						
79.	<i>Pseudanthias fasciatus</i> Randall & Hoover, 1993	One-stripe Anthias	NE					
80.	<i>Pseudanthias marcia</i> (Heemstra, 1973)	Marcia's Anthias	NE					
81.	<i>Sacurabou lengeri</i> Rüppell, 1830	Boulenger's Anthias	NE					
82.	<i>Opisthognathus nigromarginatus</i> Smith-Vaniz, Bineesh & Akhilesh, 2012	Birdled Jawfish	NE					
83.	<i>Opisthognathus pardus</i> (Bloch, 1790)	Leopard Jawfish	NE					
84.	<i>Pelates quadrilineatus</i> (Forsskal, 1775)	Fourlined Terapon	LC					
85.	<i>Terapon jarbua</i> Cuvier, 1829	Crescent Perch (Jarbua Terapon, Squeaking Perch) ¹	NE					
86.	<i>Terapon puta</i> Cuvier, 1829	Small-Scaled Terapon	NE					
87.	<i>Terapon theraps</i> (Lacepede, 1801)	Largescaled Terapon	NE					
88.	<i>Hetero priacanthus cruentatus</i> (Forsk., 1775)	Glasseye	NE					
89.	<i>Priacanthus hamrur</i> Richardson, 1846	Moontail Bullseye (Crescent Tail Big Eye)	NE					
90.	<i>Priacanthus tayenus</i>	Purple-Spotted	NE		√	√		√

	(Lacepede, 1802)	Bigeye						
91.	<i>Ostorhinchus aureus</i> (Cuvier, 1828)	Ring-Tailed Cardinalfish (Band Tail Cardinal Fish)	NE					
92.	<i>Apogon multitaeniatus</i> Cuvier, 1828	Smallscale Cardinal Fish	NE					
93.	<i>Apogon poecilopterus</i> Gilchrist, 1903	Pearly-Finned Cardinal Fish	NE					
94.	<i>Apogon queketti</i> (Gunther, 1880)	Spotfin Cardinal Fish (Signal Cardinal Fish)	NE					
95.	<i>Apogon septemstriatus</i> (Ehreberg, 1828)	Seven Banded Cardinal Fish	NE					
96.	<i>Apogon taeniatus</i> (Gon, 1986)	Twobelt Cardinal Fish	NE					
97.	<i>Apogonichthyoid espseudo taeniatus</i> (Jordan & Thompson, 1914)	Doublebar Cardinal Fish	NE					
98.	<i>Apogonich thyoidessialis</i> (Cantor, 1849)	Twinbar Cardinal Fish	NE					
99.	<i>Archamia fucata</i> (Ehreberg, 1828)	Orangelined Cardinal Fish	NE					
100	<i>Archamia lineolata</i> (White, 1790)	Shimmering Cardinal Fish	NE					
101	<i>Ostorhinchus fasciatus</i> (Cuvier, 1828)	Broadbanded Cardinal Fish	NE					
102	<i>Ostorhinchus novem fasciatus</i> (Cuvier, 1829)	Sevenstriped Cardinal Fish	NE					

103	<i>Ostorhinchus thermalis</i> (Bleeker, 1849)	Half-barred Cardinal Fish	NE					
104	<i>Sillaginopodyschon dropus</i> (Forsskål, 1775)	Clubfoot Sillago	NE					
105	<i>Sillagosihama</i> (Günther, 1887)	Silver Sillago	NE		√	√		√
106	<i>Hoplolatilus fronticinctus</i> (Bloch & Schneider, 1801)	Pastel Tilefish	NE					
107	<i>Lactarius lactarius</i> Linnaeus, 1766)	False Trevally (Big-Jawed Jumper)	NE					
108	<i>Rachycentron canadum</i> Linnaeus, 1758	Cobia (King Fish)	NE		√		√	
109	<i>Echeneis naucrates</i> (Menzies, 1791)	Live Sharksucker	NE					
110	<i>Phtheichthys lineatus</i> (Temminck& Schlegel, 1850)	Slender Suckerfish	LC					
111	<i>Remora albescens</i> (Bloch, 1787)	White Suckerfish	LC					
112	<i>Alectisciliaris</i> (Rüppell, 1830)	African Pompano (Indian Threadfin Trevally)	NE					
113	<i>Alectis indicus</i> (Forsskål, 1775)	Indian Threadfish	NE		√			
114	<i>Alepes djedaba</i> (Bloch, 1793)	Shrimp Scad	NE		√			
115	<i>Alepes kleinii</i> (Swainson, 1839)	RazorbellyScad	NE					
116	<i>Alepes melanoptera</i>	Blackfin Scad	LC					

	(Cuvier, 1833)							
117	<i>Alepes vari</i> (Bloch & Schneider, 1801)	Herring Scad	NE					
118	<i>Atropus atropus</i> (Cuvier, 1833)	Cleftbelly Trevally	NE					
119	<i>Atule mate</i> (Rüppell, 1830)	Yellowtail Scad	NE					
120	<i>Carangoides armatus</i> (Cuvier, 1833)	Longfin Trevally	NE		√	√		√
121	<i>Carangoides chrysophrys</i> (Rüppell, 1830)	Longnose Trevally	NE		√	√		√
122	<i>Carangoides coeruleopinnatus</i> (Forsskål, 1775)	Coastal Trevally	NE		√	√		√
123	<i>Carangoides ferdau</i> (Forsskål, 1775)	Blue Trevally	NE		√	√	√	√
124	<i>Carangoides fulvoguttatus</i> (Cuvier, 1833)	Yellowspotted Trevally	NE					
125	<i>Carangoides gymnostethus</i> (Whitley, 1934)	Bludger (Nakedbreast Trevally)	NE					
126	<i>Carangoides hedlandensis</i> (Bloch & Schneider, 1801)	Bumpnose Trevally	NE					
127	<i>Carangoides malabaricus</i> Bleeker, 1857	Malabar Trevally	NE					
128	<i>Carangoides plagiotaenia</i> ([Bennett], 1830)	Barcheek Trevally	NE					
129	<i>Carangoides praeustus</i> Bleeker, 1852	Brown-Backed Trevally	NE					

130	<i>Carangoides talamparoides</i> (Bennett, 1830)	Impostor Trevally	NE					
131	<i>Caranx heberi</i> (Forsskal 1775)	Blacktip Trevally	NE		√	√		√
132	<i>Caranx ignobilis</i> Cuvier, 1833	Giant Trevally (Yellowfin Jack)	NE		√	√		√
133	<i>Caranx melampygus</i> Alleyne & MacLeay, 1877	Bluefin Trevally	NE		√	√	√	√
134	<i>Caranx papuensis</i> Quoy&Gaimard, 1825	Brassy Trevally	LC					
135	<i>Caranx sexfasciatus</i> (Cuvier, 1833)	Tella Jack	NE					
136	<i>Decapterus macarellus</i> Bleeker, 1851	Mackerel Scad	NE					
137	<i>Decapterus macrosoma</i> (Rüppell, 1830)	Shortfin Scad	LC					
138	<i>Decapterus russelli</i> (Quoy&Gaimard, 1825)	Indian Scad	NE		√			√
139	<i>Elagatis bipinnulata</i> (Forsskål, 1775)	Rainbow Runner	NE					
140	<i>Gnathano donspeciosus</i> (Linnaeus, 1758)	Golden Toothless Trevally	NE					
141	<i>Megalaspis cordyla</i> (Linnaeus, 1758)	Torpedo Scad	NE		√	√		√
142	<i>Naucrates doctor</i> (Bloch, 1795)	Pilotfish	NE					
143	<i>Parastro mateusniger</i> Lacepède, 1801	Black Pomfret	NE		√	√	√	√

144	<i>Scomberoides commersonianus</i> (Forsskål, 1775)	Talang Queenfish, PaalaMeen	NE		√	√		
145	<i>Scomberoides lysan</i> (Cuvier, 1832)	Double-Spotted Queenfish	NE					
146	<i>Scomberoides tol</i> (Cuvier, 1833)	Needlescaled Queenfish	NE					
147	<i>Selarboops</i> (Bloch, 1793)	Oxeye Scad	NE					
148	<i>Selarcrumeno phthalmus</i> (Rüppell, 1829)	Bigeye Scad	NE		√			
149	<i>Seriolinanigro fasciata</i> (Lacepède, 1801)	Blackbanded Trevally	NE					
150	<i>Trachinotus baillonii</i> (Lacepède, 1801)	Small Spotted Dart (Baillon's Dart)	NE					
151	<i>Trachinotus blochii</i> Cuvier, 1832	Snubnose Pompano	NE					
152	<i>Trachinotus mookalee</i> (Cuvier, 1833)	Indian Pompano	NE					
153	<i>Ulua mentalis</i> (Forster, 1801)	Longrakered Trevally	NE					
154	<i>Uraspis helvola</i> (Poey, 1860)	Whitemouth Jack	NE					
155	<i>Uraspis secunda</i> Linnaeus, 1758	Cottonmouth Jack	LC					
156	<i>Coryphaena equiselis</i> Linnaeus, 1758	Pompano Dolphinfish	LC		√			
157	<i>Coryphaena hippurus</i>	Common	NE		√			

	(Bloch & Schneider, 1801)	Dolphinfish						
158	<i>Menem aculata</i> (Lacepède, 1803)	Moonfish	NE					
159	<i>Aurigequula fasciata</i> (Günther, 1874)	Striped Ponyfish	NE					
160	<i>Equulites elongatus</i> (Günther, 1860)	Slender Ponyfish	NE					
161	<i>Equulites leuciscus</i> (Valenciennes, 1835)	WhipfinPonyfish	NE					
162	<i>Equulites lineolatus</i> (Cuvier, 1829)	Ornate Ponyfish	NE					
163	<i>Eubleekeria splendens</i> Jordan & Starks, 1917	Splendid Ponyfish	LC					
164	<i>Gazza achlamys</i> (Bloch, 1795)	SmalltoothedPonyfish	NE					
165	<i>Gazza minuta</i> (Cuvier, 1829)	Toothpony	NE					
166	<i>Karalla daura</i> (Valenciennes, 1835)	GoldstripePonyfish	NE					
167	<i>Karalla dussumieri</i> (Valenciennes, 1835)	Dussumier'sPonyfish	NE					
168	<i>Leiognathus berbis</i> (Valenciennes, 1835)	Berber Ponyfish	NE					
169	<i>Leiognathus bindus</i> (Valenciennes, 1835)	OrangefinPonyfish	NE					
170	<i>Leiognathus brevis</i> (Forsskål, 1775)	ShortnosePonyfish	NE					
171	<i>Leiognathu sequulus</i>	Common Ponyfish	NE		√	√		√

	(Valenciennes, 1835)							
172	<i>Nuchequula blochii</i> (Bloch, 1787)	TwoblotchPonyfish	NE					
173	<i>Secutorin sidiator</i> (Hamilton, 1822)	PugnosePonyfish	NE					
174	<i>Secutorruconius</i> (Lacepède, 1801)	Deep PugnosePonyfish	NE					
175	<i>Aphareus furcatus</i> Cuvier, 1828	SmalltoothJobfish	DD					
176	<i>Etelis carbunculus</i> (Chan, 1970)	Deep-Water Red Snapper	NE					
177	<i>Lipocheilus carnolabrum</i> (Forsskål, 1775)	Tang's Snapper	NE					
178	<i>Lujanus argentimaculatus</i> (Bloch, 1790)	Mangrove Red Snapper (River Snapper)	NE		√	√		√
179	<i>Lutjanus bengalensis</i> (Forsskål, 1775)	Bengal Snapper	NE					
180	<i>Lutjanus bohar</i> (Cuvier, 1828)	Two-Spot Red Snapper	LC					
181	<i>Lutjanus decussatus</i> (Peters, 1869)	Checkered Snapper	NE					
182	<i>Lutjanus ehrenbergii</i> Bloch, 1790	Blackspot Snapper	NE					
183	<i>Lutjanus erythropterus</i> (Schneider, 1801)	Crimson Snapper	NE					
184	<i>Lutjanus fulvus</i> (Forsskål, 1775)	Blacktail Snapper (Yellow Banded	NE		√		√	

		Snapper)						
185	<i>Lutjanus gibbus</i> (Bloch, 1792)	Humpback Red Snapper	NE					
186	<i>Lutjanus johnii</i> (Forsskål, 1775)	Moses Perch	NE		√			
187	<i>Lutjanus kasmira</i> Bloch, 1790	Blue and Yellow Snapper	NE					
188	<i>Lutjanus lutjanus</i> (Valenciennes, 1831)	Bigeye Snapper	NE					
189	<i>Lutjanus madras</i> (Bloch & Schneider, 1801)	Indian Snapper	NE					
190	<i>Lutjanus malabaricus</i> (Cuvier, 1828)	Malabar Blood Snapper	NE		√		√	
191	<i>Lutjanus monostigma</i> (Bloch, 1790)	Onespot Snapper	NE					
192	<i>Lutjanus quinquelineatus</i> (Cuvier, 1828)	Five-Lined Snapper	NE					
193	<i>Lutjanus rivulatus</i> (Bleeker, 1849)	Blubberlip Snapper	NE					
194	<i>Lutjanus russellii</i> (Cuvier, 1816)	Russell's Snapper	NE		√			
195	<i>Lutjanus sebae</i> (Quoy&Gaimard, 1824)	Emperor Snapper	NE					
196	<i>Lutjanus vitta</i> (Forsskål, 1775)	Brownstripe Red- Snapper	NE					
197	<i>Macolorniger</i> Fowler, 1931	Black and White Snapper	NE					
198	<i>Macolormacularis</i>	Midnight Snapper	NE					

	(Bleeker, 1869)							
199	<i>Paracaesiox anthura</i> (Bleeker, 1850)	Yellowtail Blue Snapper	NE					
200	<i>Pinjalopinjalo</i> (Valenciennes, 1830)	Pinjalo Snapper	NE					
201	<i>Pristipomoides filamentosus</i> (Day, 1871)	Crimson Jobfish	NE					
202	<i>Pristipomoides multidens</i> (Cuvier, 1830)	Goldbanded Jobfish	NE					
203	<i>Pterocaesio chrysozona</i> (Valenciennes, 1830)	Goldband Fusilier	NE					
204	<i>Dipterygonotus balteatus</i> (Bloch, 1790)	Mottled Fusilier	NE					
205	<i>Lobotes surinamensis</i> (Bloch, 1791)	Tripletail (Atlantic Tripletail)	NE					
206	<i>Gerresery thourus</i> Cuvier, 1829	Deep-Bodied Mojarra	NE					
207	<i>Gerres filamentosus</i> Cuvier, 1830	Whipfin Mojarra	LC		√	√		√
208	<i>Gerres limbatus</i> (Lacepède, 1801)	Saddleback Silver- Biddy	NE					
209	<i>Gerres longirostris</i> Bleeker, 1854	Strongspine Silver- Biddy (Longtail Silverbiddy)	NE					
210	<i>Gerres macracanthus</i> Cuvier, 1830	Long-Rayed Mojarra	NE		√	√		√
211	<i>Gerres oblongus</i> (Cantor, 1849)	Slender Silverbiddy	NE					

212	<i>Pentaprion longimanus</i> (Thunberg, 1792)	Longfin Mojarra	NE					
213	<i>Diagram mapictum</i> (Valenciennes, 1833)	Painted Sweetlip	NE					
214	<i>Pomadasys argyreus</i> (Forsskål, 1775)	Bluecheek Silver Grunt	NE					
215	<i>Pomadasys argenteus</i> (Lacepède, 1801)	Silver Grunt	NE					
216	<i>Pomadasys commersonnii</i> (Bloch & Schneider, 1801)	Spotted Grunter (Smallspotted Grunter)	NE					
217	<i>Pomadasys furcatus</i> (Bloch, 1790)	Banded Grunter	NE					
218	<i>Pomadasys hasta</i> (Bloch, 1793)	Silver Spotted Grunt	LC					
219	<i>Pomadasys maculatus</i> (Playfair, 1867)	Saddle Grunt (Blotched-grunt)	NE					
220	<i>Pomadasys multimaculatus</i> (Day, 1875)	Cock Grunter	NE					
221	<i>Pomadasys olivaceus</i> (Linnaeus, 1758)	Olive Grunt	NE					
222	<i>Plectorhinchus diagramus</i> (Cuvier, 1830)	Silver Banded Sweetlip	NE					
223	<i>Plectorhinchus nigrus</i> (Forsskål, 1775)	Black Sweet-Lip	NE					
224	<i>Plectorhinchus schotaf</i> (Linnaeus, 1758)	Minstrel Sweetlip	NE					
225	<i>Plectorhinchus vittatus</i>	Indian Ocean	NE					

	(Forsskål, 1775)	oriental Sweetlip						
226	<i>Acanthopagrus berda</i> (Forsskål, 1775)	Picnic Seabream (River Bream)	NE					
227	<i>Acanthopagrus bifasciatus</i> (Forsskål, 1775)	Twobar Seabream	NE					
228	<i>Rhabdosargus sarba</i> (Forster, 1801)	Natal Stumpnose (Goldlined Seabream)	NE					
229	<i>Lethrinella miniata</i> (Forsskål, 1775)	Starry Pigface Bream	NE					
230	<i>Lethrinus harak</i> (Lacepède, 1802)	Thumbprint Emperor	NE					
231	<i>Lethrinus lentjan</i> (Lacepède, 1802)	Pig-Face Bream (Pink Ear Emperor)	NE					
232	<i>Lethrinus mahsenoides</i> Valenciennes, 1830	Bridled Pigface-Bream	NE					
233	<i>Lethrinus microdon</i> (Forster, 1801)	Smalltooth Emperor	NE					
234	<i>Lethrinus miniatus</i> (Forsskål, 1775)	Trumpet Emperor	NE					
235	<i>Lethrinus nebulosus</i> Valenciennes, 1830	Spangled Emperor	NE					
236	<i>Lethrinus ornatus</i> (Forsskål, 1775)	Ornate Emperor	NE					
237	<i>Lethrinus ramak</i> Valenciennes, 1830	Yellow-Banded Pigface Bream	DD					
238	<i>Lethrinus reticulatus</i> Valenciennes, 1830	Redsnout Emperor	NE					

239	<i>Lethrinus semicinctus</i> Valenciennes, 1830	Black Blotch Emperor	NE					
240	<i>Lethrinus variegatus</i> Klunzinger, 1870	Slender Emperor	NE					
241	<i>Lethrinus xanthochilus</i> (Forsskål, 1775)	Yellowlip Emperor	NE					
242	<i>Monotaxis grandoculis</i> (Valenciennes, 1830)	Humpnose Big-Eye Bream	NE					
243	<i>Nemipterus bipunctatus</i> (Bloch, 1791)	Delagoa Threadfin Bream (Bleeker's Threadfin-Bream)	NE					
244	<i>Nemipterus japonicus</i> (Bleeker, 1853)	Japanese Threadfin Bream	NE		√	√		√
245	<i>Nemipterus mesoprion</i> (Bleeker, 1853)	Mauvelip Threadfin Bream (Redfilament Threadfin-Bream)	NE		√	√		√
246	<i>Nemipterus nematophorus</i> (Valenciennes, 1830)	Doublewhip Threadfin Bream	NE					
247	<i>Nemipterus peronii</i> Russell, 1986	Notchedfin Threadfin Bream	NE					
248	<i>Nemipterus randalli</i> (Bleeker, 1856)	Randall's Threadfin Bream	NE					
249	<i>Nemipterus zysron</i> (Rao & Rao, 1981)	Slender Threadfin Bream	NE					
250	<i>Parascolopsis aspinosa</i> Russell & Golani, 1993	Smooth Dwarf Monocle Bream	NE					
251	<i>Parascolopsis baranesi</i> (Rao & Rao, 1981)	Dwarf Monocle Bream	NE					

252	<i>Parascolopsis boesemani</i> (Jordan & Richardson, 1909)	Redfin Dwarf Monocle Bream	NE					
253	<i>Parascolopsis eriomma</i> (Bloch, 1792)	Rosy Dwarf Monocle Bream	NE					
254	<i>Scolopsis vosmeri</i> (Shaw, 1804)	Whitecheek Monocle Bream (Silver Flash Spine Cheek)	NE					
255	<i>Eleutheronema tetradactylum</i> (Shaw, 1804)	Fourfinger Threadfin (White Salmon)	NE		√			
256	<i>Leptomelanosoma indicum</i> (Hora, 1926)	Indian Thread Fish	NE					
257	<i>Polydactylus mullani</i> Valenciennes, 1830	Arabian Blackspot Threadfin	NE					
258	<i>Polydactylus plebeius</i> (Valenciennes, 1831)	Striped Threadfin	NE					
259	<i>Polydactylus sexfilis</i> Linnaeus, 1758	Sixfinger Threadfin	NE					
260	<i>Polynemus paradiseus</i> (Bloch & Schneider, 1801)	Paradise Threadfin	NE		√			
261	<i>Polynemus sextarius</i> (Cuvier, 1830)	Black Spot Thread Fish	NE					
262	<i>Daysciaena albida</i> (Bleeker, 1855)	Bengal Corvina	NE					
263	<i>Johnius amblycephalus</i> (Bloch, 1793)	Bearded Croaker	NE					
264	<i>Johnius aneus</i> (Bleeker, 1851)	Bloch's Croaker	NE					

265	<i>Johnius borneensis</i> (Cuvier, 1830)	Sharpnose Hammer Croaker	NE					
266	<i>Johnius belangerii</i> (Cuvier, 1830)	Belanger's Croaker	NE					
267	<i>Johnius carutta</i> (Cuvier, 1830)	Karut Croaker	NE					
268	<i>Johnius dussumieri</i> (Mohan, 1976)	Sin Croaker	NE		√			
269	<i>Johnius macrorhynchus</i> (Cuvier, 1830)	Big-Snout Croaker	NE					
270	<i>Kathala axillaris</i> (Bloch & Schneider, 1801)	Kathala Croaker	NE					
271	<i>Nibeama culata</i> Trewavas, 1974	Blotched Croaker (Black Banded Jew Fish)	NE					
272	<i>Otolithes cuvieri</i> (Bloch & Schneider, 1801)	Lesser Tigertooth Croaker	NE					
273	<i>Otolithe sruber</i> (Bleeker, 1850)	Tiger-Toothed Croaker	NE					
274	<i>Pennahiam acrophthamlus</i> (Cuvier, 1830)	Bighead Pennah Croaker	LC					
275	<i>Pterotolithus maculatus</i> (Lacepède, 1801)	Blotched Tiger- Toothed Croaker	NE					
276	<i>Mulloidichthys flavolineatus</i> Günther, 1874)	Yellowstripe Goatfish	NE					
277	<i>Mulloidichthys somoensis</i> (Lacepède, 1801)	Slender Goldband Goatfish	NE					
278	<i>Parupeneus bifasciatus</i>	Doublebar Goatfish	NE					

	(Lacepède, 1801)							
279	<i>Parupeneus cyclostomus</i> (Shaw, 1803)	Goldsaddle Goatfish	NE					
280	<i>Parupeneus indicus</i> (Lacepède, 1801)	Indian Goatfish	NE					
281	<i>Parupeneus macronemus</i> (Lacepède, 1802)	Longbarbel Goatfish	NE					
282	<i>Parupeneus pleurotaenia</i> (Day, 1868)	White-Lined Goatfish	NE					
283	<i>Upeneus guttatus</i> (Bleeker, 1855)	Two-Tone Goatfish	NE					
284	<i>Upeneus moluccensis</i> (Bleeker, 1855)	Goldband Goatfish	NE					
285	<i>Upeneus sundaicus</i> Cuvier, 1829	Ochre-Banded Goatfish	NE					
286	<i>Upeneus taeniopterus</i> (Forskål, 1775)	Finstripe Goatfish	NE					
287	<i>Upeneus vittatus</i> Cuvier & Valenciennes 1831	Yellowstriped/Banded Goatfish	NE					
288	<i>Pempheris malabarica</i> (Cuvier, 1829)	Malabar Sweeper	NE					
289	<i>Pempheris mangula</i> Randall & Bineesh, 2014	Black-Edged Sweeper (Moluccan Sweeper)	NE					
290	<i>Pempheris sarayu</i> (Hamilton, 1822)	Sarayu Sweeper	NE					
291	<i>Toxotes chatareus</i> (Forsskål, 1775)	Spotted Archerfish (Largescale	NE					

		Archerfish)						
292	<i>Kyphosus cinerascens</i> (Quoy&Gaimard, 1825)	Blue Seachub (Ashen Drummer)	NE					
293	<i>Kyphosus vaigiensis</i> (Bloch & Schneider, 1801)	Brassy Chub (Lowfinned rudderfish)	NE					
294	<i>Drepane longimana</i> (Linnaeus, 1758)	Concertina Fish (BandedDrepane)	NE					
295	<i>Drepane punctata</i> (Linnaeus, 1758)	Spotted Sickfish	NE					
296	<i>Monodactylus argenteus</i> (Forsk, 1775)	Silver Moony (Silver Batfish)	LC					
297	<i>Chaetodon auriga</i> (Bloch, 1787)	Threadfin Butterflyfish	LC					
298	<i>Chaetodon collare</i> Cuvier, 1829	Redtail Butterflyfish (Pakistani Butterfly Fish)	LC					
299	<i>Chaetodon decussatus</i> (Forsskal, 1775)	Indian Vagabond Butterflyfish	LC					
300	<i>Chaetodon fasciatus</i> (Lacepède, 1802)	Diagonal Butterflyfish (Eight Banded Butterfly Fish)	LC					
301	<i>Chaetodon lunula</i> Bloch & Schneider, 1801	Raccoon Butterflyfish (Halfmoon Butterfly Fish)	NE					
302	<i>Chaetodon melanotus</i>	Blackback	LC					

	Bloch & Schneider, 1801	Butterflyfish						
303	<i>Chaetodon meyeri</i> (Linnaeus, 1758)	Scrawled Butterflyfish	LC					
304	<i>Chaetodon vagabundus</i> (Bennett, 1833)	Vagabond Butterfly Fish (Black Banded Butterfly Fish)	NE					
305	<i>Chaetodon xanthocephalus</i> (Linnaeus, 1758)	Yellow-Head Butterflyfish	LC					
306	<i>Heniochus acuminatus</i> (Cuvier, 1829)	Pennet Coral Fish	LC					
307	<i>Heniochus varius</i> (Cuvier, 1831)	Banner Fish	LC					
308	<i>Parachaetodon ocellatus</i> (Bennett, 1833)	Sixspine Butterflyfish	NE					
309	<i>Apolemichthys xanthurus</i> (Playfair, 1867)	Yellowtail Angelfish (Yellow-Brown Angel Fish)	LC					
310	<i>Centropyge multispinis</i> (Bloch, 1787)	Dusky Angelfish (Dusky Cherub)	NE					
311	<i>Pomacanthus annularis</i> (Bloch, 1787)	Blue Ring Angelfish (Ringed Angel Fish)	NE					
312	<i>Pomacanthus imperator</i> (Cuvier, 1831)	Emperor Angelfish	LC					
313	<i>Pomacanthus semicirculatus</i> Temminck & Schlegel, 1844	Semicircle Angelfish (Blue Angel Fish)	NE		√	√		√
314	<i>Histiopaterus typus</i> (Valenciennes, 1835)	Sailfin Armourhead	NE					

315	<i>Acanthoche polalimbata</i> (Smith, 1846)	Blackspot Bandfish	NE					
316	<i>Chelon macrolepis</i> (Hamilton, 1822)	Largescale Mullet	NE					
317	<i>Chelon parsia</i> (Valenciennes, 1836)	Goldspot Mullet	NE					
318	<i>Chelon subviridis</i> (Forsskål, 1775)	Greenback Mullet	NE					
319	<i>Liza tade</i> (Quoy&Gaimard, 1825)	Tade Mullet	NE		√			
320	<i>Liza vaigiensis</i> (Valenciennes, 1836)	Squaretail Mullet	NE					
321	<i>Moolgard acunnesius</i> (Forsskål, 1775)	Longarm Mullet	NE					
322	<i>Moolgard aseheli</i> Linnaeus, 1758	Bluespot Mullet	NE					
323	<i>Mugil cephalus</i> (Bleeker, 1853)	Flathead Mullet	NE		√		√	
324	<i>Valamugil buchanani</i> (Cuvier, 1830)	Bluetail Mullet	NE		√	√		√
325	<i>Abudefduf septem fasciatus</i> (Lacepède, 1801)	Banded Sergeant	NE					
326	<i>Abudefduf sexfasciatus</i> (Forsskål, 1775)	Scissortail Sergeant	NE					
327	<i>Abudefduf sordidus</i> (Quoy&Gaimard, 1825)	Blackspot Sergeant	NE					
328	<i>Abudefdu fvaigiensis</i> (Bennett, 1833)	Indo-Pacific Sergeant	NE					

329	<i>Aplomichthys xanthurus</i> (Macleay, 1882)	Yellow Brown Angelfish (Yellowtail Angelfish)	NE					
330	<i>Neopomacentrus filamentosus</i> (Quoy&Gaimard, 1825)	Brown Demoiselle (Long-Lobed Damsel)	NE					
331	<i>Plectro donlacrymatus</i> Quoy&Gaimard, 1825	Whitespotted Devil (Jewel Devil)	NE					
332	<i>Pomacentrus caeruleus</i> (Bleeker, 1856)	Caerulean Damsel (Blue Devil)	NE					
333	<i>Pomacentrus taeniurus</i> (Bloch, 1791)	Freshwater Damsel	LC					
334	<i>Cheilinus chlorourus</i> (Ruppell, 1835)	Floral Wrasse	NE					
335	<i>Halichoeres marginatus</i> (Bloch & Schneider, 1801)	Dusky Wrasse	LC					
336	<i>Halichoeres nigrescens</i> (Bennett, 1832)	Bubblefin Wrasse	LC					
337	<i>Halichoeres scapularis</i> (Bloch, 1792)	Zigzag Wrasse	LC					
338	<i>Hemigymnus fasciatus</i> (Rüppell, 1829)	Barred Thicklip	LC					
339	<i>Iniistius bimaculatus</i> (Valenciennes, 1840)	Two-spot Razorfish	DD					
340	<i>Iniistius cyanifrons</i> (Valenciennes, 1840)	Razorfish	LC					
341	<i>Iniistius pavo</i>	Peacock Wrasse	LC					

	(Linnaeus, 1758)							
342	<i>Iniistius pentadactylus</i> (Valenciennes, 1839)	Fivefinger Wrasse	LC					
343	<i>Labroides dimidiatus</i> (Linnaeus, 1758)	Bluestreak Cleaner Wrasse	LC					
344	<i>Thalas somalunare</i> (Forsskål, 1775)	Moon Wrasse	LC					
345	<i>Hippos carusharid</i> (Forsskal, 1775)	Candelamoa Parrotfish (Indian Ocean Longnose Parrotfish)	LC					
346	<i>Scarus ghobban</i> Forsskål, 1775	Blue-Barred Parrotfish (Blue- Barred Parrotfish)	LC					
347	<i>Scarus psittacus</i> Valenciennes, 1840	Common Parrotfish	LC					
348	<i>Scarus russelii</i> (Bloch & Schneider, 1801)	Eclipse Parrotfish	NE					
349	<i>Ichthyscopus lebeck</i> Cuvier, 1829	Longnosed Stargazer	NE					
350	<i>Uranoscopus gattatus</i> (Temminck & Schlegel, 1843)	Skygazer	NE					
351	<i>Parapercis pulchella</i> (Weber, 1909)	Harlequin Sandperch	NE					
352	<i>Enneapterygius fasciatus</i> (Günther, 1868)	Banded Triplefin	NE					
353	<i>Alticus kirkii</i> Fowler, 1903	Kirk's Blenny	NE					

354	<i>Aspidontus tractus</i> (Valenciennes, 1836)	Mimic Blenny	NE					
355	<i>Blenniella periophthalmus</i> (Valenciennes, 1836)	Blue-Dashed Rockskipper	NE					
356	<i>Entomacrodus striatus</i> (Valenciennes, 1836)	Reefmargin Blenny	NE					
357	<i>Entomacrodus vermiculatus</i> (Valenciennes, 1836)	Vermiculated Blenny	NE					
358	<i>Istiblennius dussumieri</i> (Valenciennes, 1836)	Streaky Rockskipper (Dussumier's Rockskipper)	NE					
359	<i>Istiblennius lineatus</i> Rüppell, 1830	Lined Rockskipper (Black-lined blenny)	NE					
360	<i>Petroscirtus mitratus</i> Swainson, 1839	Floral Blenny (White Spotted Blenny)	NE					
361	<i>Xiphasias etifer</i> Alcock, 1890	Hairtail Blenny (Hairtail Snakeblenny)	NE					
362	<i>Callionymus carebares</i> Day, 1876	Indian Deepwater Dragonet	NE					
363	<i>Callionymus fluviatilis</i> Houttuyn, 1782	River Dragonet	NE					
364	<i>Callionymus japonicus</i> Regan, 1919	Japanese Longtail Dragonet	NE					
365	<i>Callionymus marleyi</i> Pallas, 1770	Sand Dragonet	LC					
366	<i>Callionymus sagitta</i> (Forster, 1801)	Arrow Dragonet	LC					

367	<i>Eleotris fusca</i> (Hamilton, 1822)	Dusky Sleeper ¹	LC					
368	<i>Glossogobius giuris</i> Geevarghese & John, 1983	Tank Goby ¹	NE					
369	<i>Glossogobius minutus</i> (Hamilton, 1822)	Veli Lake Goby ¹	NE					
370	<i>Odontamblyopus rubicundus</i> (Valenciennes, 1837)	Rubicundus Eelgoby	NE					
371	<i>Oxyurichthys tentacularis</i> (Bleeker, 1853)	Tentacle Goby	NE					
372	<i>Parachaeturichthys polynema</i> (Bloch & Schneider, 1801)	Taileyed Goby	NE					
373	<i>Trypauchen vagina</i> (Valenciennes, 1837)	Burrowing Goby	NE					
374	<i>Yongeichthys criniger</i> (Bloch, 1787)	Horn Goby	NE					
375	<i>Ephippusorbis</i> (Forsskal, 1775)	Orbfish (Spadefish)	NE					
376	<i>Platax orbicularis</i> (Linnaeus, 1758)	Orbicular Batfish	NE					
377	<i>Plataxpin natus</i> (Forsskal, 1775)	Dusky Batfish (Round Batfish)	NE					
378	<i>Platateira</i> (Linnaeus, 1766)	Longfin Batfish (Tiera Batfish)	LC					
379	<i>Scatophagus argus</i> (Park, 1797)	Spotted Scat (Spotted Butterfish)	NE					
380	<i>Siganus canaliculatus</i> (Linnaeus, 1766)	White-Spotted Spinefoot	NE		√			

381	<i>Siganus javus</i> (Valenciennes, 1835)	Streaked Spinefoot	NE		√			
382	<i>Siganus lineatus</i> (Linnaeus, 1758)	Golden-Lined Spinefoot	NE		√			
383	<i>Siganus spinus</i> (Valenciennes, 1835)	Scribbled Rabbitfish	NE					
384	<i>Siganus sutor</i> (Valenciennes, 1835)	Shoemaker Spinefoot (White Spotted Rabbit Fish)	NE					
385	<i>Siganus vermiculatus</i> (Valenciennes, 1835)	Vermiculated Spine-Foot	NE					
386	<i>Siganus virgatus</i> (Valenciennes, 1835)	Double-Barred Spinefoot	LC					
387	<i>Acanthurus dussumieri</i> (Bennett, 1833)	Eyestripe Surgeonfish (Orange Banded Surgeon)	LC					
388	<i>Acanthurus leucosternon</i> (Linnaeus, 1758)	Powderblue Surgeonfish	LC					
389	<i>Acanthurus lineatus</i> (Cuvier, 1829)	Elongate Surgeonfish	LC					
390	<i>Acanthurus mata</i> (Forsskal, 1775)	Lined Surgeon Fish (Bluelined Surgeon Fish)	LC					
391	<i>Acanthurus nigro fuscus</i> (Quoy&Gaimard, 1825)	Brown Surgeonfish (White Tailed Surgeon Fish)	LC					
392	<i>Ctenochaetus striatus</i>	Striated Surgeonfish	NE					

	(Bennett, 1828)							
393	<i>Ctenochaetus strigosus</i> (Rüppell, 1829)	Spotted Surgeonfish	LC					
394	<i>Naso elegans</i> (Linnaeus, 1758)	Elegant Unicornfish	NE					
395	<i>Zanclus cornutus</i> (Walbaum, 1752)	Moorish Idol	NE					
396	<i>Sphyraena barracuda</i> Klunzinger, 1884	Great Barracuda	NE		√	√		
397	<i>Sphyraenachry sotaenia</i> Cuvier, 1829	Yellowstripe Barracuda	NE		√			
398	<i>Sphyraena forsteri</i> Cuvier, 1829	Bigeye Barracuda	NE					
399	<i>Sphyraena jello</i> Cuvier, 1829	Pickhandle Barracuda (Banded Barracuda)	NE		√	√		√
400	<i>Gempylus serpens</i> (Gilchrist & von Bonde, 1924)	Snake Mackerel	NE					
401	<i>Neopinnul aorientalis</i> (Cuvier, 1832)	Sackfish	NE					
402	<i>Promethichthy sprometheus</i> (Bleeker, 1856)	Roudi Escolar	NE					
403	<i>Rexeapro metheoides</i> Cocco, 1833	Royal Escolar	NE					
404	<i>Ruvettus pretiosus</i> Fowler, 1929	Oilfish	NE					
405	<i>Thyrsitoides marleyi</i> (Bleeker, 1860)	Black Snoek	NE					

406	<i>Eupleurogrammus glossodon</i> (Gray, 1831)	Longtooth Hairtail	NE					
407	<i>Eupleur ogrammus muticus</i> (Cuvier, 1829)	Smallhead Hairtail	NE					
408	<i>Leptur acanthus savala</i> Klunzinger, 1884	Savalai Hairtail (Small-headed Ribbonfish)	NE		√	√		√
409	<i>Trichiurus auriga</i> Linnaeus, 1758	Pearly Hairtail	NE		√	√		√
410	<i>Trichiuru slepturus</i> (Cuvier, 1832)	Largehead Hairtail	LC		√	√		√
411	<i>Acanthocybium solandri</i> (Risso, 1810)	Wahoo	LC					
412	<i>Auxisrochei</i> (Lacepède, 1800)	Bullet Tuna	LC		√	√		√
413	<i>Auxistha zard</i> (Cantor 1849)	Frigate Tuna (Frigate Tuna)	LC		√	√		√
414	<i>Euthynnus affinis</i> (Rüppell 1836)	Kawakawa (Mackerel Tuna)	LC		√	√		√
415	<i>Gymnosarda unicolor</i> (Linnaeus, 1758)	Dogtooth Tuna	LC					
416	<i>Katsuwonus pelamis</i> Cuvier, 1816)	Skipjack Tuna (Skiy Jack)	NE		√	√		√
417	<i>Rastrelliger kanagurta</i> (Temminck& Schlegel, 1844)	Rake Gillat Mackerel (Indian Mackerel)	LC		√	√		√
418	<i>Sarda orientalis</i> (Lacepède, 1800)	Striped Bonito (Oriental Bonito)	NE					
419	<i>Scomberomorus commerson</i>	Narrow-Barred	DD		√	√		√

	(Bloch & Schneider, 1801)	Spanish Mackerel (King Seer)						
420	<i>Scomberomorus guttatus</i> (Kishinouye, 1915)	Indo-Pacific King Mackerel (Spotted Spanish Mackerel)	LC		√	√		√
421	<i>Scomberomorus koreanus</i> (Cuvier, 1829)	Korean Seerfish	LC					
422	<i>Scomberomorus lineolatus</i> (Bonnaterre, 1788)	Streaked Seer	NT		√			
423	<i>Thunnus albacares</i> Bleeker, 1851	Yellow Fin Tuna	DD		√	√		√
424	<i>Thunnus tonggol</i> Linnaeus, 1758	Longtail Tuna (Longtail Tuna)	LC		√	√		√
425	<i>Xiphias gladius</i> (Shaw, 1792)	Swordfish	LC					
426	<i>Istiophorus platypterus</i> (Cuvier, 1832)	Indo-Pacific Sailfish (Indian Ocean Sail Fish)	DD					
427	<i>Istiompax indica</i> (Alcock, 1890)	Black Marlin	NE		√	√		√
428	<i>Psenopsis cyanea</i> (Waite, 1894)	Indian Ruff	NE					
429	<i>Cubiceps whiteleggii</i> (Day, 1871)	Shadow Driftfish (Indian Driftfish)	NE					
430	<i>Ariomma indica</i> (Euphrasen, 1788)	Indian Ariomma	NE					
431	<i>Pampus argenteus</i> (Euphrasen, 1788)	Silver Pomfret	NE		√	√		√

432	<i>Pampus chinensis</i> (Günther, 1860)	Chinese Silver Pomfret	NE		√	√		√
433	<i>Antigonia rubescens</i> (Bloch & Schneider 1801)	Indo-Pacific Boarfish	NE					
434	<i>Psettodes erumei</i> (Bleeker, 1865)	Indian Halibut (Indian Spiny Turbot)	NE		√	√		√
435	<i>Arnoglossus tapeinosoma</i> (Temminck & Schlegel, 1846)	Drab Flounder	NE					
436	<i>Bothus myriaster</i> (Rüppell, 1830)	Indo-Pacific Oval Flounder (Disc Flounder)	NE					
437	<i>Bothus pantherinus</i> Alcock, 1894	Leopard Flounder (Panther Flounder)	NE					
438	<i>Chascanops ettalugubris</i> (Alcock, 1890)	Pelican Flounder	NE					
439	<i>Crossorhombus valderostratus</i> (Temminck & Schlegel, 1846)	Strongsnout Flounder	NE					
440	<i>Engyprosopon grandis quama</i> (Bleeker, 1865)	Largescale Flounder	NE					
441	<i>Grammato bothus polyophthalmus</i> Norman, 1931	Threespot Flounder	NE					
442	<i>Laeops natalensis</i> von Bonde, 1922	Khaki Flounder	NE					
443	<i>Laeops nigroma culatus</i> (Hamilton, 1822)	Blackspotted Flounder	NE					
444	<i>Pseudorhombus arsius</i>	Large Toothed	NE					

	Regan, 1905	Flounder						
445	<i>Pseudorhombus dupliciocellatus</i> Ogilby, 1912	Ocellated Flounder	NE					
446	<i>Pseudorhombus elevatus</i> (Bleeker, 1853)	Deep Flounder	NE					
447	<i>Pseudorhombus javanicus</i> Gilchrist, 1904	Javanese Flounder	NE					
448	<i>Pseudorhombus natalensis</i> (Bloch & Schneider, 1801)	Smalltooth Flounder	NE					
449	<i>Pseudorhombus triocellatus</i> Gray, 1831	Three Spot Flounder	NE					
450	<i>Samaris cristatus</i> (Kaup, 1858)	Cockatoo Righteye Flounder	NE					
451	<i>Aesopiacornuta</i> Weber, 1913	Unicorn Sole (Horned Sole)	NE					
452	<i>Aseraggodescyaneu</i> (Steindachner, 1896)	Blue Sole	NE					
453	<i>Aseraggodeskobensis</i> (Alcock, 1894)	Milk Solefish	NE					
454	<i>Aseraggodesumbratilis</i> Fowler, 1934	Sole	NE					
455	<i>Brachirusannularis</i> (Bloch & Schneider, 1801)	Annular Sole	NE		√			
456	<i>Brachirusorientalis</i> (Alcock, 1889)	Oriental Sole	NE					
457	<i>Heteromycteris oculus</i> Day, 1877	Eyed Sole	NE					

458	<i>Solea elongata</i> Richardson, 1846	Elongate Sole	NE					
459	<i>Solea ovata</i> Kaup, 1858	Ovate Sole	NE					
460	<i>Synaptura al bomaculata</i> (Lacepède, 1802)	Kaup's Sole	NE					
461	<i>Synaptura commersonii</i> Joglekar, 1976	Commerson's Sole	NE					
462	<i>Zebrias vkeralensis</i> (Kaup, 1858)	Kerala Sole	NE					
463	<i>Zebrias quagga</i> (Jenkins, 1910)	Fringefin Zebra Sole (Zebra Sole)	NE					
464	<i>Zebrias synapturoides</i> (Bloch & Schneider 1801)	Indian Zebra Sole	NE					
465	<i>Cynoglossus susarel</i> (Lacepède, 1802)	Largescale Tonguesole	NE					
466	<i>Cynoglossus susbilineatus</i> Alcock, 1889	Fourlined Tonguesole	NE		√	√		√
467	<i>Cynoglossus suscarpenteri</i> Day, 1877	Hooked Tonguesole	NE					
468	<i>Cynoglossus susdispar</i> Day, 1873	Roundhead Tonguesole	NE					
469	<i>Cynoglossus susdubius</i> (Bleeker, 1851)	Carrot Tonguesole	NE					
470	<i>Cynoglossus suslida</i> Norman, 1928	Shoulderspot Tonguesole	NE					
471	<i>Cynoglossus susmacrostomus</i> (Richardson, 1846)	Malabar Tonguesole	NE					

472	<i>Cynoglossus suspuncticeps</i> Day, 1877	Speckled Toungesole	NE		√	√		√
473	<i>Cynoglossus semi fasciatus</i> Norman, 1939	Bengal Toungesole	NE		√	√		√
474	<i>Cynoglossus suszanzi barensis</i> (Bloch, 1787)	Redspotted Tonguefish	NE					
475	<i>Paraplagusi abilineata</i> Fowler, 1934	FingerlipTonguesole (DoublelinedTongue sole)	NE					
476	<i>Macrorham phosodes platycheilus</i> Fowler, 1934	TrumpetsnoutSpikefish	NE					
477	<i>Paratriacanthodes retrospinis</i> (Cantor, 1849)	SawspineSpikefish	NE					
478	<i>Pseudotriacanthus strigilifer</i> (Bloch, 1786)	Long Spined Tripod Fish	NE					
479	<i>Triacanthu sbiaculeatus</i> (Bleeker, 1852)	Short-nosed Tripodfish	NE					
480	<i>Triacanthus nieuhofii</i> (Bloch & Schneider, 1801)	Silver Tripodfish	NE					
481	<i>Abalistes stellaris</i> (Rüppell, 1836)	Starry Triggerfish	NE					
482	<i>Odonus niger</i> (Bloch & Schneider, 1801)	Redtoothed Triggerfish (Red Toothed File Fish)	NE					
483	<i>Oxymonacanthus longirostris</i> (Rüppell, 1829)	Longnose Filefish	NE					
484	<i>Pseudobalistes</i>	Yellowmargin	NE					

	<i>flavimarginatus</i> (Linnaeus, 1758)	Triggerfish						
485	<i>Rhinecanthus aculeatus</i> (Latreille, 1804)	White-banded Triggerfish (Blackbar Triggerfish)	LC					
486	<i>Sufflamen fraenatum</i> (Hollard, 1854)	Masked Triggerfish	NE					
487	<i>Xanthichthys lineopunctatus</i> (Linnaeus, 1758)	Striped Triggerfish	NE					
488	<i>Aluterus monocerus</i> (Ruppell, 1837)	Unicorn Leatherjacket	NE					
489	<i>Cantherhines pardalis</i> (Peters, 1855)	Honeycomb File Fish	NE					
490	<i>Paramonacanthus frenatus</i> (Temminck& Schlegel, 1850)	Wedgetail Filefish	NE					
491	<i>Paramonacanthus oblongus</i> (Rüppell, 1829)	Hair-finned Filefish	NE					
492	<i>Paramonacanthus pusillus</i> (Temminck& Schlegel, 1850)	Faintstripe Filefish	NE					
493	<i>Pseudalutarius nasicornis</i> (Linnaeus, 1758)	Rhinoceros Leatherjacket	NE					
494	<i>Lactoria cornuta</i> (Linnaeus, 1758)	Longhorn Cowfish	NE					
495	<i>Ostracion cubicus</i> (Bloch ,1785)	Yellow Boxfish (Ocellated Box Fish)	NE					
496	<i>Tetrosomus concatenatus</i> (Linnaeus, 1758)	Triangular Boxfish	NE					

497	<i>Tetrosomus gibbosus</i> (Linnaeus, 1758)	Humpback Turretfish	NE					
498	<i>Arothronhis pidus</i> (Bloch & Schneider, 1801)	White-Spotted Puffer (White- spotted Blossop)	NE					
499	<i>Arothronim maculatus</i> (Day, 1878)	Immaculate Puffer (Black Edged Blossop)	NE					
500	<i>Arothron leopardus</i> (Bloch & Schneider, 1801)	Banded Leopardblowfish (Bebo)	NE					
501	<i>Arothron nigropunctatus</i> (Bloch & Schneider, 1801)	Blackspotted Puffer	NE					
502	<i>Arothron reticularis</i> (Anonymous, 1798)	Reticulated Blow Fish	NE					
503	<i>Arothron stellatus</i> (Bleeker, 1854)	Stellate Puffer (Staring Blow Fish)	NE					
504	<i>Canthigaster bennetti</i> (Vaillant & Sauvage, 1875)	Bennett's Sharpnose Puffer	NE					
505	<i>Canthigaster coronata</i> (Hamilton, 1822)	Crowned Puffer	NE					
506	<i>Chelonodon patoca</i> (Temminck & Schlegel, 1850)	Milkspotted Puffer (Gangetic Pufferfish)	NE					
507	<i>Lagocephalus inermis</i> (Bloch & Schneider, 1801)	Smooth Blaasop (Smooth Backed Blow Fish)	NE					
508	<i>Lagocephalus lunaris</i> (Gmelin, 1789)	Lunartail Puffer	NE					

509	<i>Lagocephalus sceleratus</i> (Bloch, 1785)	Silver-cheeked Toadfish (SilverstripeBlasop)	NE					
510	<i>Cyclichthys orbicularis</i> (Linnaeus, 1758)	Birdbeak Burrfish	NE					
511	<i>Diodonholo canthus</i> (Linnaeus, 1758)	Long-spine Porcupinefish (Blotched Porcupine Fish)	NE					
512	<i>Diodonhy strix</i> (Cuvier, 1818)	Spot-Fin Porcupinefish (Spotted Porcupinefish)	NE					
513	<i>Tragulichthys jaculiferus</i> (Bianconi, 1854)	Longspined Porcupinefish	NE					
514	<i>Lophodiodoncalori</i> Linnaeus, 1758)	Four-bar Porcupinefish	NE					
515	<i>Mola mola</i> (Pennant, 1776)	Ocean Sunfish (Giant Sun Fish)	NE					
516	<i>Ranzani alaevis</i>	Slender Sunfish (Truncated Sunfish)						
517.								
518	<i>Hexanchus griseus</i> (Bonnaterre, 1788)	Sixgilled Shark (Cow Shark)	NT					
519	<i>Heptranchias perlo</i> (Bonnaterre, 1788)	SharpnoseSevengill Shark	NT					
520	<i>Rhincodon typus</i>	Whale Shark	VU					

	Smith, 1828		Sch.I (IIA)					
521	<i>Chiloscyllium arabicum</i> Gubanov, 1980	Arabian Carpet Shark	NT		√			
522	<i>Chiloscyllium griseum</i> Müller & Henle, 1838	Grey Bamboo Shark	NT		√			
523	<i>Chiloscyllium indicum</i> (Gmelin, 1789)	Slender Bamboo Shark (Indian Cat Shark, Ridge-back Bamboo Shark)	NT		√			
524	<i>Chiloscyllium plagiosum</i> (Anonymous [Bennett], 1830)	Whitespotted Bamboo Shark (Whitespotted Bamboo Shark)	NE		√			
525	<i>Chiloscyllium punctatum</i> Müller & Henle, 1838	BrownspeckledBamb ooshark	NE					
526	<i>Stegostoma fasciatum</i> (Hermann, 1783)	Zebra Shark (Leopard Shark)	VU					
527	<i>Nebrius ferrugineus</i> (Lesson, 1831)	Tawny Nurse Shark (Giant Sleepy Shark)	VU					
528	<i>Pseudocarcharias kamoharai</i> (Matsubara, 1936)	Crocodile Shark	NT					
529	<i>Isurus oxyrinchus</i> Rafinesque, 1810	Shortfin Mako (Shortfin Mako Shark)	VU					
530	<i>Alopias pelagicus</i> Nakamura, 1935	Pelagic Thresher Shark (Whiptail Shark)	VU		√	√		

531	<i>Alopias superciliosus</i> (Lowe, 1841)	Bigeye Thresher Shark	VU					
532	<i>Alopias vulpinus</i> (Bonnaterre, 1788)	Common Thresher (Thresher)	VU		√	√		
533	<i>Atelomycterus marmoratus</i> (Anonymous [Bennett], 1830)	Coral Catshark (Marbled Cat Shark)	NT					
534	<i>Cephalos cylliumsilasi</i> (Talwar, 1974)	Indian Swellshark (Ground Shark)	DD					
535	<i>Halaelurus quagga</i> (Alcock, 1899)	Quagga Catshark	DD					
536	<i>Bythaelurus hispidus</i> (Alcock, 1891)	Bristly Catshark	DD					
537	<i>Eridacnis radcliffei</i> Smith, 1913	Pygmy Ribbontail Catshark	LC					
538	<i>Mustelus mosis</i> Hemprich&Ehernberg, 1899	Arabian Smoothhound (Hardnosed Smoothhound)	DD		√	√		
539	<i>Chaenogaleus macrostoma</i> (Bleeker, 1852)	Hooktooth Shark	VU					
540	<i>Hemipristis elongata</i> (Klunzinger, 1871)	Snaggletooth Shark (Fossil Shark, Elliot's Grey Shark)	VU					
541	<i>Carcharhinus amblyrhynchoides</i> (Whitley, 1934)	Graceful Shark (Queensland Shark)	NT		√	√		
542	<i>Carcharhinus amboinensis</i> (Müller & Henle, 1839)	Pigeye Shark (Java Shark)	DD					

543	<i>Carcharhinus brevipinna</i> (Müller & Henle, 1839)	Spinner Shark	NT		√	√		
544	<i>Carcharhinus dussumieri</i> (Müller & Henle, 1839)	Whitecheek Shark (Widemouth Blackspot Shark)	NT		√	√	√	√
545	<i>Carcharhinus falciformis</i> (Müller & Henle, 1839)	Silky Shark (Blackspot Shark)	NT					
546	<i>Carcharhinus limbatus</i> (Müller & Henle, 1839)	Blacktip Shark	NT		√	√	√	√
547	<i>Carcharhinus longimanus</i> (Poey, 1861)	Oceanic Whitetip Shark (Whitetip Shark)	VU					
548	<i>Carcharhinus macloti</i> (Müller & Henle, 1839)	Hardnose Shark (Maclot's Shark)	NT					
549	<i>Carcharhinus melanopterus</i> Quoy&Gaimard, 1824)	Blacktip Reef Shark	NT					
550	<i>Carcharhinus sealei</i> (Pietschmann, 1913)	Blackspot Shark	NT					
551	<i>Carcharhinus sorrah</i> (Müller & Henle, 1839)	Spottail Shark	NT		√			
552	<i>Galeocerdo cuvieri</i> (Péron&Lesueur, 1822)	Tiger Shark (Ground Shark)	NE					
553	<i>Lamiopsis temminckii</i> (Müller & Henle, 1839)	Broadfin Shark	EN					
554	<i>Loxodon macrorhinus</i> Müller & Henle, 1839	Sliteye Shark	LC					
555	<i>Negaprion acutidens</i> (Rüppell, 1837)	Sicklefin Lemon Shark (Indian Lemon	VU					

		Shark)						
556	<i>Prionace glauca</i> (Linnaeus, 1758)	Blue Shark	NT					
557	<i>Rhizoprion odonacutus</i> (Rüppell, 1837)	Milk Shark (White-eyed Shark)	LC		√	√		√
558	<i>Rhizoprion odonoligolinx</i> Springer, 1964	Grey Sharpnose Shark (Grey Dog Shark)	LC					
559	<i>Scoliodonl aticaudus</i> Müller & Henle, 1838	Spadenose Shark	NT		√	√		√
560	<i>Triaenodon obesus</i> (Rüppell, 1837)	Whitetip Reef Shark	NT					
561	<i>Eusphyra blochii</i> (Cuvier, 1816)	Winghead Shark	NT					
562	<i>Sphyrna lewini</i> (Griffith & Smith, 1834)	Scalloped Hammerhead	EN					
563	<i>Sphyrna mokarran</i> (Rüppell, 1837)	Great Hammerhead Smooth Hammerhead (Round-headed	EN					
564	<i>Sphyrna zygaena</i> (Linnaeus, 1758)	Hammerhead)	VU		√	√		√
565	<i>Centroscyllium ornatum</i> (Alcock, 1889)	Ornate Dogfish	DD		√			√
566	<i>Centroscygnus crepidater</i> (Barbosa du Bocage & de Brito Capello, 1864)	Longnose Velvet Dogfish	NE					
567	<i>Centrophorus granulosus</i>	Gulper Shark	NE					

	(Bloch & Schneider, 1801)							
568	<i>Centrophorus moluccensis</i> Bleeker, 1860	Smallfin Gulper Shark	DD					
569	<i>Squalus mitsukurii</i> Jordan & Snyder, 1903	ShortspineSpurdog	DD		√			√
570	<i>Echinorhinus brucus</i> (Bonnaterre, 1788)	Bramble Shark	NE					
571	<i>Anoxypristis cuspidata</i> (Latham, 1794)	Pointed Sawfish (Knifetooth Sawfish, Narrow Sawfish)	EN					
572	<i>Pristi smicrodon</i> Latham, 1794	Targetooth Sawfish	NE, Sch I (II A)					
573	<i>Pristis zijsron</i> Bleeker, 1851	Longcomb sawfish	CR Sch I (IIA)					
574	<i>Narcine brunnea</i> Annandale, 1909	Brown Numbfish	NE					
575	<i>Narcine timlei</i> (Bloch & Schneider, 1801)	Spotted Numbfish	DD					
576	<i>Torpedo sinuspersici</i> Olfers, 1831	Marbled Electric Ray	DD					
577	<i>Glaucostegus typus</i> (Anonymous [Bennett], 1830)	Giant Shovelnose Ray (Common Shovelnose Ray)	VU					
578	<i>Rhinaan cylostoma</i> Bloch & Schneider, 1801	Bowmouth Guitarfish	VU					
579	<i>Rhinobatos annandalei</i> Norman, 1926	Annandale's Guitarfish	DD		√			√

		(Annandale's Shovelnose Ray)						
580	<i>Rhinobatos granulatus</i> Cuvier, 1829	Sharpnose Guitar Fish	NE		√			√
581	<i>Rhinobatos obtusus</i> Müller & Henle, 1841	Widenose Guitar Fish	VU					
582	<i>Rhinobatos thouiniana</i> (Shaw, 1804)	Shaw's Shovelnose Guitar Fish	NE					
583	<i>Rhynchobatus djiddensis</i> (Forsskål, 1775)	Giant Guitar Fish (White Spotted Shovelnose Ray)	VU Sch I (IIA)					
584	<i>Dasyatis bennettii</i> (Müller & Henle, 1841)	Bennett's Stingray (Frilltailed Stingray)	NE		√	√		√
585	<i>Dasyatis zugei</i> (Müller & Henle, 1841)	Paleedged Stingray (Sharpnose Stingray)	NT					
586	<i>Himantura bleekeri</i> (Blyth, 1860)	Bleeker's Whip Ray	NE		√	√		√
587	<i>Himantura gerrardi</i> (Gray, 1851)	Sharpnose Stingray	VU					
588	<i>Himantura granulata</i> (Macleay, 1883)	Mangrove Whipray	NT		√			√
589	<i>Himantura imbricata</i> (Bloch & Schneider, 1801)	Scaly Whipray	DD					
590	<i>Himantura uarnak</i> (Gmelin, 1789)	Honeycomb Stingray (Reticulate Whipray)	VU		√	√		√
591	<i>Neotry gonkuhlii</i>	Bluespotted	DD					

	(Müller & Henle, 1841)	Stingray						
592	<i>Pastinachus sephen</i> (Forsskål, 1775)	Cowtail Stingray (Frill Tailed Stingray)	DD					
593	<i>Gymnur amicrura</i> (Bloch & Schneider, 1801)	Smooth Butterfly Ray	DD					
594	<i>Gymnura poecilura</i> (Shaw, 1804)	Longtailed Butterfly Ray	NT					
595	<i>Aetobatus narinari</i> (Euphrasen, 1790)	Spotted Eagle Ray	NT					
596	<i>Aetomylaeus vespertilio</i> (Bleeker, 1852)	Ornate Eagle Ray (Reticulate Eagle Ray)	EN					
597	<i>Manta birostris</i> (Walbaum, 1792)	Giant Manta (Devil Ray)	VU		√			√
598	<i>Mobula eregoodootenkee</i> (Bleeker, 1859)	Longhorned Mobula	NT					
599	<i>Rhinoptera javanica</i> Müller & Henle, 1841	Flapnose Ray (Javanese Cownose Ray)	NE					
600	<i>Neoharriota pinnata</i> (Schnakenbeck, 1931)	Sicklefin Chimaera (Longnose Chimaera)	NE					
601	<i>Elops machnata</i> (Forsskål, 1775)	Tenpounder (Ladyfish)	LC					
602	<i>Megalops cyprinoides</i> (Broussonet, 1782)	Indo-Pacific Tarpon (Oxeye Tarpon)	DD		√			√
603	<i>Albula vulpes</i> (Linnaeus, 1758)	Bone Fish	NE					

604	<i>Anguilla bengalensis</i> (Gray, 1831)	Indian Mottled Eel (Indian Longfin Eel)	NT		√			√
605	<i>Anguilla bicolor</i> McClelland, 1844	Indonesian Shortfin Eel (Shortfin Eel)	NT					
606	<i>Echidna delicatula</i> (Kaup, 1856)	Mottled Moray	NE					
607	<i>Echidna leucotaenia</i> Schultz, 1943	Whiteface Moray	NE					
608	<i>Gymnomuraena zebra</i> (Shaw, 1797)	Zebra Moray (Reticulated Moray)	NE					
609	<i>Gymnothorax favagineus</i> Bloch & Schneider, 1801	Laced moray	NE					
610	<i>Gymnothorax enigmaticus</i> (McCosker& Randall, 1982)	Enigmatic moray (Banded moray)	NE					
611	<i>Gymnothorax flavimarginatus</i> (Rüppell, 1830)	Yellow-Edged Moray	NE					
612	<i>Gymnothorax meleagris</i> (Shaw, 1795)	Turkey Moray (Painted Moray)	NE					
613	<i>Gymnothorax reticularis</i> Bloch, 1795	Reticulated Morey (Dusky-banded moray)	NE					
614	<i>Gymnothorax rueppelliae</i> (McClelland, 1844)	Banded Moray (Rupell's Moray)	NE					
615	<i>Gymnothorax undulatus</i> (Lacepède, 1803)	Undulated Moray	NE					
616	<i>Strophidon sathete</i> (Hamilton, 1822)	Slender Giant Moray (Gangetic Moray)	NE					

617	<i>Caecula pterygera</i> Vahl, 1794	Finny Snake Eel	NE					
618	<i>Lamnostom aorientalis</i> (McClelland, 1844)	Oriental Sand Eel (Oriental Worm Eel)	LC					
619	<i>Leiuranus semicinctus</i> Lay & Bennett, 1839)	Saddled Snake-eel	NE					
620	<i>Pisodonophis cancrivorus</i> (Richardson, 1848)	Longfin Snake-eel	NE					
621	<i>Ostichthys japonicus</i> (Cuvier, 1829)	Japanese Soldier Fish (Brocade Perch)	NE					
622	<i>Conger cinerens</i> Rüppell, 1830	Longfin African Conger (Moustache Conger)	NE					
623	<i>Uroconger lepturus</i> (Richardson, 1845)	Slender Conger (Yellow Pike- Conger)	NE					
624	<i>Congresoxtala bonoides</i> (Bleeker, 1853)	Indian Pike Conger	NE					
625	<i>Muraenesox bagio</i> (Hamilton, 1822)	Common Pike Conger (Pike Eel, Siver Eel)	NE		√			√
626	<i>Muraenesox cinereus</i> (Forsskål, 1775)	Daggertooth Pike Conger	NE					
627	<i>Anodonto stomachacunda</i> (Hamilton, 1822)	Chacunda Gizzard- Shad	NE					
628	<i>Dussumieria acuta</i> Valenciennes, 1847	Rainbow Sardine	NE					

629	<i>Ehirava fluviatilis</i> Deraniyagala, 1929	Malabar Sprat	NE					
630	<i>Escualo sathoracata</i> (Valenciennes, 1847)	White Sardine	NE					
631	<i>Herklotsichthys quadrimaculatus</i> (Rüppell, 1837)	Bluestripe Herring	NE					
632	<i>Nematalosa nasus</i> (Bloch, 1795)	Bloch's Gizzard Shad (Hairback)	LC					
633	<i>Amblygas tersirm</i> (Walbaum, 1792)	Spotted Sardinella	NE					
634	<i>Amblyga sterclupeoides</i> Bleeker, 1849	Bleeker Smoothbelly Sardinella (Sharpnose Sardine)	NE					
635	<i>Sardinella albella</i> (Valenciennes, 1847)	White Sardinella	LC					
636	<i>Sardinella brachysoma</i> Bleeker, 1852	Deepbody Sardinella (Indian Sprat)	NE					
637	<i>Sardinella jussieu</i> (Lacepède, 1803)	Mauritian Sardinella	NE					
638	<i>Sardinella fimbriata</i> (Valenciennes, 1847)	Fringescale Sardinella	NE		√	√	√	√
639	<i>Sardinella gibbosa</i> (Bleeker, 1849)	Goldstripe Sardinella	NE		√	√	√	√
640	<i>Sardinella longiceps</i> Valenciennes, 1847	Indian Oil Sardine	LC		√		√	√
641	<i>Sardinella melanura</i>	Blacktip Sardinella	NE					

	(Cuvier, 1829)							
642	<i>Sardinella sindensis</i> (Day, 1878)	Sind Sardinella	NE					
643	<i>Tenualos ailisha</i> (Hamilton, 1822)	Hilsa (Hilsa Shad)	LC		√		√	√
644	<i>Encrasicholina devisi</i> (Whitley, 1940)	Devis' Anchovy	NE					
645	<i>Encrasicholina heteroloba</i> (Rüppell, 1837)	Shorthead Anchovy	NE					
646	<i>Encrasicholina punctifer</i> Fowler, 1938	Buccaneer Anchovy	NE					
647	<i>Stolephorus baganensis</i> Hardenberg, 1933	Bagan anchovy	NE					
648	<i>Stolephorus commersoni</i> Lacepède, 1803	Commerson's Anchovy	NE					
649	<i>Stolephorus indicus</i> (van Hasselt, 1823)	Indian Anchovy	NE					
650	<i>Stolephorus ularis</i> Hardenberg, 1933	Hardenberg's Anchovy	NE					
651	<i>Stolephorus waitei</i> Jordan & Seale, 1926	Spotty-Face Anchovy	NE					
652	<i>Thryssadus sumieri</i> (Valenciennes, 1848)	Dussumier's Thryssa (Long Anchovy)	NE		√			√
653	<i>Thrys sahamiltonii</i> Gray, 1835	Hamilton's Thryssa	NE					
654	<i>Thrys samalabarica</i> (Bloch, 1795)	Malabar Thryssa	NE		√	√	√	√
655	<i>Thrys samystax</i>	Moustached Thryssa	LC		√			√

√

	(Bloch & Schneider, 1801)							
656	<i>Thrys sasetirostris</i> (Broussonet, 1782)	LongjawThryssa	NE					
657	<i>Thrys savitirostris</i> Gilchrist & Thompson, 1908)	Orangemouth Anchovy	NE					
658	<i>Chanoschanos</i> (Forsskål, 1775)	Milk Fish	NE		√		√	√
659	<i>Arius arius</i> (Hamilton, 1822)	Threadfin Sea Catfish (Hamilton's Catfish)	LC					
660	<i>Arius maculatus</i> (Thunberg, 1792)	Spotted Catfish	NE					
661	<i>Arius subrostratus</i> Valenciennes, 1840	Shovelnose Sea Catfish	NE					
662	<i>Nemapteryx caelata</i> (Valenciennes, 1840)	Engraved Catfish	NE					
663	<i>Netumathalas sina</i> (Rüppell, 1837)	Giant Catfish	NE					
664	<i>Plicofollisdus sumieri</i> (Valenciennes, 1840)	Blacktip Sea Catfish	LC					
665	<i>Sciadessona</i> (Hamilton, 1822)	Sona Sea Catfish (Dusky Catfish)	NE					
666	<i>Plotosuscanius</i> Hamilton, 1822	Gray Eel-Catfish (Canine Catfish-Eel)	NE					
667	<i>Plotosus limbatus</i> Valenciennes, 1840	Darkfin Eel Catfish	NE					
668	<i>Plotosus lineatus</i> (Thunburg, 1787)	Striped Eel Cat Fish	NE					

669	<i>Astronesthes fibulatus</i> Gibbs, Amaoka&Haruta, 1984	Triplethread Snaggletooth	NE					
670	<i>Chlorophthalmus agassizi</i> Bonaparte, 1840	ShortnoseGreeneye	NE					
671	<i>Sauridatumbil</i> (Bloch, 1795)	Greater Lizardfish	NE					
672	<i>Sauridaundo squamis</i> (Richardson, 1848)	Brushtooth Lizardfish	NE					
673	<i>Synodus binotatus</i> Schultz, 1953	Two-Spot Lizard Fish	NE					
674	<i>Synodus indicus</i> (Day, 1873)	Indian Lizardfish	NE					
675	<i>Diaphus garmani</i> Gilbert, 1906	Garman's Lanternfish	NE					
676	<i>Diaphus splendidus</i> (Brauer, 1904)	Horned Lanternfish	NE					
677	<i>Diaphus thiollierei</i> Fowler, 1934	Thiolliere's Lanternfish	NE					
678	<i>Diaphus watasei</i> Jordan & Starks, 1904	Watases Lanternfish	NE					
679	<i>Myctophumo btusirostre</i> Tåning, 1928	Bluntnout Lanternfish	NE					
680	<i>Polymixia japonica</i> Günther, 1877	Silver Eye	NE					
681	<i>Bregmaceros macclellandi</i> Thompson, 1840	Unicorn Cod (Spotted Codlet)	NE					
682	<i>Brotula multibarata</i> Temminck& Schlegel, 1846	Goatsbeard Brotula	NE					

683	<i>Colletteichthys flavipinnis</i> Greenfield, Bineesh & Akhilesh, 2012	Yellowfin toadfish	NE					
684	<i>Colletteichthys dussumieri</i> (Valenciennes, 1837)	Flat Toadfish	NE					
685	<i>Lophiodes mutilus</i> (Alcock, 1894)	Smooth Angler	NE					
686	<i>Lophiomus setigerus</i> (Vahl, 1797)	Blackmouth Angler (Blackmouth Goosefish)	NE					
687	<i>Antennarius nummifer</i> (Cuvier, 1817)	Spotfin Frogfish	NE					
688	<i>Antennarius striatus</i> (Shaw, 1794)	Striated Frogfish	NE					
689	<i>Halieutaea indica</i> Annandale & Jenkins, 1910	Indian Handfish (Starry Handfish)	NE					
690	<i>Atherinomorus duodecimalis</i> (Valenciennes, 1835)	Tropical Silverside	NE					
691	<i>Ablenneshians</i> (Valenciennes, 1846)	Flat Needlefish	NE					
692	<i>Strongy uraleiura</i> (Bleeker, 1850)	Banded Needlefish	NE					
693	<i>Strongylura strongylura</i> (van Hasselt, 1823)	Spottail Needlefish	NE					
694	<i>Tylosurusacus</i> (Bleeker, 1850)	Keel-Jawed Needlefish ³⁴	NE					
695	<i>Hemiramphus far</i> (Forsskål, 1775)	Blackbarred Halfbeak	NE					

696	<i>Hemiram phuslutkei</i> Valenciennes, 1847	Lutke's Halfbeak	NE					
697	<i>Hyporhamphus dus sumieri</i> (Valenciennes, 1847)	Dussumier's Halfbeak	NE					
698	<i>Hyporhamphus limbatus</i> (Valenciennes, 1847)	Congaturi Halfbeak	LC		√			√
699	<i>Rhynchorhamphus georgii</i> (Valenciennes, 1847)	Long Billed Half Beak	NE					
700	<i>Rhynchorhamphus malabaricus</i> Collette, 1976	Malabar Halfbeak	NE					
701	<i>Cheilopogoncy anopterus</i> (Valenciennes, 1847)	Margined Flyingfish	NE					
702	<i>Exocoetus monocirrhus</i> Richardson, 1846	Barbel Flyingfish	NE					
703	<i>Exocoetus volitans</i> Linnaeus, 1758	Tropical Two-Wing Flyingfish	NE					
704	<i>Hirundichthys coromandelensis</i> (Hornell, 1923)	Coromandel Flying Fish	NE					
705	<i>Hirundichthys oxycephalus</i> (Bleeker, 1852)	Bony Flying Fish	NE					
706	<i>Gephyro beryxdarwinii</i> (Johnson, 1866)	Darwin's Slimehead	NE					
707	<i>Sargocentron melanospilos</i> (Bleeker, 1858)	Black Spot Squirrel Fish	NE					
708	<i>Sargocentron rubrum</i> (Forsskal, 1775)	Redcoat (Red Striped Squirrelfish)	NE					

709	<i>Myripristis adjustus</i> Bleeker, 1853	Shadowfin Soldier Fish	NE					
710	<i>Myripristis murdjan</i> (Forsskål, 1775)	Pinecone Soldier Fish	NE					
711	<i>Ostichthys acanthorhinus</i> Randall, Shimizu & Yamakawa, 1982	Spinesnout Squirrel Fish	NE					
712	<i>Cyttopsis rosea</i> (Lowe, 1843)	Rosy Dory	NE					
713	<i>Zenopsisconchifer</i> (Lowe, 1852)	Silvery John Dory	NE					
714	<i>Aulostomus chinensis</i> (Linnaeus, 1766)	Chinese Trumpet Fish	NE					
715	<i>Fistularia petimba</i> Lacepède, 1803	Red Cornet Fish	NE					
716	<i>Fistularia commersonii</i> Rüppell, 1838	Blue-spotted Cornet Fish	NE					
717	<i>Centriscus scutatus</i> Linnaeus, 1758	Grooved Shrimpfish	NE					

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; K – Kerala

Source: Various sources ; Compiled by Dr. Ranjith & Dr. Deepa

Annexure 14 : Crustacean bio-resources of mangroves areas of Kerala

Sl. No	Scientific Name	Common Name	IUCN Status / Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
1	<i>Tortanus(Tortanus) gracilis</i> (Brady, 1883)	Maxillopoda		K				
2	<i>Metapenaeusdobsoni</i> (Miers, 1878)	Kadal shrimp	NE	K	√	√		
3	<i>Penaeusindicus</i> H. Milne Edwards, 1837	Indian prawn	NE	K	√	√		
4	<i>Penaeusmonodon</i> Fabricius, 1798	Tiger prawn	NE	K	√	√		
5	<i>Calappalophos</i> (Herbst, 1782)	Common box crab	NE	K			√	
6	<i>Ashtoretlunaris</i> (Forskål, 1775)	Yellow moon crab	NE	K				
7	<i>Matuta victor</i> (Fabricius, 1781)	Common moon crab	NE	K				
8	<i>Cylindrotelphusasteniops</i> (Alcock, 1909)	Gecarcinucid crabs	NE	K				
9	<i>Sartorianaspinigera</i> (Wood-Mason, 1871)	Freshwater crab	NE	K				
10	<i>Doclearissoni</i> Leach, 1815		NE	K				
11	<i>Eurycarcinusorientalis</i> A. Milne Edwards, 1867	pilumnid crab	NE	K				
12	<i>Charybdis (Charybdis) feriata</i> (Linnaeus, 1758)	crucifix crab	NE	K	√	√	√	√

13	<i>Charybdis (Charybdis) lucifera</i> (Fabricius, 1798)	Yellowish brown crab.	NE	K	√	√	√	√
14	<i>Charybdis (Goniohellenus) hoplites</i> (Wood-Mason, 1877)		NE	K				
15	<i>Portunus (Monomia) gladiator</i> Fabricius, 1758		NE	K	√	√	√	√
16	<i>Portunus (Portunus) pelagicus</i> (Linnaeus, 1758)	Flower crab	NE	K	√	√	√	√
17	<i>Portunussanguinolentus</i> (Herbst, 1783)	Three spot swimming crab	NE	K	√	√	√	√
18	<i>Scylla serrata</i> (Forskål, 1775)	Mud crab	NE	K	√	√	√	√
19	<i>Scylla tranquebarica</i> (Fabricius, 1798)	Mangrove crab	NE	K	√	√	√	√
20	<i>Metopograpsuslatifrons</i> (White, 1847)		NE	K				
21	<i>Metopograpsusmessor</i> (Forskål, 1775)		NE	K				
22	<i>Clistocoelomamerguiensede</i> Man, 1888		NE	K				
23	<i>Clistocoelomalantum</i> (Alcock, 1900)		NE	K				
24	<i>Episesarmaederi</i> (H. Milne Edwards, 1853)		NE	K				
25	<i>Nanosesarmaandersoni</i> (De Man, 1887)		NE	K				
26	<i>Neosarmatiummalabaric</i>		NE	K				

	<i>um</i> (Henderson, 1893)							
27	<i>Parasesarmapictum</i> (De Haan, 1835)		NE	K				
28	<i>Parasesarmaplicatum</i> (Latreille, 1803)		NE	K				
29	<i>Pseudosesarmaedwardsii</i> (De Man, 1887)		NE	K				
30	<i>Sesarmopsintermedius</i> (De Haan, 1835)		NE	K				
31	<i>Varunalitterata</i> (Fabricius, 1798)		NE	K				
32	<i>Dotillaintermediade</i> Man, 1888		NE	K				
33	<i>Dotillamyctiroides</i> (H. Milne Edwards, 1852)		NE	K				
34	<i>Austrucaannulipes</i> (H. Milne Edwards, 1837)		NE	K				
35	<i>Austrucalactea</i> (De Haan, 1835)		NE	K				
36	<i>Gelasimusvocans</i> (Linnaeus, 1758)		NE	K				
37	<i>Ocypodeceratophthalmus</i> (Pallas, 1772)	Ghost crab	NE	K		√		
38	<i>Tubucaacuta</i> (Stimpson, 1858)		NE	K				
39	<i>Scleroplaxgranulata</i> Rathbun, 1894		NE	K				
40	<i>Macrobrachiumrosenbergii</i> (de Man, 1879)	Scampi	LC	K	√	√	√	√

41	<i>Macrobrachium idella</i> Hilgendorf, 1897	Slender River Prawn	LC	K	√	√	√	√
42	<i>Macrobrachium sulcatus</i> Henderson & Matthai, 1910	Striped prawn	LC	K	√	√	√	
43	<i>Macrobrachium equidens</i> Dana, 1852	Spotted prawn	LC	K	√	√	√	√
44	<i>Macrobrachium rude</i> Dana, 1852	Bushy prawn	Rare	K	√			
45	<i>Macrobrachium idae</i> Heller, 1862	Estuarine prawn	Rare	K	√			
46	<i>Victoriopsis acusatensis</i> Joseph, Bijoy Nandan, Jayachandran, 2018		NE	K				
47	<i>Sphaeromaterrebrans</i> Bate, 1866	isopod	NE	K				
48	<i>Ctenopseudeschilkensis</i> (Chilton, 1924)		NE	K				

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; k – Kerala

Source : Compiled by Dr. K. V. Jayachandran; Chandra, K., Gopi, K.C., Mishra, S.S. and Raghunathan, C. 2019. *Faunal Diversity of Mangrove Ecosystem in India*: 1-736. (Published by the Director, Zool. Surv. India, Kolkata).

Annexure 15 : Molluscan bioresources of mangrove area of Kerala

Sl. No	Scientific Name	Common Name	IUCN Status / Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startu
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									p
	Gastropoda								
1	<i>Umboniumvestiarium</i> (Linnaeus, 1758)	button tops	NE	K	√				
2	<i>Neripteronviolaceum</i> (Gmelin, 1791)	brackish water snail	NE	K	√				
3	<i>Neritaalbicilla</i> Linnaeus, 1758	blotched nerite	NE	K	√				
4	<i>Clithonoualaniense</i> (Lesson, 1831)	brackish water snail	LC	K	√				
5	<i>Pilavirens</i> (Lamarck, 1822)	Apple snail	LC	K	√				
6	<i>Littorariamelanostoma</i> (Gray, 1839)	sea snail	NE	K	√				
7	<i>Littorariascabra</i> (Linnaeus, 1758)	mangrove periwinkle	NE	K	√				
8	<i>Littorariaundulata</i> (Gray, 1839)	robust shell,	LC	K	√				
9	<i>Pirenellacingulata</i> (Gmelin, 1791)	mud snails	NE	K	√				
10	<i>Telescopiumtelescopium</i> (Linnaeus, 1758)	gastropod mollusc	LC	K	√				
11	<i>Mieniplotiascabra</i> (O. F. Müller, 1774)		NE	K					
12	<i>Nassariusstolatus</i> (Gmelin, 1791)	sea snail,	NE	K					
13	<i>Indoplanorbissexustus</i> (Deshayes, 1833)	air-breathing freshwater snail	LC	K					
14	<i>Peroniaverruculata</i> (Cuvier, 1830)	air-breathing sea slug,	NE	K					
	Bivalvia								
15	<i>Tegillarcagranosa</i> (Linnaeus, 1758)	blood cockle	NE	K					
16	<i>Crassostrea</i> Sacco, 1897		NE	K	√	√	√	√	√

17	<i>Saccostreacuccullata</i> (Born, 1778)	hooded oyster	NE	K	√	√	√	√
18	<i>Meretrixcasta</i> (Gmelin, 1791)	Backwater hard clam	NE	K	√	√		
19	<i>Meretrixmeretrix</i> (Linnaeus, 1758)	Asiatic hard clam	NE	K	√	√		
20	<i>Protapesgallus</i> (Gmelin, 1791)		NE	K				
21	<i>Villoritacyprinoides</i> (Gray, 1825)	black clam	LC	K	√	√	√	√
22	<i>Paphiamalabarica</i>	Yellow clam	LC	Ko	√	√	√	√

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; K- Kollam, Ko-Kollam

Source: Compiled by Dr. K. V. Jayachandran; Chandra, K., Gopi, K.C., Mishra, S.S. and Raghunathan, C. 2019. *Faunal Diversity of Mangrove Ecosystem in India*: 1-736. (Published by the Director, Zool. Surv. India, Kolkata)

Annexure 16 Echinoderm bioresources of mangrove area of Kerala

Sl. No.	Scientific Name	Common Name	IUCN Status / Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
1	<i>Asliaforbesi</i> (Bell, 1886)	Kadalvellarikka	NE	K	√			√
2	<i>Astropectenindicus</i> Doderlein, 1888.	Fringed Star fish	NE	K	√			√
3	<i>Clypeasterrarispinus</i> de Meijere, 1902	Cake urchins	NE	K	√			√
4	<i>Comanthinaschlegeli</i> (Carpenter, 1881)	Bushy feather star, Yellow feather star	NE	K	√			√
5	<i>Sculpsitechinusauritus</i> (Leske,	Yellow sea Pancake,Kadal	NE	K				

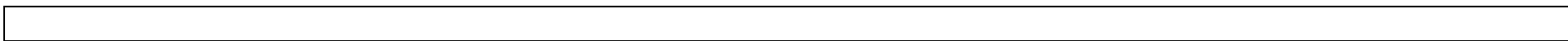
	1778). <i>Echinodiscusauritus</i>	cake						
6	<i>Echinodermata mathaei</i> (Blainville 1825).	Common urchin, Nadankadalchena	NE	K	√			√
7	<i>Echinothrixcalamaris</i> (Pallas 1774).	Kadal pencil, Kadalchena, Haptin urchin	NE	K				
8	<i>Gonicliscasterforficulatus</i> (Perrier, 1875).	Kadalnakshathram	NE	K	√			√
9	<i>Heterocentrotusmamillatus</i> (Linnaeus 1758).	Red pencil urchin, Pencil chena	NE	K				
10	<i>Holothurialeucospilota</i> (Brnadt 1835).	Black sea cucumber, Karimkadalvellarikka	NE	K	√			√
11	<i>Holothuriascabra</i> Jaeger 1833. (mainly associated with Mangroves)	Sand fish, Golden sand fish.	NE	K				
12	<i>Holothuriamollis</i> Hutton, 1872.	Black sea urchin, Brown mottled sea cucumber	NE	K				
13	<i>Heterometraphilibrio</i>). Muller, 1762.		NE	K				
14	<i>Lamprometrapalmata</i>). Muller, 1841.		NE	K	√			√
15	<i>Astropectenbengalensis</i> Doderlein 1917.		NE	K				
16	<i>Asterinacoronate</i> .von Mar tens, 1866	Grey urchin	NE	K				
17	<i>Echinasterpurpureus</i> Gray, 1840.	Grey mong	NE	K				
18	<i>Amphloplusdepressus</i> Mark 1875.		NE	K	√			√
19	<i>Ohiocoma</i> L. Agassiz , 1836.		NE	K				
20	<i>Ophiactismodesta</i> Brock, 1888.		NE	K	√			√
21	<i>Promocidarisbaculosa</i> Lamarck, 1816.		NE	K				

22	<i>Clypeasteramandalei</i> Koehler,1922		NE	K				
23	<i>Echinolampas ovate</i> (Leske, 1778).		NE	K	√			√
24	<i>Fibularia volva</i> Agassiz,1847	Sea mullerins	NE	K				
25	<i>Brissopsis luzonica</i> (Gray ,1851).		NE	K				
26	<i>Lovaniaelongate</i> (Gray, 1845).		NE	K				
27	<i>Actionopygavarians</i> (Selenka, 1867).		NE	K				
28	<i>Havelockiaversicolor</i> Semper, 1868.		NE	K				
29	<i>Anaptagracilis</i> Semper 1867.		NE	K	√			√
30	<i>Acardinamalpadioides</i> Semper, 1868.		NE	K				
31	<i>Astropyga radiate</i> Leske 1778.		NE	K				
32	<i>Asterinaburtonii</i> Gray, 1840.		NE	K				
33	<i>Metaliasternalis</i> Lamarck, 1816.		NE	K				

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated: K- Kerala

Source :Compiled by Dr. K. V. Jayachandran; Chandra, K., Gopi, K.C., Mishra, S.S. and Raghunathan, C. 2019. *Faunal Diversity of Mangrove Ecosystem in India*: 1-736. (Published by the Director, Zool. Surv. India, Kolkata)

Annexure 17 : Ichthyofaunal bioresource of mangrove area of Kerala



Sl. No.	Scientific Name	Common Name	IUCN Status/ Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of start up
1	<i>Elopsmachnata</i> (Forsskal 1775)	tenpounder	LC	K				
2	<i>Megalopscyprinoides</i> (Broussonet 1782)	Indo-Pacific tarpon	DD	K	√	√		√
3	<i>Anguilla bengalensis</i> (Gray 1834)	Indian mottled eel	NT	K	√	√		√
4	<i>Gymnothorax tile</i> (Hamilton, 1822)	Indian mud moray	LC	K				
5	<i>Strophidonsathete</i> (Hamilton 1822)	Slender giant moray	NE	K				
6	<i>Lamnostomaorientalis</i> (McClelland 1844)	Oriental worm-eel	LC	K				
7	<i>Pisodonophisboro</i> (Hamilton 1822)	Rice-paddy eel	LC	K				
8	<i>Muraenesoxbaggio</i> (Hamilton 1822)	Common pike conger	NE	K				
9	<i>Muraenesoxcinereus</i> (Forsskål 1775)	Daggertooth pike conger	NE	K				
10	<i>Dayellamalabarica</i> (Day 1873)	Day's round herring	LC	K	√	√		√
11	<i>Ehiravafluviatilis</i> Deraniyagala 1929	Malabar sprat	DD	K	√	√		√
12	<i>Nematalosanasus</i> (Bloch 1795)	Bloch's gizzard shad	LC	K				
13	<i>Stolephoruscommersonii</i> Lacepede 1803	Commerson's anchovy	LC	K	√	√		√
14	<i>Stolephorusindicus</i> (van Hasselt 1823)	Indian anchovy	LC	K	√	√		√
15	<i>Thryssamalabarica</i> (Bloch 1795)	Malabar thryssa	DD	K	√	√		√

16	<i>Chanoschanos</i> (Forsskal 1775)	Milkfish	LC	K	√	√		√
17	<i>Puntiusvittatus</i> (Day 1865)	Greenstripe barb	LC	K	√	√		√
18	<i>Rasboradaniconius</i> (Hamilton 1822)	Slender rasbora	LC	K	√	√		√
19	<i>Horabagrusbrachysoma</i> (Günther 1864)	Günther's catfish	VU	K	√	√		
20	<i>Mystuscavasius</i> (Hamilton 1822)	Gangeticmystus	LC	K	√	√		
21	<i>Mystusgulio</i> (Hamilton, 1822)	Long whiskers catfish	LC	K	√	√		
22	<i>Mystusvittatus</i> (Bloch 1794)	striped dwarf catfish	LC	K	√	√		
23	<i>Arius arius</i> (Hamilton 1822)	Threadfin sea catfish	LC	K	√	√		
24	<i>Nemapteryxnenga</i> (Hamilton 1822)		NE	K				
25	<i>Plicofollislayardi</i> (Günther 1866)	Thinspine sea catfish	NE	K				
26	<i>Plotosuscanius</i> Hamilton 1822	Gray eel-catfish	NE	K				
27	<i>Plotosuslimbatus</i> Valenciennes 1840	Darkfin eel catfish	NE	K				
28	<i>Plotosuslineatus</i> (Thunberg 1787)	striped eel catfish	NE	K				
29	<i>Allenbatrachusgrunniens</i> (Linnaeus 1758)	Grunting toadfish	NE	K				
30	<i>Ichthyocampuscarce</i> (Hamilton 1822)	freshwater pipefish	LC	K				
31	<i>Microphiscuncalus</i> (Hamilton 1822)	Crocodile-tooth pipefish	LC	K				
32	<i>Butisbutis</i> (Hamilton 1822)	Duckbill sleeper	LC	K				
33	<i>Eleotrisfusca</i> (Bloch & Schneider 1801)	Dusky sleeper	LC	K				
34	<i>Glossogobiusgiuris</i> (Hamilton 1822)	Tank goby	LC	K	√	√		
35	<i>Odontamblyopusrubicundus</i> (Hamilton 1822)	eel goby	LC	K				

36	<i>Oligolepisacutipennis</i> (Valenciennes 1837)	Sharptail goby	LC	K				
37	<i>Parapocryptesrictuosus</i> (Valenciennes 1837)		DD	K				
38	<i>Pseudapocrypteselongatus</i> (Cuvier 1816)			K				
39	<i>Sicyopterusgriseus</i> (Day 1877)	Clown goby,	LC	K				
40	<i>Taenioidesanguillaris</i> (Linnaeus 1758)	Eel worm goby	LC	K				
41	<i>Trypauchen vagina</i> (Bloch & Schn. 1801)	burrowing goby	NE	K				
42	<i>Ophisternonbengalense</i> (McClelland, 1844)	Bengal eel	LC	K				
43	<i>Nandusnandus</i> (Hamilton 1822)	Gangeticleaffish,	LC	K	√	√		
45	<i>Etroplussuratensis</i> (Bloch 1790)	Pearl spo	LC	K	√	√		√
46	<i>Oreochromismossambicus</i> (Peters 1852)	tilapia	LC	K	√	√		√
47	<i>Pseudetroplusmaculatus</i> (Bloch 1795)	Orange chromidae	LC	K	√	√		
48	<i>Aplocheilusblockii</i> (Arnold 1911)	green panchax	LC	K	√	√		√
49	<i>Aplocheiluslineatus</i> (Valenciennes 1846)	striped panchax	LC	K	√			
50	<i>Oryziassetnai</i> (Kulkarni 1940)	Malabar ricefish	LC	K				
51	<i>Hyporhamphuslimbatus</i> (Valenciennes 1847)	Congaturi halfbeak,	LC	K	√	√		
52	<i>Hyporhamphusxanthopterus</i> (Valenciennes 1847)	Red-tipped halfbeak	VU	K	√	√		
53	<i>Strongylurastrongylura</i> (van Hasselt 1823)	Spottail needlefish	NE	K	√	√		
54	<i>Xenentodoncancila</i> (Hamilton 1822)	Freshwater garfish	LC	K	√			√
55	<i>Ellochelonvaigiensis</i> (Quoy&Gaimard 1824)	Squaretail mullet	LC	K				
56	<i>Mugilcephalus</i> (Linnaeus 1758)	Flathead grey mullet	LC	K	√	√		√

57	<i>Osteomugilcunnesius</i> (Valenciennes 1836)	Longarm mullet	NE	K	√	√		√
58	<i>Planilizamacrolepis</i> (Smith 1849)	Largescale mullet	LC	K				
59	<i>Planilizaparsia</i> (Hamilton 1822)	Goldspot mullet	NE	K	√	√		
60	<i>Planilizasubviridis</i> (Valenciennes 1836)	Greenback mullet	NE	K				
61	<i>Planilizatade</i> (Bloch & Schneider 1801)		NE	K				
62	<i>Rhinomugilcorsula</i> (Hamilton 1822)	Corsula	LC	K	√	√		√
63	<i>Platycephalusindicus</i> (Linnaeus 1758)	Bartail flathead	DD	K				
64	<i>Sunagociacarbunculus</i> (Valenciennes 1833)	Papillose flathead	LC	K				
65	<i>Teraponjarbua</i> (Forsskål 1775)	Jarbuaterapon	LC	K	√	√		
66	<i>Teraponputa</i> Cuvier, 1829	Small-scaled terapon	NE	K	√	√		
67	<i>Terapontheraps</i> (Cuvier, 1829)	Largescaledterapon	LC	K	√	√		
68	<i>Ambassisambassis</i> (Lacepede 1802)	Commerson's glassy	LC	K	√	√		
69	<i>Ambassisgymnocephalus</i> (Lacepède 1802)	Bald glassy	LC	K	√	√		
70	<i>Ambassisnalua</i> (Hamilton 1822)	Scalloped perchlet	LC	K	√			
71	<i>Chandanama</i> (Hamilton, 1822)	Elongate glass-perchlet	LC	K	√			
72	<i>Parambassisdayi</i> (Bleeker 1874)	Day's glassy perchlet	LC	K	√			
73	<i>Latescalcarifer</i> (Bloch 1790)	Barramundi	LC	K	√	√		√
74	<i>Epinephelusareolatus</i> (Forsskål 1775)	Areolate grouper	LC	K	√			
75	<i>Epinepheluscoioides</i> (Hamilton 1822)	Orange-spotted grouper	LC	K	√	√		

76	<i>Epinephelusdiacanthus</i> (Valenciennes 1828)	Spinycheek grouper	NE	K	√	√		
77	<i>Epinephelusflavocaeruleus</i> (Lacepède 1802)	Blue-and-yellow grouper	LC	K	√	√		
78	<i>Epinephelusmalabaricus</i> (Bloch & Schneider 1801)	Malabar grouper	LC	K	√	√		
79	<i>Sillagosihama</i> (Forsskål 1775)	Silver sillago	LC	K	√	√		
80	<i>Sillagovincenti</i> (McKay 1980)	Vincent's sillago	NE	K	√	√		
81	<i>Carangoidesmalabaricus</i> (Bloch & Schn. 1801)	Malabar trevally	LC	K	√	√		
82	<i>Carangoidespraeustus</i> (Anon.[Bennett] 1830)	Brownback trevally	LC	K	√	√		
83	<i>Caranxignobilis</i> (Forsskal 1775)	Giant trevally	LC	K	√	√		
84	<i>Caranxmelampygus</i> (Cuvier 1833)	Bluefin trevally	LC	K	√	√		
85	<i>Caranxsexfasciatus</i> (Quoy&Gaimard 1825)	Bigeye trevally	LC	K	√	√		
86	<i>Eubleekeriasplendens</i> (Cuvier, 1829)	Splendid ponyfish	LC	K				
87	<i>Gazzaminuta</i> (Bloch 1795)	Toothpony	LC	K				
88	<i>Leiognathusequula</i> (Forsskal 1775)	Common ponyfish	LC	K				
89	<i>Photopectoralisbindus</i> (Valenciennes 1835)	Orangefinponyfish	NE	K				
90	<i>Deveximentuminsidiator</i> (Bloch 1787)	Pugnoseponyfish	NE	K				
91	<i>Secutorruconius</i> (Hamilton 1822)	Deep pugnoseponyfish	NE	K				
92	<i>Lutjanusargentimaculatus</i> (Forsskål 1775)	Mangrove red snapper	LC	K	√	√		
93	<i>Lutjanusjohnii</i> (Bloch 1792)	John's snapper	LC	K	√	√		
94	<i>Lobotessurinamensis</i> (Bloch 1790)	Tripletail	LC	K				
95	<i>Gerreserythrourus</i> (Bloch 1791)	Deep-bodied	LC	K	√	√		

		mojarra						
96	<i>Gerresfilamentosus</i> (Cuvier 1829)	Whipfin silver-biddy	LC	K	√	√		
97	<i>Gerresoblongus</i> (Cuvier 1830)	Slender silver-biddy	LC	K	√	√		
98	<i>Gerressetifer</i> (Hamilton 1822)	Small Bengal silver-biddy	NE	K	√	√		
99	<i>Eleutheronematetradactylum</i> (Shaw 1804)	Fourfinger threadfin	NE	K				
100	<i>Leptomelanosomaindicum</i> (Shaw, 1804)	Indian threadfin	NE	K				
101	<i>Polydactylussexxtarius</i> (Bloch &Schn. 1801)	Blackspot threadfin	NE	K				
102	<i>Daysciaenaalbida</i> (Cuvier 1830)	Bengal corvina	LC	K	√	√		
103	<i>Johniusbelangerii</i> (Cuvier 1830)	Belanger's croaker	LC	K	√	√		
104	<i>Johniuscarouna</i> (Cuvier 1830)	Caroun croaker	LC	K				
105	<i>Johniuscarutta</i> (Bloch 1793)	Karut croaker	LC	K				
106	<i>Protonibeadiacanthus</i> (Lacepède 1802)	Blackspotted croaker	NT	K				
107	<i>Abudefdufseptemfasciatus</i> (Cuvier 1830)	Banded sergeant	LC	K				
108	<i>Abudefdufsordidus</i> (Forsskål 1775)	Blackspot sergeant	LC	K				
10	<i>Abudefdufvaigiensis</i> (Quoy&Gaimard	Indo-Pacific	LC	K				

9	1825)	sergeant						
11 0	<i>Plataxteira</i> (Forsskål 1775)	Longfin batfish	LC	K				
11 1	<i>Scatophagusargus</i> (Linnaeus 1766)	Spotted scat	LC	K				
11 2	<i>Sphyraenajello</i> (Cuvier 1829)	Pickhandle barracuda	NE	K	√	√		
11 3	<i>Cynoglossusmacrostomus</i> (Norman 1926)	Malabar tonguesole	VU	K	√	√		
11 4	<i>Brachirusorientalis</i> (Bloch &Schn. 1801)	Oriental sole	LC	K				
11 5	<i>Soleaovata</i> (Richardson 1846)	Ovate sole	LC	K				
11 6	<i>Carinotetraodontravancoricus</i> (Hora& Nair 1941)	Malabar pufferfish	VU	K	√	√		
11 7	<i>Chelonodontopsleopardus</i> (Day 1878)	Banded leopardblowfish	DD	K				
11 8	<i>Dichotomycterefluviatilis</i> (Hamilton 1822)	Green pufferfish	LC	K				

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; K- Kerala

Source :Compiled by Dr.K. V. Jayachandran&Dr.Ranjith; Jisha S., Aravindan C.M. and Ritakumari S.D. 2004. Checklist of fish fauna of Ayiramthengu mangroves, Kollam district, Kerala, India. *Seshaiyana*, **12**(2): 4-5; Mishra, S.S., Gopi, K.C., Kosygin, L. and Rajan, P.T. 2019. Ichthyofauna - Fishes. In: Faunal Diversity of Mangrove Ecosystem in India: 539-586.

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Annexure 18 : Aquatic flora and zooplankton bioresources of Kerala

Table 5.4.1 a : Consolidated checklist of Aquatic flora and zooplankton bio-resources of Kerala								
Sl. No	Scientific Name	Common Name	IUCN Status / Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
Free floating Hydrophytes								
1	<i>Azolla pinnata</i> R. Br.	Duckweed	DD		Ecological	✓	✓	✓
2	<i>Eichhornia crassipes</i> (Mart.) Solms	Giant Water Fern	DD		Ecological		✓	
3	<i>Pistia stratiotes</i> L.	Water Cabbage	DD		Ecological	✓		
4	<i>Salvinia adnate</i> Desv.	Water Fern	DD		Ecological			
5	<i>Spirodela polyrrhiza</i> (L.) Schleid.	Water Hyacinth	DD		Ecological			
6	<i>Wolffia globosa</i> (Roxb.) Hartog & Plas	Water Meal	DD		Ecological			
7	Floating and Rooted Hydrophytes							
8	<i>Aponogeton natans</i> (L.) Engl. & K. Krause	American Pondweed	DD		Ecological			
9	<i>Hydrocharis dubia</i> (Blume) Backer	Blue Egyptian Lotus	DD		Ecological			
10	<i>Ludwigia sedioides</i> (Humb. & Bonpl.) H. Hara	Blue Lotus	DD		Ecological			
11	<i>Nelumbo nucifera</i> Gaertn.	Chromatella Waterlily	DD		Ecological	✓	✓	✓

12	<i>Nymphaea marliacea</i> Wildsmith	Crested Floating Heart	DD		Ecologica 	✓	✓	✓
13	<i>Nymphaea micrantha</i> Guill. &Perr.	Curled Pondweed	DD		Ecologica 	✓	✓	✓
14	<i>Nymphaea nouchali</i> var. <i>caerulea</i> (Savigny) Verdc.	Drifting Sword Plant	DD		Ecologica 	✓	✓	✓
15	<i>Nymphaea omarana</i> var. <i>rosea</i> (Sims) R. Ansari &Jeeja	Frog Bit	DD		Ecologica 	✓	✓	✓
16	<i>Nymphaea pubescens</i> Willd.	Lotus	DD		Ecologica 	✓	✓	✓
17	<i>Nymphoides hydrophylla</i> (Lour.) Kuntze	Mosaic Flower	DD		Ecologica 	✓	✓	✓
18	<i>Nymphoides indica</i> (L.) Kuntze	Pink Lotus	DD		Ecologica 			
19	<i>Potamogeton crispus</i> L.	Tropical Night- Blooming WaterLily	DD		Ecologica 			
20	<i>Potamogeton nodosus</i> Poir.	Water Chestnut	DD		Ecologica 			
21	<i>Trapa natans</i> L.	Water Snowflake	DD		Ecologica 			
Emergent Hydrophytes								
22	<i>Acanthus ilicifolius</i> L.	Alligator Weed	DD		Ecologica 			
23	<i>Acorus calamus</i> L.	Arrow Head	DD		Ecologica 			

24	<i>Aeschynomene indica</i> L.	Barbedbristle Bulrush	DD		Ecologica 			
25	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Bengal Wild Rice	DD		Ecologica 			
26	<i>Arundo donax</i> L.	Blue Water Hyssop	DD		Ecologica 			
27	<i>Bacopa caroliniana</i> (Walter) B.L. Rob.	Bog Bulrush	DD		Ecologica 			
27	<i>Bacopa monnieri</i> (L.) Wettst.	Brahmi	DD		Ecologica 			
29	<i>Baldelliaranu nculoides</i> (L.) Parl.	Branched Horsetail	DD		Ecologica 			
30	<i>Ceratopteris thalictroides</i> (L.) Brongn.	Budda Pea	DD		Ecologica 			
31	<i>Colocasia esculenta</i> black magic	Chinese Water Chestnut	DD		Ecologica 			
32	<i>Crinum asiaticum</i> L.	Club-Rush	DD		Ecologica 			
33	<i>Cryptocoryne sivadasanii</i> Bogner	Common Derris	DD		Ecologica 			
34	<i>Cyperus javanicus</i> Houtt.	Common Marsh Buckwheat	DD		Ecologica 			
35	<i>Cyperus prolifer</i> Lam.	Diverse Balsam	DD		Ecologica 			
36	<i>Derris trifoliata</i> Lour.	Dwarf Rotala	DD		Ecologica 			
37	<i>Echinodorus palifolius</i> (Nees& Mart.) J.F. Macbr.	Erect Hygrophila	DD		Ecologica 			

38	<i>Eleocharis dulcis</i> (Burm.f.) Trin. ex Hensch	Fragrant Pandan	DD		Ecologica 			
39	<i>Equisetum hyemale</i> L.	Frog Fruit	DD		Ecologica 			
40	<i>Equisetum ramosissimum</i> Desf.	Giant Mint	DD		Ecologica 			
41	<i>Fimbristylis ferruginea</i> (L.) Vahl	Golden Bladderwort	DD		Ecologica 			
42	<i>Hydrilla verticillata</i> (L.f.) Royle	Grand Crinum Lily	DD		Ecologica 			
43	<i>Hygrophila auriculata</i> (Schumach.) Heine	Grassy Arrowhead	DD		Ecologica 			
44	<i>Hygrophila difformis</i> Blume	Heyne Burnet	DD		Ecologica 			
45	<i>Hygrophila ringens</i> (L.) R. Br. ex Spreng.	Holly Mangrove	DD		Ecologica 			
46	<i>Hygrophila stricta</i> (Vahl) Lindau	Hydrilla	DD		Ecologica 			
47	<i>Hygroryza aristata</i> (Retz.) Nees ex Wight & Arn.	Indian Toothcup	DD		Ecologica 			
48	<i>Impatiens diversifolia</i> B.Heyne ex Wight & Arn.	Joint Weed	DD		Ecologica 			
49	<i>Lagenan dramee boldii</i> (Engl.) C.E.C. Fisch.	Lesser Water-Plantain	DD		Ecologica 			
50	<i>Limnocharis flava</i> (L.) Buchenau	Mangrove Palm	DD		Ecologica 			
51	<i>Limnophila chinensis</i> (Osbeck) Merr.	Marsh Barbel	DD		Ecologica 			

52	<i>Limnophyton obtusifolium</i> (L.) Miq.	Marsh Cyperus	DD		Ecologica 			
53	<i>Lindernia rotundifolia</i> (L.) Alston	Mexican Sword-Plant	DD		Ecologica 			
54	<i>Ludwigia adscendens</i> (L.) H. Hara	Miniature Cyperus	DD		Ecologica 			
55	<i>Ludwigia peruviana</i> (L.) H.Hara	Net Veined Bladderwort	DD		Ecologica 			
56	<i>Marsilea minuta</i> L.	Oval Leaf Pondweed	DD		Ecologica 			
57	<i>Monochoria vaginalis</i> (Burm.f.) C.Presl	Peruvian Water Primrose	DD		Ecologica 			
58	<i>Myriophyllum alterniflorum</i> DC.	Pickerel Weed	DD		Ecologica 			
59	<i>Nuphar lutea</i> (L.) Sm.	Red Round Leaf Lagenandra	DD		Ecologica 			
60	<i>Nypa fruticans</i> Wurmb	Rough Horsetail	DD		Ecologica 			
61	<i>Pandanus amaryllifolius</i> Roxb.	Roundleaf Lindernia	DD		Ecologica 			
62	<i>Persicaria barbata</i> (L.) H. Hara	Sawah Lettuce	DD		Ecologica 			
63	<i>Persicaria glabra</i> (Willd.) M.Gómez	Sensitive Smithia	DD		Ecologica 			
64	<i>Phyla nodiflora</i> (L.) Greene	Small Reed Mace	DD		Ecologica 			
65	<i>Pimpinella heyneana</i> (DC.) Kurz.	Spanish Cane	DD		Ecologica 			

66	<i>Pontederia cordata</i> L.	Swamp Fern	DD		Ecologica 			
67	<i>Rotala indica</i> (Willd.) Koehne	Swamp Leaf	DD		Ecologica 			
68	<i>Rotala rotundifolia</i> (Buch. - Ham. ex Roxb.) Koehne	Swamp Lily	DD		Ecologica 			
69	<i>Sagittaria graminea</i> Michx.	Sweet Flag	DD		Ecologica 			
70	<i>Schoenoplectiella articulata</i> (L.) Lye	Taro	DD		Ecologica 			
71	<i>Schoenoplectiel lalateriflora</i> (J.F.Gmel.) Lye	Water Clover	DD		Ecologica 			
72	<i>Schoenoplectiel lamucronata</i> (L.) J.Jung & H.K.Choi	Water Primrose	DD		Ecologica 			
73	<i>Smithia sensitiva</i> Aiton	Water Trumpet	DD		Ecologica 			
74	<i>Thalia geniculata</i> L.	Water Wisteria	DD		Ecologica 			
75	<i>Typha angustifolia</i> L.	Water-Milfoil	DD		Ecologica 			
76	<i>Utricularia aurea</i> Lour.	West Indian Fimbry	DD		Ecologica 			
77	<i>Utricularia reticulata</i> Sm.	Yellow Pond Lily	DD		Ecologica 			
Submerged Hydrophytes								
78	<i>Blyxa aubertii</i> Rich.	Carolina Fanwort	DD		Ecologica 			
79	<i>Cabomba caroliniana</i> A.Gray	Chara	DD		Ecologica			

80	<i>Ceratophyl lundemersum</i> L.	Duck Lettuce	DD		Ecologica 			
81	<i>Chara</i> sp.	Hornwort	DD		Ecologica 			
82	<i>Otteliaalis moides</i> (L.) Pers.	RoundfruitBlyxa	DD		Ecologica 			
83	<i>Vallisneria natans</i> (Lour.) H.Hara	Tape-Grass	DD		Ecologica 			
84	<i>Crinum malabaricum</i>	Periya in Kasargode	DD	Kasargode	Ecologica 			
85	<i>Aponogetonappendiculatus</i>	Vembanad in Alappuzha	DD	Vembanad in Alappuzha	Ecologica 			
86	<i>Cryptocoryneweghtii</i>	Kozhikode and Malappuram	DD	Kozhikode and Malappur am	Ecologica 			
87	<i>Lagendrakeralensis</i>	Ernakulam and Pathanamthitta	DD	Ernakulam and Pathanam thitta	Ecologica 			
88	<i>Lagendra nairii</i>	Athirappally in Thrissur	DD	Athirappal ly in Thrissur	Ecologica 			
89	<i>Impatiens anaimudica</i>	Anaimudi in Idukki	DD	Anaimudi in Idukki	Ecologica 			
90	<i>Impatiens cochinica</i>	Ernakulam	DD	Ernakulam	Ecologica			

					I			
91	<i>Impatiens coelotropis</i>	Nemakad in Idukki	DD	Nemakad in Idukki	Ecologica I			
92	<i>Impatiens johnii</i>	Kallar in Idukki	DD	Kallar in Idukki	Ecologica I			
93	<i>Impatiens munnarensis</i>	Munnar in Idukki	DD	Munnar in Idukki	Ecologica I			
94	<i>Heliotropium keralense</i>	Kerala	DD	Kerala	Ecologica I			
95	<i>Lobelia lammersiana</i>	Kannur	DD	Kannur	Ecologica I			
96	<i>Comme linawightii</i>	Malappuram, Palakkad, Thrissure	DD	Malappuram, Palakkad, Thrissure	Ecologica I			
97	<i>Murdannia crocea</i>	Alappuzha, Kozhikode and Kollam	DD	Alappuzha, Kozhikode and kollam	Ecologica I			
98	<i>Murdannia fadeniana</i>	Vagamon in Kottayam	DD	Vagamon in Kottayam	Ecologica I			
99	<i>Fimbristylis dauciformis</i>	Kasargode and Kozhikode	DD	Kasargode and Kozhikode	Ecologica I			
100	<i>Fimbristylis hirsutifolia</i>	Malappuram	DD	Malappuram	Ecologica I			

101	<i>Fimbristylis narayanii</i>	Kerala	DD	Kerala	Ecologica I			
102	<i>Fuirenas wamyi</i>	Idukki and Thiruvananthapuram	DD	Idukki and Thiruvananthapuram	Ecologica I			
103	<i>Eriocaulon ansarii</i>	Kodungalloor in Thrissur	DD	Kodungalloor in Thrissur	Ecologica I			
104	<i>Eriocaulon cheemenianum</i>	Cheemeni in Kasargode	DD	Cheemeni in Kasargode	Ecologica I			
105	<i>Eriocaulon devendranii</i>	Anappady in Palakkad	DD	Anappady in Palakkad	Ecologica I			
106	<i>Eriocaulon gopalakrishnanum</i>	Kannur, Kasargod and Palakkad	DD	Kannur, Kasargod and Palakkad	Ecologica I			
107	<i>Eriocaulon madayiparensense</i>	Madayipara in Kannur	DD	Madayipara in Kannur	Ecologica I			
108	<i>Eriocaulon malabaricum</i>	Sulthanbatteri in Wayanad	DD	Sulthanbatteri in Wayanad	Ecologica I			
109	<i>Eriocaulon manoharanii</i>	Ernakulam, Idukki	DD	Ernakulam, Idukki	Ecologica I			

110	<i>Eriocaulon palghatense</i>	Palakkad	DD	Palakkad	Ecologica I			
111	<i>Eriocaulon sivarajanii</i>	Calicut University campus	DD	Calicut University campus	Ecologica I			
112	<i>Eriocaulon vandaanamense</i>	Vandaanum in Alappuzha	DD	Vandaanu m in Alappuzh a	Ecologica I			
113	<i>Eriocaulon vasudevanii</i>	Nelliyampathy in Palakkad and Idukki	DD	Nelliyamp athy in Palakkad and Idukki	Ecologica I			
114	<i>Eriocaulon wayanadense</i>	Kammana in Wayanad	DD	Kammana in Wayanad	Ecologica I			
115	<i>Henckeliapra deepiana</i>	Vellarimala Kozhikode	DD	Vellarimal a Kozhikode	Ecologica I			
116	<i>Blyxakas argodensis</i>	Kasargode	DD	Kasargod e	Ecologica I			
117	<i>Pogostemon peethapushpam</i>	Kannur and Kozhikode	DD	Kannur and Kozhikode	Ecologica I			
118	<i>Utricularia malabarica</i>	Mulleria	DD	Mulleria	Ecologica I			
119	<i>Utricularia subramanii</i>	Pathanamthitta, Malappuram	DD	Pathanam thitta, Mal	Ecologica I			

				appuram				
120	<i>Rotala anamika</i>	Malappuram	DD	Malappuram	Ecologica I			
121	<i>Rotala cheruchakkiensis</i>	Thrissur	DD	Thrissur	Ecologica I			
122	<i>Rotala cookie</i>	Ernakulam and Malappuram	DD	Ernakulam and Malappuram	Ecologica I			
123	<i>Rotala dhaneshiana</i>	Muthanga in Wayanad	DD	Muthanga in Wayanad	Ecologica I			
124	<i>Rotala khaleeliana</i>	Kanayikanam in Kannur	DD	Kanayikanam in Kannur	Ecologica I			
125	<i>Rotala malabarica</i>	Aduthila&Madayipara in Kannur	DD	Aduthila&Madayipara in Kannur	Ecologica I			
126	<i>Rotala malampuzhensis</i>	Kerala	DD	Kerala	Ecologica I			
127	<i>Rotala meenkulamensis</i>	Kannur and Kasargode	DD	Kannur & Kasargode	Ecologica I			
128	<i>Rotala tulunadensis</i>	Perumude in Kasargode	DD	Perumude in Kasargode	Ecologica I			

129	<i>Nymphoides krishnakesara</i>	Madayipara in Kannur	DD	Madayipara in Kannur	Ecologica I			
130	<i>Nymphoides macrospermum</i>	Kerala	DD	Kerala	Ecologica I			
131	<i>Nymphoides sivarajanii</i>	Kerala	DD	Kerala	Ecologica I			
132	<i>Nymphaea malabarica</i>	Kerala	DD	Kerala	Ecologica I			
133	<i>Dimerianam boodiriana</i>	Ponnambalamedu in Pathanamthitta	DD	Ponnambalamedu in Pathanamthitta	Ecologica I			
134	<i>Ischaemum copeanum</i>	Cherkala in Kasargode	DD	Cherkala in Kasargode	Ecologica I			
135	<i>Ischaemum jayachandranii</i>	Nileswar in Kasargode	DD	Nileswar in Kasargode	Ecologica I			
136	<i>Ischaemum keralensis</i>	Cherkala in Kasargode	DD	Cherkala in Kasargode	Ecologica I			
137	<i>Ischaemumkumarakodiensis</i>	Pallana in Kasargode	DD	Pallana in Kasargode	Ecologica I			

138	<i>Ischaemum nairii</i>	Kanjeerakadavu in Kasargode	DD	Kanjeerakadavu in Kasargode	Ecological			
139	<i>Ischaemum pappinisseriensis</i>	Pappinisseri in Kannur	DD	Pappinisseri in Kannur	Ecological			
140	<i>Ischaemum quilonensis</i>	Perumkulam in Kollam	DD	Perumkulam in Kollam	Ecological			
141	<i>Ischaemum travencoreense</i>	Alappuzha and Kottayam	DD	Alappuzha and Kottayam	Ecological			
142	<i>Ischaemum vembanadense</i>	Vembanad in Alappuzha	DD	Vembanad in Alappuzha	Ecological			
143	<i>Limno poameeboldii</i>	Ernakulam and Kannur	DD	Ernakulam and Kannur	Ecological			
144	<i>Ochlandrae bracteata</i>	Kollam and Thiruvananthapuram	DD	Kollam and Thiruvananthapuram	Ecological			
145	<i>Ochlandrakeralensis</i>	Pachakanam in Pathanamthitta	DD	Pachakanam in Pathanamthitta	Ecological			

146	<i>Podostemum munnarensense</i>	Munnar and Idukki	DD	Munnar and Idukki	Ecological			
147	<i>Polypleurum filifolium</i>	Parambikulam in Palakkad	DD	Parambikulam in Palakkad	Ecological			
148	<i>Willisia arekaliana</i>	Silent Valley in Palakkad	DD	Silent Valley in Palakkad	Ecological			
149	<i>Zeylandiumma heshwari</i>	Moovattupuzha in Idukki	DD	Moovattupuzha in Idukki	Ecological			
150	<i>Adensoma malabaricum</i>	Kannur and Kottayam	DD	Kannur and Kottayam	Ecological			
151	<i>Lindernia manilaliana</i>	Kozhikode and Malappuram	DD	Kozhikode and Malappuram	Ecological			
Zoo plankton								
1	<i>Victoriopsis achilkensis</i> (Chilton, 1921)	Amphipods	DD	Kerala	Ecological			
2	<i>Tortanus (Tortanus) gracilis</i> (Brady, 1883)	Copepods	DD	Kerala	Ecological	yes	yes	yes
3	<i>Mysis</i> sp.	Copepod	DD	Kerala	Ecological			
4	<i>Calanus</i> spp.	Copepod	DD		Live feed	yes	yes	yes
5	<i>Eucalanaus</i> spp.	Copepod	DD		Live feed	yes	yes	yes

6	<i>Cyclops spp.</i>	Copepod	DD		Live feed	yes	yes	yes
7	<i>Centropages</i>	Copepod	DD		Live feed	yes	yes	yes
8	<i>Moina spp.</i>	Cladoceran	DD		Live feed	yes	yes	yes
9	<i>Daphnia spp.</i>	Cladoceran	DD		Live feed	yes	yes	yes

Source: Various sources; Compiled by Dr. K.V. Jayachandran, Subject Expert, RKI Project, KSBB

Annexure 19 : Consolidated checklist of Gastrotrich bio-resource of inland waters of Kerala

Table 5.4.4. a : Consolidated checklist of Gastrotrich bio-resource of inland waters of Kerala								
Sl. No.	Scientific Name	Common Name	IUCN Status/ Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
1	<i>Chaetonotus caudalspinosus</i> Visveswara 1964		NE	K	Ecological/ aquaculture		Yes	
2	<i>Chaetonotus formosus</i> Stokes 1887		NE	K	Ecological/ aquaculture		Yes	
3	<i>Chaetonotus laterospinosus</i> Visveswara 1964		NE	K	Ecological/ aquaculture		Yes	
4	<i>Chaetonotus longipinosus</i> Stokes 1887		NE	K	Ecological/ aquaculture		Yes	
5	<i>Chaetonotus anomalus</i> Brunson 1950		NE	K	Ecological/ aquaculture		Yes	
6	<i>Chaelonotus brevispinosus</i> Zelinka 1889		NE	K	Ecological/ aquaculture		Yes	

7	<i>Chaetonotus longipinosus</i> Stokes 1887		NE	K	Ecological/ aquaculture		Yes	
8	<i>Chaetonotus monobarbatus</i> Visveswara 1964		NE	K	Ecological/ aquaculture		Yes	
9	<i>Chaetonotus octonarius</i> Slokes 1887		NE	K	Ecological/ aquaculture		Yes	
10	<i>Chaetonolus schulzei</i> Zelinka 1889		NE	K	Ecological/ aquaculture		Yes	
11	<i>Chaetonotus sextospinosus</i> Visveswara 1964		NE	K	Ecological/ aquaculture		Yes	
12	<i>Chaetonotus similis</i> Stokes 1887		NE	K	Ecological/ aquaculture		Yes	
13	<i>Chaetonotus spinulosus</i> Slokes 1887		NE	K	Ecological/ aquaculture		Yes	
14	<i>Chaetonotus tachyneusticus</i> Brunson 1948		NE	K	Ecological/ aquaculture		Yes	
15	<i>Chaetonotus trianguliformis</i> Visveswara 1964		NE	K	Ecological/ aquaculture		Yes	
16	<i>Chaetonotus vulgaris</i> Brunson 1950		NE	K	Ecological/ aquaculture		Yes	
17	<i>Iclhydium minimum</i> Brunson 1950		NE		Ecological/ aquaculture		Yes	
18	<i>Icthydium monolobum</i> Brunson 1950		NE	K	Ecological/ aquaculture		Yes	
19	<i>Lepidodermella squarnutum</i> (Dujardin 1841)		NE	K	Ecological/ aquaculture		Yes	
20	<i>Polymerurus magnus</i> Visveswara 1963		NE	K	Ecological/ aquaculture		Yes	

21	<i>Polymerurus nodicaudus</i> Voigt 1901		NE	K	Ecological/ aquaculture		Yes	
22	<i>Stylochaela abarbila</i> Visveswara 1963		NE	K	Ecological/ aquaculture		Yes	
23	<i>Neogosseia antennigera</i> (Goose 1857		NE	K	Ecological/ aquaculture		Yes	

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated: K – Kerala

Source: Various sources; Compiled by Dr. K. V. Jayachandran, Subject Expert, RKI Project, KSBB; Sharma, B.K. 1980. Taxonomic notes on some freshwater gastrotricha from West Bengal, India. *Hydrobiologia*; Sharma, B.K. and S. Sharma. 1987. On species of genus *Lepadella* (Eurotatoria, Monogononta: Colurellidae) from North- Eastern India, with remarks on Indian taxa. *Hydrobiologia*; Sharma B.K. & Sharma S. 1990. On some Freshwater Gastrotricha from N.E. Region. *Rec. zool. Surv. India*, 86 (2): 211-215; Vanamala Naidu, K. 1962. Three species of Gastrotrichs from fresh Waters of Cuddapah, India. *Ann. Mag. Nat. Hist. N.S.*; Visveswara, G. 1963. On some Gastrotricha from India with description of two new species. *Ann. Mag. Nat. Hist.*; Visveswara, G. 1964. On some Gastrotricha of genus *Chaetonotus* from India. *Ann. Mag. Nat. Hist.*, (13)7: 209-216.

Annexure 20: Rotifer bioresources of inland waters of Kerala

Sl. No.	Scientific Name	Common Name	IUCN Status/ Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of startup
1	<i>Brachionus donneri</i> Brehm, 1951		NE	K	Aquaculture	Yes		Yes
2	<i>Brachionus durgae</i> Dhanapathi, 1974		NE	K	Aquaculture	Yes		Yes
3	<i>Keratellaed mondsoni</i> Ahlstrom, 1943		NE	K	Aquaculture	Yes		Yes
4	<i>Keratellalenzi</i> Hauer, 1953		NE	K	Aquaculture	Yes		Yes
5	<i>Platylas leloupi</i> (Gillard, 1967)		NE	K	Aquaculture	Yes		Yes

6	<i>Pseudoeuchlanis longipedes</i> Dhanapathi, 1978		NE	K	Aquaculture	Yes		Yes
7	<i>Mytilina acanthophora</i> Hauer, 1938		NE	K	Aquaculture	Yes		Yes
8	<i>Macrochaetus longipes</i> (Myers, 1934)		NE	K	Aquaculture	Yes		Yes
9	<i>Lepadella biloba</i> Hauer, 1958		NE	K	Aquaculture	Yes		Yes
10	<i>Lepadella dactyliseta</i> (Stenroos, 1898)		NE	K	Aquaculture	Yes		Yes
11	<i>Lepadella eurysterna</i> Myers, 1942		NE	K	Aquaculture	Yes		Yes
12	<i>Lecanebraumi</i> Koste, 1978		NE	K	Aquaculture	Yes		Yes
13	<i>Lecaneeswari</i> Dhanapathi, 1976		NE	K	Aquaculture	Yes		Yes
14	<i>Lecane lateralis</i> Sharma, 1978		NE	K	Aquaculture	Yes		Yes
15	<i>Lecane simonneae</i> Segers, 1993		NE	K	Aquaculture	Yes		Yes
16	<i>Lecane sola</i> Hauer, 1936		NE	K	Aquaculture	Yes		Yes
17	<i>Ascomorphae caudis</i> (Perty, 1850)		NE	K	Aquaculture	Yes		Yes
18	<i>Trichocerca bicristata</i> (Gosse, 1887)		NE	K	Aquaculture	Yes		Yes
19	<i>Trichocerca iernis</i> (Gosse, 1887)		NE	K	Aquaculture	Yes		Yes
20	<i>Trichocerca kostei</i> Segers, 1993		NE	K	Aquaculture	Yes		Yes
21	<i>Trichocerca similis grandis</i> Hauer, 1965		NE	K	Aquaculture	Yes		Yes
22	<i>Asplanchnopus bhimavaramensis</i> Dhanapathi, 1971		NE	K	Aquaculture	Yes		Yes
23	<i>Dicranophoroides caudatus</i> (Ehrenberg, 1834)		NE	K	Aquaculture	Yes		Yes
24	<i>Sinantherina spinosa</i> (Thorpe, 1893)		NE	K	Aquaculture	Yes		Yes
25	<i>Filinia brachiata</i> (Rousselet, 1901)		NE	K	Aquaculture	Yes		Yes
26	<i>Trochosphaera aequatorialis</i> Semper, 1872		NE	K	Aquaculture	Yes		Yes
27	<i>Anuraeopsis coe Lata</i> (De Beauchamp, 1932)		NE	K	Aquaculture	Yes		Yes
28	<i>Platyias quadricornis</i> (Ehrenberg, 1832)		NE	K	Aquaculture	Yes		Yes
29	<i>Dipleuchlanis propatula</i> (Gosse, 1886)		NE	K	Aquaculture	Yes		Yes
30	<i>Tripleuchlanis plicata</i> (Levander, 1894)		NE	K	Aquaculture	Yes		Yes

31	<i>Macrochaetus sericus</i> (Thorpe, 1893)		NE	K	Aquaculture	Yes		Yes
32	<i>Trichotria tetractis</i> (Ehrenberg, 1830)		NE	K	Aquaculture	Yes		Yes
33	<i>Scaridiuln longieaudum</i> (O. F. Milller, 1786)		NE	K	Aquaculture	Yes		Yes
34	<i>Filinia longiseta</i> (Ehrenberg, 1834)		NE	K	Aquaculture	Yes		Yes
35	<i>Filinia opoliensis</i> (Zacharias, 1898)		NE	K	Aquaculture	Yes		Yes
36	<i>Filinia pejleri</i> Hutchinson, 1964		NE	K	Aquaculture	Yes		Yes
37	<i>Horaella brehmi</i> Donner, 1949		NE	K	Aquaculture	Yes		Yes
38	<i>Brachionus mirabilis</i> Daday, 1897		NE	K	Aquaculture	Yes		Yes
39	<i>Lecane curvicornis</i> (Murray, 1913		NE	K	Aquaculture	Yes		Yes
40	<i>Lecane crepida</i> Haring, 1914		NE	K	Aquaculture	Yes		Yes
41	<i>Lecane flexilis</i> (Gosse, 1886)		NE	K	Aquaculture	Yes		Yes
42	<i>Notommata aurita</i> (Müller, 1786)		NE	K	Aquaculture	Yes		Yes
43	<i>Notommata glyphura</i> Wulfert, 1935		NE	K	Aquaculture	Yes		Yes
45	<i>Notommata pachyura</i> (Gosse, 1886)		NE	K	Aquaculture	Yes		Yes
46	<i>Notommata pseudocerberus</i> De Beauchamp, 1908		NE	K	Aquaculture	Yes		Yes
47	<i>Notommata saccigera</i> Ehrenberg, 1830		NE	K	Aquaculture	Yes		Yes
48	<i>Cephalodella gigantea</i> Remane, 1933		NE	K	Aquaculture	Yes		Yes
49	<i>Cephalodella gigantea</i> Remane, 1933		NE	K	Aquaculture	Yes		Yes
50	<i>Cephalodella misgurnus</i> Wulfert, 1937		NE	K	Aquaculture	Yes		Yes
51	<i>Cyrtonia tuba</i> (Ehrenberg, 1834)		NE	K	Aquaculture	Yes		Yes
52	<i>Euchlanis deflexa</i> Gosse, 1851		NE	K	Aquaculture	Yes		Yes
53	<i>Euchlanis meneta</i> Myers, 1930		NE	K	Aquaculture	Yes		Yes
54	<i>Eosphora anthadis</i> Haring & Myers, 1922		NE	K	Aquaculture	Yes		Yes
55	<i>Itura aurita</i> (Ehrenberg, 1830)		NE	K	Aquaculture	Yes		Yes
56	<i>Gastropus hyptopus</i> (Ehrenberg, 1838)		NE	K	Aquaculture	Yes		Yes

Abbreviations: NE- Not evaluated; K- Kerala

Source: Various sources; Compiled by Dr. K. V. Jayachandran, Subject Expert, RKI project, KSBB; Nayar, C.K.G. 1965. Taxonomic notes on Indian species of Keratella (Rotifera). *Hydrobiologia*; Dhanapathi, M.V.S.S.S. 1975. Rotifers from Andhra Pradesh, India. *Zool. J. Linn. Soc.*, 57 : 85-94; Dhanapathi, M.V.S.S.S. 1976. New species of rotifer from India belonging to the family Brachionidae. *Zool. J. Linn. Soc.*, 62 : 305-308; Anderson, H.H., 1889. Notes on Indian rotifers. *J. Asiatic Soc. Bengal*, 58: 345-358; Anitha, P.S., 2003. Studies on certain selected live feed organisms used in aquaculture with special reference to rotifers (Family: Brachionidae). Ph.D. Thesis, Central Institute of Fisheries Education University in Andheri, India; Anuradha, R., 1996. Plankton ecology of Kadinamkulam lake- a backwater system of Southern Kerala Coast. Ph.D. Thesis, University of Kerala, India

Annexure 21: Prawn bioresources of inland waters of Kerala

SI No	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Start up possibility
Family: Palaemonidae Rafinesque, 1815								
1	<i>Exopalaemonm styliferus</i> (H. Milne Edwards, 1840)	Estuarine prawn	NA	E	LT, food prawn	LT	nil	nil
2	<i>Nematopalaemon tenuipes</i> (Henderson, 1893)	Estuarine prawn	NA	E	Food prawn	LT	Nil	Nil
3	<i>Leptocarpus fluminicola</i> (Kemp, 1917)	Slender prawn	NA	E, Kn, Ks	Food prawn LT	Nil	Nil	Nil
4	<i>Leptocarpus potamiscus</i> (Kemp, 1917)	Slender prawn	NA	E, Kn, Ks	Food prawn LT	Nil	Nil	Nil
5	<i>Leptocarpus kempii</i> Jayachandran, 1992		EN, En	E	-	Nil	Nil	Nil

6	<i>Macrobrachium aemulum aemulum</i> (Nobili, 1906)		EN,	T	-	Nil	Nil	Nil
7	<i>Macrobrachium aemulum keralauni</i> Pillai & Unnikrishnan, 2013		EN, En	T	-	Nil	Nil	Nil
8	<i>Macrobrachium australe</i> (Guerin-Meneville, 1838)		EN	T	-	Nil	Nil	Nil
9	<i>Macrobrachium canarae</i> (Tiwari, 1958)	Glassy prawn	LC	Kerala	LT, food prawn	Nil	Nil	Nil
10	<i>Macrobrachium divakarani</i> Jayachandran, 2001		DD, En	A	LT, food prawn	Nil	Nil	Nil
11	<i>Macrobrachium elatum</i> Jayachandran, 1989		EN, En	K	-	Nil	Nil	Nil
12	<i>Macrobrachium equidens</i> (Dana, 1852)	Spotted prawn	LC	Kerala	LT, Food prawn	Nil	Nil	Nil
13	<i>Macrobrachium gurudeve</i> Jayachandran & Raji, 2004	Ornamental prawn	VU, En	W	ornamental	yes	yes	yes
14	<i>Macrobrachium idae</i> (Heller, 1862)		VU	T, E	-	Nil	Nil	Nil
15	<i>Macrobrachium idellaidella</i> (Hilgendorf, 1898)	Slender river prawn	LC	Kerala	LT, food prawn			
16	<i>Macrobrachium idellageorgii</i> Jayachandran & Joseph, 1985	Slender river prawn	VU, En	Ko	LT, food prawn	Nil	Nil	Nil
17	<i>Macrobrachium indianum</i> Pillai, Unnikrishnan & Prasannan, 2015		EN, En	K	-	Nil	Nil	Nil
18	<i>Macrobrachium indicum</i> Jayachandran & Joseph, 1986	Indian freshwater prawn	EN, En	T	-	Nil	Nil	Nil
19	<i>Macrobrachium jayasreei</i> Jayachandran & Joseph, 1985	Ornamental prawn	VU, En	W	ornamental	Nil	Nil	Nil
20	<i>Macrobrachium josephi</i> Jayachandran, 2001	Giant river prawn	EN, En	Kerala	-	-	yes	yes
21	<i>Macrobrachium kunjuramani</i> Jayachandran &		VU, En	W	Ornamental	Nil	Nil	Nil

	Joseph, 1985							
22	<i>Macrobrachium latimanus</i> (von Martens, 1868)	Hill stream prawn	NT, En	Kerala, WG	Food prawn, ornamental	yes	yes	yes
23	<i>Macrobrachium madhusoodani</i> Unnikrishnan, Pillai & Jayachandran, 2011		DD, En			Nil	Nil	Nil
24	<i>Macrobrachium novaehollandiae</i> (De Man, 1908)		EN, En	T, K		Nil	Nil	Nil
25	<i>Macrobrachium ornatus</i> Jayachandran & Raji, 2004	Ornamental prawn	EN, En	I	ornamental	Nil	Nil	Nil
26	<i>Macrobrachium rosenbergii</i> (De Man, 1879)	Giant river prawn	LC	Kerala	T	yes	yes	yes
27	<i>Macrobrachium rude</i> (Heller, 1862)		EN, En	E	Food	Nil	Nil	Nil
28	<i>Macrobrachium scabriculum</i> (Heller, 1862)		LC	Kerala	Food prawn ornamental	Nil	Nil	Nil
29	<i>Macrobrachium sulcatus</i> (Henderson & Matthai, 1910)		LC	E	Food prawn ornamental	Nil	Nil	Yes
30	<i>Macrobrachium veliense</i> Jayachandran & Joseph, 1985		EN, En	T	-	Nil	Nil	Nil
31	<i>Palaemon concinnus</i> Dana, 1852	Slender prawn	VU, En	T	-	Nil	Nil	Nil
32	<i>Leandrite scelebensis</i> (De Man, 1881)		VU	T	-	Nil	Nil	Nil
	Family: Euryrhynchidae Holthuis, 1950							
33	<i>Eurindicus bhugarbha</i> De Grave, Arjun & Raghavan, 2018	Subterranean prawn	DD, under threat	C	-	Nil	Nil	Nil

Abbreviations: EN – Endangered, VU – Vulnerable, LC – Least Concern, DD – Data deficient, NT- Near Threatened, NA- Not Assessed, En – Endemic, WG – Western Ghats; LT- Local trade

Source : Compiled by Prof. Dr. K. V. Jayachandran, Subject Expert, RKI Project, KSSB; Jayachandran, K. V., 2001. *Palaemonid prawns – Biodiversity, Taxonomy, Biology and Management*. Science Publishers, INC, New York, USA, 624p. + I – xii prelims; De Grave, S.; Arjun, C. P.; Raghavan, R. (2018). The discovery of Euryrhynchidae (Crustacea: Decapoda) in India, with the description of a new genus and species. *Zootaxa*. 4462(3): 367-378., available online at <https://doi.org/10.11646/zootaxa.4462.3.4>

Annexure 22 : Shrimp bioresources of inland waters of Kerala

SI No.	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Start up possibility
Family: Atyidae De Haan, 1849								
1	<i>Caridina babaulti</i> Bouvier, 1837	Freshwater shrimp	NA	WG, P	Ornamental	T	Yes	Yes
2	<i>Caridina carli</i> J. Roux, 1931	Freshwater shrimp	VU	WG, Pa	Nil	Nil	Nil	Nil
3	<i>Caridina fernandoi</i> Arudpragasam & Costa, 1962	Freshwater shrimp	NA	Kerala				
4	<i>Caridina gracilirostris</i> De Man, 1892	Freshwater shrimp	VU	Kerala	Ornamental	Nil	Nil	Yes
5	<i>Caridina gracilipes</i> De Man, 1892	Freshwater shrimp	NA	Kerala	Forage	Nil	Nil	Yes
6	<i>Caridina gurneyi</i> Jalihal, Shenoy & Sankolli, 1984	Freshwater shrimp	NA	Kerala	Nil	Nil	Nil	Nil
7	<i>Caridina jalihali</i> Mariappan & Richard, 2006	Freshwater shrimp	NA	A, P, Ko	Ornamental	Nil	Yes	Yes
8	<i>Caridina laevis</i> Heller, 1862	Freshwater shrimp	EN, En	T	Nil	Nil	Nil	Nil
9	<i>Caridina mathiassi</i> Silas & Jayachandran, 2010	Hill stream shrimp	NA, En	T	ornamental	Nil	Yes	yes

10	<i>Caridina natarajani</i> Tiwari & Pillai, 1968	Estuarine shrimp	NA	Kerala	Forage	Nil	Nil	Nil
11	<i>Caridina nilotica</i> (P. Roux, 1833)	Now saline shrimp	NA	Kerala	Forage	Nil	Nil	Nil
12	<i>Caridina pseudo gracilirostris</i> Thomas, Pillai & Pillai, 1973	Estuarine shrimp	LC	Kerala	Forage, ornamental in low saline aquaria	Nil	yes	yes
13	<i>Caridina shenoyi</i> Jalihal&Sankolli, 1984	Freshwater shrimp	DD	A, Ko, W	Nil	Nil	Nil	Nil
14	<i>Caridina simoni</i> Bouvier, 1904	Freshwater shrimp	DD	A, Ko, W	Nil	Nil	Nil	Nil
15	<i>Caridina sumatrensis</i> De Man, 1892	Freshwater shrimp	NA	Kerala	Nil	Nil	Nil	Nil
16	<i>Caridina weberi</i> De Man, 1892	Freshwater shrimp	VU	Kerala	Nil	Nil	Nil	Nil
17	<i>Caridina williamsoni</i> Jalihal, Shenoy &Sankolli, 1984	Freshwater shrimp	LC	Kerala	Nil	Nil	Nil	Nil
18	<i>Caridina vithuraensis</i> Jayachandran & Thomas, 2012	Western Ghat shrimp	VU, En	W	ornamental	yes	yes	yes
19	<i>Caridina zeylanica</i> Arudpragasam& Costa,1962	-	VU	T	Nil	Nil	Nil	Nil

Abbreviations: EN – Endangered, VU – Vulnerable, LC – Least Concern, DD – Data deficient, NT- Near Threatened, NA- Not Assessed, En – Endemic, WG – Western Ghats; LT- Local trade

Source: Compiled by Prof. Dr. K. V. Jayachandran, Subject Expert, RKI Project, KSSB; Tessa Thomas, 2011, Freshwater shrimps of the Family Atyidae De Haan of Kerala and culture of a selected species for forage/ food in aquaculture. Ph. D. Thesis, M G University

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Annexure 23 : Crab bio-resources of inland waters of Kerala

SI No	Scientific name	Common name	IUCN/ other criteria	Distribution	Economic Importance	Present Trade	Trade Possibility	Start up possibility
	Family: Gecarcinucidae							
1	<i>Arcithelphusa cochleari formis</i> Pati & Sudha Devi, 2015		En	WG	Nil	Nil	Nil	Nil
2	<i>Arcithelphusa tumpikkai</i> Pati, Sujila& Sudha Devi, 2019		En	WG	Nil	Nil	Nil	Nil
3	<i>Baratha peena</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil
4	<i>Baratha pushta</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil
5	<i>Barytelphus acunicularis</i> (Westwood in Sykes, 1836)			WG	Caught for food by tribes	Nil	Nil	Nil
6	<i>Cylindrotelphusa breviphallus</i> Pati et al., 2017		En	WG	Nil	Nil	Nil	Nil
7	<i>Cylindrotelphusa granulata</i> (Pillai, 1951)		En		Nil	Nil	Nil	Nil
8	<i>Cylindrotelphusa longiphallus</i> Pati et al., 2017		En		Nil	Nil	Nil	Nil
9	<i>Cylindrotelphusa steniops</i> (Alcock, 1909)			WG	Nil	Nil	Nil	Nil
10	<i>Karkata kusumbha</i> Pati et al., 2017		En	WG	Nil	Nil	Nil	Nil
11	<i>Karkata ghanarakta</i> Pati et al., 2017		En	WG	Nil	Nil	Nil	Nil
12	<i>Lamella lamelli frons</i> (Alcock, 1909)		En	WG	Nil	Nil	Nil	Nil
13	<i>Oziotelphusa biloba</i> Bahir & Yeo, 2005		En	WG	Nil	Nil	Nil	Nil
14	<i>Oziotelphusa kerala</i> Bahir & Yeo, 2005		En		Nil	Nil	Nil	Nil
15	<i>Oziotelphusa wagra karowensis</i> (Rathbun, 1904)			WG	Nil	Nil	Nil	Nil
16	<i>Pilar taanuka</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil

17	<i>Pilar taaroma</i> Pati et al., 2017		En	WG	Nil	Nil	Nil	Nil
18	<i>Pilarta puncta tissima</i> Pati et al., 2017		En	WG	Nil	Nil	Nil	Nil
19	<i>Rajathelphusa a ala</i> Raj, Kumar & Ng, 2021		En	WG	Nil	Nil	Nil	Nil
20	<i>Rajathelphusa amuni</i> Raj, Kumar & Ng, 2021		En	WG	Nil	Nil	Nil	Nil
21	<i>Snaha aruna</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil
22	<i>Spiralothelphusa gibberosa</i> Pati & Sudha Devi, 2015		En		Nil	Nil	Nil	Nil
23	<i>Travancoriana charu</i> Bahir & Yeo, 2007			WG	Nil	Nil	Nil	Nil
24	<i>Travancoriana convexa</i> (Roux, 1931)		En	WG	Nil	Nil	Nil	Nil
25	<i>Travancoriana granulate</i> Pati & Sharma, 2013			WG	Nil	Nil	Nil	Nil
26	<i>Travancoriana kuleera</i> Bahir & Yeo, 2007			WG	Nil	Nil	Nil	Nil
27	<i>Travancoriana pollicaris</i> (Alcock, 1909)			WG	Nil	Nil	Nil	Nil
28	<i>Travancoriana schirnerae</i> Bott, 1969			WG	Nil	Nil	Nil	Nil
29	<i>Vanni ashini</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil
30	<i>Vanni deepta</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil
31	<i>Vanni giri</i> Bahir & Yeo, 2007			WG	Nil	Nil	Nil	Nil
32	<i>Vanni malabarica</i> (Henderson, 1912)		En	WG	Nil	Nil	Nil	Nil
33	<i>Vanni nilgiriensis</i> (Roux, 1931)			WG				
34	<i>Vanni virupa</i> Bahir & Yeo, 2007		En	WG	Nil	Nil	Nil	Nil
35	<i>Vela carli</i> (Roux, 1931)			WG	Nil	Nil	Nil	Nil
36	<i>Vela virupa</i>		En		Nil	Nil	Nil	Nil

Abbreviations: En – Endemic, WG – Western Ghats;

Source: Compiled by Dr. K. V. Jayachandran, Subject Expert, RKI project, KSBB, Bahir, M.M. & Yeo, D.C.J. 2005. A revision of the genus *Oziotelphusa* Müller, 1887 (Crustacea: Decapoda: Parathelphusidae), with descriptions of eight new species. *Raffles Bulletin of Zoology*, **12** (Supplement): 77–120; Bahir, M.M. & Yeo, D.C.J. 2007. The gecarcinucid freshwater crabs of southern India (Crustacea: Decapoda: Brachyura). *Raffles Bulletin of Zoology*, **16** (Supplement): 309–354; Kiruba, S., Mishra, B.P., Stalin, S.I., Jeeva, S. & Dhas, S.S.M. 2006. Traditional pest management practices in Kanyakumari district, southern peninsular India. *Indian Journal of Traditional Knowledge*, **5** (1): 71–74; Pati, S.K. & Pradhan, R.N. 2020. An overview of the freshwater crabs (Brachyura: Gecarcinucidae) of the Western Ghats, India. *Oceanography & Fisheries Open Access Journal*, **12** (3): 555836.

<https://doi.org/10.19080/OFOAJ.2020.12.555836>; Pati, S.K. & Sudha Devi, A.R. 2015a. Description of a new genus and new species of freshwater crab (Brachyura: Gecarcinucidae) from the Western Ghats, Kerala, India. *Zoological Studies*, **54**: 35. <https://doi.org/10.1186/s40555-015-0112-0>; Pati, S.K. & Sudha Devi, A.R. 2015b. *Spiralothelphusagibberosa*, a new freshwater crab (Brachyura: Gecarcinucidae) from Thrissur district, Kerala, India. *Zootaxa*, **3963**(3): 416–424; Pati, S.K., Rajesh, L., Raj, S., Sheeja, V.U., Kumar, A.B. & Sureshan, P.M. 2017. *Karkata*, a new genus of gecarcinucid freshwater crab with two new species, and four new species of *Pilarta* Bahir and Yeo, 2007 and *Cylindrotelphusa* Alcock, 1909 (Decapoda: Brachyura) from Kerala, India. *Journal of Natural History*, **51** (23-24): 1295–1330; Pati, S.K., Sharma, R.M. & Sureshan, P.M. 2014. Freshwater crabs (Crustacea: Decapoda: Brachyura: Gecarcinucidae) in the collection of Western Ghat Regional Centre, Zoological Survey of India, Kozhikode. *Records of the Zoological Survey of India*, **114** (4): 651–668; Pati, S.K., Sujila, P.S. & Sudha Devi, A.R. 2019a. Description of a new species of freshwater crab of the genus *Arcithelphusa* Pati & Sudha Devi, 2015 (Decapoda: Brachyura: Gecarcinucidae) from the Western Ghats, Kerala, India. *Zootaxa*, **4674** (2): 203–214; Pati, S.K., Sujila, P.S. & Sudha Devi, A.R. 2019b. New records of two species of freshwater crabs (Decapoda: Gecarcinucidae) from Kerala, India, with notes on their distribution. *Nauplius*, **27**: e2019006. <https://doi.org/10.1590/2358-2936e2019006>; Raj, S., Kumar, A.B. & Ng, P.K.L. 2021. Description of a new genus with two new species of freshwater crab (Decapoda: Brachyura: Gecarcinucidae) from the Southwestern Ghats, India. *Zoological Studies*, **60**: 14. <https://doi.org/10.6620/ZS.2021.60-14>; Rajesh, L., Raj, S., Pati, S.K. & Biju Kumar, A. 2017. The freshwater crabs (Decapoda: Brachyura) of Kerala, India. *Journal of Aquatic Biology & Fisheries*, **5**: 132–153.

Annexure 24: Estuarine fishes bio-resources of Kerala

SI No.	Scientific name	Common name	IUCN/ other criteria	Economic importance	Present trade	Trade possibility	Start up possibility*
Family :Acanthuridae Bonaparte, 1832							
1	<i>Acanthurus xanthopterus</i> (Valenciennes, 1835)	Yellowfin Surgeon fish	LC	Food fish			
Family: Ambassidae Klunzinger, 1870							
2	<i>Ambassis ambassis</i> (Lacepède, 1802)	Commerson's glassy perchlet	LC	Food fish	LT		
3	<i>Ambassis dussumieri</i> (Cuvier, 1828)	Malabar glassy perchlet	LC	Food fish	LT		
4	<i>Parambas sisdayi</i> (Bleeker, 1874)	Day's glass fish	LC	Food fish, Ornamental			

5	<i>Parambassis thomassi</i> (Day, 1870)	Western Ghat glassy perchlet	LC	Food fish	LT		
Family: Anabantidae Bonaparte, 1831							
6	<i>Anabas testudineus</i> (Bloch, 1792)	Climbing perch	DD	Food fish	LT	A	ICAR CIFA
Family: Anguillidae Rafinesque, 1810							
7	<i>Anguilla bicolor</i> (McClelland, 1844)	Shortfin eel	NT	Food fish		A	
Family: Apistidae Kaup, 1873							
8	<i>Apistus carinatus</i> (Bloch & Schneider, 1801)	Ocellated wasp fish	LC	Minor commercial			
Family: Aplocheilidae Bleeker, 1859							
9	<i>Aplocheilus lineatus</i> (Valenciennes, 1846)	Striped panchax	LC	Ornamental			
10	<i>Aplocheilus blockii</i> (Arnold, 1911)	Green panchax	LC	Ornamental			
Family: Apogonidae Günther, 1859							
11	<i>Ostorhinchus fasciatus</i> (Shaw, 1790)	Broad banded cardinalfish	NE	Minor commercial, Ornamental			
Family : Ariidae L. S. Berg, 1958							
12	<i>Arius maculatus</i> (Thunberg, 1792)	Spotted catfish	NE	Food fish	LT		
13	<i>Arius subrostratus</i> (Valenciennes, 1840)	Short nosed catfish	NE	Food fish	LT		
Family : Atherinidae Risso, 1827							
14	<i>Doboatherina cf. valenciennei</i> (Bleeker, 1854)	Sumatran silverside	NE	Minor commercial, Food fish			
Family : Bagridae Bleeker, 1858							

15	<i>Mystusgulio</i> (Hamilton, 1822)	Long-whiskered catfish	LC	Food fish, Ornamental	LT	A	ICAR CIBA
16	<i>Mystus malabaricus</i> (Jerdon, 1849)	Jerdon'smystus	NT	Food fish, Ornamental	LT		
17	<i>Mystus oculatus</i> (Valenciennes, 1840)	Malabar mystus	LC	Food fish	LT		
Family :Batrachoididae Jordan, 1896							
18	<i>Colletteichthys dussumieri</i> (Valenciennes, 1837)	Flat toadfish	NE	Medicinal value			
19	<i>Colletteichthys flavipinnis</i> (Greenfield, Bineesh & Akhilesh, 2012)	Yellowfin toadfish	NE	Medicinal value			
Family :Belonidae Bonaparte, 1832							
20	<i>Strongyluras trongylura</i> (van Hasselt, 1823)	Spottailneedle fish	NE	Food fish			
21	<i>Xenentodon cancila</i> (Hamilton, 1822)	Freshwater garfish	LC	Food fish	LT		
Family : Carangidae Rafinesque, 1815							
22	<i>Alepes kleinii</i> (Bloch, 1793)	Razorbellyscad	LC	Food fish			
23	<i>Carangoides armatus</i> (Ruppell, 1830)	Longfin trevally	LC	Food fish			
24	<i>Carangoides praeustus</i> (Anonymous [Bennett], 1830)	Brownback trevally	LC	Commercial Food fish			
25	<i>Caranx heberi</i> (Bennett, 1830)	Blacktio trevally	LC	Commercial Food fish	LT		
26	<i>Caranx ignobilis</i> (Forsskål, 1775)	Giant trevally	LC	Commercial Food fish	LT		
27	<i>Caranx melampygus</i> (Cuvier,	Bluefin trevally	LC	Commercial	LT		

	1833)			Food fish			
28	<i>Caranx sexfasciatus</i> (Quoy&Gaimard, 1825)	Bigeye trevally	LC	Commercial Food fish	LT		
29	<i>Scomberoides commers onnius</i> (Lacepède, 1801)	Talangqueenfish	LC	Commercial, Food fish			
30	<i>Scomberoides lysan</i> (Forsskål, 1775)	Double spotted queenfish	LC	Commercial, Food fish			
31	<i>Trachinotus baillonii</i> (Lacepède, 1801)	Small spotted dart	LC	Minor commercial, Food fish			
32	<i>Trachinotus blochii</i> (Lacepède, 1801)	Snubnose pompano	LC	Commercial, Food fish		A	ICAR CMFRI
33	<i>Trachinotus mookalee</i> (Cuvier, 1832)	Indian pompano	LC	Food fish		A	
Family :Chaetodontidae Rafinesque, 1810							
34	<i>Chaetodon collare</i> (Bloch, 1787)	Redtail butterfly fish	LC	Ornamental		O	ICAR-CMFRI
Family : Chanidae Günther, 1868							
35	<i>Chanoschanos</i> (Forsskal, 1775)	Milkfish	LC	Food fish	LT	A	ICAR CIBA
Family :Channidae Fowler, 1934							
36	<i>Channa diplogramma</i> (Day, 1865)	Tiger snakehead	VU	Food fish Ornamental	LT	A	ICAR CIFA
37	<i>Channa pseudo marulius</i> (Günther, 1861)	Great snakehead	NE	Commercial Food fish	LT	A	ICAR CIFA
38	<i>Channa striata</i> (Bloch, 1793)	Striped snakehead	LC	Commercial Food fish	LT	A	ICAR CIFA, CARE, St. Xaviers College, Palayamkottai
Family :CichlidaeBonaparte, 1835							

39	<i>Etroplus suratensis</i> (Bloch, 1790)	Pearl spot	LC	Food fish, Cultivable	T	A	RARS, Kumarakom, Dept. of Fisheries, Kerala, Private farmers
40	<i>Pseudetroplus maculatus</i> (Bloch, 1795)	Orange chromide	LC	Food fish, Ornamental	LT		
Family :Clariidae Bonaparte, 1846							
41	<i>Clarias dus sumieri</i> (Valenciennes, 1840)	Valenciennes clariid	NT	Minor commercial		A	RARS, Kumarakom, ICAR NBFGR
Family :Clupeidae Bonaparte, 1846							
42	<i>Anodonto stomachacunda</i> (Hamilton, 1822)	Chacunda gizzard shad	LC	Commercial Food fish			
43	<i>Dayella malabarica</i> (Day, 1873)	Day's round herring	LC	Food fish			
44	<i>Ehirava fluviatilis</i> (Deraniyagala, 1929)	Malabar sprat	DD	Minor commercial, Food fish	LT		
45	<i>Escualo sathoracata</i> (Valenciennes, 1847)	White sardine	LC	Commercial Food fish			
46	<i>Nematalosa nasus</i> (Bloch, 1795)	Bloch's gizzard shad	LC	Commercial Food fish			
Family :Congridae Kaup, 1856							
47	<i>Uroconger cf. lepturus</i> (Richardson, 1845)	Slender conger	LC	Food fish			
Family :Cynoglossidae Jordan, 1888							
48	<i>Cynoglossus macro</i>	Malabar tonguesole	NE	Commercial			

	<i>stomus</i> Norman, 1928			Food fish			
49	<i>Cynoglossus cynoglossus</i> (Hamilton, 1822)	Bengal tonguesole	NE	Commercial Food fish			
50	<i>Cynoglossus puncticeps</i> (Richardson, 1846)	Speckled tonguesole	NE	Commercial Food fish			
Family : Cyprinidae Linnaeus, 1758:							
51	<i>Amblyphya ryngodon melettinus</i> (Valenciennes, 1844)	Attentive carplet	LC	Food fish			
52	<i>Dawkinsia filamentosa</i> (Valenciennes, 1844)	Blackspot barb	LC	Minor commercial Food fish, Ornamental		O	ICAR CIFA, KUFOS
53	<i>Labeodus sumieri</i> (Valenciennes, 1842)	Malabar Labeo	LC	Commercial, Food fish	LT	A	ICAR NBFGR, RARS, Kumarakom,
54	<i>Puntius mahecola</i> (Valenciennes, 1844)	Malini's barb	DD	Food fish, Ornamental fish	LT		
55	<i>Puntius vittatus</i> (Day, 1865)	Kooli barb	LC	Ornamental			
56	<i>Systemus sarana</i> (Hamilton, 1822)	Olive barb	LC	Food fish, Ornamental	LT	A, O	ICAR-CIFA
57	<i>Systemus subnasutus</i> (Valenciennes, 1842)	Olive barb	LC	Food fish, Ornamental	LT	A, O	KUFOS, Kochi
Family : Dasyatidae D. S. Jordan, 1888							
58	<i>Brevitrygon imbricata</i> (Bloch & Schneider, 1801)	Bengal whipray	DD	Commercial Food fish			
59	<i>Pastinachus sephen</i> (Fabricius, 1775)	Cow tail stingray	NT	Commercial, Food fish			

Family :Eleotridae Bonaparte, 1835							
60	<i>Butis butis</i> (Hamilton, 1822)	Duckbill sleeper	LC	Minor commercial			
61	<i>Buti shumeralis</i> (Valenciennes, 1837)	Dark sleeper	NE	Nil			
62	<i>Butis koilamatodon</i> (Bleeker, 1849)	Mud sleeper	NE	Ornamental			
63	<i>Elops machnata</i> (Fabricius, 1775)	Lady fish	LC	Food fish	LT		
Family: Engraulidae Gill, 1861							
64	<i>Coiliadus sumieri</i> (Valenciennes, 1848)	Golden anchovy	LC	Minor Commercial Food fish			
65	<i>Encrasicholina heteroloba</i> (Ruppell, 1837)	Shorthead anchovy	LC	Minor commercial, Food fish			
66	<i>Stolephorus commersonnii</i> (Lacepède, 1803)	Indian anchovy	LC	Food fish, Commercial	LT		
67	<i>Thryssa cf. hamiltoni</i> (Gray, 1835)	Hamilton's thryssa	LC	Commercial, Food fish			
68	<i>Thryssa dussumieri</i> (Valenciennes, 1848)	Long anchovy	LC	Commercial, Food fish			
69	<i>Thryssa malabarica</i> (Bloch, 1795)	Malabar thryssa	DD	Commercial, Food fish			
70	<i>Thryssa polybranchialis</i> (Wongratana, 1983)	Humpheadthryssa	DD	Commercial, Food fish			
Family : Gerreidae Leach, 1815							
71	<i>Gerres filamentosus</i> (Cuvier, 1829)	Whipfin silver biddy	LC	Food fish	LT		
72	<i>Gerresoyena</i> (Fabricius, 1775)	Common silver biddy	LC	Commercial Food fish	LT		

Family :Gobiidae G. Cuvier, 1816							
73	<i>Acentrogobius viridipunctatus</i> (Valenciennes, 1837)	Spotted green goby	NE	Food fish Ornamental			
74	<i>Arcygobius baliurus</i> (Valenciennes, 1837)	Isthmus goby	DD	Food fish			
75	<i>Glossogobius giuris</i> (Hamilton, 1822)	Bar eyed goby	LC	Food fish, Ornamental	LT		
76	<i>Oligolepisa cutipennis</i> (Valenciennes, 1837)	Sharptail goby	DD	Ornamental			
77	<i>Oxyurichthys ophthalmonema</i> (Bleeker, 1856)	Eyebrow goby	LC	Nil			
78	<i>Stenogobius gymnopomus</i> (Bleeker, 1853)	Malabar goby	LC	Food fish			
79	<i>Trypauchen vagina</i> (Bloch & Schneider, 1801)	Burrowing goby	NE	Minor commercial			
Family :Hemirhamphidae T. N. Gill, 1859							
80	<i>Hemiramphus xanthopterus</i> (Valenciennes, 1847)	Red-tipped halfbeak	VU	Commercial Food fish	LT		
Family :Heteropneustidae Hora, 1936							
81	<i>Heteropneustes fossilis</i> (Bloch, 1794)	Stinging catfish	LC	Commercial, Food fish, Medicinal value	LT	A	ICAR-CIFA
Family : Holocentridae J. Richardson, 1846							
82	<i>Myripristis berndti</i> Jordan &Evermann, 1903.	Blotcheyesoldierfish	LC	Commercial, Ornamental			
Family :Horabagridae Pinna, 1993							
83	<i>Horabagrus brachysoma</i> (Günther, 1864)	Gunther's catfish	VU	Food fish, Ornamental fish	LT	A, O	ICAR NBFGR, RARS, Kumarakom,
Family :Labridae G. Cuvier, 1816							

84	<i>Bodianus nielli</i> (Day, 1867)	Bay of Bengal hogfish	LC	Ornamental			
Family :Lactariidae Boulenger, 1904							
85	<i>Lactarius lactarius</i> (Bloch & Schneider, 1801)	False trevally	NE	Commercial, Food fish			
Family :Latidae D S Jordan, 1888							
86	<i>Lates calcarifer</i> (Bloch, 1790)	Barramundi	NE	Food fish, Cultivable	LT	A	ICAR CIBA
Family :Leiognathidae T N Gill, 1893							
87	<i>Eubleekeria splendens</i> (Cuvier, 1829)	Splendid ponyfish	LC	Commercial Food fish			
88	<i>Gazza minuta</i> (Bloch, 1795)	Toothpony	LC	Commercial Food fish			
89	<i>Leiognathus equulus</i> (Forsskål 1775)	Common ponyfish	LC	Commercial, Food fish	LT		
90	<i>Leiognathus ruconius</i> (Hamilton, 1822)	Deep pugnoseponyfish	NE	Minor commercial	LT		
91	<i>Nuchequula gerreoides</i> (Bleeker, 1851)	Decorated ponyfish	NE	Food fish			
92	<i>Secutorin sidiator</i> (Bloch, 1787)	Pugnoseponyfish	NE	Commercial, Food fish			
Family :Lutjanidae T N Gill, 1861							
93	<i>Lutjanus argentima culatus</i> (Forsskål, 1775)	Mangrove red snapper	LC	Food fish, Cultivable	LT	A	
94	<i>Lutjanus fulvi flamma</i> (Forsskål, 1775)	Dory snapper	LC	Food fish	LT		ICAR CMFRI
95	<i>Lutjanus johnii</i> (Bloch, 1792)	John's snapper	LC	Commercial	LT	A	ICAR CMFRI
96	<i>Lutjanus Russelli</i> (Bleeker, 1849)	Russell's snapper	LC	Food fish	LT		
Family: Mastacembelidae Swainson, 1839							

97	<i>Macrognathus guentheri</i> (Day, 1865)	Malabar spinyeel	LC	Food fish, Ornamental fish			
98	<i>Mastacembelus armatus</i> (Lacepède, 1800)	Spiny eel	LC	Food fish, Ornamental fish	LT	O	ICAR-CIFRI
Family :Megalopidae Jordan, 1923							
99	<i>Megalops cyprinoides</i> (Broussonet, 1782)	Oxeye tarpon	DD	Commercial Food fish	LT		
Family : Monodactylidae Jordan & Evermann, 1898							
100	<i>Monodactylus argenteus</i> (Linnaeus, 1758)	Silver moony	LC	Minor commercial Food fish, Ornamental		O	ICAR CIBA
Family :Mugilidae Jarocki, 1822							
101	<i>Osteomugi lperusii</i> (Valenciennes, 1836)	Long finned mullet	LC	Commercial Food fish	LT		
102	<i>Mugil cephalus</i> (Linnaeus, 1758)	Flathead grey mullet	LC	Commercial Food fish, Cultivable	LT		ICAR CIBA
103	<i>Planiliza macrolepis</i> (Smith, 1846)	Largescale mullet	LC	CommercialFood fish	LT		
104	<i>Planiliza subviridis</i> (Valenciennes,1836)	Greenback mullet	NE	Commercial, Food fish	LT		
Family :Mullidae Rafinesque. 1815							
105	<i>Upeneus sulphureus</i> (Cuvier, 1829)	Sulphur goatfish	LC	Minor commercial, Ornamental			
Family :Muraenosocidae Bleeker, 1864							
106	<i>Muraenesox bagio</i> (Hamilton, 1822)	Common pike conger	NE	Food fish			
Family :Nandidae Bleeker, 1852							
107	<i>Nandus nandus</i> (Hamilton,	Gangetic leaf-fish	LC	Food fish			

	1822)						
Family :Osphronemidae van der Hoeven, 1832							
108	<i>Pseudo sphromenus cupanus</i> (Cuvier, 1831)	Spiketailparadisefish	LC	Ornamental			
Family :Platycephalidae T N Gill, 1872							
109	<i>Cociella punctata</i> (Cuvier, 1829)	Spotted flathead	LC	Minor commercial Food fish			
110	<i>Grammoplites scaber</i> (Linnaeus, 1758)	Rough flathead	NE	Food fish			
111	<i>Kumococius rodericensis</i> (Cuvier, 1829)	Spiny flathead	LC	Food fish			
112	<i>Platycephalus indicus</i> (Linnaeus, 1758)	Bartail flathead	DD	Food fish			
Family :Plotosidae Bleeker, 1858							
113	<i>Plotosus lineatus</i> (Thunberg, 1787)	Striped eel catfish	NE	Commercial Food fish			
Family :Polynemidae Rafinesque, 1815							
114	<i>Eleutheronema tetradactylum</i> (Shaw, 1804)	Indian salmon	NE	Food fish			
Family :Pomocentridae Bonaparte, 1832							
115	<i>Abudefduf vaigiensis</i> (Quoy&Gaimard, 1825)	Indo-Pacific sergeant	LC	Aquarium trade		O	ICAR CMFRI
Family :Pristigasteridae Bleeker, 1872							
116	<i>Opisthopteru stardoore</i> (Cuvier, 1829)	Long-finned herring	LC	Minor commercial, Food fish			
117	<i>Pristolepisru bripinnis</i> (Britz, Kumar & Baby, 2012)	Red finned catopra	NE	Food fish			
Family :Scaridae Rafinesque, 1810							

118	<i>Scarusg hobban</i> (Forsskål, 1775)	Blue-barred parrotfish	LC	Food fish, Ornamental			
Family : Scatophagidae Gill, 1883							
119	<i>Scatophagus argus</i> (Linnaeus, 1766)	Spotted scat	LC	Food fish, Ornamental			
Family :Sciaenidae Cuvier, 1829							
120	<i>Otolithes ruber</i> (Bloch & Schneider, 1801)	Tigertooth croaker	NE	Food fish			
121	<i>Daysciaena albida</i> (Cuvier, 1830)	Croaker	NE	Food fish			
Family : Scombridae Rafinesque, 1815							
122	<i>Rastrelliger kanagurta</i> (Cuvier, 1816)	Indian mackerel	DD	Commercial Food fish			
123	<i>Scomberomorus commerson</i> (Lacepède, 1800)	Seer fish	NT	Commercial Food fish			
Family : Serranidae Swainson, 1839							
124	<i>Epinephelus coioides</i> (Hamilton, 1822)	Orange-spotted grouper	LC	Commercial Food fish, Cultivable		A	ICAR CMFRI
125	<i>Epinephelus diacanthus</i> (Valenciennes, 1828)	Spinycheek grouper	LC	Commercial Food fish			
126	<i>Epinephelu smalabaricus</i> (Bloch & Schneider, 1801)	Malabar grouper	LC	Commercial Food fish			
Family :Siganidae Richardson, 1837							
127	<i>Siganus canaliculatus</i> (Park, 1797)	Whitespottedspinefoot	LC	Commercial Food fish			
128	<i>Siganus javus</i> (Linnaeus, 1766)	Streaky-spinefoot	LC	Food fish			
129	<i>Siganus sutor</i> (Valenciennes, 1835)	Shoemaker spinefoot	LC	Commercial			

130	<i>Siganus vermiculatus</i> (Valenciennes, 1835)	Vermiculated spinefoot	LC	Commercial Food fish, Cultivable		A	ICAR CMFRI
Family :Sillaginidae Richardson, 1846							
131	<i>Sillago sihama</i> (Fabricius, 1775)	Silver sillago	LC	CommercialFood fish, Cultivable			
132	<i>Sillago vincenti</i> (McKay, 1980)	Vincent's sillago	NE	Commercial Food fish			
Family :Siluridae Cuvier, 1816							
133	<i>Ompok malabaricus</i> (Valenciennes, 1840)	Goan catfish	LC	Commercial Food fish	LT	A	
134	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Fresh water shark	NT	Commercial Food fish	LT		
Family : Soleidae Bonaparte, 1832							
135	<i>Brachirus orientalis</i> (Bloch & Schneider, 1801)	Oriental-sole	NE	Food fish			
136	<i>Solea ovate</i> (Richardson, 1846)	Ovate sole	NE	Food fish			
137	<i>Acanthopagrus berda</i> (Fabricius, 1775)	Goldsilkeabream	LC	Commercial Food fish		A	ICAR CMFRI
Family : Sphyraenidae Rafinesque, 1815							
138	<i>Sphyrae najello</i> (Cuvier,1829)	Banded barracuda	NE	Commercial			
Family :Terapontidae Richardon, 1842							
139	<i>Pelates quadrilineatus</i> (Bloch, 1790)	Fourlinedterapon	NE	Minor commercial			
140	<i>Terapo njarbua</i> (Fabricius, 1775)	Crescent perch	LC	Food fish	LT		
141	<i>Terapon puta</i> (Cuvier, 1829)	Small-scaled terapon	NE	Food fish			
142	<i>Terapon theraps</i> (Cuvier, 1829)	Large scaled grunter	LC	Minor commercial, Food fish			

143	<i>Sphoeroides cf. maculatus</i> (Bloch & Schneider, 1801)	Northern puffer	LC	Minor commercial			
Family :Tricanthidae Günther, 1859							
144	<i>Triacanthus nieuhofii</i> (Bleeker, 1851)	Silver tripodfish	NE	Minor commercial			
Exotic / Non-native fishes							
Family: Cichlidae Bonaparte, 1835							
145	<i>Oreochromis mossambicus</i> (Peters, 1852)	Mozambique Tilapia	NT	Food fish	LT		
146	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	Nile Tilapia	LC	Commercial Food fish, Cultivable	LT	A	RGCA, Sirkali
Family :Clariidae Bonaparte, 1846							
147	<i>Clarias gariepinus</i> (Burchell, 1822)	African sharp-tooth catfish	LC	Minor commercial, Food fish	LT		
Family :Cyprinidae Linnaeus, 1758							
148	<i>Cirrhinus mrigala</i> (Hamilton, 1822)	Mrigal carp	LC	Commercial, Food fish	LT	A	ICAR-CIFA
149	<i>Catla catla</i> (Hamilton, 1822)	Catla	LC	Food fish, cultivable	LT	A	ICAR-CIFA
Family :Pangasiidae Bleeker, 1858							
150	<i>Pangasiano donhypophthalmus</i> (Sauvage, 1878)	Striped catfish	EN	Commercial Food fish	LT	A	
Family :Serrasalminidae Bleeker, 1859							
151	<i>Piaractus brachypomus</i> (Cuvier, 1818)	Red-bellied pacu	NE	Food fish, cultivable	LT	A	

* The institutions successful in hatchery production indicated in the column against each species

Abbreviations :A – Aquaculture; O – Ornamental; LC – Least Concern, En – Endangered; NE – Not Evaluated; NT - Nearly Threatened; DD – Data Deficient; T – Trade; LT - Local Trade

Source :Compiled by : Dr. Ranjith, Dr. K. V. Jayachandran, Subject Expert, RKI Project, KSBB;Jayachandran, K.V., 2003. Fishery resources on the Western Ghats. *Natural Resource Management : Changing Scenarios and Shifting Paradigms*,College of Forestry, KAU: 20-29; Jayachandran, K. V., 2005. Inland fishes and fisheries In :*State Biodiversity Strategy and Action Plan (SABSAP) for Kerala*.134-144; Divya, P. R., Syamkrishnan, M. U., Rahul Kumar, G. and Kuldeep Kumar Lal, 2020. Handbook on fishes and shellfishes of Ramsar sites in Kerala. ICAR National Bureau of Fish Genetic Resources, 220p; Vinod, K. and Asokan, P. K.,Joshi, K. K., Narayanakumar, R., Zacharia, P. U.,Varghese, Molly,Jasmine, S., AnasuKoya, A.,Kunhikoya, V. A., Ansar, C. P.,Nikhiljith, M., Vijesh, V.,Jafer, Palot,Cheruvat, Dinesan and Gopalakrishnan, A. 2021. *Glimpses of biodiversity in the Kadalundi-Vallikunnu Community Reserve, the first Community Reserve of Kerala*. CMFRI Special Publication (139). ICAR - Central Marine Fisheries Research Institute, Kochi.

Annexure 25: Freshwater fishes of Kerala

Sl. No	Scientific Name	Common Name	IUCN Status/ Other	Distribution in Kerala	Economic importance	Whether trade at present	Possibility of trade	Possibility of start up
1	<i>Acanthocobitis mooreh</i> (Sykes, 1839)	Mooreh Loach	LC				√	
2	<i>Ambassis interrupta</i> Bleeker, 1853	Long Spined Glass Perchlet	LC		√	√		
3	<i>Ambassis nalu</i> (Hamilton, 1822)	Scalloped Perchlet	LC		√	√		
4	<i>Amblypharyngodon melettinus</i> (Valenciennes, 1844)							
5	<i>Amblypharyngodon microlepis</i> (Bleeker, 1853)							

6	<i>Anabas testudineus</i> (Bloch, 1792)	Climbing Perch	DD					
7	<i>Anguilla bengalensis</i> (Gray, 1831)	Indian mottled eel	VU		√		√	
8	<i>Anguilla bicolor</i> McClelland, 1844	Indian short finned eel	VU		√		√	
9	<i>Aplocheilus blockii</i> (Arnold, 1911)	Green Panchax	LC		√	√		√
10	<i>Aplocheilu sparvus</i> Sundara Raj, 1916	Raj's Panchax	LC		√	√		√
11	<i>Aplocheilus lineatus</i> (Valenciennes, 1846)	Striped Panchax	LC					
12	<i>Awaousgam mepomus</i> (Bleeker, 1849)	Scribbled goby	DD					
13	<i>Balito rajalpalli</i> Raghavan, Tharian, Ali, Jadhav & Dahanukar, 2012	Silent Valley Stone Loach	NE				√	
14	<i>Balitoramys oremsis</i> Hora, 1941	Mysore Stone Loach	VU					
15	<i>Barilius gatensis</i> (Valenciennes, 1844)	Emerald Baril	LC		√	√		√
16	<i>Barilius malabaricus</i> Jerdon, 1849	Malabar Baril	NE		√		√	
17	<i>Batasio travancoria</i> Hora & Law, 1941	Travancore Batasio	VU		√	√		
18	<i>Bathygobius fuscus</i> (Rüppell, 1830)	Brown Frillfin	LC					
19	<i>Bhavana australis</i> Jerdon, 1849	Bhavani Stone Loach	LC		√	√		
20	<i>Bhavana annandalei</i> Hora, 1920	Annadale's stone loach	VU					
21	<i>Bunaka gyrinoides</i> (Bleeker, 1853)	Green back guavina	DD					
22	<i>Carino tetraodon travancoricus</i> (Hora & Nair, 1941)	Malabar Puffer Fish	VU		√	√		√
23	<i>Carino tetraodon imitator</i> Britz & Kottelat, 1999	Drarf puffer fish	VU		√			√
24	<i>Chanda nama</i> Hamilton, 1822	Elongate Glassy Perchlet	LC					
25	<i>Channa diplo gramma</i> (Day, 1865)	Tiger Snakehead	VU		√	√		√
26	<i>Channa gachua</i> (Hamilton, 1822)	Dwarf Snakehead	LC		√	√		√
27	<i>Channa pseudo marulius</i> (Günther, 1861)	Giant Snakehead	LC		√			

28	<i>Channa punctata</i> (Bloch, 1793)	Spotted Snakehead	LC			√		√
29	<i>Channa striata</i> (Bloch, 1793)	Striped Snakehead	LC		√			
30	<i>Clariasdayi</i> Hora, 1936	Malabar Clarid	NE					
31	<i>Clariasdus sumieri</i> Valenciennes, 1840	Valencienne'sClarid	NT		√	√		
32	<i>Danio rerio</i> (Hamilton, 1822)	Zebra Fish	LC		√	√		
33	<i>Dario urops</i> Britz, Ali & Philip, 2012	Western Ghats Dario	NE					
34	<i>Dario neela</i> Britz, Anoop & Duhanukar, 2018	Blue dario	DD					
35	<i>Dawklinsia arulius</i> (Jerdon, 1849)	Aruli barb	DD					
36	<i>Dawkinsia assimilis</i> (Jerdon, 1849)	Mascara Barb	VU		√	√		√
37	<i>Dawkinsia austellus</i> Katwateet <i>al.</i> , 2020	Southern filament barb	DD					
38	<i>Dawkinsia exclamation</i> (Pethiyagoda & Kottelat, 2005)	Exclamatio Barb	EN					
39	<i>Dawkinsia filamentosa</i> (Valenciennes, 1844)	Filament Barb	LC		√	√		√
40	<i>Dawkinsia lepida</i> (Katwateet <i>al.</i> , 2020)	barb	DD					
41	<i>Dawkinsia rohani</i> (Rema Devi, Indra & Knight, 2010)	Rohan's Barb	VU					
42	<i>Dawkinsia rubrotinctus</i> (Jerdon, 1849)	Three Spot Barb	NE					
43	<i>Dayella malabarica</i> (Day, 1873)	Day's round herring	NA					
44	<i>Devario aequipinnatus</i> (McClelland, 1839)	Giant Danio	LC		√	√		√
45	<i>Devario malabaricus</i> (Jerdon, 1849)	Malabar Danio	LC		√	√		√
46	<i>Devario neilgherriensis</i> (Day, 1867)	Nilgiri Danio	EN					
47	<i>Echathala kendaophipcephalus</i> (Raj, 1941)	Snakehead Barb	EN					

48	<i>Ehirava fluviatilis</i> Deraniyagala, 1929	Malabar sprat	LC		√		√	√
49	<i>Eleotris fusca</i> (Foster, 1801)	Dusky sleeper	DD					
50	<i>Esomus barbatus</i> (Jerdon, 1849)	South Indian Flying Barb	LC					
51	<i>Esomus danricus</i> (Hamilton, 1822)	Common Flying Barb	LC					
52	<i>Esomus thermoicos</i> (Valenciennes, 1842)	Flying Barb	LC					
53	<i>Etroplus suratensis</i> (Bloch, 1790)	Pearl Spot	LC		√	√		√
54	<i>Garra arunachalami</i> Johnson&Soranam, 2001	Arunachalam's Stone Sucker	CR		√		√	
55	<i>Garrae marginata</i> Kurup& Radhakrishnan, 2011	Emarginate Stone Sucker	NE					
56	<i>Garra hughi</i> Silas, 1955	Hughe's Stone Sucker	EN		√		√	
57	<i>Garramc Clellandi</i> (Jerdon, 1849)	McClelland's Stone Sucker	LC					
58	<i>Garramenoni</i> Rema Devi & Indra, 1984	Menon's Stone Sucker	VU		√		√	
59	<i>Garramlap paraensis</i> Kurup& Radhakrishnan, 2011	Mlappara Stone Sucker	NE					
60	<i>Garra mullya</i> (Sykes, 1839)	Striped Stone Sucket	LC		√		√	
61	<i>Garra periyarensis</i> Gopi, 2001	Periyar Stone Sucker	VU					
62	<i>Garra stenorhynchus</i> (Jerdon, 1849)	Sahyadri Horned Stone Sucker	LC				√	
63	<i>Garra surendranathanii</i> Shaji, Arun &Easa, 1996	Surendran's Stone Sucker	EN		√			
64	<i>Ghatsa menoni</i> (Shaji&Easa, 1995)	Menon's Stone Loach	LC					
65	<i>Ghatsa Montana</i> (Herre, 1945)	Anamalai Stone Loach	EN					
66	<i>Ghatsa pillaii</i> (Indra & Rema Devi, 1981)	Pillai's Stone Loach	LC					
67	<i>Ghatsa santham paraiensis</i>	Santhampara Stone	EN					

	(Arunachalam, Johnson & Rema Devi, 2002)	Loach						
68	<i>Ghatsa silasi</i> (Kurup & Radhakrishnan, 2011)	Silas's Stone Loach	NE					
69	<i>Glossogobius giuris</i> (Hamilton, 1822)	Goby	LC		√	√	√	
70	<i>Glyptothorax anamalaiensis</i> Silas, 1952	Anamalai Mountain Catfish	EN		√		√	√
71	<i>Glyptothorax annandalei</i> Hora, 1923	Annandale's Mountain Catfish	LC		√		√	√
72	<i>Glyptothorax davissinghi</i> Manimekalan & Das, 1998	Nilambur Mountain Catfish	EN					
73	<i>Glyptothorax elankadensis</i> Plamoottil & Abraham, 2013	Elankadu Mountain Catfish	NE					
74	<i>Glyptothorax housei</i> Herre, 1942	Valparai Mountain Catfish	EN					
75	<i>Glyptothorax madraspatanus</i> (Day, 1873)	Madras Mountain Catfish	EN					
76	<i>Glyptothorax malabarensis</i> Gopi, 2010	Malabar Mountain Catfish	DD					
77	<i>Gonorhynchus periyarensis</i> Menon & Jacob, 1996	Periyar Latia	EN					
78	<i>Gymnosto musariza</i> (Hamilton, 1807)	Ariza carp	LC					
79	<i>Haludaria fasciata</i> (Jerdon, 1849)	Nilgiri Melon Barb	LC		√	√	√	√
80	<i>Haludaria kannikattiensis</i> (Arunachalam & Johnson, 2003)	Melon barb	VU					
81	<i>Haludaria melanampyx</i> (Day, 1865)	Melon Barb	DD					
82	<i>Hemibagrus punctatus</i> (Jerdon, 1849)	Cauvery Giant Catfish	CR					
83	<i>Heteropneustes fossilis</i> (Bloch, 1794)	Stinging Catfish	LC		√	√		√
84	<i>Hippichthys penicillus</i> (Cantor, 1849)	Beady Pipefish	LC					
85	<i>Horabagrus brachysoma</i> (Günther,	Yellow Catfish	VU		√	√		√

	1864)	(Gunther's Catfish)						
86	<i>Horabagrus nigricollaris</i> Pethiyagoda&Kottelat, 1994	Imperial Collared Catfish	EN					
87	<i>Horadandia brittani</i> Rema Devi & Menon, 1992	Glass Carplet	LC					
88	<i>Hyporhamphus limbatus</i> (Valenciennes, 1847)	Lower half beak	LC		√	√		
89	<i>Hyporhamphus xanthopterus</i> (Valenciennes, 1847)	Lower half beak	DD					
90	<i>Hypselobarbus carnaticus</i> (Jerdon, 1849)	Carnatic carp	VU		√	√		
91	<i>Hypselobarbus Dobsoni</i> (Day, 1876)	Krishna Carp (Dobson's Carp)	DD		√	√		
92	<i>Hypselobarbus dubius</i> (Day, 1867)	Nilgiri carb	VU					
93	<i>Hypselobarbus jerdoni</i> (Day, 1870)	Jerdon's Carp	LC		√	√		√
94	<i>Hypselobarbus kurali</i> Menon & Rema Devi, 1995	Hill stream carb	VU					
94	<i>Hypselobarbus lithopidos</i> (Day, 1874)	Canara Barb	DD		√	√		
96	<i>Hypselobarbus micropogon</i> (Valenciennes, 1842)	Korhi Barb	EN					
97	<i>Hypselobarbus mussullah</i> Menon& Rema Devi, 1995	Kurali Barb	LC					
98	<i>Hypselobarbus periyarensis</i> (Raj, 1941)	Periyar Barb	EN					
99	<i>Hypselobarbus thomassi</i> (Day, 1874)	Red Canarese Barb	CR		√		√	√
10 0	<i>Ichthyocampus carce</i> (Hamilton, 1822)	Freshwater pipe fish	VU					
10 1	<i>Indoreonectes keralensis</i> (Rita &Nalbant, 1978)	Cardamom Hills River Loach	VU					
10	<i>Kanataka brevidorsalis</i> (Day, 1874)	Karnataka barb	DD					

2								
10 3	<i>Labeo dussumieri</i> (Valenciennes, 1842)	Malabar Labeo	LC		√	√		
10 4	<i>Labeo fimbriatus</i> (Bloch, 1795)	Fringe Lipped Carp	LC					
10 5	<i>Labeo kontius</i> (Jerdon, 1849)	Pig mouth carp	DD					
10 6	<i>Labeo nigrescens</i> (Day 1870)	Black Labeo	NE					
10 7		Burjor's Brilliance (Dadio)	LC					
10 8	<i>Laubuca fasciata</i> (Silas, 1958)	Malabar Leaping Barb	VU					
10 9	<i>Laubuca trevori</i> Knight, 2015	Leaping barb	DD					
11 0	<i>Lepido cephalichthys thermalis</i> (Valenciennes, 1846)	Common Spiny Loach	LC					
11 1	<i>Lepido pygopsistypus</i> Raj, 1941	Periyar Hill Barb	EN					
11 2	<i>Macrognaathus guentheri</i> (Day, 1865)	Malabar Spiny Eel	LC					
11 3	<i>Mastacembelu sarmatus</i> (Lacepède, 1800)	Zig-zag Eel (Tyre-track Eel)	LC		√	√		
11 4	<i>Mastacembelus malabaricus</i> (Jerdon 1849)	Malabar Tyre-Track Eel	NE					
11 5	<i>Mesonoemacheilus guentheri</i> (Day, 1867)	Gunther's Loach	LC		√	√		
11	<i>Mesonoemacheilus herrei</i>	Anamalai Loach	CR					

6	Nalbant&Bănărescu, 1982							
11 7	<i>Mesonoemacheilus Menoni</i> (Zacharias &Minimol, 1999)	Menon's River Loach	VU		√			
11 8	<i>Mesonoemacheilus pambarensis</i> (Rema Devi & Indra, 1994)	Pambar Loach	VU					
11 9	<i>Mesonoemacheilus periyarensis</i> (Kurup& Radhakrishnan, 2005)	Periyar Loach	VU					
12 0	<i>Mesonoemacheilus pulchellus</i> (Day, 1873)	Pretty Spotted Loach	EN					
12 1	<i>Mesonoemacheilus remadevii</i> Shaji, 2002	Remadevi's Loach	LC					
12 2	<i>Mesonoemacheilus tambaraparniensis</i> (Menon, 1987)	Zodiac loach	LC					
12 3	<i>Mesonoemacheilus triangularis</i> (Day, 1865)	Zodiac Loach	LC		√	√		√
12 4	<i>Microphiscuncalus</i> (Hamilton, 1822)	Crocodile Tooth Pipe Fish	LC					
12 5	<i>Mystusarmatus</i> (Day, 1865)	Dwarf Mystus Catfish	LC					
12 6	<i>Mystuscavasius</i> (Hamilton, 1822)	Gangetic Mystus	LC					
12 7	<i>Mystus gulio</i> (Hamilton, 1822)	Long whiskered catfish	VU		√	√		
12 8	<i>Mystus malabaricus</i> (Jerdon, 1849)	Malabar Mystus	NT		√	√		√
12 9	<i>Mystus montanus</i> (Jerdon, 1849)	WynadMystus	LC					
13	<i>Mystus oculatus</i> (Valenciennes, 1840)	Spotted Mystus	LC		√			

0								
13 1	<i>Mystus seengtee</i> (Sykes, 1839)				√			
13 2	<i>Mystus vittatus</i> (Bloch, 1794)	Striped Mystus	LC		√			
13 3	<i>Nandus nandus</i> (Hamilton, 1822)	Gangetic Leaf fish	LC		√	√		
13 4	<i>Nemacheilus Anguilla</i> Annandale, 1919	Black Lined Loach	LC					
13 5	<i>Nemacheilus monilis</i> Hora, 1921	Black Bead Loach	LC					
13 6	<i>Neochelada diburjori</i> (Menon, 1952)	Burjor's Brilliance	DD					
13 7	<i>Neolissochilus wynaadensis</i> (Day, 1873)	Wayanad Mahseer	CR		√		√	
13 8	<i>Notopterus synurus</i> (Bloch & Schneider, 1801)	Cat fish	VU					
13 9	<i>Ompok bimaculatus</i> (Bloch, 1794)	Butter Catfish	NT		√		√	√
14 0	<i>Ompok karunkodu</i> Ng, 2013	Cauvery catfish	NT					
14 1	<i>Ompok malabaricus</i> (Valenciennes, 1840)	Malabar Butter Catfish	LC		√		√	
14 2	<i>Ophichthys fossorius</i> (Nayar, 1951)	Malabar swamp eel	EN		√			
14 3	<i>Ophisternon bengalense</i> (Mc Clelland, 1844)	Bengal Swamp Eel	LC					
14	<i>Opsarius bakeri</i> (Day, 1865)	Baker's baril	LC					

4								
14 5	<i>Opsarius bendelisis</i> (Hamilton, 1807)	Spotted baril	LC					
14 6	<i>Opsarius canarensis</i> (Jerdon, 1849)	Canara baril	LC					
14 7	<i>Opsarius gatensis</i> (Valenciennes, 1844)	Emerald baril	LC					
14 8	<i>Opsarius malabaricus</i> (Jerdon, 1849)	Malabar baril	LC					
14 9	<i>Oreichthys coorgensis</i> (Jayaram, 1982)							
15 0	<i>Oreichthys incognito</i> Knight & Kumar 2015	Kerala High Fin Barb	NE					
15 1	<i>Oryzias setnai</i> (Kulkarni, 1940)	Malabar Ricefish (Miniature Indian Ricefish)	LC					
15 2	<i>Osteo bramabakeri</i> (Day, 1873)	Baker's Barb	LC		√	√		
15 3	<i>Osteo bramaneilli</i> (Day, 1873)	Neil's Barb	LC					
15 4	<i>Osteo chilichthys brevidorsalis</i> (Day, 1873)	Kantaka Barb	LC					
15 5	<i>Osteo chilichthys longidorsalis</i> Pethiyagoda & Kottelat, 1994	Long Finned Kerala Barb	EN		√	√		
15 6	<i>Osteo chilichthys nashi</i> (Day, 1869)	Nash's Barb	LC		√		√	
15 7	<i>Osteo chilichthys thomassi</i> (Day, 1877)	Thomas' Barb	LC					
15	<i>Pangio bhujia</i> Anoop et al., 2019	Bhujia loach	LC					

8								
159	<i>Pangio goaensis</i> (Tilak 1972)	Indian Coolie Loach	LC					
160	<i>Paracanthoco bitissinuata</i> (Day, 1870)	Wynad loach	LC					
161	<i>Parambassis dayi</i> (Bleeker, 1874)	Day's Glassy Perchlet	NE		√	√		
162	<i>Parambassis ranga</i> (Hamilton, 1822)	Indian Glassy Fish	LC		√	√		
163	<i>Parambassis thomassi</i> (Day, 1870)	Western Ghats Glassy Perchlet	LC		√	√		
164	<i>Pethia conchoni</i> (Hamilton, 1822)	Rosy Barb	LC					
165	<i>Pethia nigripinna</i> (Knight, Rema Devi, Indra & Arunachalam, 2012)	Black Finned Barb	NE					
166	<i>Pethia pookodensis</i> (Mercy & Jacob, 2007)	Pookode Barb	CR					
167	<i>Pethia punctata</i> (Day, 1865)	Dotted Sawfin Barb	LC					
168	<i>Pethia ticto</i> (Hamilton, 1822)	Ticto Barb	LC		√	√		
168	<i>Pisodonophis boro</i> (Hamilton, 1822)	Rice paddy eel	VU					
170	<i>Poeciliareticulate</i> Peters 1859	Guppy	LC*					
171	<i>Pristolepis marginata</i> Jerdon, 1849	Common Catpora	LC		√	√		
17	<i>Pristolepis rubripinnis</i> Britz, Kumar &	Red Finned Catopra	NE					

2	Baby, 2012							
17 3	<i>Pseudetroplus maculatus</i> (Bloch, 1795)	Orange Chromide	LC					
17 4	<i>Pseudeutropius mitchelli</i> Günther, 1864	Mitchell's River Catfish	EN					
17 5	<i>Pseudogobiopsis oligactis</i> (Bleeker, 1875)	goby	DD					
17 6	<i>Pseudolaguvia austrina</i> Radhakrishnan, Sureshkumar & Ng, 2011	Southern Indian Torrent Catfish	DD					
17 7	<i>Pseudosphromenus cupanus</i> (Cuvier, 1831)	Spike Tailed Paradise Fish	LC		√	√		√
17 8	<i>Pseudo sphromenusdayi</i> Engmanna, 1909	Day's Paradise Fish	VU		√	√		√
17 9	<i>Pterocryptis wynaadensis</i> (Day, 1873)	Wayanad Catfish	EN					
18 0	<i>Puntius amphibius</i> (Valenciennes, 1842)	Lake barb	LC		√	√		
18 1	<i>Puntius bimaculatus</i> (Bleeker, 1863)	Redside Barb	LC		√	√		
18 2	<i>Puntius cauveriensis</i> (Hora, 1937)	Cauvery Barb	EN		√	√		
18 3	<i>Puntius chola</i> (Hamilton, 1822)	Chola Barb	LC		√		√	
18 4	<i>Puntius dorsalis</i> (Jerdon, 1849)	Long Snouted Barb	LC					
18 5	<i>Puntius madhusoodani</i> Kumar, Pereira & Radhakrishnan, 2012	Madhusoodan's Barb	NE					
18	<i>Puntius mahecola</i> (Valenciennes,	Mahe Barb	DD					

6	1844)							
18 7	<i>Puntius melanostigma</i> (Day, 1878)	One spot Barb	NE					
18 8	<i>Puntius parrah</i> Day, 1865	Parrah Barb	LC					
18 9	<i>Puntius sophore</i> (Hamilton, 1822)	Pool Barb	LC		√			
19 0	<i>Puntius vittatus</i> Day, 1865	Green Stripe Barb	LC		√			
19 1	<i>Rasbora dandia</i> (Valenciennes, 1844)	Black Line Rasbora	NE		√	√		
19 2	<i>Rasbora neilgherriensis</i> (Day, 1867)	Nilgiri rasbora	DD					
19 3	<i>Sahyadria chalakkudiensis</i> (Menon, Rema Devi & Thobias, 1999)	Chalaky Redline Torpedo Barb	EN		√	√		√
19 4	<i>Sahyadria denisonii</i> (Day, 1865)	Denison's Barb (Miss Kerala)	EN		√	√		√
19 5	<i>Salmophasia acinaces</i> (Valenciennes, 1844)	Silver Razorbelly Minnow	LC					
19 6	<i>Salmophasia balooke</i> (Sykes, 1839)	Balooke Razorbelly Minnow	LC					
19 7	<i>Salmophasia boopis</i> (Day, 1874)	Boopis Razorbelly Minnow	LC					
19 8	<i>Schismatogobius deraniyagala</i> iKottelat & Pethiyagoda, 1989	Redneck Goby	DD					
19 9	<i>Schistura denisoni</i> (Day, 1867)	Denison's Loach	LC		√	√		
20	<i>Schistura nilgiriensis</i> (Menon 1987)	Nilgiri Loach	LC					

0								
20 1	<i>Schistura semiarmata</i> (Day, 1867)	Small-spotted Loach	LC					
20 2	<i>Schistura striata</i> (Day, 1867)	Long Bodied Striped Loach	LC					
20 3	<i>Sicyopterus griseus</i> (Day, 1877)	Clown Goby	LC		√	√		√
20 4	<i>Sperata seenghala</i> (Sykes, 1839)	Giant River Catfish	LC					
20 5	<i>Systemus subnasutus</i> (Valenciennes, 1842)	Swamp Barb	NE					
20 6	<i>Tariqilabeo periyarensis</i> (Menon & Jacob, 1996)							
20 7	<i>Tor khudree</i> (Sykes, 1839)	Deccan Mahseer	EN		√	√		√
20 8	<i>Tor malabaricus</i> (Jerdon, 1849)	Malabar Mahseer	EN		√		√	√
20 9	<i>Tor remadevii</i> Kurup & Radhakrishnan, 2011	Chinnar Mahseer	NE		√		√	√
21 0	<i>Travancoria elongate</i> Pethiyagoda & Kottelat, 1994	Elongated Stone Loach	EN		√			
21 1	<i>Travancoria jonesi</i> Hora, 1941	Jone's Stone Loach	EN					
21 2	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Freshwater Shark	NT		√	√		√
21 3	<i>Xenentodon cancila</i> (Hamilton, 1822)	Needlefish	LC		√	√		

Abbreviations: CR- Critically Endangered, EN-Endangered, VU- Vulnerable, NT- Near Threatened, DD- Data deficient, LC- Least Concern, NE- Not evaluated; NA – Not assessed

Source: Compiled by Dr. Ranjith and Dr. K. V. Jayachandran, Subject Expert, RKI project, KSBB; Jayachandran, K.V., 2003. Fishery resources on the Western Ghats. *Natural Resource Management: Changing Scenarios and Shifting Paradigms*, College of Forestry, KAU: 20-29; Jayachandran, K.V., 2005. Inland fishes and fisheries of Kerala State. Status paper. *Proc. State Biodiversity Strategy and Action Plan (SBSAP) for Kerala, prepared under The National Biodiversity Strategy and Action Plan (NBSAP) – India*, Kerala Forest Research Institute: 134-144.

Annexure 26 : Alien/invasive flora and faunal bio-resources recorded from the water bodies along southern Western Ghats and marine regions of Kerala.

Sl. No	Scientific name	Common name	Native Range	Pathway of introduction	Alien/Invasive	Presence in number of water bodies		
						Rivers	Reservoir	F W lakes
FLORA (Macrophytes)								
1	<i>Salvinia molesta</i> D. S. Mitchell	Kariba Weed	South eastern Brazil	GP	Invasive	44	4	3
2	<i>Pistia stratiotes</i> L.	Water Lettuce	Pantropical	GP	Invasive	20	2	2
3	<i>Eichhornia crassipes</i> (Mart.) Solms	Water Hyacinth	South America	GP	Invasive	38	0	1
4	<i>Cabombafurcata</i> Schult. &Schult.f.	Red Cabomba	South America	AQ	Invasive	7	0	2
FAUNA (Fish)								
5	<i>Oreochromis mossambicus</i> (W. K. H. Peters, 1852)	Mozambique Tilapia	Tropical and subtropical Africa	AS	Invasive	44	18	2
6	<i>Oreochromis niloticus</i> (Linnaeus, 1852)	Nile Tilapia	Africa	AS	Invasive	4	0	0
7	<i>Pterygoplichthys pardalis</i> (Castelnau, 1855)	Sailfin Catfish	South America	AQ	Invasive	5	0	1
8	<i>Cyprinus carpio</i> (Linnaeus, 1758)	Common Carp	Europe to Asia	AS	Invasive	17	29	1
9	<i>Clariasga riepinus</i> Burchell, 1822	North African Catfish	Pan Africa	AS	Invasive	7	10	0
10	<i>Poecilia reticulata</i> W. Peters, 1859	Guppy	South America	MC	Invasive	14	22	0
11	<i>Gambusia affinis</i> (S. F. Baird & Girard, 1853)	Mosquito Fish	North and Central America	MC	Invasive	2	5	0

12	<i>Xiphophorus helleri</i> Heckel, 1848	Green Swordtail	Central America	AQ	Alien	1	0	0
13	<i>Xiphophorus maculatus</i> (Günther, 1866)	Southern Platyfish	North America	AQ	Alien	1	0	0
14	<i>Osphronemus goramy</i> Lacépède, 1801	Giant Gourami	South east Asia	MC	Alien	2	0	0
15	<i>Trichopodus trichopterus</i> Pallas, 1770	Three Spot Gourami	South east Asia	AQ	Alien	1	0	0
16	<i>Trichopodus microlepis</i> (Günther, 1861)	Moonlight Gourami	South east Asia	AQ	Alien	1	0	0
17	<i>Poecilia mexicana</i> Steindachner, 1863	Shortfin Molly	North and Central America	AQ	Alien	1	0	0
18	<i>Piaractusmes opotamicus</i> (Holmberg, 1887)	Pacu	South America	AS/AQ	Alien	2	0	0
19	<i>Piaractus brachypomus</i> (Cuvier, 1818)	Pirapitinga	South America	AS/AQ	Alien	9	0	1
20	<i>Pangasiano donhypoph thallus</i> (Sauvage, 1878)	Striped Catfish	Asia	AS/AQ	Alien	8	0	0
21	<i>Osteoglos sumbicirrhosum</i> Cuvier (ex Vandelli), 1829	Arawana	South America	AQ	Alien	1	0	0
22	<i>Oncorhynchus mykiss</i> (Wallbaum, 1792)	Rainbow Trout	Asia and North America	SF	Alien	1	0	0
23	<i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)	Silver Carp	East Asia	AS	Alien	2	0	0
24	<i>Helostomatem minckii</i> Cuvier, 1829	Kissing Gourami	Asia (Thailand to Indonesia)	AQ	Alien	1	0	0
25	<i>Ctenopharyn godonidella</i> (Valenciennes in Cuvier & Valenciennes, 1844)	Grass Carp	Asia (Eastern China and Russia)	AS	Alien	5	0	0
26	<i>Channa lucius</i> (Cuvier, 1831)	Forest Snakehead	Asia (Thailand to Indonesia)	AQ	Alien	1	0	0
27	<i>Barbonymus altus</i> (Günther, 1868)	Red Tailed Tinfoil	Asia	AQ	Alien	2	0	0

28	<i>Atractosteus spatula</i> (Lacépède, 1803)	Alligator Gar	North America	AQ	Alien	3	0	0
29	<i>Astronotus ocellatus</i> (Agassiz, 1831)	Oscar	South America	AQ	Alien	1	0	0
30	<i>Arapaima gigas</i> (Schinz, 1822)	Arapaima	South America	AQ	Alien	3	1	0
31	<i>Carassius auratus</i> (Linnaeus, 1758)	Gold fish	Central Asia and China	AQ	Alien	1	0	0
32	<i>Maya herosuroph thalmus</i> (Günther, 1862)	Mexican mojarra	Central America	AQ	Alien	1	0	0
Marine invasive species of Kerala								
Phylum Mollusca			35	<i>Perna perna</i> (Linnaeus, 1758)		Western Indian Ocean and the west coast of Africa.		
33	<i>Mytella strigata</i> (d'Orbigny, 1842)	Atlantic coast of South America	36	<i>Tenellia adspersa</i> (Nordmann, 1845)		Native to the Eastern Atlantic and Western Mediterranean		
34	<i>Mytilosissallei</i> (Recluz, 1849)	Caribbean islands and the Bay of Mexico	37	<i>Thecacera pennigera</i> (Montagu, 1813)		South and west of the British Isles, extending up the English Channel		
Bryozoa			Cnidaria (Jelly fish)					
38	<i>Bugula neritina</i> (Linnaeus,	Mediterranean Sea	39	<i>Pelagiano ctiluca</i> (Forsskål, 1775)		Atlantic ocean.		
Crustacea			Ascidia					
40	<i>Penaeus vannamei</i> Boone, 1931	Pacific coast	42	<i>Didemnum candidum</i> Savigny, 1816		North America		
Sea weeds			43	<i>Hypnea mu sciformis</i> (Wulfen) J.V.Lamouroux, 1813		Eastern and western Atlantic		

Expansion of Abbreviations :GP: Garden Pond; AS: Aquaculture Systems; AQ: Aquarium System and Ornamental fish trade fish trade; MC: Mosquito larvae control; SF: Sport Fisheries (Compiled by Dr. A. Bijukumar, Dept. of Aquatic Biology and Fisheries, Univeristy of Kerala)

Table 27 Species caught along Kerala coast (2010-2019)	
Group	Species
Sharks	<i>Chiloscyllium spp.</i>
Sharks	<i>Chiloscyllium indicum</i>
Sharks	<i>Chiloscyllium griseum</i>
Sharks	<i>Nebrius ferrugineus</i>
Sharks	<i>Rhincodon typus</i> (= <i>Rhincodon typus</i>)
Sharks	<i>Stegostoma fasciatum</i>
Sharks	<i>Alopias spp.</i>
Sharks	<i>Alopias pelagicus</i>
Sharks	<i>Alopias superciliosus</i>
Sharks	<i>Alopias vulpinus</i>
Sharks	<i>Isurus spp.</i>
Sharks	<i>Isurus oxyrinchus</i>
Sharks	<i>Isurus paucus</i>
Sharks	<i>Pseudocarcharias kamoharai</i>
Sharks	<i>Carcharhinus spp.</i>
Sharks	<i>Carcharhinus amblyrhynchos</i>
Sharks	<i>Carcharhinus brevipinna</i>
Sharks	<i>Carcharhinus dussumieri</i>
Sharks	<i>Carcharhinus leucas</i>
Sharks	<i>Carcharhinus limbatus</i>
Sharks	<i>Carcharhinus longimanus</i>
Sharks	<i>Carcharhinus macloti</i>
Sharks	<i>Carcharhinus melanopterus</i>
Sharks	<i>Carcharhinus sorrah</i>
Sharks	<i>Carcharhinus falciformis</i>
Sharks	<i>Carcharhinus albimarginatus</i>
Sharks	<i>Chaenogaleus macrostoma</i>
Sharks	<i>Galeocerdo cuvier</i>
Sharks	<i>Loxodon macrorhinus</i>
Sharks	<i>Mustelus mosis</i>
Sharks	<i>Prionace glauca</i>
Sharks	<i>Hexanchus griseus</i>
Sharks	<i>Rhizoprionodon spp.</i>
Sharks	<i>Rhizoprionodon acutus</i>
Sharks	<i>Rhizoprionodon oligolinx</i>
Sharks	<i>Scoliodon spp.</i>
Sharks	<i>Scoliodon laticaudus</i>
Sharks	<i>Triaenodon spp.</i>
Sharks	<i>Triaenodon obesus</i>
Sharks	<i>Eusphyra spp.</i>
Sharks	<i>Sphyrna spp.</i>
Sharks	<i>Sphyrna lewini</i>

Sharks	<i>Sphyrna mokarran</i>
Sharks	<i>Sphyrna zygaena</i>
Sharks	<i>Centrophorus spp.</i>
Sharks	<i>Centrophorus moluccensis</i>
Sharks	<i>Echinorhinus brucus</i>
Sharks	<i>Iago spp.</i>
Sharks	<i>Iago omanensis</i>
Sharks	<i>Other Sharks</i>
Sharks	<i>Neoharriotta pinnata</i>
Skates/Guitarfish	<i>Rhina ancylostoma</i>
Skates/Guitarfish	<i>Rhinobatos spp.</i>
Skates/Guitarfish	<i>Glaucostegus granulatus (=Rhinobatos granulatus)</i>
Skates/Guitarfish	<i>Rhinobatos variegatus</i>
Skates/Guitarfish	<i>Rhinobatos annandalei</i>
Skates/Guitarfish	<i>Rhynchobatus spp.</i>
Skates/Guitarfish	<i>Rhynchobatus djiddensis</i>
Skates/Guitarfish	<i>Rhynchobatus australiae</i>
Skates/Guitarfish	<i>Pristis microdon</i>
Rays	<i>Dasyatis spp.</i>
Rays	<i>Dasyatis microps</i>
Rays	<i>Dasyatis zugei (=Amphotistius zugei)</i>
Rays	<i>Neotrygon kuhlii (Dasyatis kuhlii)</i>
Rays	<i>Gymnura spp.</i>
Rays	<i>Gymnura poecilura</i>
Rays	<i>Himantura spp.</i>
Rays	<i>Pateobatis bleekeri (H. bleekeri)</i>
Rays	<i>Maculabatis gerrardi (=Himantura gerrardi)</i>
Rays	<i>Himantura imbricata (=Amphotistius imbricatus)</i>
Rays	<i>Himantura marginata</i>
Rays	<i>Himantura uarnak</i>
Rays	<i>Himantura fai</i>
Rays	<i>Hypolophus (=Pastinachus) sephen (=P. sephen)</i>
Rays	<i>Taeniura spp.</i>
Rays	<i>Taeniura meyeri</i>
Rays	<i>Urogymnus spp.</i>
Rays	<i>Urogymnus granulatus</i>
Rays	<i>Pteroplatytrygon violacea</i>
Rays	<i>Aetobatus spp.</i>
Rays	<i>Aetobatus narinari</i>
Rays	<i>Aetomylaeus spp.</i>
Rays	<i>Aetomylaeus maculatus</i>
Rays	<i>Aetomylaeus vespertilio</i>
Rays	<i>Rhinoptera spp.</i>
Rays	<i>Rhinoptera javanica</i>

Rays	<i>Manta spp.</i>
Rays	<i>Manta birostris</i>
Rays	<i>Mobula spp.</i>
Rays	<i>Mobula diabolus</i>
Rays	<i>Mobula kuhlii</i>
Rays	<i>Mobula tarapacana</i>
Rays	<i>Mobula japonica</i>
Rays	<i>Mobula thurstoni</i>
Rays	<i>Narcine spp.</i>
Rays	<i>Narcine timlei</i>
Rays	<i>Torpedo marmorata</i>
Rays	Other Rays
Eels	<i>Anguilla spp.</i>
Eels	<i>Gymnothorax spp.</i>
Eels	<i>Gymnothorax fimbriatus</i>
Eels	<i>Congresox spp.</i>
Eels	<i>Congresox talabanooides</i>
Eels	<i>Congresox talabon</i>
Eels	<i>Muraenesox spp.</i>
Eels	<i>Muraenesox cinereus</i>
Eels	<i>Muraenesox bagio</i>
Eels	<i>Ariosoma spp.</i>
Eels	Other Eels
Catfishes	<i>Arius spp.</i>
Catfishes	<i>Nemapteryx caelata (=A. caelatus)</i>
Catfishes	<i>Plicofollis dussumieri (=A. dussumieri)</i>
Catfishes	<i>Arius jella</i>
Catfishes	<i>Arius maculatus</i>
Catfishes	<i>Plicofollis tenuispinis (=A. tenuispinis)</i>
Catfishes	<i>Netuma thalassina (=A. thalassinus)</i>
Catfishes	<i>Arius arius</i>
Catfishes	<i>Plotosus spp.</i>
Catfishes	<i>Plotosus lineatus (=P. anguillaris)</i>
Wolf herring	<i>Chirocentrus spp.</i>
Wolf herring	<i>Chirocentrus dorab</i>
Wolf herring	<i>Chirocentrus nudus</i>
Oil sardine	<i>Sardinella longiceps</i>
Lesser sardines	<i>Sardinella spp.</i>
Lesser sardines	<i>Sardinella albella</i>
Lesser sardines	<i>Sardinella brachysoma</i>
Lesser sardines	<i>Amblygaster clupeioides (=Sardinella clupeioides)</i>
Lesser sardines	<i>Sardinella jussieu (=Sardinella dayi)</i>
Lesser sardines	<i>Sardinella fimbriata</i>
Lesser sardines	<i>Sardinella gibbosa</i>

Lesser sardines	<i>Amblygaster sirm</i> (= <i>Sardinella sirm</i>)
Lesser sardines	<i>Amblygaster leiogaster</i> (= <i>Sardinella leiogaster</i>)
Other shads	<i>Tenuialosa</i> spp.
Other shads	<i>Tenuialosa toli</i> (= <i>Hilsa toli</i>)
Other shads	<i>Hilsa</i> spp.
Other shads	<i>Hilsa kelee</i>
Coilia	<i>Coilia</i> spp.
Coilia	<i>Coilia dussumieri</i>
Setipinna	<i>Setipinna</i> spp.
Stolephorus	<i>Stolephorus</i> spp.
Stolephorus	<i>Stolephorus waitei</i>
Stolephorus	<i>Encrasicholina punctifer</i> (= <i>Stolephorus punctifer</i>)
Stolephorus	<i>Stolephorus commersonii</i>
Stolephorus	<i>Encrasicholina devisi</i> (= <i>Stolephorus devisi</i>)
Stolephorus	<i>Encrasicholina</i> spp.
Stolephorus	<i>Encrasicholina heteroloba</i> (= <i>Stolephorus heterolobus</i>)
Stolephorus	<i>Stolephorus indicus</i>
Stolephorus	<i>Stolephorus baganensis</i> (= <i>S. macrops</i>)
Thryssa	<i>Thryssa</i> spp.
Thryssa	<i>Thryssa baelama</i>
Thryssa	<i>Thryssa dussumieri</i>
Thryssa	<i>Thryssa kammalensis</i>
Thryssa	<i>Thryssa malabarica</i>
Thryssa	<i>Thryssa mystax</i>
Thryssa	<i>Thryssa setirostris</i>
Other clupeids	<i>Elops machnata</i>
Other clupeids	<i>Megalops cyprinoides</i>
Other clupeids	<i>Albula</i> spp.
Other clupeids	<i>Anodontostoma</i> spp.
Other clupeids	<i>Anodontostoma chacunda</i>
Other clupeids	<i>Dussumieria</i> spp.
Other clupeids	<i>Dussumieria acuta</i>
Other clupeids	<i>Dussumieria elopsoides</i>
Other clupeids	<i>Ehirava fluviatilis</i>
Other clupeids	<i>Escualosa</i> (= <i>Kowala</i>) <i>thoracata</i> (= <i>K. coval</i>)
Other clupeids	<i>Herklotsichthys punctatus</i>
Other clupeids	<i>Ilisha</i> spp.
Other clupeids	<i>Ilisha elongata</i>
Other clupeids	<i>Ilisha megaloptera</i>
Other clupeids	<i>Ilisha melastoma</i>
Other clupeids	<i>Ilisha filigera</i>
Other clupeids	<i>Nematalosa</i> spp.
Other clupeids	<i>Nematalosa nasus</i>
Other clupeids	<i>Opisthopterus</i> spp.

Other clupeids	<i>Opisthopterus tardoore</i>
Other clupeids	<i>Pellona ditchela</i>
Other clupeids	<i>Raconda russeliana</i>
Other clupeids	<i>Chanos spp.</i>
Other clupeids	<i>Chanos chanos</i>
BOMBAYDUCK	<i>Harpadon nehereus</i>
LIZARD FISHES	<i>Saurida spp.</i>
LIZARD FISHES	<i>Saurida gracilis</i>
LIZARD FISHES	<i>Saurida tumbil</i>
LIZARD FISHES	<i>Saurida undosquamis</i>
LIZARD FISHES	<i>Synodus indicus</i>
LIZARD FISHES	<i>Trachinocephalus myops</i>
HALF BEAKS&FULL BEAKS	<i>Ablennes hians</i>
HALF BEAKS&FULL BEAKS	<i>Strongylura spp.</i>
HALF BEAKS&FULL BEAKS	<i>Strongylura incisa</i>
HALF BEAKS&FULL BEAKS	<i>Strongylura leiura</i>
HALF BEAKS&FULL BEAKS	<i>Strongylura strongylura</i>
HALF BEAKS&FULL BEAKS	<i>Tylosurus spp.</i>
HALF BEAKS&FULL BEAKS	<i>Tylosurus crocodilus (=Strongylura crocodilus)</i>
HALF BEAKS&FULL BEAKS	<i>Tylosurus acus melanotus</i>
HALF BEAKS&FULL BEAKS	<i>Hemiramphus spp.</i>
HALF BEAKS&FULL BEAKS	<i>Hyporhamphus affinis(=Hemiramphus archipelagicus)</i>
HALF BEAKS&FULL BEAKS	<i>Hemiramphus far</i>
HALF BEAKS&FULL BEAKS	<i>Hemiramphus lutkei (=H. marginatus)</i>
HALF BEAKS&FULL BEAKS	<i>Hyporhamphus spp.</i>
FLYING FISHES	<i>Cheilopogon spp.</i>
FLYING FISHES	<i>Cheilopogon cyanopterus(=Cypselurus cyanopterus)</i>
FLYING FISHES	<i>Cypselurus spp.</i>
FLYING FISHES	<i>Exocoetus spp.</i>
FLYING FISHES	<i>Exocoetus volitans</i>
FLYING FISHES	<i>Exocoetus monocirrhus</i>
Rock cods	<i>Cephalopholis spp.</i>
Rock cods	<i>Cephalopholis argus</i>

Rock cods	<i>Cephalopholis boenak</i> (= <i>C. pachycentron</i>)
Rock cods	<i>Cephalopholis miniata</i> (= <i>C. miniatus</i>)
Rock cods	<i>Cephalopholis sonnerati</i>
Rock cods	<i>Anthias spp.</i>
Rock cods	<i>Pseudanthias spp.</i>
Rock cods	<i>Pseudanthias pillai</i>
Rock cods	<i>Epinephelus spp.</i>
Rock cods	<i>Epinephelus areolatus</i>
Rock cods	<i>Epinephelus bleekeri</i>
Rock cods	<i>Epinephelus chlorostigma</i>
Rock cods	<i>Epinephelus diacanthus</i>
Rock cods	<i>Epinephelus fasciatus</i>
Rock cods	<i>Epinephelus malabaricus</i>
Rock cods	<i>Epinephelus merra</i>
Rock cods	<i>Epinephelus morrhua</i>
Rock cods	<i>Epinephelus tauvina</i>
Rock cods	<i>Epinephelus undulosus</i>
Rock cods	<i>Aethaloperca spp.</i>
Rock cods	<i>Aethaloperca rogae</i>
Rock cods	<i>Epinephelus longispinis</i>
Rock cods	<i>Epinephelus radiatus</i>
Rock cods	<i>Epinephelus flavocaeruleus</i>
Rock cods	<i>Epinephelus latifasciatus</i>
Rock cods	<i>Epinephelus ongus</i>
Rock cods	<i>Epinephelus epistictus</i>
Rock cods	<i>Epinephelus coioides</i>
Rock cods	<i>Epinephelus miliaris</i>
Rock cods	<i>Plectropomus spp.</i>
Rock cods	<i>Sacura spp.</i>
Rock cods	<i>Sacura boulengeri</i>
Rock cods	<i>Variola spp.</i>
Rock cods	<i>Variola louti</i>
Rock cods	<i>Variola albimarginata</i>
Rock cods	<i>Other Rockcods, Groupers etc.</i>
Rock cods	<i>Odontanthias spp.</i>
Rock cods	<i>Odontanthias rhodopeplus</i>
Rock cods	<i>Chelidoperca spp.</i>
Rock cods	<i>Hyporthodus octafasciatus</i>
Snappers	<i>Etelis carbunculus</i>
Snappers	<i>Aprion spp.</i>
Snappers	<i>Aprion virescens</i>
Snappers	<i>Lutjanus spp.</i>
Snappers	<i>Lutjanus argentimaculatus</i>
Snappers	<i>Lutjanus bohar</i>

Snappers	<i>Lutjanus fulviflamma</i> (= <i>L. fulviflammus</i>)
Snappers	<i>Lutjanus gibbus</i>
Snappers	<i>Lutjanus johnii</i>
Snappers	<i>Lutjanus kasmira</i>
Snappers	<i>Lutjanus lutjanus</i> (= <i>L. lineolatus</i>)
Snappers	<i>Lutjanus malabaricus</i> (= <i>L. sanguineus</i>)
Snappers	<i>Lutjanus indicus</i>
Snappers	<i>Lutjanus fulvus</i> (= <i>L. vaigiensis</i>)
Snappers	<i>Lutjanus bengalensis</i>
Snappers	<i>Lipocheilus carnolabrum</i>
Snappers	<i>Pinjalo pinjalo</i>
Snappers	<i>Pinjalo lewisi</i>
Snappers	<i>Lutjanus vitta</i>
Snappers	<i>Lutjanus quinquelineatus</i>
Snappers	<i>Lutjanus rivulatus</i>
Snappers	<i>Pristipomoides spp.</i>
Snappers	<i>Pristipomoides typus</i>
Snappers	<i>Pristipomoides multidens</i>
Snappers	<i>Pristipomoides filamentosus</i>
Snappers	<i>Other Snappers, Jobfishes etc.</i>
Snappers	<i>Macolor spp.</i>
Snappers	<i>Macolor niger</i>
Snappers	<i>Macolor macularis</i>
Snappers	<i>Paracaesio sordida</i>
Pig-face breams	<i>Lethrinus spp.</i>
Pig-face breams	<i>Lethrinus lentjan</i>
Pig-face breams	<i>Lethrinus miniatus</i> (= <i>L. miniata</i>)
Pig-face breams	<i>Lethrinus nebulosus</i> (= <i>L. choerorhynchus</i> , <i>L. fraenatus</i>)
Pig-face breams	<i>Lethrinus ornatus</i>
Pig-face breams	<i>Lethrinus obsoletus</i> (= <i>L. ramak</i>)
Pig-face breams	<i>Lethrinus microdon</i> (= <i>L. elongatus</i>)
Pig-face breams	<i>Lethrinus conchyliatus</i>
Pig-face breams	<i>Lethrinus mahsena</i>
Pig-face breams	<i>Lethrinus erythracanthus</i>
Threadfin breams	<i>Nemipterus spp.</i>
Threadfin breams	<i>Nemipterus bipunctatus</i> (= <i>N. delagoae</i>)
Threadfin breams	<i>Nemipterus japonicus</i>
Threadfin breams	<i>Nemipterus mesoprion</i>
Threadfin breams	<i>Nemipterus randalli</i> (= <i>Nemipterus mesoprion</i>)
Other perches	<i>Sargocentron</i> (= <i>Holocentrus</i>) <i>spp.</i>
Other perches	<i>Sargocentron</i> (= <i>Holocentrus</i>) <i>diadema</i> (= <i>H. diadema</i>)
Other perches	<i>Sargocentron</i> (= <i>Holocentrus</i>) <i>punctatissimum</i> (= <i>S. lacteoguttatus</i>)
Other perches	<i>Sargocentron</i> (= <i>Holocentrus</i>) <i>rubrum</i> (= <i>H. ruber</i>)
Other perches	<i>Myripristis spp.</i>

Other perches	<i>Ambassis spp.</i>
Other perches	<i>Ambassis ambassis</i> (=A. commersoni)
Other perches	<i>Ambassis gymnocephala</i>
Other perches	<i>Ambassis dussumieri</i>
Other perches	<i>Lates spp.</i>
Other perches	<i>Lates calcarifer</i>
Other perches	<i>Pelates spp.</i>
Other perches	<i>Terapon spp.</i>
Other perches	<i>Terapon jarbua</i>
Other perches	<i>Terapon theraps</i> (=Eutherapon theraps)
Other perches	<i>Terapon puta</i>
Other perches	<i>Priacanthus spp.</i>
Other perches	<i>Heteropriacanthus cruentatus</i> (=Priacanthus cruentatus)
Other perches	<i>Priacanthus hamrur</i>
Other perches	<i>Priacanthus tayenus</i>
Other perches	<i>Priacanthus proluxus</i>
Other perches	<i>Pristigenys spp.</i>
Other perches	<i>Pristigenys refulgens</i>
Other perches	<i>Pristigenys nipponia</i>
Other perches	<i>Cookeolus spp.</i>
Other perches	<i>Cookeolus japonicus</i>
Other perches	<i>Bolbometopon muricatum</i>
Other perches	<i>Zoramia</i> (=Apogon)
Other perches	<i>Ostorhinchus spp.</i>
Other perches	<i>Sillago spp.</i>
Other perches	<i>Sillago maculata</i>
Other perches	<i>Sillago sihama</i>
Other perches	<i>Sillago vincenti</i>
Other perches	<i>Malacanthus latovittatus</i>
Other perches	<i>Erythrocles spp.</i>
Other perches	<i>Erythrocles schlegelii</i>
Other perches	<i>Aphareus spp.</i>
Other perches	<i>Aphareus rutilans</i>
Other perches	<i>Caesio and Pterocaesio spp.</i>
Other perches	<i>Caesio and Pterocaesio caerulea</i> (=C. caeruleus)
Other perches	<i>Caesio and Pterocaesio varilineata</i>
Other perches	<i>Parascolopsis spp.</i>
Other perches	<i>Parascolopsis eriomma</i>
Other perches	<i>Parascolopsis aspinosa</i>
Other perches	<i>Scolopsis spp.</i>
Other perches	<i>Scolopsis bimaculata</i>
Other perches	<i>Scolopsis vosmeri</i>
Other perches	<i>Lobotes spp.</i>
Other perches	<i>Lobotes surinamensis</i>

Other perches	<i>Gerres spp.</i>
Other perches	<i>Gerres filamentosus</i>
Other perches	<i>Gerres limbatus (=G. lucidus)</i>
Other perches	<i>Gerres oyena</i>
Other perches	<i>Gerres longirostris (=G. acinaces)</i>
Other perches	<i>Pentaprion longimanus</i>
Other perches	<i>Plectorhinchus (=Gaterin) spp.</i>
Other perches	<i>Pomadasys spp.</i>
Other perches	<i>Pomadasys argyreus</i>
Other perches	<i>Pomadasys kaakan (=P. hasta)</i>
Other perches	<i>Pomadasys maculatus (=P. maculatum)</i>
Other perches	<i>Pomadasys argenteus</i>
Other perches	<i>Diagramma picta</i>
Other perches	<i>Other Sweetlips And Grunters</i>
Other perches	<i>Monotaxis spp.</i>
Other perches	<i>Watssia spp.</i>
Other perches	<i>Watssia mossambica</i>
Other perches	<i>Gymnocranius griseus</i>
Other perches	<i>Acanthopagrus (=Mylio) spp.</i>
Other perches	<i>Acanthopagrus (=Mylio) berda(=M. berda)</i>
Other perches	<i>Monodactylus argenteus</i>
Other perches	<i>Pempheris spp.</i>
Other perches	<i>Pempheris vanicolensis</i>
Other perches	<i>Kyphosus spp.</i>
Other perches	<i>Kyphosus cinerascens</i>
Other perches	<i>Ephippus orbis</i>
Other perches	<i>Platax spp.</i>
Other perches	<i>Platax teira</i>
Other perches	<i>Drepane spp.</i>
Other perches	<i>Drepane longimana</i>
Other perches	<i>Drepane punctata</i>
Other perches	<i>Scatophagus spp.</i>
Other perches	<i>Scatophagus argus</i>
Other perches	<i>Roa jayakari</i>
Other perches	<i>Oreochromis spp.</i>
Other perches	<i>Etroplus spp.</i>
Other perches	<i>Etroplus suratensis</i>
Other perches	<i>Abudefduf spp.</i>
Other perches	<i>Scarus (=Callyodon) spp.</i>
Other perches	<i>Scarus (=Callyodon) ghobban(=C. ghobban)</i>
Other perches	<i>Cheilinus spp.</i>
Other perches	<i>Cheilinus undulatus</i>
Other perches	<i>Parapercis spp.</i>
Other perches	<i>Parapercis alboguttata</i>

Other perches	<i>Siganus spp.</i>
Other perches	<i>Siganus canaliculatus</i> (= <i>S. oramin</i>)
Other perches	<i>Siganus javus</i>
Other perches	<i>Siganus stellatus</i>
Other perches	<i>Siganus lineatus</i>
Other perches	<i>Siganus vermiculatus</i>
Other perches	<i>Acanthurus spp.</i>
Other perches	<i>Acanthurus mata</i> (= <i>A. bleekeri</i>)
Other perches	<i>Acanthurus xanthopterus</i> (= <i>A. matoides</i>)
Other perches	<i>Naso spp.</i>
Other perches	<i>Naso brevirostris</i>
Other perches	<i>Neopinnula</i> (= <i>Epinnula</i>) <i>orientalis</i> (= <i>E. orientalis</i>)
Other perches	<i>Promethichthys prometheus</i>
Other perches	<i>Ruvettus pretiosus</i>
Other perches	<i>Thyrsitoides spp.</i>
Other perches	<i>Lepidocybium flavobrunneum</i>
Other perches	<i>Rexea spp.</i>
Other perches	<i>Rexea prometheoides</i>
Other perches	<i>Psenopsis cyanea</i>
Other perches	<i>Cubiceps spp.</i>
Other perches	<i>Cubiceps whiteleggii</i> (= <i>C. natalensis</i>)
Other perches	<i>Platycephalus spp.</i>
Other perches	<i>Sunagocia carbunculus</i> (= <i>T. carbunculus</i>)
Other perches	<i>Cociella crocodila</i> (= <i>P. crocodilus</i>)
Other perches	<i>Platycephalus indicus</i>
Other perches	<i>Grammoplites scaber</i> (= <i>P. scaber</i>)
Other perches	<i>Sorsogona tuberculata</i>
Other perches	<i>Sorsogona supposita</i> (= <i>Grammoplites supposita</i>)
Other perches	<i>Grammoplites spp.</i>
Other perches	<i>Bembrops caudimacula</i>
Other perches	<i>Synagrops philippinensis</i>
Other perches	<i>Owstonia totomiensis</i>
Other perches	<i>Symphysanodon typus</i>
Other perches	<i>Other perches</i>
GOATFISHES	<i>Parupeneus spp.</i>
GOATFISHES	<i>Parupeneus indicus</i>
GOATFISHES	<i>Upeneus spp.</i>
GOATFISHES	<i>Upeneus sulphureus</i>
GOATFISHES	<i>Upeneus vittatus</i>
GOATFISHES	<i>Upeneus tragula</i>
GOATFISHES	<i>Upeneus supravittatus</i>
GOATFISHES	<i>Upeneus japonicus</i> (= <i>U. bensasi</i>)
GOATFISHES	<i>Upeneus moluccensis</i>
GOATFISHES	<i>Other Goatfishes</i>

THREADFINS	<i>Eleutheronema tetradactylum</i>
THREADFINS	<i>Polynemus spp.</i>
THREADFINS	<i>Filimanus heptadactyla (=Polynemus heptadactylus)</i>
THREADFINS	<i>Leptomelanosoma indicum (=Polynemus indicus)</i>
THREADFINS	<i>Polydactylus plebeius (=Polynemus plebeius)</i>
CROAKERS	<i>Dendrophysa russelli</i>
CROAKERS	<i>Johnieops spp.</i>
CROAKERS	<i>Pennahia anea (=Johnieops aneus)</i>
CROAKERS	<i>Johnius sina (=Johnieops sina)</i>
CROAKERS	<i>Johnius borneensis (=Johnieops vogleri)</i>
CROAKERS	<i>Johnius macrorhynchus (=Johnieops macrorhynchus)</i>
CROAKERS	<i>Johnius spp.</i>
CROAKERS	<i>Johnius belangerii</i>
CROAKERS	<i>Johnius carutta</i>
CROAKERS	<i>Johnius dussumieri</i>
CROAKERS	<i>Johnius elongatus</i>
CROAKERS	<i>Kathala spp.</i>
CROAKERS	<i>Kathala axillaris</i>
CROAKERS	<i>Nibea spp.</i>
CROAKERS	<i>Nibea maculata</i>
CROAKERS	<i>Otolithes spp.</i>
CROAKERS	<i>Otolithes cuvieri</i>
CROAKERS	<i>Otolithes ruber</i>
CROAKERS	<i>Otolithoides spp.</i>
CROAKERS	<i>Otolithoides biauritus</i>
CROAKERS	<i>Protonibea diacanthus</i>
CROAKERS	<i>Other Croakers</i>
RIBBON FISHES	<i>Lepturacanthus spp.</i>
RIBBON FISHES	<i>Lepturacanthus savala</i>
RIBBON FISHES	<i>Trichiurus spp.</i>
RIBBON FISHES	<i>Trichiurus lepturus</i>
RIBBON FISHES	<i>Trichiurus auriga</i>
Horse Mackerel	<i>Megalaspis cordyla</i>
Scads	<i>Decapterus spp.</i>
Scads	<i>Decapterus russelli (=D. dayi)</i>
Scads	<i>Decapterus macrosoma</i>
Scads	<i>Decapterus macarellus</i>
Leather-jackets	<i>Scomberoides spp.</i>
Leather-jackets	<i>Scomberoides commersonianus</i>
Leather-jackets	<i>Scomberoides lysan</i>
Leather-jackets	<i>Scomberoides tala</i>
Leather-jackets	<i>Scomberoides tol</i>
Other carangids	<i>Rachycentron canadum</i>
Other carangids	<i>Alectis spp.</i>

Other carangids	<i>Alectis ciliaris</i>
Other carangids	<i>Alectis indica</i>
Other carangids	<i>Alepes spp.</i>
Other carangids	<i>Alepes djedaba</i>
Other carangids	<i>Atule mate</i> (= <i>Alepes mate</i>)
Other carangids	<i>Alepes melanoptera</i> (=A. <i>melanopterus</i>)
Other carangids	<i>Alepes kleinii</i> (=A. <i>kalla</i>) (=A. <i>para</i>)
Other carangids	<i>Atropus atropos</i>
Other carangids	<i>Alepes vari</i>
Other carangids	<i>Carangoides spp.</i>
Other carangids	<i>Carangoides armatus</i>
Other carangids	<i>Carangoides ferdau</i>
Other carangids	<i>Carangoides gymnostethus</i>
Other carangids	<i>Carangoides malabaricus</i>
Other carangids	<i>Carangoides talamparoides</i>
Other carangids	<i>Caranx spp.</i>
Other carangids	<i>Caranx ignobilis</i>
Other carangids	<i>Caranx melampygus</i>
Other carangids	<i>Caranx sexfasciatus</i>
Other carangids	<i>Caranx lugubris</i>
Other carangids	<i>Caranx heberi</i> (=C. <i>sem</i>)
Other carangids	<i>Caranx tille</i>
Other carangids	<i>Elagatis bipinnulata</i>
Other carangids	<i>Gnathanodon spp.</i>
Other carangids	<i>Gnathanodon speciosus</i>
Other carangids	<i>Naucrates ductor</i>
Other carangids	<i>Selar spp.</i>
Other carangids	<i>Selar boops</i>
Other carangids	<i>Selar crumenophthalmus</i>
Other carangids	<i>Selaroides spp.</i>
Other carangids	<i>Selaroides leptolepis</i>
Other carangids	<i>Seriolina spp.</i>
Other carangids	<i>Seriolina nigrofasciata</i>
Other carangids	<i>Seriola spp.</i>
Other carangids	<i>Trachinotus spp.</i>
Other carangids	<i>Trachinotus baillonii</i>
Other carangids	<i>Trachinotus blochii</i>
Other carangids	<i>Trachinotus mookalee</i>
Other carangids	<i>Ulua spp.</i>
Other carangids	<i>Ulua mentalis</i>
Other carangids	<i>Uraspis spp.</i>
Other carangids	<i>Uraspis helvola</i>
Other carangids	<i>Other Carangids</i>
Other carangids	<i>Mene maculata</i>

Other carangids	<i>Coryphaena spp.</i>
Other carangids	<i>Coryphaena hippurus</i>
Other carangids	<i>Coryphaena equiselis</i>
SILVERBELLIES	<i>Gazza spp.</i>
SILVERBELLIES	<i>Gazza minuta</i>
SILVERBELLIES	<i>Leiognathus spp.</i>
SILVERBELLIES	<i>Leiognathus berbis</i>
SILVERBELLIES	<i>Photopectoralis bindus (=Leiognathus bindus)</i>
SILVERBELLIES	<i>Nuchequula blochii (=Leiognathus blochi)</i>
SILVERBELLIES	<i>Leiognathus brevirostris</i>
SILVERBELLIES	<i>Karalla daura (=Leiognathus daura)</i>
SILVERBELLIES	<i>Karalla dussumieri (=Leiognathus dussumieri)</i>
SILVERBELLIES	<i>Leiognathus equula(=L. equulus)</i>
SILVERBELLIES	<i>Equulites lineolatus (=Leiognathus lineolatus)</i>
SILVERBELLIES	<i>Eubleekeria splendens (=Leiognathus splendens)</i>
SILVERBELLIES	<i>Secutor spp.</i>
SILVERBELLIES	<i>Secutor insidiator</i>
SILVERBELLIES	<i>Secutor ruconius</i>
SILVERBELLIES	<i>Other Silverbellies</i>
BIG-JAWED JUMPER	<i>Lactarius lactarius</i>
Black pomfret	<i>Parastromateus (=Formio) niger(=F. niger)</i>
Silver pomfret	<i>Pampus spp.</i>
Silver pomfret	<i>Pampus argenteus</i>
Chinese pomfret	<i>Pampus chinensis</i>
Indian mackerel	<i>Rastrelliger kanagurta</i>
S. commersoni	<i>Scomberomorus spp.</i>
S. commersoni	<i>Scomberomorus commerson</i>
S. guttatus	<i>Scomberomorus guttatus</i>
S. lineolatus	<i>Scomberomorus lineolatus</i>
Acanthocybium solandri	<i>Acanthocybium solandri</i>
E. affinis	<i>Euthynnus affinis</i>
Auxis spp.	<i>Auxis rochei</i>
Auxis spp.	<i>Auxis thazard</i>
K. pelamis	<i>Katsuwonus pelamis</i>
T. tonggol	<i>Thunnus tonggol</i>
Other tunnies	<i>Gymnosarda unicolor</i>
Other tunnies	<i>Sarda orientalis</i>
Other tunnies	<i>Thunnus albacares</i>
Other tunnies	<i>Thunnus obesus</i>
Other tunnies	<i>Thunnus orientalis</i>
Other tunnies	<i>Scomber indicus</i>
BILL FISHES	<i>Istiophorus platypterus</i>
BILL FISHES	<i>Makaira spp.</i>
BILL FISHES	<i>Istiompax indica (=Makaira indica)</i>

BILL FISHES	<i>Makaira mazara</i>
BILL FISHES	<i>Xiphias gladius</i>
BILL FISHES	<i>Kajikia spp.</i>
BARRACUDAS	<i>Sphyaena spp.</i>
BARRACUDAS	<i>Sphyaena acutipinnis</i>
BARRACUDAS	<i>Sphyaena barracuda</i>
BARRACUDAS	<i>Sphyaena forsteri</i>
BARRACUDAS	<i>Sphyaena jello</i>
BARRACUDAS	<i>Sphyaena obtusata</i>
BARRACUDAS	<i>Sphyaena putnamae</i>
MULLETS	<i>Crenimugil crenilabis</i>
MULLETS	<i>Liza spp.</i>
MULLETS	<i>Chelon macrolepis(=Liza macrolepis)</i>
MULLETS	<i>Mugil spp.</i>
MULLETS	<i>Mugil cephalus</i>
MULLETS	<i>Valamugil spp.</i>
MULLETS	<i>Moolgarda cunnesius(=Valamugil cunnesius)</i>
Halibut	<i>Psettodes erumei</i>
Flounders	<i>Bothus spp.</i>
Flounders	<i>Bothus pantherinus</i>
Flounders	<i>Chascanopsetta lugubris</i>
Flounders	<i>Chascanopsetta prognatha</i>
Flounders	<i>Engyprosopon grandisquama</i>
Flounders	<i>Pseudorhombus spp.</i>
Flounders	<i>Pseudorhombus arsuis</i>
Flounders	<i>Pseudorhombus javanicus</i>
Flounders	<i>Pseudorhombus triocellatus</i>
Flounders	<i>Pseudorhombus elevatus</i>
Soles	<i>Aesopia cornuta</i>
Soles	<i>Euryglossa(=Brachirus) orientalis(=B. orientalis)</i>
Soles	<i>Heteromycteris oculus</i>
Soles	<i>Synaptura spp.</i>
Soles	<i>Dagetichthys commersonnii(=Synaptura commersonnii)</i>
Soles	<i>Dagetichthys albomaculatus(=Synaptura albomaculatus)</i>
Soles	<i>Zebrias spp.</i>
Soles	<i>Zebrias synapturoides</i>
Soles	<i>Cynoglossus spp.</i>
Soles	<i>Cynoglossus macrolepidotus (=C. arel)</i>
Soles	<i>Cynoglossus bilineatus</i>
Soles	<i>Cynoglossus dubius</i>
Soles	<i>Cynoglossus lida</i>
Soles	<i>Cynoglossus lingua</i>
Soles	<i>Cynoglossus macrostomus</i>
Soles	<i>Cynoglossus puncticeps</i>

Soles	<i>Other Flatfishes</i>
Penaeid prawns	<i>Solenocera spp.</i>
Penaeid prawns	<i>Solenocera crassicornis</i>
Penaeid prawns	<i>Solenocera hextii</i>
Penaeid prawns	<i>Solenocera choprai</i>
Penaeid prawns	<i>Aristeus spp.</i>
Penaeid prawns	<i>Aristeus alcocki</i>
Penaeid prawns	<i>Aristeus semidentatus</i>
Penaeid prawns	<i>Metapenaeopsis spp.</i>
Penaeid prawns	<i>Metapenaeopsis andamanensis</i>
Penaeid prawns	<i>Metapenaeus spp.</i>
Penaeid prawns	<i>Metapenaeus affinis</i>
Penaeid prawns	<i>Metapenaeus dobsoni</i>
Penaeid prawns	<i>Metapenaeus monoceros</i>
Penaeid prawns	<i>Parapenaeopsis spp.</i>
Penaeid prawns	<i>Parapenaeopsis styliifera</i>
Penaeid prawns	<i>Parapenaeopsis uncta</i>
Penaeid prawns	<i>Penaeopsis spp.</i>
Penaeid prawns	<i>Penaeopsis jerryi</i>
Penaeid prawns	<i>Penaeus spp.</i>
Penaeid prawns	<i>Penaeus canaliculatus</i>
Penaeid prawns	<i>Penaeus indicus</i>
Penaeid prawns	<i>Penaeus japonicus</i>
Penaeid prawns	<i>Penaeus latisulcatus</i>
Penaeid prawns	<i>Penaeus merguensis</i>
Penaeid prawns	<i>Penaeus monodon</i>
Penaeid prawns	<i>Penaeus penicillatus</i>
Penaeid prawns	<i>Penaeus semisulcatus</i>
Penaeid prawns	<i>Trachypenaeus spp.</i>
Penaeid prawns	<i>Trachypenaeus curvirostris</i>
Non-penaeid prawns	<i>Acetes indicus</i>
Non-penaeid prawns	<i>Heterocarpus spp.</i>
Non-penaeid prawns	<i>Heterocarpus gibbosus</i>
Non-penaeid prawns	<i>Heterocarpus wood-masoni</i>
Non-penaeid prawns	<i>Plesionika spp.</i>
Non-penaeid prawns	<i>Plesionika martia</i>
Non-penaeid prawns	<i>Plesionika spinipes</i>
Non-penaeid prawns	<i>Plesionika quasigrandis</i>
Non-penaeid prawns	<i>Oplophorus spp.</i>
Non-penaeid prawns	<i>Glyphocrangon spp.</i>
Non-penaeid prawns	<i>Acanthephyra spp.</i>
Non-penaeid prawns	<i>Other Prawns</i>
Lobsters	<i>Panulirus spp.</i>
Lobsters	<i>Panulirus homarus</i>

Lobsters	<i>Panulirus ornatus</i>
Lobsters	<i>Panulirus penicillatus</i>
Lobsters	<i>Panulirus versicolor</i>
Lobsters	<i>Puerulus spp.</i>
Lobsters	<i>Puerulus sewelli</i>
Lobsters	<i>Thenus spp.</i>
Lobsters	<i>Thenus unimaculatus</i> (= <i>t. orientalis</i>)
Lobsters	<i>Nephropsis stewarti</i>
Lobsters	Other Lobsters
Crabs	<i>Calappa spp.</i>
Crabs	<i>Calappa lophos</i>
Crabs	<i>Scylla spp.</i>
Crabs	<i>Scylla serrata</i>
Crabs	<i>Portunus spp.</i>
Crabs	<i>Portunus pelagicus</i>
Crabs	<i>Portunus sanguinolentus</i>
Crabs	<i>Scylla olivacea</i>
Crabs	<i>Charybdis spp.</i>
Crabs	<i>Charybdis annulata</i>
Crabs	<i>Charybdis feriatus</i> (= <i>C. cruciata</i>)
Crabs	<i>Charybdis natator</i>
Crabs	<i>Charybdis (Goniohellenus) smithii</i>
Crabs	<i>Charybdis lucifera</i>
Crabs	<i>Varuna litterata</i>
Crabs	<i>Sesarma tetragonum</i>
Crabs	<i>Podophthalmus vigil</i>
Crabs	<i>Doclea spp.</i>
Crabs	<i>Menippe rumphii</i>
Crabs	Crabs
Stomatopods	<i>Oratosquilla spp.</i>
Stomatopods	<i>Oratosquilla nepa</i>
Stomatopods	Other Stomatopods
Bivalves	<i>Perna indica</i>
Bivalves	<i>Perna viridis</i>
Bivalves	<i>Paphia spp.</i>
Gastropods	<i>Dentalium spp.</i>
Gastropods	<i>Umbonium spp.</i>
Gastropods	<i>Turritella spp.</i>
Gastropods	<i>Tibia spp.</i>
Gastropods	<i>Tibia curta</i>
Gastropods	<i>Lambis spp.</i>
Gastropods	<i>Cassis</i> (= <i>Carsis</i>) <i>spp.</i>
Gastropods	<i>Bursa spp.</i>
Gastropods	<i>Tona spp.</i>

Gastropods	<i>Murex spp.</i>
Gastropods	<i>Babylonia spp.</i>
Gastropods	<i>Babylonia spirata</i>
Gastropods	<i>Babylonia zeylanica</i>
Gastropods	<i>Turbinella(= Xancus) spp.</i>
Gastropods	<i>Turbinella(= Xancus) pyrum(=X. pyrum)</i>
Gastropods	<i>Harpulina (=Voluta) spp.</i>
Gastropods	<i>Conus spp.</i>
Gastropods	<i>Ficus(=Pirula) spp.</i>
Gastropods	<i>Fusinus spp.</i>
Gastropods	<i>Hemifusus spp.</i>
Gastropods	<i>Phalium spp.</i>
Gastropods	<i>Phalium bisulcatum</i>
Gastropods	<i>Pleuroploca spp.</i>
Gastropods	<i>Rapana spp.</i>
Gastropods	<i>Gastropods</i>
Squids	<i>Loliolus (Nipponololigo) spp.</i>
Squids	<i>Loliolus (Nipponololigo) hardwickei(=L. investigatoris)</i>
Squids	<i>Uroteuthis(Photololigo)(=Loligo) spp.</i>
Squids	<i>Uroteuthis(Photololigo)(=Loligo) duvaucelii(=L. duvaucelli)</i>
Squids	<i>Sepioteuthis spp.</i>
Squids	<i>Sepioteuthis lessoniana</i>
Squids	<i>Sthenoteuthis (=Symplectoteuthis) oualaniensis</i>
Squids	<i>Uroteuthis(Photololigo)(=Doryteuthis) spp.</i>
Squids	<i>Uroteuthis(Photololigo)(=Doryteuthis) singhalensis(=D. sibogae)</i>
Squids	<i>Uroteuthis(Photololigo)(=Doryteuthis) edulis(=D. singhalensis)</i>
Squids	<i>Thysanoteuthis rhombus</i>
Squids	<i>Uroteuthis(Photololigo)(=Doryteuthis) sibogae</i>
Cuttlefish	<i>Sepia spp.</i>
Cuttlefish	<i>Sepia aculeata</i>
Cuttlefish	<i>Sepia elliptica</i>
Cuttlefish	<i>Sepia pharaonis</i>
Cuttlefish	<i>Sepia prashadi</i>
Cuttlefish	<i>Sepia trygonina</i>
Cuttlefish	<i>Sepia brevimana</i>
Cuttlefish	<i>Sepiella spp.</i>
Cuttlefish	<i>Sepiella inermis</i>
Octopus	<i>Octopus spp.</i>
Octopus	<i>Octopus dollfusi</i>
Octopus	<i>Octopus globosus</i>
Octopus	<i>Cistopus spp.</i>
Octopus	<i>Cistopus indicus</i>
Octopus	<i>Amphioctopus spp.</i>

Octopus	<i>Amphioctopus marginatus</i>
Octopus	<i>Amphioctopus neglectus</i>
MISCELLANEOUS	<i>Chlorophthalmus spp.</i>
MISCELLANEOUS	<i>Chlorophthalmus agassizi</i>
MISCELLANEOUS	<i>Diaphus spp.</i>
MISCELLANEOUS	<i>Neoscopelus spp.</i>
MISCELLANEOUS	<i>Fistularia spp.</i>
MISCELLANEOUS	<i>Fistularia petimba (=F. villosa)</i>
MISCELLANEOUS	<i>Fistularia commersonii</i>
MISCELLANEOUS	<i>Beryx spp.</i>
MISCELLANEOUS	<i>Beryx splendens</i>
MISCELLANEOUS	<i>Centroberyx spp.</i>
MISCELLANEOUS	<i>Zenopsis conchifer</i>
MISCELLANEOUS	<i>Atherinomorus (=Pranesus) spp.</i>
MISCELLANEOUS	<i>Atherinomorus lacunosus (=Allanetta forskali)</i>
MISCELLANEOUS	<i>Emmelichthys spp.</i>
MISCELLANEOUS	<i>Entomacrodus spp.</i>
MISCELLANEOUS	<i>Brotula spp.</i>
MISCELLANEOUS	<i>Callionymus spp.</i>
MISCELLANEOUS	<i>Ariomma (=Psenes) spp.</i>
MISCELLANEOUS	<i>Ariomma (=Psenes) indicum(=Psenes indicus)</i>
MISCELLANEOUS	<i>Obliquogobius cometes</i>
MISCELLANEOUS	<i>Trypauchen vagina</i>
MISCELLANEOUS	<i>Setarches guentheri</i>
MISCELLANEOUS	<i>Pterygotrigla hemisticta</i>
MISCELLANEOUS	<i>Lepidotriglas longipinnis</i>
MISCELLANEOUS	<i>Satyrichthys adeni (=Peristedion adeni)</i>
MISCELLANEOUS	<i>Satyrichthys spp.</i>
MISCELLANEOUS	<i>Dactyloptena spp.</i>
MISCELLANEOUS	<i>Dactyloptena macracantha</i>
MISCELLANEOUS	<i>Dactyloptena orientalis</i>
MISCELLANEOUS	<i>Dactyloptena peterseni</i>
MISCELLANEOUS	<i>Echeneis naucrates</i>
MISCELLANEOUS	<i>Remora remora</i>
MISCELLANEOUS	<i>Triacanthus spp.</i>
MISCELLANEOUS	<i>Triacanthus biaculeatus (=T. brevirostris)</i>
MISCELLANEOUS	<i>Abalistes spp.</i>
MISCELLANEOUS	<i>Abalistes stellatus</i>
MISCELLANEOUS	<i>Balistes spp.</i>
MISCELLANEOUS	<i>Canthidermis spp.</i>
MISCELLANEOUS	<i>Balistes rotundatus (=C. rotundatus)</i>
MISCELLANEOUS	<i>Canthidermis maculata</i>
MISCELLANEOUS	<i>Balistapus spp.</i>
MISCELLANEOUS	<i>Balistapus undulatus</i>

MISCELLANEOUS	<i>Odonus niger</i>
MISCELLANEOUS	<i>Rhinecanthus aculeatus</i>
MISCELLANEOUS	<i>Sufflamen spp.</i>
MISCELLANEOUS	<i>Sufflamen frenatum</i> (= <i>S. capistratus</i>)
MISCELLANEOUS	<i>Paramonacanthus spp.</i>
MISCELLANEOUS	<i>Acreichthys tomentosus</i> (= <i>P. tomentosus</i>)
MISCELLANEOUS	<i>Alutera monoceros</i>
MISCELLANEOUS	<i>Lagocephalus spp.</i>
MISCELLANEOUS	<i>Lagocephalus inermis</i>
MISCELLANEOUS	<i>Arothron</i> (= <i>Tetradon</i>) <i>spp.</i>
MISCELLANEOUS	<i>Arothron</i> (= <i>Tetradon</i>) <i>hispidus</i>
MISCELLANEOUS	<i>Diodon spp.</i>
MISCELLANEOUS	<i>Diodon holocanthus</i>
MISCELLANEOUS	<i>Mola mola</i>
MISCELLANEOUS	<i>Masturus lanceolatus</i>
MISCELLANEOUS	<i>Mola ramzai</i>
MISCELLANEOUS	<i>Halieutaea spp.</i>
MISCELLANEOUS	<i>Syngnathoides biaculeatus</i>
MISCELLANEOUS	<i>Jellyfish</i>
MISCELLANEOUS	<i>Chelonia mydas</i>
MISCELLANEOUS	<i>Delphinus delphis</i>
MISCELLANEOUS	<i>Iconaster spp.</i>
MISCELLANEOUS	MISCELLANEOUS

Source : CMFRI

Annexure 28 Export of marine products from Kerala

SI No	Item Name	2019-20			2020-21		
		Qty. Tons	Value Rs.Crore	U S \$ (Mln)	Qty. Tons	Value Rs.Crore	U S \$ (Mln)
1	LIVE FISH	93	4.20	0.60	2	0.22	0.03
2	LIVE LOBSTER	122	23.45	3.35	17	3.36	0.46
3	LIVE AQUARIUM FISH	9	2.26	0.33	5	1.70	0.23
4	LIVE MUD CRAB	24	2.95	0.42	0	0.00	0.00
5	LIVE AQUATIC PLANT	0	0.04	0.01	0	0.00	0.00
6	CHILLED LOBSTER	7	0.14	0.02	1	0.10	0.01
7	CHILLED POMFRET	1	0.07	0.01	1	0.07	0.01
8	CHILLED FISH	939	34.54	4.97	32	1.35	0.19
9	CHILLED FRESHWATER FISH	0	0.00	0.00	0	0.01	0.00
10	CHILLED SHRIMP/PRAWN	9	0.21	0.03	19	0.96	0.13
11	CHILLED TUNA	21	1.14	0.16	0	0.02	0.00
12	CHILLED CLAM MEAT/ELEPHANT MULLI MEAT/BLOOD RED CL	1	0.01	0.00	5	0.12	0.02
13	CHILLED GROUPER	155	5.42	0.77	190	5.76	0.79
14	CHILLED GHOLE FISH	0	0.00	0.00	0	0.00	0.00
15	CHILLED RIBBON FISH	1	0.01	0.00	0	0.02	0.00
16	CHILLED POMFRET (SILVER/WHITE)	4	0.22	0.03	18	1.23	0.17
17	CHILLED POMFRET (BLACK)	1	0.04	0.01	4	0.15	0.02
18	CHILLED POMFRET (CHINESE)	0	0.02	0.00	2	0.11	0.01
19	CHILLED CROAKER (SILVER)	0	0.00	0.00	0	0.00	0.00
20	CHILLED CROAKER (YELLOW)	0	0.00	0.00	0	0.00	0.00
21	CHILLED CUTTLEFISH	1	0.03	0.00	0	0.01	0.00
22	CHILLED OCTOPUS	7	0.21	0.03	4	0.14	0.02
23	CHILLED SQUID	35	0.93	0.13	51	1.61	0.22
24	CHILLED SHRIMP (WHITE/NARAN)	31	1.32	0.19	45	2.23	0.31
25	CHILLED SHRIMP (SCAMPI)	25	2.06	0.29	13	0.72	0.10
26	CHILLED SHRIMP (TIGER)	3	0.24	0.03	21	1.61	0.22
27	CHILLED SHRIMP (BROWN)	1	0.03	0.00	9	0.56	0.08
28	CHILLED KING FISH	6	0.31	0.04	7	0.29	0.04
29	CHILLED REEF COD	4	0.24	0.03	2	0.05	0.01
30	CHILLED BAIGAI	1	0.03	0.00	2	0.07	0.01
31	CHILLED BOMBAY DUCK	2	0.02	0.00	1	0.01	0.00
32	CHILLED SNAPPER (RED)	9	0.35	0.05	33	1.17	0.16
33	CHILLED CRAB	22	0.83	0.12	19	0.70	0.10
34	CHILLED GROUPER (BROWN)	19	0.71	0.10	9	0.27	0.04
35	CHILLED FISH FILLET	5	0.25	0.04	1	0.03	0.00
36	CHILLED THREADFIN	5	0.17	0.02	24	0.70	0.10
37	CHILLED BARACUDA	6	0.16	0.02	6	0.21	0.03
38	CHILLED MULLET	1	0.04	0.01	2	0.06	0.01
39	CHILLED MULLET (RED)	4	0.16	0.02	9	0.34	0.05
40	CHILLED PARROT FISH	65	3.03	0.43	107	5.07	0.70
41	CHILLED TREVALLY (MALABAR)	9	0.25	0.04	21	0.71	0.10

42	CHILLED MACKEREL	13	0.25	0.04	18	0.50	0.07
43	CHILLED SEER FISH	3	0.11	0.02	10	0.45	0.06
44	CHILLED EEL FISH	0	0.00	0.00	0	0.00	0.00
45	CHILLED BUTTER FISH	0	0.01	0.00	1	0.01	0.00
46	CHILLED MUSSEL MEAT	0	0.00	0.00	1	0.05	0.01
47	CHILLED JEW FISH	0	0.00	0.00	0	0.00	0.00
48	CHILLED FLOWER PRAWN	1	0.08	0.01	1	0.02	0.00
49	CHILLED CRAB MEAT	7	1.40	0.20	6	0.69	0.10
50	CHILLED REEF COD FILLET	0	0.00	0.00	0	0.00	0.00
51	CHILLED YELLOW FIN TUNA	1	0.05	0.01	5	0.16	0.02
52	CHILLED MARLIN	1	0.04	0.01	1	0.03	0.00
53	CHILLED SWORDFISH	25	1.17	0.17	59	2.46	0.34
54	CHILLED YELLOWFIN TUNA LOINS	34	1.80	0.25	4	0.16	0.02
55	CHILLED TUNA(GUTTED)	1	0.02	0.00	0	0.00	0.00
56	CHILLED PEARL SPOT	3	0.08	0.01	13	0.52	0.07
57	CHILLED SARDINE	43	0.66	0.09	13	0.31	0.04
58	CHILLED SOLE FISH	8	0.15	0.02	6	0.16	0.02
59	CHILLED PONY FISH	4	0.08	0.01	6	0.20	0.03
60	CHILLED RANI FISH	1	0.02	0.00	0	0.01	0.00
61	CHILLED SCAD (VATTA)	7	0.14	0.02	24	0.58	0.08
62	CHILLED HALIBUT	0	0.00	0.00	0	0.00	0.00
63	CHILLED TILAPIA	0	0.00	0.00	0	0.00	0.00
64	CHILLED HILSA FISH	0	0.00	0.00	0	0.00	0.00
65	CHILLED SALMON FISH	0	0.00	0.00	0	0.00	0.00
66	CHILLED SILVER BIDDY	0	0.01	0.00	1	0.05	0.01
67	CHILLED SILVER SILAGO	0	0.02	0.00	1	0.03	0.00
68	CHILLED WHITE SNAPPER	0	0.00	0.00	0	0.00	0.00
69	CHILLED CATLA	1	0.01	0.00	3	0.08	0.01
70	CHILLED FISH MAWS	1	0.03	0.00	0	0.00	0.00
71	CHILLED ANCHOVY	120	3.04	0.44	98	2.31	0.31
72	CHILLED LEATHER JACKET FISH	0	0.00	0.00	0	0.00	0.00
73	CHILLED RED SEA BREAM	0	0.00	0.00	0	0.00	0.00
74	CHILLED EMPEROR	87	2.15	0.30	57	1.82	0.25
75	CHILLED RABBIT FISH	2	0.05	0.01	11	0.26	0.04
76	CHILLED RED SNAPPER FILLET	1	0.04	0.01	5	0.17	0.02
77	CHILLED DOCTOR FISH	0	0.00	0.00	0	0.00	0.00
78	CHILLED BARRAMUNDI	0	0.00	0.00	0	0.01	0.00
79	CHILLED SHARK	0	0.01	0.00	0	0.00	0.00
80	CHILLED MURREL/SNAKEHEAD(F W)	0	0.00	0.00	0	0.00	0.00
81	CHILLED NEEDLEFISH	1	0.02	0.00	1	0.04	0.00
82	CHILLED ROHU (F W)	4	0.05	0.01	2	0.05	0.01
83	CHILLED HAMOUR	0	0.00	0.00	0	0.00	0.00
84	CHILLED SEA BREAM FISH	0	0.01	0.00	2	0.06	0.01
85	CHILLED CAT FISH	0	0.01	0.00	1	0.02	0.00

86	CHILLED MUD SKIPPER	0	0.00	0.00	0	0.00	0.00
87	CHILLED SEABASS	0	0.01	0.00	2	0.10	0.01
88	CHILLED WOLF HERRING	1	0.02	0.00	1	0.02	0.00
89	CHILLED YELLOW FIN TUNA FILLET	78	4.37	0.63	9	0.55	0.08
90	CHILLED RAY FISH	2	0.05	0.01	3	0.10	0.01
91	CHILLED MULLET RED FILLETS	6	0.33	0.05	3	0.18	0.02
92	CHILLED COBIA	0	0.01	0.00	0	0.00	0.00
93	CHILLED GROUPER FILLET	12	1.05	0.15	2	0.08	0.01
94	CHILLED BARRACUDA FILLET	0	0.00	0.00	0	0.01	0.00
95	CHILLED MAHI MAHI FILLET	1	0.03	0.00	1	0.03	0.00
96	CHILLED SURGEON FISH	1	0.04	0.01	3	0.13	0.02
97	CHILLED WHITE FISH	0	0.00	0.00	0	0.01	0.00
98	CHILLED SWORD FISH LOINS	208	10.55	1.49	89	3.53	0.48
99	CHILLED SWORD FISH FILLETS	104	5.14	0.73	29	1.07	0.15
100	CHILLED YELLOWFIN TUNA H/L GUTTED	0	0.00	0.00	0	0.02	0.00
101	CHILLED YELLOW TUNA G/G	0	0.00	0.00	3	0.12	0.02
102	CHILLED YELLOWFIN TUNA H/L	11	0.47	0.07	0	0.01	0.00
103	CHILLED SAIL FISH	1	0.04	0.01	6	0.14	0.02
104	YELLOWFIN TUNA (WOUNDED)	0	0.02	0.00	4	0.22	0.03
105	CHILLED BOAL FISH	0	0.00	0.00	0	0.00	0.00
106	CHILLED LADY FISH	0	0.01	0.00	0	0.01	0.00
107	CHILLED SILVER BELLY FISH	1	0.02	0.00	0	0.01	0.00
108	CHILLED RED REEF COD	0	0.00	0.00	0	0.01	0.00
109	CHILLED SNAPPER (WHITE)	1	0.03	0.00	2	0.07	0.01
110	CHILLED CROAKER	1	0.01	0.00	1	0.02	0.00
111	CHILLED SEA TIGER	1	0.09	0.01	0	0.00	0.00
112	CHILLED BLACK TIGER	1	0.05	0.01	1	0.09	0.01
113	CHILLED RED GROUPER FISH	11	0.54	0.08	7	0.26	0.04
114	CHILLED CORAL TROUT FISH	7	0.17	0.02	0	0.01	0.00
115	CHILLED SAND LOBSTER	0	0.01	0.00	0	0.00	0.00
116	CHILLED OYSTER	0	0.00	0.00	0	0.00	0.00
117	CHILLED MOON TAIL FISH	0	0.01	0.00	0	0.00	0.00
118	CHILLED TOMATO GROUPER FISH	0	0.00	0.00	0	0.00	0.00
119	CHILLED SNAPPER	3	0.10	0.01	5	0.19	0.03
120	CHILLED PERCH FISH	0	0.00	0.00	0	0.00	0.00
121	CHILLED GREEN MUSSEL	0	0.00	0.00	0	0.00	0.00
122	CHILLED JOB FISH	0	0.00	0.00	0	0.00	0.00
123	CHILLED GOAT FISH	0	0.00	0.00	0	0.00	0.00
124	CHILLED LIZARD FISH	0	0.00	0.00	1	0.02	0.00
125	CHILLED ORA FISH	0	0.00	0.00	0	0.00	0.00
126	CHILLED TIGER PERCH FISH	0	0.00	0.00	0	0.00	0.00
127	FR. POMFRET (WHITE)	7	0.46	0.06	5	0.28	0.04
128	FR. POMFRET (BLACK)	1	0.06	0.01	6	0.23	0.03
129	FR. SNAPPER	22	0.86	0.12	32	0.98	0.13

130	FR. RIBBON FISH/WHOLE	61	1.24	0.18	67	1.39	0.19
131	FR. REEF COD WHOLE	21	0.81	0.11	0	0.00	0.00
132	FR. TUNA (YELLOW FIN)	1,900	29.14	4.18	838	9.12	1.25
133	FR. TUNA (SKIP JACK)	4,318	36.26	5.23	1,889	16.36	2.24
134	FR. TUNA (BIG EYE)	15	0.29	0.04	0	0.00	0.00
135	FR. MACKEREL	276	3.86	0.55	541	8.97	1.23
136	FR. SARDINE/WHOLE	9	0.10	0.01	21	0.25	0.03
137	FR. SEER FISH/SPANISH MACKEREL	0	0.00	0.00	23	1.79	0.24
138	FR. FISH FILLET	492	12.12	1.74	61	2.04	0.28
139	FR. FISH (OTHERS)	6	0.18	0.03	12	0.31	0.04
140	FR. FISH STEAKS/LOINS	2	0.05	0.01	10	0.42	0.06
141	FR. CROAKER	0	0.00	0.00	180	4.06	0.56
142	FR. RAY WINGS	9	0.21	0.03	0	0.00	0.00
143	FR. BARACUDA	0	0.01	0.00	0	0.00	0.00
144	FR. FISH ROE/FISH	0	0.00	0.00	0	0.03	0.00
145	FR. FISH FILLET (SNAPPER)	0	0.00	0.00	9	0.47	0.07
146	FR. REEF COD (HEAD ON GUTTED)	62	2.14	0.31	36	0.97	0.13
147	FR. KING FISH (HEAD ON GUTTED)	3	0.07	0.01	0	0.00	0.00
148	FR. LEATHER JACKET / LEATHER SKIN	410	8.77	1.25	1,951	41.88	5.74
149	FR. SOLE FISH	2	0.06	0.01	0	0.01	0.00
150	FR. THREADFIN	33	0.65	0.09	4	0.13	0.02
151	IQF MACKEREL	86	1.24	0.18	93	1.44	0.20
152	FR. GROUPER	92	2.32	0.33	193	6.22	0.85
153	FR. POMFRET (IQF)	0	0.00	0.00	0	0.00	0.00
154	FR. POMFRET (SILVER)	0	0.00	0.00	6	0.31	0.04
155	FR. TUNA (WHOLE)	181	1.52	0.21	127	1.86	0.25
156	FR. FISH FILLET (TUNA)	10	0.22	0.03	73	1.72	0.23
157	FR. SCAD	46	0.38	0.05	111	1.02	0.14
158	FR. PONY FISH (MULLAN/KATTI/KARAL)	0	0.01	0.00	7	0.10	0.01
159	FR. (F.W.) FISH (BOAL)	2	0.02	0.00	0	0.00	0.00
160	FR. (F.W.) FISH (ROHU)	0	0.00	0.00	0	0.00	0.00
161	FR. (F.W.) FISH (OTHERS)	0	0.01	0.00	4	0.05	0.01
162	FR. PEARL SPOT	4	0.23	0.03	4	0.32	0.04
163	FR. MULLET (RED)	1	0.02	0.00	23	0.67	0.09
164	FR. ANCHOVY	78	1.13	0.16	36	1.21	0.16
165	FR. TUNA (LOINS)	1,090	32.81	4.68	497	9.55	1.31
166	FR. GROUPER (GUTTED)	42	1.82	0.26	45	1.59	0.22
167	FR. SNAPPER (GUTTED)	7	0.36	0.05	3	0.06	0.01
168	FR. EMPEROR FISH (GUTTED)	0	0.00	0.00	33	0.80	0.11
169	FR. PARROT FISH (GUTTED)	1	0.05	0.01	0	0.00	0.00
170	FR. JOB FISH (GUTTED)	15	0.46	0.06	4	0.14	0.02
171	FR. FISH FILLET (MARLIN)	0	0.00	0.00	1	0.02	0.00
172	IQF FISH FILLET	0	0.00	0.00	9	0.44	0.06
173	FR. EMPEROR FISH STEAKS	3	0.07	0.01	7	0.19	0.03

174	FR. LADY FISH	5	0.14	0.02	1	0.02	0.00
175	FROZEN YELLOW FIN TUNA WHOLE ROUND IQF	2,468	32.67	4.59	2,702	31.12	4.20
176	IQF RED MULLET	10	0.28	0.04	0	0.00	0.00
177	IQF FISH STEAK (TUNA)	0	0.00	0.00	0	0.01	0.00
178	IQF SARDINE	21	0.21	0.03	3	0.03	0.00
179	IQF ANCHOVY	6	0.16	0.02	5	0.13	0.02
180	FR. SWORD FISH (HL GUTTED)	207	7.39	1.07	52	1.31	0.18
181	FR. TUNA (CUBES)	41	0.87	0.12	4	0.11	0.01
182	FR (F.W) TILAPIA WHOLE	0	0.00	0.00	0	0.00	0.00
183	FR. KING FISH STEAKS	4	0.31	0.04	21	1.43	0.19
184	FR RED SNAPPER STEAKS	1	0.01	0.00	1	0.06	0.01
185	FR RAYFISH STEAKS	13	0.34	0.05	0	0.00	0.00
186	FR RABBIT FISH WHOLE CLEANED/OTTI	0	0.00	0.00	1	0.02	0.00
187	SILVER BIDDY(GUTTED, SCALED)	0	0.00	0.00	0	0.00	0.00
188	FR.YELLOW TREVALLY/CHOOPARAI(WHOLE CLEANED)	2	0.01	0.00	0	0.00	0.00
189	FR. TREVALLY STEAKS	30	0.28	0.04	8	0.19	0.03
190	FR PARROT FISH HEADLESS	0	0.03	0.00	0	0.00	0.00
191	IQF REEF COD (GUTTED)	0	0.00	0.00	22	0.62	0.08
192	IQF RED MULLET (GUTTED)	1	0.01	0.00	0	0.00	0.00
193	FR GROUPEL/RED GROUPEL FILLET	33	1.92	0.27	130	8.85	1.22
194	FR NEEDLE FISH	6	0.16	0.02	6	0.15	0.02
195	IQF OORA	1	0.02	0.00	0	0.00	0.00
196	FR. MARLIN FISH	39	0.93	0.13	23	0.45	0.06
197	FR LIZARD FISH FILLET	23	0.40	0.06	0	0.00	0.00
198	IQF (F W) FISH (TENGARA)	0	0.00	0.00	0	0.00	0.00
199	FR GHOL FISH	0	0.00	0.00	0	0.00	0.00
200	FR. ANCHOVY HEADLESS	12	0.29	0.04	27	0.73	0.10
201	IQF GROUPEL FILLETS	17	1.31	0.18	0	0.00	0.00
202	IQF GROUPEL	0	0.00	0.00	5	0.36	0.05
203	IQF TUNA (SKIPJACK)	50	1.25	0.18	0	0.00	0.00
204	FR. SILVER SILLAGO (KATHIRAN)	0	0.00	0.00	0	0.01	0.00
205	FR. ANCHOVY DRESSED	19	0.39	0.06	15	0.40	0.06
206	FR. MACKEREL (HEADLESS)	0	0.00	0.00	2	0.07	0.01
207	IQF YELLOW FIN TUNA	27	0.87	0.12	23	0.45	0.06
208	FR TUNA BELLY FLAPS	35	1.16	0.16	0	0.00	0.00
209	FR SARDINE DRESSED	8	0.19	0.03	8	0.19	0.03
210	FR SARDINE HEADLESS, GUTLESS	0	0.00	0.00	3	0.07	0.01
211	FROZEN TUNA(GUTTED)	71	1.23	0.17	156	2.19	0.30
212	FR RED MULLET WHOLE ROUND	52	1.35	0.19	51	1.40	0.19
213	FROZEN TUNA(STEAK)	29	0.69	0.10	12	0.32	0.04
214	IQF SNAPPER STEAKS	0	0.00	0.00	0	0.01	0.00
215	YELLOWFIN TUNA LOINS(IQF)	0	0.00	0.00	75	2.48	0.33
216	YELLOWFIN TUNA CUBES(IQF)	24	0.49	0.07	2	0.07	0.01
217	OTTI(WHOLE ROUND)	4	0.06	0.01	21	0.24	0.03

218	CHOPARAI(WHOLE ROUND)IQF	0	0.00	0.00	2	0.03	0.00
219	OORA GUTTED IQF	3	0.08	0.01	1	0.03	0.00
220	OORA STEAKS IQF	4	0.10	0.01	0	0.00	0.00
221	ANCHOVY GUTTED (IQF)	11	0.26	0.04	0	0.00	0.00
222	PONY FISH IQF	0	0.00	0.00	0	0.00	0.00
223	FR YELLOW FIN TUNA ROE	118	2.03	0.30	0	0.00	0.00
224	FROZEN CATLA	0	0.00	0.00	0	0.00	0.00
225	FR.TUNA WHOLE ROUND(SKIPJACK)	5,869	48.84	6.88	14,821	121.20	16.48
226	FR.SKIPJACK TUNA CHUNKS IN BRINE (POUCHES)	34	0.87	0.12	45	0.76	0.10
227	FR.YELLOWFIN TUNA CHUNKS IN BRINE (POUCHES)	174	3.32	0.47	32	0.41	0.06
228	FR.YELLOW EEL	0	0.00	0.00	133	1.30	0.18
229	FR.YELLOW FIN TUNA CHUNK	42	0.67	0.10	0	0.00	0.00
230	FR. LIZARD FISH	367	2.17	0.31	76	0.45	0.06
231	FR. WHITE FISH WHOLE	16	0.39	0.06	0	0.00	0.00
232	FR.TUNA MEAT (RED)/FR. DARK MEAT/FR. TUNA DARKBONE	55	1.17	0.17	37	0.35	0.05
233	FR SAIL FISH	142	2.25	0.32	93	1.47	0.20
234	FR GROUPER (GILLED GUTTED)	6	0.21	0.03	21	1.06	0.15
235	FR TUNA CHUNK MEAT/CHOPPED MEAT	76	1.95	0.28	0	0.00	0.00
236	FR TUNA BELLY SKINLESS	10	0.20	0.03	0	0.00	0.00
237	FR YELLOWFIN TUNA GILLED & GUTTED	27	0.48	0.07	111	1.76	0.25
238	FR RED SNAPPER FILLET	0	0.00	0.00	20	1.24	0.17
239	IQF INDIAN MACKEREL WHOLE ROUND	42	0.66	0.09	0	0.00	0.00
240	FR MACKEREL (TRAY PACK)	16	0.19	0.03	49	0.76	0.10
241	FR GROUPER ROE	0	0.00	0.00	0	0.02	0.00
242	FR LITTLE TUNA	23	0.18	0.03	0	0.00	0.00
243	FR YELLOWFIN TUNA STRIPS	28	0.25	0.04	5	0.15	0.02
244	IQF YELLOW STRIPPED TREVALLY	2	0.03	0.00	0	0.00	0.00
245	TUNA IN RETORT POUCH	0	0.00	0.00	15	0.37	0.05
246	FR GROUPER HEAD GILLED	8	0.32	0.05	0	0.01	0.00
247	FR GROUPER STEAK	1	0.04	0.01	13	0.54	0.07
248	FR FISH STEAK	4	0.11	0.02	6	0.16	0.02
249	FR CAT FISH WHOLE	0	0.02	0.00	0	0.01	0.00
250	FR SWORD FISH	162	5.24	0.74	137	4.33	0.59
251	IQF FISH STEAK (KING FISH)	0	0.00	0.00	4	0.30	0.04
252	FR LEATHER JACKET GUTTED	152	3.40	0.49	91	2.88	0.39
253	FR SILVER BREEM	1	0.02	0.00	0	0.00	0.00
254	FR REEF COD FILLET	0	0.00	0.00	3	0.11	0.02
255	FR BACHA WHOLE (F W)	0	0.00	0.00	0	0.00	0.00
256	IF CORAL TROUT	0	0.00	0.00	1	0.03	0.00
257	IF SWORD FISH HL	0	0.00	0.00	2	0.06	0.01
258	FR RED GROUPER HEAD	4	0.17	0.03	3	0.14	0.02
259	IF ANCHOVY PAN READY	97	2.46	0.35	64	1.90	0.26
260	IF RABBIT FISH PAN READY	4	0.08	0.01	13	0.22	0.03
261	IF LADY FISH WHOLE	14	0.46	0.07	0	0.00	0.00

262	IF PEARL SPOT WHOLE CLEANED	15	0.78	0.11	6	0.38	0.05
263	IF JAPANESE THREAD FIN BREAM	7	0.19	0.03	3	0.11	0.02
264	IF TREVALLY WHOLE CLEANED	5	0.13	0.02	1	0.03	0.00
265	IF EMPEROR STEAKS	5	0.34	0.05	1	0.05	0.01
266	IF LEATHER JACKET STEAKS	1	0.04	0.01	1	0.06	0.01
267	IF YELLOWFIN TREVALLY STEAKS	2	0.04	0.01	2	0.04	0.01
268	IF MALABAR TREVALLY STEAKS	0	0.00	0.00	4	0.10	0.01
269	IF RAY FISH STEAKS	0	0.00	0.00	2	0.06	0.01
270	IF ORA STEAKS	6	0.23	0.03	1	0.04	0.00
271	IF GROUPEL STEAKS	0	0.00	0.00	5	0.30	0.04
272	IF NEEDLE FISH STEAKS	3	0.07	0.01	0	0.00	0.00
273	FR GROUPEL HEAD ON GUTTED	18	0.71	0.10	54	2.73	0.37
274	FR REEF COD GUTTED, SCALE OFF, TAIL ON	239	8.52	1.22	121	3.85	0.53
275	IF RED SNAPPER GUTTED GILLES	0	0.00	0.00	17	0.49	0.07
276	FR SEABASS	0	0.00	0.00	1	0.07	0.01
277	IF SARDINE PAN READY	16	0.34	0.05	14	0.39	0.05
278	IF WHITEFISH WHOLE	2	0.07	0.01	2	0.05	0.01
279	IF RABBIT FISH WHOLE CLEANED	2	0.05	0.01	8	0.20	0.03
280	IF LEATHER JACKET HL/TAIL LESS/SKIN OFF	1	0.04	0.01	0	0.02	0.00
281	FR SEA BASS	0	0.01	0.00	0	0.00	0.00
282	FR TUNA BAIT	28	0.24	0.03	0	0.00	0.00
283	IF BARACUDA STEAKS	1	0.03	0.00	0	0.01	0.00
284	IF INDIAN MACKEREL WHOLE	248	3.28	0.47	3	0.05	0.01
285	IF RED SNAPPER WHOLE	0	0.00	0.00	0	0.01	0.00
286	IF MACKEREL PAN READY	2	0.06	0.01	5	0.18	0.02
287	IF PONY FISH WHOLE CLEANED	0	0.00	0.00	1	0.01	0.00
288	IF ANCHOVY HEADLESS	1	0.01	0.00	0	0.00	0.00
289	IF SARDINE CLEANED	7	0.11	0.01	9	0.12	0.02
290	IF SARDINE HEADLESS CLEANED	3	0.05	0.01	4	0.05	0.01
291	IF ANCHOVY WHOLE	2	0.02	0.00	0	0.00	0.00
292	IF REEF COD WHOLE GUTTED SCALELESS	22	0.74	0.11	0	0.00	0.00
293	IF GROUPEL FILLET SKINLESS	0	0.00	0.00	2	0.09	0.01
294	IF RED SNAPPER WHOLE GUTTED	0	0.00	0.00	2	0.06	0.01
295	IF RED SNAPPER FILLET SKIN ON	19	0.91	0.13	0	0.00	0.00
296	IF YELLOW FIN TUNA LOINS	1	0.01	0.00	27	0.79	0.11
297	FR GROUPEL PIECES	2	0.05	0.01	10	0.31	0.04
298	IF LEATHER JACKET WHOLE	1	0.03	0.00	257	7.04	0.97
299	IF ORA/RABBITFISH HEAD ON GUTTED, SCALELESS	20	0.52	0.07	0	0.00	0.00
300	FR RIBBONFISH WHOLE	1,415	28.16	4.00	249	4.17	0.58
301	FR SARDINE WHOLE	86	0.89	0.13	126	1.60	0.22
302	FR MACKEREL WHOLE	2,999	40.54	5.75	5,498	87.63	12.02
303	IF RIBBON FISH STEAKS	0	0.00	0.00	5	0.06	0.01
304	IF ANCHOVY CLEANED	8	0.14	0.02	0	0.00	0.00
305	IF RABBIT FISH HL CLEANED	1	0.03	0.00	0	0.00	0.00

306	IF BLACK POMFRET STEAK	0	0.00	0.00	15	0.59	0.08
307	IF SWORD FISH STEAK	1	0.04	0.01	3	0.10	0.01
308	IF SWORD FISH FILLET	0	0.00	0.00	5	0.16	0.02
309	IF MAHI MAHI FILLET	6	0.18	0.03	6	0.21	0.03
310	IF TRAVELLY WHOLE	2	0.05	0.01	2	0.11	0.01
311	IF MACKEREL HEADLESS CLEANED	1	0.01	0.00	37	0.48	0.07
312	IF FROZEN KING FISH	22	1.39	0.20	5	0.38	0.05
313	IF MOON FISH	2	0.04	0.01	2	0.03	0.00
314	IF SILVER BELLY	9	0.15	0.02	1	0.02	0.00
315	IF CROCKER	0	0.00	0.00	228	5.12	0.71
316	IF SKINLESS BONELESS SWORDFISH CUBES	0	0.00	0.00	4	0.15	0.02
317	SHRIMP/PRAWN PICKLES	10	0.67	0.10	18	0.83	0.11
318	FISH PICKLES	12	0.74	0.11	24	0.99	0.13
319	SUCHI SHRIMP PICKLES	0	0.00	0.00	0	0.01	0.00
320	CANNED TUNA	102	3.27	0.46	86	2.54	0.35
321	CANNED SARDINE	560	10.48	1.50	139	2.79	0.37
322	CANNED FISH	20	0.42	0.06	0	0.00	0.00
323	CANNED SARDINE IN OIL	0	0.00	0.00	360	5.69	0.78
324	DRIED SHRIMP/PRAWN	88	22.97	3.32	46	8.66	1.19
325	DRIED FISH	25	0.53	0.08	7	0.45	0.06
326	DRIED BOMBAY DUCK	2	0.04	0.01	6	0.21	0.03
327	DRIED SHRIMP POWDER/MEAT	1	0.29	0.04	0	0.00	0.00
328	DRIED FISH MEAL	0	0.00	0.00	2,960	27.65	3.82
329	DRIED SHARK	0	0.00	0.00	1	0.05	0.01
330	DRIED FISH FILLET	0	0.00	0.00	0	0.00	0.00
331	DRIED MALDIVE FISH	0	0.00	0.00	0	0.00	0.00
332	DRIED SALTED FISH	2	0.03	0.00	0	0.00	0.00
333	DRIED SPRATTS	7	0.14	0.02	11	0.24	0.03
334	DRIED SILVER BELLY	6	0.10	0.01	5	0.19	0.03
335	DRIED SOLE FISH	3	0.06	0.01	5	0.16	0.02
336	DRIED RIBBON FISH	0	0.00	0.00	1	0.01	0.00
337	DRIED ANCHOVIES	8	0.11	0.02	2	0.08	0.01
338	DRIED SARDINE	0	0.00	0.00	1	0.02	0.00
339	DRIED MACKEREL	0	0.00	0.00	1	0.02	0.00
340	STEAM DRIED FEEDING FISH FLOUR	0	0.00	0.00	200	1.73	0.24
341	DRIED CROAKER	0	0.00	0.00	0	0.02	0.00
342	DRIED LIZARD FISH	0	0.00	0.00	0	0.03	0.00
343	FISH SOLUBLE PASTE	1	0.01	0.00	391	1.55	0.21
344	DRIED STING RAY	0	0.00	0.00	0	0.00	0.00
345	DRIED SHRIMP/PRAWN (CULTURED)	0	0.00	0.00	1	0.18	0.03
346	CRAB (CRAB SHELLS)	0	0.00	0.00	0	0.01	0.00
347	FR BAIGAI WHOLE	3,299	51.11	7.41	1,813	27.21	3.70
348	FR TOP SHELL (BAIGAI)	237	3.23	0.47	16	0.12	0.02
349	IQF SEAFOOD MIX BLANCHED	85	2.63	0.38	104	3.36	0.46

350	FR. ROCK LOBSTER TAIL	4	0.70	0.10	0	0.00	0.00
351	FR.SAND/SLIPPER LOBSTER TAIL	1	0.16	0.02	6	1.18	0.16
352	FR. DEEP SEA LOBSTER TAILS	10	0.66	0.09	0	0.00	0.00
353	FR. LOBSTER MEAT	1	0.09	0.01	1	0.07	0.01
354	FR. ROCK LOBSTER WHOLE	2	0.19	0.03	0	0.00	0.00
355	FR. SAND LOBSTER WHOLE	1	0.12	0.02	0	0.00	0.00
356	FR. HEADON LOBSTER	17	2.72	0.39	0	0.01	0.00
357	IQF LOBSTER HEADON	0	0.05	0.01	0	0.00	0.00
358	IQF LOBSTER WHOLE ROUND	0	0.00	0.00	9	0.77	0.10
359	FR. LOBSTER WHOLE ROUND	44	4.26	0.61	16	0.84	0.12
360	SLIPPER LOBSTER WHOLE	7	0.54	0.08	0	0.00	0.00
361	IQF SAND LOBSTER WHOLE	13	1.07	0.15	3	0.31	0.04
362	FR SAND LOBSTER MEAT	0	0.00	0.00	8	0.49	0.07
363	IF LOBSTER WHOLE	0	0.00	0.00	1	0.10	0.01
364	IF SAND LOBSTER WHOLE	4	0.40	0.06	4	0.38	0.05
365	IQF H ON WHITE SHRIMP	0	0.00	0.00	0	0.00	0.00
366	IQF H ON TIGER SHRIMP	4	0.23	0.03	5	0.33	0.04
367	IQF H ON SEA TIGER SHRIMP	2	0.11	0.01	0	0.00	0.00
368	IQF H ON FLOWER SHRIMP	0	0.00	0.00	27	2.56	0.35
369	IQF H ON SCAMPI	0	0.00	0.00	13	1.02	0.14
370	IQF H ON DEEP SEA SHRIMP	1	0.11	0.02	0	0.00	0.00
371	IQF HL WHITE SHRIMP	0	0.01	0.00	0	0.00	0.00
372	IQF HL BROWN/PINK SHRIMP	23	1.32	0.19	56	2.46	0.34
373	IQF HL DEEP SEA SHRIMP	2	0.12	0.02	6	0.25	0.03
374	IQF PUD SHRIMP	725	27.87	3.98	647	27.29	3.74
375	IQF PUD TAIL ON/FAN TAIL ROUND SHRIMP	20	1.13	0.16	0	0.00	0.00
376	IQF COOKED PEELED SHRIMP	316	18.11	2.59	28	1.75	0.24
377	IQF PD COOKED (PDC) SHRIMP	25	1.54	0.22	25	2.48	0.34
378	IQF PD SHRIMP/PD PINK BROWN SHRIMP	143	6.08	0.87	41	1.96	0.26
379	IQF PD TAIL ON SHRIMP	671	38.34	5.51	358	20.23	2.77
380	IQF PUD COOKED SHRIMP	42	2.11	0.31	11	0.78	0.11
381	IQF WHOLE COOKED SHRIMP	5	0.32	0.04	0	0.00	0.00
382	IQF PULLED VEIN - TAIL ON	0	0.00	0.00	6	0.38	0.05
383	IQF BUTTERFLY SHRIMP	12	0.82	0.12	2	0.13	0.02
384	IQF COOKED SALAD SHRIMP	354	29.02	4.15	12	0.87	0.11
385	IQF BLANCHED PUD SHRIMP	2,300	79.60	11.38	2,085	74.97	10.26
386	IQF BLANCHED PD SHRIMP	143	5.80	0.82	239	10.86	1.48
387	IQF PD (DEEP CUT) SHRIMP	14	0.65	0.10	40	1.35	0.18
388	IQF COOKED PD TAIL ON SHRIMP	4,166	265.89	37.85	5,524	396.76	54.07
389	IQF COOKED PUD SHRIMP	1,558	57.41	8.20	1,327	53.76	7.36
390	IQF PEELED COOKED SHRIMP	55	3.16	0.46	0	0.00	0.00
391	IQF SCAMPI (DEEP CUT)	0	0.03	0.00	0	0.00	0.00
392	IQF HL BLANCHED PINK SHRIMP	0	0.00	0.00	61	2.52	0.35
393	IQF COOKED PD TAIL ON BLACK TIGER	15	0.84	0.12	20	1.23	0.16

394	IQF BUTTERFLY GARLIC HERB SHRIMP	0	0.00	0.00	45	3.23	0.44
395	IQF PUD COOKED DEEP SEA SHRIMP	26	1.15	0.17	73	3.47	0.48
396	IQF PVPD SHRIMP	6	0.41	0.06	84	6.08	0.83
397	IQF PD VANNAMEI SHRIMP	35	1.96	0.28	109	5.44	0.73
398	IQF BLANCHED PD VANNAMEI SHRIMP	168	12.02	1.72	266	12.19	1.65
399	IQF RAW VANNAMEI SHRIMP	47	2.31	0.32	222	13.08	1.81
400	IQF PD TO VANNAMEI SHRIMP	45	2.65	0.38	99	7.68	1.06
401	IQF VENNAMEI EZ PEEL SHRIMP	158	8.73	1.25	244	14.40	1.94
402	IQF CRISPY SHRIMP WRAPS	11	0.77	0.11	0	0.00	0.00
403	IQF HEAD ON SHELL ON BLACK TIGER SHRIMP	18	1.04	0.15	27	2.20	0.30
404	IQF HL EASY PEEL WHITE SHRIP	0	0.00	0.00	3	0.18	0.02
405	IQF COOKED PD TAIL OFF BLACK TIGER SHRIMP	86	6.30	0.91	20	0.94	0.13
406	IQF BLANCHED PD T OFF PINK SHRIMP	23	1.02	0.14	0	0.00	0.00
407	IQF PD T OFF VANNAMEI SHRIMP	667	33.08	4.70	1,137	61.88	8.50
408	IQF BLANCHED PD T OFF BROWN SHRIMP	0	0.00	0.00	20	1.25	0.17
409	IQF BLANCHED PINK SHRIMP	20	0.64	0.09	0	0.00	0.00
410	IQF HL BUTTERFLY SCAMPI (MARINATED)	38	2.67	0.38	0	0.00	0.00
411	IQF HL EASY PEEL BLACK TIGER SHRIMP	4	0.23	0.03	0	0.00	0.00
412	IQF COOKED PEELED TAIL ON VANNAMEI SHRIMP	180	10.10	1.46	237	16.70	2.28
413	IQF HL VANNAMEI SHRIMP	0	0.00	0.00	19	1.06	0.14
414	IQF BREADED BATTERED PRAWN (PRAWNS TOFFEE BAGS)	0	0.00	0.00	6	0.36	0.05
415	IQF BREADED BATTERED PRAWN (PRAWN SAMOSA)	0	0.00	0.00	15	0.92	0.13
416	IQF BREADED BATTERED PRAWN (PRAWNS LOLLIPOP)	0	0.00	0.00	15	0.92	0.13
417	IQF COOKED PD T OFF VANNAMEI SHRIMP	2,764	153.88	22.00	4,249	252.20	34.42
418	IQF BT LIME CHILLI MARINATED SHRIMP	0	0.00	0.00	5	0.29	0.04
419	IQF HL VANNAMEI SHRIMP EASY PEEL	36	1.55	0.22	41	2.39	0.32
420	IQF RAW BREADED BATTERED BLACK TIGER SHRIMP	0	0.00	0.00	14	1.02	0.14
421	IQF RAW PD TO COOKED BT SHRIMP	5	0.33	0.05	0	0.00	0.00
422	IQF SHRIMP	95	4.96	0.71	22	1.19	0.16
423	BL. FR. H ON SCAMPI	2	0.16	0.02	0	0.00	0.00
424	BL. FR. H ON BLANCHED SHRIMP	0	0.00	0.00	20	0.70	0.10
425	BL. FR. HL BROWN/PINK/BAMBOO SHRIMP	0	0.00	0.00	21	0.90	0.12
426	BL. FR. PUD SHRIMP/MEAT	22	0.84	0.12	82	3.46	0.48
427	BL. FR. COOKED & PEELED SHRIMP	0	0.00	0.00	48	2.52	0.35
428	BL. FR. PD SHRIMP	0	0.01	0.00	11	0.57	0.08
429	BL. FR. PD TAIL ON SHRIMP	0	0.00	0.00	5	0.21	0.03
430	BL. FR. H ON SHELLON THELLY SHRIMP (ISSA)	0	0.00	0.00	19	0.32	0.04
431	FR. PUD BLANCHED SHRIMP	10	0.25	0.04	0	0.00	0.00
432	BL. FR. P D (CUT DEVINED) SHRIMP	0	0.00	0.00	15	0.66	0.09
433	BL. FR. PUD DEEP SEA SHRIMP/RED RING	42	1.59	0.23	10	0.35	0.05
434	FR. BREADED COCONUT SHRIMP	0	0.00	0.00	35	2.04	0.28
435	FR. MARINATED SHRIMP	0	0.00	0.00	55	3.45	0.47
436	BREADED SHRIMP	16	0.83	0.12	89	3.18	0.43
437	FR. SHRIMP (HEADON, TAILON BODY PEELED)	1,333	34.14	4.92	912	21.74	2.94

438	IQF PUD BLANCHED DEEP SEA SHRIMP	20	0.64	0.09	122	4.36	0.60
439	FR SHRIMP (BREADED TAIL ON)	19	1.26	0.18	6	0.27	0.04
440	FR PV PD SHRIMP	350	19.93	2.84	288	17.40	2.39
441	FR PV PD BLACK TIGER SHRIMP	3	0.45	0.06	0	0.00	0.00
442	FR PD BLANCHED SHRIMP	3	0.24	0.04	0	0.00	0.00
443	BREADED BATTERED PRAWN	0	0.00	0.00	32	1.69	0.23
444	FR. PRAWN SPRING ROLL	0	0.00	0.00	0	0.00	0.00
445	FR.HEADON KARIKADI SHRIMP	91	1.83	0.26	42	0.96	0.13
446	IQF HEAD ON BLACK TIGER	0	0.00	0.00	5	0.16	0.02
447	FR PD BUTTERFLY PRAWN	0	0.01	0.00	0	0.00	0.00
448	FR PUD RED RING SHRIMP	63	3.25	0.47	131	7.83	1.07
449	FR PPV BT SHRIMP	19	0.99	0.14	29	2.09	0.28
450	BL FR PD VANNAMEI SHRIMP	0	0.02	0.00	180	6.16	0.84
451	FR VANNAMEI SHRIMP	205	6.72	0.98	163	10.53	1.45
452	FR HLSO VANNAMEI SHRIMP	11,555	428.83	61.41	11,658	470.13	63.58
453	FR PEELED TAIL ON VANNAMEI SHRIMP	114	6.14	0.88	90	4.97	0.68
454	FR HLSO RAW BLACK TIGER SHRIMP	72	2.43	0.35	39	3.36	0.47
455	FR EZP WHITE SHRIMP (WILD)	0	0.00	0.00	4	0.16	0.02
456	FR BLACK TIGER (WILD)	7	0.39	0.06	30	1.87	0.26
457	FR PD WHITE SHRIMP	113	6.00	0.87	155	8.01	1.10
458	FR RAW HEAD ON SHELL ON VANNAMEI SHRIMP	13	0.59	0.08	393	16.15	2.19
459	FR PD TO WHITE SHRIMP	18	1.05	0.15	14	0.95	0.13
460	FR PD PINK BROWN SHRIMP	203	9.58	1.35	321	16.44	2.26
461	FR HEAD ON BLACK TIGER SHRIMP (EASY PEEL)	12	2.02	0.29	4	0.26	0.04
462	FR HEAD ON SHELL ON BLACK TIGER SHRIMP (TRAY PACK)	69	2.50	0.36	8	0.71	0.10
463	FR HEAD ON SHELL ON BLACK TIGER SHRIMP	136	7.44	1.09	25	1.45	0.20
464	FR PUD FLOWER SHRIMP	251	12.23	1.78	202	8.49	1.17
465	FR PD TAILON BUTTERFLY SHRIMP	1	0.05	0.01	0	0.00	0.00
466	FR HEAD ON VANNAMEI SHRIMP (TRAY PACK)	99	3.45	0.49	41	1.27	0.17
467	FR EZ PEEL PINK SHRIMP	22	1.12	0.16	4	0.17	0.02
468	FR PUD BLANCHED BROWN SHRIMP - TRAY PACK	12	0.35	0.05	0	0.00	0.00
469	FR PUD BROWN SHRIMP - TRAY PACK	969	41.85	5.97	878	41.10	5.59
470	FR HL SHELL ON BROWN SHRIMP - TRAY PACK	222	8.05	1.15	173	6.03	0.82
471	FR PD BLANCHED SHRIMPS - TRAY PACK	21	1.05	0.15	0	0.00	0.00
472	FR HEAD ON SHELL ON SEA TIGER SHRIMP	98	3.75	0.55	3	0.22	0.03
473	FR VANNAMEI SHRIMP EASY PEEL	83	3.86	0.56	24	1.02	0.14
474	HO SO SEA TIGER (TRAY PACK)	40	2.01	0.29	5	0.25	0.03
475	FR HL SO SEA TIGER (TRAY PACK)	105	4.54	0.65	42	2.76	0.38
476	FR PD TAIL OFF VANNAMEI SHRIMP	205	10.60	1.52	267	14.70	2.02
477	FR HEAD ON WHITE SHRIMP (TRAY PACK)	151	7.28	1.04	37	1.58	0.21
478	FR PD PV VANNAMEI SHRIMP	722	41.23	5.86	876	56.14	7.57
479	FR PUD VANNAMEI SHRIMP	2,322	98.36	14.05	3,000	131.08	17.94
480	FR PUD VANNAMEI SHRIMP (TRAY PACK)	12	0.60	0.09	0	0.00	0.00
481	FR HL SO VANNAMEI SHRIMP EASY PEEL (TRAY PACK)	120	4.39	0.62	122	5.10	0.69

482	BL. FR. SHRIMP	0	0.00	0.00	1	0.03	0.00
483	AFD SHRIMP (FROZEN DRIED SHRIMP) WILD	881	233.48	33.30	158	57.92	7.84
484	AFD SHRIMP POWDER	0	0.00	0.00	0	0.01	0.00
485	FD SQUID PIECES	79	2.57	0.37	300	11.51	1.58
486	AFD CLAM MEAT	0	0.00	0.00	0	0.00	0.00
487	AFD SHRIMP (FROZEN DRIED SHRIMP) CULTURED	0	0.00	0.00	478	131.34	17.93
488	IQF HL FRESH WATER EZ PEEL SHRIMP	16	0.99	0.15	0	0.00	0.00
489	IF HLSO PINK/BROWN SHRIMP	10	0.42	0.06	1	0.05	0.01
490	IF HEAD ON FLOWER SHRIMP	2	0.10	0.01	0	0.00	0.00
491	IF PUD RED RING SHRIMP	11	0.02	0.00	0	0.00	0.00
492	IQF PUD VANNAMEI SHRIMP	39	1.96	0.28	150	8.46	1.17
493	IQF PD TO SKEWER VANNAMEI SHRIMP	3	0.24	0.03	8	0.63	0.08
494	IQF HL SO VANNAMEI SHRIMP (TRAY PACK)	13	0.85	0.12	76	2.84	0.39
495	IQF HO SO VANNAMEI SHRIMP (TRAY PACK)	20	0.82	0.12	0	0.00	0.00
496	IQF BLANCHED PUD VANNAMEI SHRIMP (TRAY PACK)	0	0.00	0.00	39	1.14	0.15
497	IF HO SO VANNAMEI SHRIMP	4	0.11	0.02	13	0.75	0.10
498	IQF HL SO BROWN SHRIMP	13	0.61	0.09	49	2.08	0.28
499	IQF HL SO EASY PEEL SEA TIGER	0	0.00	0.00	20	0.82	0.11
500	IF PD TAIL ON VANAMEI SHRIMPS	46	1.76	0.25	56	2.38	0.33
501	IQF BLANCHED PUD VANNAMEI SHRIMPS (TRAY PACK)	0	0.00	0.00	1	0.07	0.01
502	IQF BLANCHED PD TO VANAMEI SHRIMP	90	4.69	0.67	231	9.64	1.32
503	FR.PUD TAIL ON VANNAMEI	0	0.00	0.00	14	0.55	0.08
504	FR.PUD TAIL-OFF VANNAMEI	0	0.00	0.00	93	4.29	0.58
505	FR.HEADLESS SEA WHITE	25	0.95	0.14	0	0.00	0.00
506	HL SO TAIL ON WHITE	0	0.00	0.00	9	0.58	0.08
507	IQF COOKED HLSO EASY PEELED VANNAMEI	13	0.79	0.11	134	8.62	1.16
508	IQF COOKED PD VANNAMEI	319	20.87	2.97	624	43.03	5.85
509	IQF PD PV TO VANNAMEI SHIRMP	106	6.54	0.91	260	16.64	2.23
510	IQF PD SEA WATER SHRIMP	69	3.50	0.51	57	2.71	0.36
511	IQF PUD SEA WATER SHRIMP	61	2.82	0.41	22	1.01	0.14
512	IQF RAW HL SO EASY PEEL VANNAMEI SHRIMP	29	1.78	0.25	70	3.78	0.52
513	IQF BLANCHED HEADLESS SHELLON VANNAMEI SHRIMP	136	5.97	0.84	106	4.63	0.63
514	IQF HEADLESS SHELLON VANNAMEI SHRIMP	86	5.21	0.75	116	5.69	0.78
515	FR PD TAILON VANNAMEI SHRIMP (TRAY PACK)	149	6.89	0.99	327	17.44	2.38
516	FR HEADON BROWN SHRIMPS (TRAY PACK)	129	3.40	0.49	77	1.76	0.24
517	FR PD FLOWER SHRIMP	34	1.84	0.26	103	4.59	0.63
518	FR.HL SO VANNAMEI (TRAY PACK)	43	1.40	0.20	0	0.00	0.00
519	FROZEN SEA WATER PD SHRIMPS	1,423	71.93	10.32	1,217	64.21	8.70
520	FR. VANNAMEI PD SHRIMPS	702	38.14	5.46	1,225	70.55	9.61
521	FR.HEAD ON SHELL ON SCAMPI	198	12.87	1.83	101	8.13	1.10
522	FR.HEADLES SHELL ON SEA WHITE	20	0.78	0.12	46	2.64	0.36
523	FR.HEADLESS SHELL ON PINK SHRIMP	0	0.00	0.00	9	0.29	0.04
524	FR. PUD SEA CAUGHT SHRIMP	2,344	97.70	13.82	1,862	88.40	12.00
525	FR HO SEA WHITE SHRIMP	88	2.21	0.32	75	3.89	0.54

526	FR.RAW PUD KARIKADI/POOVALAN SHRIMP	1,834	75.83	10.87	1,806	81.68	11.11
527	FR RAW PD SEA WATER SHRIMP	179	9.03	1.31	266	14.28	1.95
528	FR PUD SEA WATER SHRIMP	5,676	246.76	35.49	3,469	154.87	21.11
529	FR HL SO SEA WATER SHRIMP	158	7.33	1.05	23	1.16	0.15
530	FR HO SO VANNAMEI SHRIMP	621	19.14	2.73	403	12.95	1.74
531	FR RAW PD TO SEA WHITE SHRIMP	1	0.03	0.00	22	1.47	0.20
532	FR PUD CAT TIGER SHRIMP	66	2.81	0.40	25	0.78	0.11
533	FR PUD DEEP SEA SHRIMP	2,341	82.98	11.85	2,889	104.61	14.34
534	FR PEELED CUT DEVEINED T - OFF BLACK TIGER	64	3.88	0.56	33	1.71	0.23
535	CUL. HL SCAMPI (DEEP CUT)	0	0.00	0.00	0	0.00	0.00
536	NOBASHI EBI VACCUME (CUL. HL BLACK TIGER)	0	0.00	0.00	4	0.28	0.04
537	IQF CUL. H ON SCAMPI	0	0.00	0.00	0	0.00	0.00
538	IQF CUL. HL SCAMPI	0	0.00	0.00	0	0.00	0.00
539	IQF CUL. P COOKED SCAMPI (FW SHRIMP)	0	0.00	0.00	0	0.00	0.00
540	IQF CUL. BLACK TIGER (TRAY PACKED)	0	0.00	0.00	16	1.06	0.15
541	IQF CUL. HL BLACK TIGER (EASY PEEL)	0	0.00	0.00	0	0.02	0.00
542	IQF PD TAIL-ON RAW BLACK TIGER SHRIMP	12	0.63	0.09	0	0.00	0.00
543	IQF PUD DEEP SEA SHRIMP/RED RING	73	2.96	0.43	89	3.42	0.47
544	IQF PD DEEP SEA SHRIMP	104	5.49	0.79	59	2.44	0.33
545	IQF DEEP SEA SHRIMP	37	1.96	0.28	15	0.79	0.11
546	IQF PUD BLACK TIGER(BLANCHED)	3	0.20	0.03	7	0.36	0.05
547	IQF PD TAIL OFF WHITE SHRIMPS	53	2.66	0.39	0	0.00	0.00
548	FR HL BLANCHED PINK/BROWN SHRIMP	20	0.66	0.10	0	0.00	0.00
549	IQF HL SHELL ON BLANCHED BROWN/PINK SHRIMP	0	0.00	0.00	31	1.41	0.19
550	IQF BLANCHED EASY PEELED HL BROWN SHRIMP	0	0.00	0.00	20	0.83	0.11
551	IQF BLANCHED PD TAILON SHRIMPS	277	13.67	1.94	121	5.64	0.77
552	IQF HEAD ON SHELL ON VANNAMEI SHRIMP	10	0.60	0.09	0	0.00	0.00
553	IQF COCKTAIL SHRIMP	165	13.69	1.95	22	0.83	0.11
554	IQF COOKED HL SHELL ON BROWN/PINK SHRIMP	2	0.15	0.02	0	0.00	0.00
555	IQF HEAD ON SHRIMP	0	0.00	0.00	0	0.00	0.00
556	IQF HL SHRIMP	0	0.01	0.00	1	0.04	0.01
557	IQF PD FLOWER SHRIMP	20	0.96	0.14	0	0.00	0.00
558	IF PD TAIL ON BLACK TIGER SHRIMP	0	0.00	0.00	6	0.32	0.04
559	IQF COOKED PUD SHRIMP VANNAMEI	0	0.00	0.00	30	1.73	0.23
560	IQF COCKTAIL SHRIMP (CULTURED)	0	0.00	0.00	99	8.54	1.14
561	FR. CUTTLEFISH FILLETS	57	2.08	0.30	34	1.27	0.17
562	FR. CUTTLEFISH WHOLE	7,344	212.47	30.15	5,063	126.52	17.28
563	FR. CUTTLEFISH WHOLE CLEANED	5,262	192.76	27.53	5,677	204.10	27.81
564	FR. CUTTLEFISH TENTACLE	20	0.23	0.03	28	0.36	0.05
565	FR. CUTTLEFISH RINGS	3	0.20	0.03	0	0.00	0.00
566	FR. CUTTLEFISH ROE	122	4.59	0.65	50	2.18	0.30
567	IQF CUTTLEFISH	19	0.56	0.08	9	0.20	0.03
568	FR. CUTTLEFISH INK	70	1.49	0.21	59	1.34	0.18
569	FR. CUTTLEFISH WINGS	1	0.02	0.00	11	0.29	0.04

570	FR. CUTTLEFISH W.C. (TRAY PACKED)	30	1.18	0.17	0	0.00	0.00
571	FR. CUTTLEFISH (BABY)	13	0.36	0.05	13	0.40	0.05
572	FR. CUTTLEFISH BLANCHED	0	0.00	0.00	1	0.01	0.00
573	FR. CUTTLEFISH HEAD	3	0.07	0.01	0	0.00	0.00
574	FR. CUTTLEFISH MEAT (TRIMMED)	0	0.01	0.00	0	0.00	0.00
575	FR. CUTTLEFISH (WHOLE ROUND)	1,719	45.57	6.47	1,167	28.17	3.87
576	FR. CUTTLEFISH STRIPS	124	7.04	0.99	275	15.85	2.14
577	IQF CUTTLEFISH STRIPS	245	13.47	1.92	103	5.70	0.78
578	IQF CUTTLEFISH TENTACLES	0	0.00	0.00	7	0.14	0.02
579	AFD CUTTLEFISH WHOLE	15	0.25	0.04	22	0.92	0.13
580	IQF CUTTLEFISH (WHOLE CLEANED)	2,530	89.52	12.82	1,811	69.34	9.50
581	IQF WHOLE ROUND CUTTLE FISH	3	0.07	0.01	0	0.00	0.00
582	FR CUTTLE FISH SKIN	46	0.34	0.05	29	0.22	0.03
583	IQF CUTTLEFISH CUBES	0	0.00	0.00	0	0.01	0.00
584	IQF CUTTLE FISH TENTACLES(BLANCHED)	0	0.00	0.00	31	0.62	0.09
585	IQF CUTTLEFISH SKEWERS	2	0.04	0.01	0	0.00	0.00
586	IQF CUTTLEFISH FILLET	0	0.00	0.00	1	0.03	0.00
587	IQF CUTTLE FISH ROE	7	0.29	0.04	1	0.04	0.01
588	IF CUTTLEFISH STRIPS BLANCHED	0	0.00	0.00	5	0.31	0.04
589	IF CUTTLEFISH WHOLE CLEANED	6,505	227.89	32.42	3,090	100.72	13.69
590	FR CUTTLEFISH SPOTTED	14	0.45	0.06	0	0.00	0.00
591	FR BROKEN CUTTLEFISH MEAT CLEANED	0	0.00	0.00	1	0.03	0.00
592	IF SOFT CUTTLEFISH WHOLE	0	0.00	0.00	19	0.71	0.09
593	IF SOFT CUTTLEFISH WHOLE CLEANED	12	0.39	0.06	0	0.00	0.00
594	IQF BLANCHED CUTTLEFISH STRIPS	11	0.23	0.03	76	1.83	0.25
595	IQF CUTTLEFISH WHOLE CLEANED BLANCHED CUTTLE CUBE	103	3.70	0.53	11	0.35	0.05
596	FR. SQUID WHOLE	13,821	402.52	57.27	11,234	428.52	58.65
597	FR. SQUID (WHOLE CLEANED)	2,601	75.60	10.78	3,134	110.93	15.15
598	FR. SQUID TUBE	400	15.76	2.24	139	6.14	0.84
599	FROZEN SQUID RINGS	279	13.31	1.91	236	10.44	1.41
600	FROZEN SQUID TENTACLES	300	6.45	0.92	121	3.64	0.50
601	FROZEN SQUID (STUFFED)	0	0.00	0.00	17	0.56	0.08
602	FR. SQUID/TUBES/RINGS/TENTACLE	423	16.90	2.40	517	21.20	2.88
603	FROZEN SQUID WINGS/TUBES	0	0.01	0.00	0	0.00	0.00
604	FROZEN SQUID RINGS BLANCHED	93	2.55	0.37	0	0.00	0.00
605	FR. SQUID STRIPS	16	0.39	0.05	23	1.25	0.17
606	IQF SQUID RINGS	635	21.35	3.04	258	9.24	1.25
607	IQF SQUID TENTACLES	38	1.49	0.21	22	0.66	0.09
608	IQF SQUID STUFFED	12	0.32	0.04	14	0.36	0.05
609	IQF SQUID WHOLE CLEANED	364	9.59	1.36	308	10.27	1.40
610	FROZEN SQUID WHOLE ROUND	1,715	48.35	6.86	1,052	38.43	5.26
611	FROZEN BABY SQUID WHOLE ROUND	45	0.38	0.05	24	0.26	0.03
612	FROZEN SQUID TENTACLES BLANCHED	28	0.66	0.09	0	0.00	0.00
613	IQF SQUID TENTACLES (BLANCHED)	630	14.44	2.07	282	7.23	0.98

614	IQF SQUID RINGS (BLANCHED)	1,168	31.77	4.54	975	29.15	3.98
615	FROZEN SQUID WHOLE (BABY SQUID)	19	0.13	0.02	0	0.00	0.00
616	IQF SQUID WHOLE	352	11.38	1.61	183	6.06	0.83
617	IQF SQUID TUBES	30	0.85	0.12	36	1.12	0.15
618	FROZEN SQUID RINGS (BOILED)	0	0.00	0.00	11	0.58	0.08
619	FROZEN SQUID (FLOUR CUT IQF)	6	0.14	0.02	0	0.00	0.00
620	FROZEN SQUID (AFD)	19	0.42	0.06	0	0.00	0.00
621	IQF SQUID TUBES (BLANCHED)	48	1.57	0.23	16	0.54	0.07
622	FR. SQUID RINGS (BREADED)	51	2.30	0.33	14	0.70	0.09
623	FR. SQUID WHOLE CLEANED SKIN TRAY PACK	70	2.53	0.37	0	0.00	0.00
624	IQF SQUID SLICED	10	0.24	0.03	39	1.05	0.14
625	FR. NEEDLE SQUID WHOLE	119	3.10	0.44	148	2.75	0.38
626	IQF BLANCHED SQUID	40	0.85	0.12	23	0.50	0.07
627	FR DUSTED SQUID AND TENTACLES	91	4.40	0.64	21	1.21	0.17
628	FR SQUID SEMI NEEDLE/FILLETS	69	1.94	0.28	254	7.54	1.04
629	IQF SQUID STRIPS BLANCHED	0	0.01	0.00	5	0.19	0.03
630	FR SQUID TUBE NEEDLE	20	0.61	0.09	0	0.00	0.00
631	FR SQUID WHOLE ROUND (POUCH PACK/TRAY PACK)	209	6.45	0.93	59	2.60	0.35
632	IQF SQUID WHOLE ROUND	80	2.10	0.31	110	3.72	0.51
633	IF SQUID TENTACLE BLANCHED	38	0.87	0.12	70	1.84	0.25
634	IF SQUID RINGS BLANCHED	43	0.89	0.13	57	1.85	0.25
635	IQF SQUID TUBES COOKED	5	0.18	0.03	3	0.10	0.01
636	FR SQUID WHOLE CLEANED (POUCH PACK)	139	4.60	0.66	0	0.00	0.00
637	IQF BOILED SQUID RING	12	0.31	0.04	18	0.44	0.06
638	IF SQUID WHOLE CLEANED	1,018	26.14	3.72	1,596	52.29	7.12
639	IF SQUID RING	13	0.43	0.06	45	0.99	0.13
640	IF SQUID TENTACLE	20	0.60	0.09	2	0.05	0.01
641	IQF COOKED SQUID RINGS	290	10.54	1.50	292	11.27	1.53
642	IQF COOKED SQUID TENTACLES	6	0.14	0.02	0	0.00	0.00
643	IQF BLANCHED SQUID RINGS & TENTACLES	115	3.16	0.46	172	4.89	0.67
644	FROZEN OCTOPUS	5,806	120.45	17.18	3,767	82.86	11.33
645	FROZEN OCTOPUS (BABY)	8	0.21	0.03	325	6.80	0.94
646	IQF BABY OCTOPUS	37	1.10	0.16	20	0.54	0.07
647	FROZEN OCTOPUS TENTACLES	3	0.02	0.00	0	0.00	0.00
648	FROZEN OCTOPUS (WHOLE CLEANED)	1,203	29.75	4.26	1,699	41.70	5.70
649	IQF OCTOPUS (WHOLE CLEANED)	56	1.43	0.21	76	2.00	0.27
650	FROZEN OCTOPUS (GUTTED & COOKED)	21	0.47	0.07	0	0.00	0.00
651	FR. BABY OCTOPUS WHOLE CLEANED	837	22.36	3.19	777	20.61	2.83
652	IQF OCTOPUS (GUTTED)	113	3.04	0.44	53	1.37	0.19
653	FR. OCTOPUS(GUTTED)	52	1.41	0.20	42	1.03	0.14
654	FR OCTOPUS (WHOLE ROUND)	1,439	29.35	4.19	831	18.59	2.53
655	FR OCTOPUS LONG ARM	39	0.89	0.13	162	3.37	0.46
656	FR OCTOPUS (BABY CUT OPEN)	59	1.82	0.26	0	0.00	0.00
657	IQF OCTOPUS(BLANCHED)	3	0.05	0.01	20	0.44	0.06

658	IQF BABY OCTOPUS (WHOLE CLEANED)	72	1.96	0.28	72	1.81	0.25
659	IQF CLEANED BIG OCTOPUS	15	0.44	0.06	21	0.69	0.10
660	FR BABY OCTOPUS WHOLE GUTTED	157	3.84	0.54	97	2.35	0.33
661	FR WHOLE GUTTED OCTOPUS	602	13.99	1.98	130	3.54	0.49
662	IF OCTOPUS WHOLE CLEANED	83	2.05	0.30	111	2.78	0.38
663	IF BABY OCTOPUS WHOLE GUTTED	32	0.79	0.11	28	0.62	0.09
664	CLAM (FR. BOILED CLAM/WHELK/COCKLE MEAT)	8	0.20	0.03	42	0.70	0.10
665	FR. MUSSEL MEAT	1	0.07	0.01	0	0.01	0.00
666	FROZEN SNAIL MEAT	150	1.98	0.29	34	0.48	0.07
667	CRAB (FR. CRAB MEAT)	8	0.65	0.09	0	0.00	0.00
668	FR. BAIGAI MEAT	183	3.09	0.45	0	0.00	0.00
669	CRAB (FR. MUD CRAB)	0	0.01	0.00	0	0.00	0.00
670	CRAB (FR. CUT SWIMMING CRAB)	0	0.00	0.00	3	0.10	0.01
671	CRAB (FR. DRESSED CRAB)	0	0.00	0.00	0	0.00	0.00
672	CRAB (IQF WHOLE CRAB)	0	0.00	0.00	0	0.00	0.00
673	CRAB (FR. WHOLE CRAB)	2	0.15	0.02	1	0.02	0.00
674	CRAB (FR. CUT CRAB WITH CLAWS)	0	0.00	0.00	0	0.00	0.00
675	CRAB (FR. CUT CRAB)	10	0.66	0.09	0	0.00	0.00
676	CRAB (FR. CRAB MEAT WITH SHELL/CRAB CHUNKS)	0	0.00	0.00	0	0.01	0.00
677	FROZEN OYSTER MEAT	1	0.03	0.00	0	0.01	0.00
678	CLAM (FR. BOILED CLAM MEAT)	167	3.16	0.45	114	2.44	0.33
679	CLAM (FR. CLAM MEAT- RAW IQF)	2	0.10	0.02	1	0.10	0.01
680	CRAB (CRAB FLAKES)	0	0.00	0.00	0	0.00	0.00
681	FR THREE SPOT CRAB	0	0.00	0.00	0	0.01	0.00
682	FR. MUSSEL (COOKED)	20	0.39	0.06	0	0.01	0.00
683	FR. MUSSEL (BLANCHED)	4	0.11	0.02	0	0.01	0.00
684	CLAM (CLAM MEAT YELLOW)	0	0.01	0.00	13	0.11	0.02
685	IQF CUT CRAB (3 SPOT)	8	0.28	0.04	2	0.07	0.01
686	FR.CLAM MEAT(BABY)	0	0.01	0.00	46	0.55	0.08
687	IQF BLUE SWIMMING CUT CRAB	2	0.12	0.02	0	0.00	0.00
688	FR.BLUE SWIMMING CUT CRAB	0	0.00	0.00	2	0.07	0.01
689	HALF SHELL GREEN MUSSEL	0	0.00	0.00	0	0.00	0.00
690	FR.IMITATION CRAB STICK	0	0.00	0.00	0	0.01	0.00
691	FR IMITATION CRAB CLAWS	0	0.00	0.00	0	0.01	0.00
692	FR IMITATION CRAB SHREDS	0	0.00	0.00	1	0.04	0.01
693	IQF WHOLE ROUND BAIGAI	211	3.48	0.51	0	0.00	0.00
694	FR THREE SPOT HALF CUT CRAB	0	0.00	0.00	0	0.00	0.00
695	FR THREE SPOT CUT CRAB WITH CLAW	0	0.00	0.00	0	0.00	0.00
696	FR BLUE SWIMMING CUT CRAB WITH CLAW	16	0.66	0.09	13	0.66	0.09
697	FR BLUE SWIMMING CUT CRAB WITHOUT CLAW	15	0.51	0.07	6	0.21	0.03
698	IF CUT CRAB	1	0.04	0.01	0	0.00	0.00
699	IF CRAB WHOLE	0	0.00	0.00	0	0.00	0.00
700	FROZEN STONE CRAB	0	0.00	0.00	0	0.01	0.00
701	IQF COOKED SEAFOOD MIX	0	0.00	0.00	1	0.02	0.00

702	FISH SOLUBLE POWDER	0	0.00	0.00	2	0.03	0.00
703	FISH CUTLETS	1	0.02	0.00	2	0.05	0.01
704	AGAR AGAR	121	13.80	1.96	94	11.49	1.56
705	PRAWN CUTLETS	18	0.70	0.10	1	0.07	0.01
706	SEAFOOD MIX	8	0.26	0.04	7	0.19	0.03
707	BREADED SHRIMP	0	0.00	0.00	2	0.17	0.02
708	FISH FINGERS	0	0.00	0.00	0	0.00	0.00
709	BREADED SQUID RINGS	0	0.00	0.00	7	0.29	0.04
710	FISH CURRY	8	0.26	0.04	17	0.66	0.09
711	FR.CRAB CUTLETS	6	0.22	0.03	0	0.00	0.00
712	CHEMMEEN CHUTNEY-COCONUT	0	0.01	0.00	0	0.00	0.00
713	PRAWN CHUTNEY (WITHOUT COCONUT)	1	0.09	0.01	3	0.18	0.02
714	SPICED AND FRIED SHRIMP	0	0.01	0.00	37	1.06	0.15
715	FRIED FISH	0	0.00	0.00	0	0.00	0.00
716	FISH CHUTNEY	1	0.05	0.01	0	0.01	0.00
717	FISH POWDER (READY TO EAT)	0	0.00	0.00	40	0.72	0.10
718	FR. SEAFOOD COCKTAIL	0	0.00	0.00	133	10.96	1.51
719	IQF MEAL KIT	0	0.00	0.00	22	0.19	0.03
720	FISH CURRY (GOA)	0	0.00	0.00	0	0.00	0.00
721	FISH CURRY (KERALA)	2	0.13	0.02	0	0.03	0.00
722	SHRIMP (READY TO COOK)	0	0.00	0.00	1	0.07	0.01
723	PRAWN ROAST	0	0.03	0.00	7	0.43	0.06
724	FR. MAHI MAHI	74	0.81	0.12	57	0.55	0.08
725	FR. MAHI MAHI FISH FILLET	15	0.16	0.02	2	0.07	0.01
726	MEEN PEERA KOZHUVA(ANCHOVY)	1	0.07	0.01	1	0.06	0.01
727	FISH BIRIYANI	1	0.08	0.01	1	0.07	0.01
728	SARDINE PEERA	0	0.01	0.00	2	0.10	0.01
729	FR SEAFOOD MIX (TRAY PACK)	4	0.12	0.02	60	1.77	0.24
730	SHRIMP/ PRAWN MASALA	2	0.12	0.02	0	0.00	0.00
731	IF SEAFOOD COCKTAIL	0	0.00	0.00	99	8.31	1.13
732	FISH OIL	8	0.16	0.02	9	2.89	0.40
733	SQUALENE (SHARK OIL)	0	0.00	0.00	1	0.16	0.02
734	IQF SEAFOOD MIX	136	4.02	0.57	137	4.07	0.55
735	IQF BAIGAI (SHELL ON)	334	5.20	0.76	165	2.63	0.36
736	FR MARINATED CRAB CURRY	0	0.00	0.00	0	0.00	0.00
	** Grand Total **	1,48,226	5,020.33	716.81	1,44,700	5,039.89	687.23

Annexure 29 ICAR-CIFT Cochin List of Technology Transfers from 2018-2021

Year	Name of technology transfer	Name of licensee party
2018-19	Frozen fish products	Baby Marine Seafoods Retail Pvt. Ltd., Kochi
	Value added products – Fish cutlet	Coral Exports, Smt. LissyBiju, Kochi
	Fresh fish retail outlet and dry production unit	Smt. UmmulHaira, Tripti Dry Fish, Malappuram
	Value added products– Fish pickle, prawn chutney powder & dry prawn fry	VanithaEntreprises, Smt. Sobha Thomas, Kochi
	Protein Hydrolysate from fish, shrimp and distillery by products	Sanj Feed Technologies Pvt Ltd., Andhra Pradesh
	Dry fish products	Nallakarshakan Agro Private Limited, Kochi
	Value Added Products from fish	SagarManthanMachhimarUtthanMandal, Gujarat
	Waste utilization – shrimp shell	Fab Dye Kem, Alleppey
	Waste utilization – fish feed	Smt. Akhila Mole, Ponnos Fish Feed, Thrissur
	Fish Pickle and fish silage	Mrs. Mary Sunitha ChellanamSeafish, Kochi
	Value Added Products from fish	Mr. Johnson K. (Nanma), Alappuzha
	Fish Pickle	Mrs.Beena J.T. Travancore Pickles, Trivandrum
	Fish Pickle	Mrs.ShahinaNishad, Kottayam
	Dry fish production and establishment of solar dryer	Mr. M.A. Remesan, Vaikans Fisheries, Kochi
	Pre-processing and packaging of fresh fish	Smt. Rejitha T.K, Green Marine, Kochi
	Ready-to-eat thermal processed product: frozen stuffed mussels	Mr.Mansoor O.P., Mejillon Foods, Calicut
	Insulated Fish Bag	Mr.PentapalliRambabu, Visakhapatnam
Fish collagen peptideand hydroxyapatite	Eklavya Biotech Pvt Ltd., Mumbai	

	Extraction of polysaccharide and fucoxanthin from seaweed	Accelerated Freeze Drying Co. Ltd - AFDC (Amalgam Group), Alappuzha
	Value Added Products – Fish cutlet & fish pickle	Smt. Akhila Mole M.A, Ponnos Fish Feed, Thrissur
2019-20	Value Added Products – fish pickle and masala fried clam	Vedika Food Industrial, Mr.Saneesh K.S., Kottayam
	Waste utilization – foliar spray from fish waste	Kallar Plantation, Mr. Abdul Shukoor N.M., Idukki
	Value Added Products – fish and prawn pickles	Dasan K.K., Kozhikode
	Ready-to-eat retort processed: stuffed mussels and mussel meats	Foo Foods, Mr. Mohammed Fawaz T.C., Kozhikode
	Value Added Products - fish and prawn pickles	Herbs & Spices, Smt. Prasanthi S., Kollam
	Value Added Products (pickle) & Waste utilization	Seby Cherian, Alappuzha
	Value Added Products - fish/prawn pickles and chutney powder	Basil Thankachen, Ernakulam
	Value Added Products (fish pickle)	Faisal M.P., Malappuram
	Fertilizers from fish hydrolysate	Sandesh K Salian, Karnataka
	Value-added products (pickle and cutlet)	Bharat V Kamaliya, Gujarat
	Value-added products (fish and prawn pickle)	M. Assu, Calicut
	Value-added products	AdvikDhanyati Enterprises, Odisha
	Value-added products	Manasa Fish Con, Andhra Pradesh
	Marinated products	Mr.Ramees C.P.M., Calicut
	Collagen/gelatin/collagen-peptide extraction	Sulchem Industries, Ernakulam
	Fish collagen peptide and fish calcium	M/s. ANDR, Mr. Sherwin James, Karnataka
	Production of collagen peptide from fresh water fish scale	Pratik Kantilal Kothari
Production of Seaweed Nutri-powder, Calcium-Iron fortified fish soup powder and hand sanitizer	Bodina Naturals Pvt. Ltd. (BNPL)	

2020-21	Production of Fish Protein "Fish Pro"	Arecia Life Sciences Pvt. Ltd.
	Production of fish pickle and handling of fresh fish	Fauna Foods



TRADABLE/ COMMERCIALY POTENTIAL AQUATIC BIORESOURCES OF KERALA

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