Note

Stake net fishery in the Chettuva Estuary, south-western coast of India

Molly Varghese^{1*}, Somy Kuriakose¹, K. R. Aju¹, K. M. Sreekumar¹, K. B. Sheeba¹, P. A. Thobias¹ and K. Vinod²

¹ICAR-Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, India ²Regional Centre of ICAR-Central Marine Fisheries Research Institute, Mandapam, Tamil Nadu - 623 520, Kerala, India



Abstract

The stake net landing in the Chettuva Estuary was studied for two years from October 2019-September 2021 on the basis of the data and samples collected fortnightly from five stations along the estuary. A total of 123 species of finfish and shellfish belonging to 98 genera, 56 families and 29 orders were recorded during the study. The average monthly landing by stake net was estimated as 51.86 t and the catch was minimal during August and maximum in March. Seasonally, 38.65% of the catch was recorded during the pre-monsoon season, followed by 35.02% during the post-monsoon and the remaining 26.33% caught during the monsoon season. Shrimps dominated the total landings in all the months and stations, with an average contribution of 58.72%, followed by 35.79% by fishes and 5.49% by crabs. The mean catch per unit effort in the Chettuva Estuary was estimated to be 24.69 kg and the catch rates of shrimps, crabs and fishes were 14.13, 1.66 and 8.89 kg, respectively. The trend in the catch rate for both shrimps and total resources remained the same for all the stations as well as for all the months, indicating the importance of shrimp catch in the fishery by stake nets in the Chettuva Estuary. The modal length classes observed for these species indicated that majority of them were juveniles. The exploitation of juveniles, especially of shrimps, by stake nets in this estuary is a matter of concern; hence, increasing the cod end mesh size of the nets operating in the Chettuva Estuary is recommended for resource sustainability.

.....

.....



*Correspondence e-mail: mollykandathil@hotmail.com

Keywords:

Catch per unit effort, Chettuva Estuary, Juveniles, Landings, Species composition, Stake net

> Received : 01.11.2023 Accepted : 26.03.2025

The estuarine fishery resources of Kerala are of high magnitude and support a rich fishery. The fauna comprises both marine and a few freshwater species that can tolerate variations in salinity in addition to the truly estuarine species, as the species move to or from the sea during spawning. Kerala is blessed with several estuaries and these water bodies are considered good nursery arounds for different species of finfishes and shellfishes. The backwaters in Kerala form habitats for more than 200 resident and migratory fish and shellfish species and fishing activities in these backwaters provide livelihoods to approximately 200,000 fishers and full-time employment to more than 50,000 fishermen (Bijoy Nandan, 2008). With respect to the importance of estuaries, several studies on fishery resources in different estuaries have been conducted (Harikrishnan et al., 2011; Bijoy Nandan et al., 2012; Regi and Bijukumar, 2012; Rejna et al., 2015; Remya and Amina, 2018; Muthupandi et al., 2020; Amrutha and Talwar, 2021; Kumar et al., 2023a,b; Swetha et al., 2023; Geethalakshmi et al., 2024). Different types of fishing gear are in operation in estuaries. Among the different gear operated, stake nets were found to contribute a maximum of 28.39% to the total landings in selected backwaters along the south-western coast of India (CIFRI, 2005) and a contribution of up to 57% by stake nets in total landings was recorded in Cochin backwaters (Kurup et al., 1993). Uskelwar et al. (2017) reported that stake net fisheries constitute one of the prominent traditional fisheries practiced along the estuarine villages of Ratnagiri, whereas stake nets and Chinese dip nets together constitute only 8% of finfish landings in the

Ashtamudi Estuary (Kumar et al., 2023a). However, Kumar et al. (2023a) did not consider the shrimp landings in this estuary, which constitute the major component of stake net fisheries. Marine debris in the stake net fisheries of Vembanad Lake was assessed by Shylaja et al. (2018) and anthropogenic impacts on the stake net fishery of the Theyara-Venduruthy region were studied by Leva et al. (2015). The Chettuva backwater is located between the Engandivur Panchavat and the Kadappuram Panchavat of Thrissur District in Kerala. The backwaters start at Enamakkal Lake and empties to Arabian Sea. This estuary is bestowed with good coverage of mangroves and associated bioresources. Some studies have been carried out on the fishery resources of this estuary by a few researchers (George et al., 2002; CIFRI, 2005; Laxmilatha et al., 2006; Jayachandran et al., 2008; CMFRI, 2012; Sreedevi et al., 2014; Swapana et al., 2016; Vinitha et al., 2016; Vivekanand et al., 2016). Among the different fishing gear that operate in the Chettuva Estuary, stake net landings contribute the most to the fishery (CIFRI, 2005). It is an age-old practice in this area, and no reports are available on a detailed investigation of stake net fisheries in this estuary. Hence, an attempt is made here to study the qualitative and guantitative aspects of stake net landings in the Chettuva Estuary.

Stake nets locally known as "Oonnuvala" are traditional fishing gear that are operated with the help of stakes or poles fixed across the water body. It is a conical net with different mesh sizes for different portions, with the largest mesh size at the mouth area, and it gradually decreases towards the cod end. In the Chettuva Estuary, traditional stake nets with a total length of 22 m and a cod end mesh size of 8 mm are usually used. The total length of net is divided into cod end region (5.45 m), middle portion (14.55 m), top region (1 m) and extreme top part (1 m). The nets are spaced at a distance of 6 m at each station. The stake net fishery is influenced by tides and when the water starts receding during the start of low tide, the stake nets are erected, and the fishery resources that enter the nets are collected. During the present study, catch and effort data for shrimps, crabs and fishes were collected fortnightly from

five stations, *viz*. Azhipadu (Station 1), Thanthapadu (Station 2), Mukkom (Station 3), Kanakkampadu (Station 4) and near Chettuva bridge (Station 5) during the period from October 2019 to September 2021 (Fig. 1).

Among the stations, station 1 (Azhipadu) is located near the barmouth and subsequent stations are located upstream. The distance between Azhipadu and Thanthapadu is 1.10 km, Mukkom is located 870 m away from Thanthapadu, Kanakkampadu is 503 m away from Mukkom and Chettuva bridge station is located 710 m far from Kanakkampadu. From the catch and effort (number of nets/units operated) data collected from each station, the catch per unit effort (CPUE) of different fishery resources was calculated, and month-wise and station-wise values were estimated. The total catch was calculated on the basis of the number of fishing days in each month. The data collected for 24 months were averaged to 12 months for proper interpretation of the data. For the seasonal studies, October-January was considered the post-monsoon period, February-May was considered the pre-monsoon period, and June-September the monsoon period. Samples of fishery resources were collected on a fortnightly basis from different stations, the collected samples were identified (Fischer and Bianchi, 1984; Smith and Heemstra, 1986; Munro, 2000) and length measurements of each species were recorded to determine the modal length class of the landed species.

The catch per unit effort of total resources, shrimps, crabs and fishes collected for 24 months were taken for analysis. One-way ANOVA and *post hoc* tests were carried out to examine the monthly, seasonal and stationwise variations between these entities.

A total of 123 species of finfish and shellfish were recorded from stake net landings in the Chettuva Estuary during the study period in addition to jellyfish. These 123 species belong to 98 genera, 56 families and 29 orders. The list of species of fishes, crustaceans and mollusks landed by stake nets along with their modal length classes, families and IUCN status are given in Table 1.



Fig. 1. Map showing the locations of the sampling stations

The 123 species included 104 species of fishes belonging to 49 families, 14 species of crustaceans (4 families) and 5 species of mollusks (3 families). In terms of IUCN status, *Cynoglossus macrostomus*, which belongs to the vulnerable category, is included in this list. Jyothilal *et al.* (2015) recorded 48 species of fishes (33 families), 12 species of crustaceans (4 families) and 5 species of mollusks (4 families) in the stake net catch of Ashtamudi Lake. The lower number of fishes recorded from Ashtamudi Lake may be due to the lower frequency and number of observations than those reported in the present study. Amrutha and Talwar (2021) reported 20 finfishes and 6 shellfishes in coastal set bagnets operating in the Hooghly Matlah Estuary in an experimental study conducted for four months. In another study, Jayawardane and Perera (2003) recorded only 41 species of finfish and crustaceans in stake nets from Negombo Lagoon, Sri Lanka. Ali *et al.* (2013) recorded

95 species of finfishes and shell fishes from stake nets operating in intertidal areas in Kuwait and reported that 40% of the catches were juveniles.

The majority of species recorded were juveniles, as evidenced by the modal length class observed, which may be due to the very small mesh size of the cod end of the net used. The exploitation of juveniles by stake nets has also been recorded in Cochin backwaters (Nandakumar, 2004), the Ashtamudi Estuary (Jyothilal *et al.*, 2015, Kumar *et al.*, 2023a), Pulicat Lake (Muthupandi *et al.*, 2020) and the Hooghly Matlah Estuary (Amrutha and Talwar, 2021). The modal lengths of *Metapenaeus dobsoni* recorded by Jayawardane and Perera (2003) and during the present study were 4.3 and 4.5 cm, respectively.

The annual landings by stake nets in the Chettuva Estuary were estimated to be 622.32 t, which included shrimps, crabs and fishes.

Table 1. List of species, modal length classe	, families and IUCN status of the finfishes	and shellfishes recorded during the study period
---	---	--

Species	Modal length class (cm)	Family	IUCN Status
Acanthurus mata (Cuvier, 1829)	3.1-4	Acanthuridae	LC
Ambassis gymnocephalus (Lacepède, 1802)	5.1-6	Ambassidae	LC
Nemapteryx caelata (Valenciennes, 1840)	3.1-4	Ariidae	NE
Arius subrostratus Valenciennes, 1840	6.1-8	Ariidae	NE
Atherinomorus lacunosus (Forster, 1801)	6.1-8	Atherinidae	LC
Colletteichthys dussumieri (Valenciennes 1837)	3.1-4	Batrachoididae	LC
Colletteichthys flavipinnis Greenfield, Bineesh and Akhilesh, 2012	4.1-5	Batrachoididae	LC
Strongylura strongylura van Hasselt, 1823	17.1-19	Belonidae	NE
Tylosurus crocodilus (Peron and Lesueur 1821)	23-23.5	Belonidae	LC
Bothus Rafinesque, 1810	12.1-13	Bothidae	
Bregmaceros mcclellandi Thompson, 1840	4.1-6	Bregmacerotidae	NE
Alepes kleinii (Bloch, 1793)	6.1-8	Carangidae	LC
Alepes djedaba (Forsskal, 1775)	10.1-11	Carangidae	LC
Atule mate (Cuvier, 1833)	9.1-10	Carangidae	LC
Carangoides ferdau (Forsskal, 1775)	6.1-7	Carangidae	LC
Caranx heberi (Bennett, 1830)	8.1-9	Carangidae	LC
Caranx hippos (Linnaeus, 1766)	8.1-9	Carangidae	LC
Caranx ignobilis (Forsskal, 1775)	8.1-9	Carangidae	LC
Elagatis bipinnulata (Quoy and Gaimard, 1825)	7.1-8	Carangidae	LC
Gnathanodon speciosus (Forsskal, 1775)	6.1-8	Carangidae	LC
Megalaspis cordyla (Linnaeus, 1758)	6.1-7	Carangidae	LC
Parastromateus niger (Bloch, 1795)	1-2	Carangidae	LC
Scomberoides tol (Cuvier, 1832)	5.5-7.5	Carangidae	LC
Trachinotus blochii (Lacepede, 1801)	11.1-12	Carangidae	LC
Etroplus suratensis (Bloch, 1790)	6.1-6.5	Cichlidae	LC
Anodontostoma chacunda (Hamilton, 1822)	6.1-8	Clupeidae	LC
Dussumieria acuta Valenciennes, 1847	4-4.5	Clupeidae	LC
Escualosa thoracata (Valenciennes, 1847)	4.1-5	Clupeidae	LC
Nematalosa nasus (Bloch, 1795)	8.1-10	Clupeidae	LC
Sardinella albella (Valenciennes, 1847)	4.1-5	Clupeidae	LC
Sardinella fimbriata (Valenciennes, 1847)	6.1-7	Clupeidae	LC
Sardinella gibbosa (Bleeker, 1849)	4.1-5	Clupeidae	LC
Conger sp. Bosc, 1817	30.1-32	Congridae	
Ariosoma anago (Temminck and Schlegel, 1846)	20.1-20.5	Congridae	DD
Cynoglossus macrostomus Norman, 1928	6.1-7	Cynoglossidae	VU
Drepane longimana (Bloch and Schneider, 1801)	3.1-4	Drepaneidae	NE

Countd.....

Echensis naurones Linansus, 175823.1-23.5EchensidaeLCEconscishedia ords (White, 1903)5.1-6EngravilatesNEStolephones commercannet Lacepède, 18034.1-5EngravilatesDThysse matis (Boot, 1755)5.1-6EngravilatesDThysse angravit (Boot, 1755)8.1-0EngravilatesLCEdita Cubier 18163.54.5EphipoidaeLCCorres Infinitos Covier, 18207.19GerreidaeLCGerres Minitos Covier, 18217.58.5CorreidaeLCGeneration (Boot, and Schneider, 1801)0.1-11GobidaeDDTipaachen argan group (Valencience, 1847)2.15.5HernitamphideLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLCLCLCHernitamphideLCLC<	Drepane punctata (Linnaeus, 1758)	6.1-7	Drepaneidae	LC
Encase/onia devia (While) (1940)5.1-6EnguladesNEDisplaybus conversional scapelle, 18034.1-5Engulades10Thysas antestarias (Bloch and Schneider, 1801)6.1-7Engulades10Dysks antestarias (Bloch and Schneider, 1801)8.1-00Engulades10Plata Cuiver, 18183.5-4.5Ephipidae10Carres finantessous Cuiver, 18297.1-9Gerrediae10Carres finantessous Cuiver, 182010.1-11Sobiaca10Carres finantessous (Byth, 1860)10.1-11Sobiaca10Tryasa vertex (Byth, 1860)10.1-11Sobiaca10Star (Byth, 1860)10.1-11Sobiaca10Engueta (Both, 1877)10.1-51LactariadaNEEngueta (Both, 1877)11.5LactariadaNEEngueta (Both, 1877)11.5LactariadaNEEngueta (Both, 1873)11.6LactariadaNE </td <td>Echeneis naucrates Linnaeus, 1758</td> <td>33.1-33.5</td> <td>Echeneidae</td> <td>LC</td>	Echeneis naucrates Linnaeus, 1758	33.1-33.5	Echeneidae	LC
Shelpdows commersmin Langehör, 18031-5EngraulidaeICTryssa mystar (Bloch and Schmeider, 1801)5.1 - 6EngraulidaeDDTryssa mystar (Bloch and Schmeider, 1801)6.1-7EngraulidaeLCTryssa servistris (Broussmet, 1792)8.1-10EngraulidaeLCCorres Inflatto, Novin, 18007.5-8GerreidaeI.CCorres Inflatto, Novin, 18007.5-8GerreidaeI.CCorres Inflatto, Novin, 180010.1 - 1.1GobidaeDDTryanchen angin (Bich and Schneider, 1801)10.1 - 1.1GobidaeDDTryanchen angin (Bich and Schneider, 1801)1.5LeograntindaeI.CLactarus (Bloch and Schneider, 1801)4.1-5LeograntindaeI.CLactarus (Bloch and Schneider, 1801)4.1-5LeograntindaeI.CLactarus (Bloch and Schneider, 1801)3.1-5LeograntindaeI.CLactarus (Bloch and Schneider, 1801)4.1-5LeograntindaeI.CLactarus (Bloch and Schneider, 1801)4.1-5LeograntindaeI.CLactarus (Bloch and Schneider, 1803)5.1-6LeograntindaeI.CLactarus (Bloch and Schneider, 1803)5.1-6LeograntindaeI.CLactarus (Bloch and Schneider, 1823)6.1-7LeograntindaeI.CLactarus (Bloch and Schneider, 1823)6.1-7LeograntindaeI.CLactarus (Bloch and Schneider, 1775)9.1-5.5LeograntindaeI.CLactarus (Bloch and Schneider, 1835)6.1-7LeograntindaeI.CLactarus (Bloch a	Encrasicholina devisi (Whitley, 1940)	5.1-6	Engraulidae	NE
Thyses metabahca (Bioh, 1785)51-6EngrauidaeDDThyses metabahca (Bioh)61-7EngrauidaeLCThyses metabahca (Bioh)81-10EngrauidaeLDPatar Cuvier 181635.45EphipbianLDCares diametoss Cuvier, 18307.88.5ContideLDCosscophile guiver, Hamilton, 1820)41-5ColidideLDCosscophile guiver, Hamilton, 1820)10.1.1.1ColuidaeLDTypeuchen vagine (Boch and Schneider, 1801)9.1.11ColuidaeLDTypeuchen vagine (Boch and Schneider, 1801)4.15LeograthidaeNEPypeuchen vagine (Boch and Schneider, 1801)4.15LeograthidaeNEEvulters elignet, (Gorh 177)4.15LeiograthidaeNEEvulters elignet, (Gorh 177)5.15.5LeiograthidaeLDEvulters elignet, (Gorh 177)5.15.5LeiograthidaeLDEvulters elignet, (Borh 177)5.16LeiograthidaeLDEvulters ingentice, 1825)5.17LeiograthidaeLDEuloekents (Valenciennes, 1835)5.17LeiograthidaeNELeiograthidaeLDLeiograthidaeLDLeiograthidaeLDLDLDLeiograthidaeLDLDLDLeiograthidaeLDLDLDLeiograthidaeLDLDLDEvulter signet, 17855.17LeiograthidaeNELeiograthidaeLDLDLDLDLeiograthidaeLDLDLD	Stolephorus commersonnii Lacepède, 1803	4.1-5	Engraulidae	LC
Thysas services (Book and Schneider, 1001)6.1-7EngraulidaeICThysas services (Browsoner, 1782)81-10EngraulidaeICGerres dinstances Curier, 18297.1-9GerredinaeICGerres dinstances (Curier, 1829)7.1-5GerredinaeICConscription (Barnel Curier, 1829)41-5GerredinaeICConscription (Springer, 1947)9.1-11GobidseDDTyppachen vagine (Boch and Schneider, 1801)9.1-11GobidseICHernitamphisa sp. Curier, 18167.1-9HernitamphidaeICLactorius (Boch and Schneider, 1801)4.1-5LeiognathidaeDDEvenimediam Startification (Boch TSP)5.1-55LeiognathidaeDDEvenimediam Startification (Boch TSP)5.1-55LeiognathidaeICEvenimediam Startification (Schneider, 1874)3.1-55LeiognathidaeICEvenimediam Startification (Schneider, 1875)5.1-6LeiognathidaeICEvenimediam Startification (Schneider, 1835)6.1-7LeiognathidaeICLeiograthida Curier, 18294.1-5LeiognathidaeICLeiograthida curier, 1835)6.1-7LeiognathidaeICLeiognathida curier, 1835)6.1-7LeiognathidaeICLeiognathida curier, 1835)6.1-7LeiognathidaeICLeiognathida curier, 1835)6.1-7LeiognathidaeICLeiognathida curier, 1835)6.1-7LeiognathidaeICLeiognathida curier, 1835)6.1-7LeiognathidaeIC </td <td>Thryssa malabarica (Bloch, 1795)</td> <td>5.1 - 6</td> <td>Engraulidae</td> <td>DD</td>	Thryssa malabarica (Bloch, 1795)	5.1 - 6	Engraulidae	DD
Tryps serviseric (Broussonet, 1782)8.1-10EngrauidaeICPlatar Cuvier 18163.5-4.5EphipidaeBerres filamentasar Cuvier, 18297.1-9GerreidaeICGerres filamentasar Cuvier, 18307.5.8.5GeblickeICGerres filamentasar Cuvier, 18307.5.8.5GeblickeICTanoidos cirratus (Byth, 1860)10.1.1.1.1GobidseICTrypsuchen vagins (Bloch and Schneider, 1801)9.1-11GobidseICHyportanghus guogi (Valenciennes, 1847)25.125.5HemiramphicaeICEquuities elongatus (Bloch and Schneider, 1801)4.1-5LeiognathidaeNEEquuities elongatus (Gloch and Schneider, 1807)5.1-5.5LeiognathidaeICEquuities elongatus (Gloch 1787)5.1-5.5LeiognathidaeICEquuities elongatus (Gloch and Schneider, 1803)5.1-5.5LeiognathidaeICEquuities elongatus (Gloch 1787)5.1-5.5LeiognathidaeICEuders lancedus (Valenciennes, 1835)5.1-7LeiognathidaeICElongatus travinsits (Valenciennes, 1835)5.1-7LeiognathidaeICLeiognathidae travius ruconius (Hamilton, 1822)5.1-5.5LeiognathidaeICLeiognathidae travits (Valenciennes, 1835)5.1-7LeiognathidaeICLeiognathidae travits (Valenciennes, 1835)5.1-7LeiognathidaeICLeiognathidae travits (Valenciennes, 1835)5.1-7LeiognathidaeICLeiognathidae travits (Valenciennes, 1835)5.1-7LeiognathidaeIC<	Thryssa mystax (Bloch and Schneider, 1801)	6.1-7	Engraulidae	LC
Plate Curver 18163.5.4.5EprippidaeGerres dimentious Curver, 18297.1-9GerreidaeLCGlossagobia guirs (Hamilton, 1822)4.1-5GobildaeDDTraincidae curver, 18300.1-11GobildaeDDTraincidae curver, 18400.1-11GobildaeDDTraincidae curver, 18407.1-9HemiramphidaeLCHemiramphidae (Byh), 1860, 19714.1-5Lactarui (Boch and Schneider, 1801)4.1-5Lactarui (Boch and Schneider, 1801)4.1-5Lactarui (Boch and Schneider, 1801)4.1-5LeiograthidaeDDEquilate congatis (Ginchen, 1874)3.1-5LeiograthidaeLCEuclarui (Ginchen, 1874)S.1-5.5LeiograthidaeLCEquilate scharuis (Ginchen, 1873)5.1-5.5LeiograthidaeLCEuclarui (Ginchen, 1873)LeiograthidaeLCEubleakeria splenders (Curver, 1829)4.1-5LeiograthidaeLCLeiograthidaeLCEubleakeria splenders (Curver, 1829)5.1-6LeiograthidaeLCLeiograthidaeLCEubleakeria splenders (Curver, 1829)6.1-7LeiograthidaeLCLeiograthidaeLCLeiograthidae (Curver, 1829)6.1-8.5LeiograthidaeLCLeiograthidaeLCLeiograthidae (Curver, 1829)6.1-7LeiograthidaeLCLCLeiograthidae (Curver, 1829)6.1-8.5LeiograthidaeLCLeiograthidae (Curver, 1829)6.1-8.5LeiograthidaeLCLeiograthidae (Curver, 1829)6.1-8.5LeiograthidaeLC </td <td>Thryssa setirostris (Broussonet, 1782)</td> <td>8.1-10</td> <td>Engraulidae</td> <td>LC</td>	Thryssa setirostris (Broussonet, 1782)	8.1-10	Engraulidae	LC
Geners limbuts Curier, 18207.9GeneralizeLCGeners limbuts Curier, 18307.58.5GeneralizeLCGeners limbuts Curier, 183010.1GabilateLCTaenalates cirratus (Byth, 1860)10.1GabilateDDTypaucher varging (Bloch and Schneider, 1801)9.1.11GabilateLCHeminamphitas p. Curier, 18167.1.9HeminamphidaeLCLactarius schering (Bloch and Schneider, 1801)4.1.5LedinglateNEDevenimentum insidiator (Bloch 1777)4.1.5LeiognathidaeLCEquilates indexistas (Gabiner, 1827)3.1.5LeiognathidaeLCEquilates indexistas (Gabiner, 1829)5.1.6.5LeiognathidaeLCEquilates indexistas (Gabiner, 1829)5.1.6.6LeiognathidaeLCEquilates indexistas (Gabiner, 1829)5.1.6.6LeiognathidaeLCEdiopathidaLCLeiognathidaeLCLCEdiopathidaLCLeiognathidaeLCLCEdiopathidaLCLeiognathidaeLCLCEdiopathidaLCLeiognathidaeLCLCEdiopathidaLCLeiognathidaeLCLCLeiognathidaLCLeiognathidaeLCLCLeiognathidaLCLCLeiognathidaeLCLeiognathidaLCLCLeiognathidaeLCLCLeiognathidaLCLCLeiognathidaeLCLCLeiognathidaLCLCLeiognathidaeLC <td< td=""><td>Platax Cuvier 1816</td><td>3.5-4.5</td><td>Ephippidae</td><td></td></td<>	Platax Cuvier 1816	3.5-4.5	Ephippidae	
General Instants7.8.4 SGeneral deeICGlossogobus guirs (Hamilton, 1822)4.1.5 GobildaeDTranacides stratus (Blyth, 1860)10.1 - 11GobildaeDTranacides stratus (Blyth, 1860)7.1.9HemitamphidaeLHerratamptus sp. Cuvier, 18167.1.9HemitamphidaeLCLactarius lactarius (Bloch and Schneider, 1801)4.1.5Lactarius lactarius (Bloch and Schneider, 1802)5.1.6Lactarius lactarius (Bloch and Schneider, 1802)5.1.6Lactarius lactarius (Bloch and Schneider, 1802)5.1.6Lactarius lactarius (Bloch and Schneider, 1802)1.1.6Lactarius lactarius (Bloch and Schneider, 1802)1.1.6Lactarius lactarius (Bloch and Schneider, 1802)1.1.6Lactarius lactarius lactarius (Clovier, 1829)1.1.6Lactarius lactarius lactarius (Clovier, 1829)1.1.6LaiognathidaeLCLalognathidae (Clovier, 1829)1.1.6LaiognathidaeLCLaiognathidaeLCLalognathidae (Clovier, 1820)1.1.6LaiognathidaeLCLaiognathidaeLCLalognathidae (Lactarius lactarius (Bloch, 1790)5.7.7LaiognathidaeLCLalognathidae (LagonathidaeLCLaiognathidaeLCLalognathidae (LagonathidaeLCLaiognathidaeLCLaiognathidae (LagonathidaeLCLaiognathidaeLCLaiognathidae (LagonathidaeLCLaiognathidae <t< td=""><td>Gerres filamentosus Cuvier, 1829</td><td>7.1-9</td><td>Gerreidae</td><td>LC</td></t<>	Gerres filamentosus Cuvier, 1829	7.1-9	Gerreidae	LC
Glessophix gluoris (Hamitton, 1822)41.5GobidaeLCJaeniotes orratus (Blyth, 1860)10.1 - 11GobidaeLCHemicamphitos sp. Cuvie, 18167.1.9HemicamphitosHemicamphitos sp. Cuvie, 18167.1.9HemicamphitosHemicamphitos sp. Cuvie, 18167.1.9HemicamphitosLactarius lactarius (Bloch nd Schneider, 1801)4.1.5LactariusLactarius (Bloch nd Schneider, 1801)4.1.5LeiognathidaeDCEquultars elongatos (Gunter, 1873)5.1.5.5LeiognathidaeLCEquultars elongatos (Gunter, 1829)4.1.5LeiognathidaeLCKarala daura (Cuvier, 1829)4.1.5LeiognathidaeLCKarala daura (Cuvier, 1829)4.1.5LeiognathidaeLCKarala daura (Cuvier, 1829)4.1.5LeiognathidaeLCLeiognathidar uconits (Valenciennes, 1835)5.1.7LeiognathidaeLCLeiognathidar uconits (Valenciennes, 1835)5.1.7LeiognathidaeLCLeiognathidar uconits (Valenciennes, 1835)5.1.7LeiognathidaeLCLeiognathidar uconits (Valenciennes, 1835)5.1.7LeiognathidaeLCLobices surianeness (Bich, 1790)5.5.7.5LobidaeLCLobices surianeness (Bich, 1797)51.9.5.5MuglidaeLCLobices surianeness (Bich, 1792)51.1.58MuglidaeLCLobices surianeness (Bich, 1793)51.5.5MuglidaeLCLobices surianeness (Bich, 1792)51.5.8MuglidaeLCLobices surianeness (Bich	Gerres limbatus Cuvier, 1830	7.5-8.5	Gerreidae	LC
Teenandes crimina (Bijch and Schneider, 1801)10.1.1.1GobiidaeDDTypaucher vagina (Bioch and Schneider, 1801)9.1.11GobiidaeLCHypanharphus quoy (Valenciennes, 1847)25.1.25.5HemiramphidaeLCExertantia Instruction (Bioch 1787)4.1.5LeiognathidaeDDEquuities leiofactics (Glinch 1787)3.1.5.5LeiognathidaeLCEquuities leiofactics (Valenciennes, 1835)5.1.5.5LeiognathidaeLCKaralla dasarder (Valenciennes, 1835)7.1.8LeiognathidaeLCKaralla dusarder (Valenciennes, 1835)7.1.8LeiognathidaeLCLeiognathidae (Grosskal, 1775)9.1.9.5LeiognathidaeLCLeiognathidae (Grosskal, 1775)9.1.9.5LeiognathidaeLCLeiognathidae (Grosskal, 1775)9.1.9.5LeiognathidaeLCLeiognathidae (Grosskal, 1775)9.1.9.5LeiognathidaeLCLeiognathidae (Grosskal, 1775)8.1.8.5LuignidaeLCLeiognathidae (Grosskal, 1775)8.1.8.5LuignidaeLCLeiognathidae (Grosskal, 1775)8.1.8.5MultidaeLCLeiognathidae (Grosskal, 1775)8.1.8.5MultidaeLCLeiognathidaeLCLCLaiognathidaeLCLeiognathidaeLCLCLaiognathidaeLCLeiognathidaeLCLCLaiognathidaeLCLeiognathidaeLCLCLaiognathidaeLCLeiognathidaeLCLaiognathidaeLCLeiognathidae	Glossogobius giuris (Hamilton, 1822)	4.1-5	Gobiidae	LC
Typauene vagina (Bloch and Schneider, 1801)9.1-11GobiladeLCHerniramphizes guo (Valenciennes, 1847)25.1-25.5HerniramphidaeLCLactarias bactarius (Bloch and Schneider, 1801)4.1-5Lactarias bactarius (Bloch and Schneider, 1801)4.1-5LeiognathidaeDDDeveximentum insidiator (Bloch 1787)3.1-5LeiognathidaeLCLCEquilities elongatus (Ginther, 1874)3.1-5LeiognathidaeLCEquilities ineolatus (Valenciennes, 1835)5.1-5.5LeiognathidaeLCKarafa daura (Cuvier, 1829)4.1-5LeiognathidaeLCKarafa daura (Cuvier, 1829)6.1-7LeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeNELeiognathidaeLCLeiognathidaeNELeiognathidaeLCLeiognathidaeNELeiognathidaeS.5-7.5LeiognathidaeNELobetes surinamensis (Bloch, 1790)5.7-5.5LobitidaeLCLobetes surinamensis (Bloch, 1790)S.7-5.5LobitidaeLCLobetes surinamensis (Bloch, 1790)S.5-7.5LobitidaeLCLobetes surinamensis (Bloch, 1790)S.5-1.5MurgiteranceLCLobetes surinamensis (Bloch, 1790)S.1-5.5MurgiteranceLCLobetes surinamensis (Bloch, 1790)S.1-5.5MurgiteranceLCLobetes surinamensis (Bloch, 1790)S.1-5.5MurgiteranceLCLobetes surinamensis (Bloch, 1790)S.1-5.5	Taenioides cirratus (Blyth, 1860)	10.1 - 11	Gobiidae	DD
Hemicramphus sp. Cuvier, 1816 7.1-9 Hemicramphidae LC Hynotramphus quoy (Valenciennes, 1847) 25.1-25.5 Hemicramphidae NE Loctarius locitoris (Bloch 1787) 4.1-5 Lecigranthidae DD Equilites linealities (Valenciennes, 1825) 5.1-5.5 Leiogranthidae LC Eubleserie spienders (Cuvier, 1829) 5.1-6 Leiogranthidae LC Karala dussumiter (Valenciennes, 1835) 7.1-8 Leiogranthidae LC Leiogranthidae (Valenciennes, 1835) 6.1-7 Leiogranthidae NE Leiogranthius erwirostis (Valenciennes, 1835) 5.1-7 Leiogranthidae NE Leiogranthius conconis (Hamilton, 1822) 4.1-5 Leiogranthidae NE Lobotes surinamensis (Bioch, 1790) 5.1-7 Leiogranthidae NE Lobotes surinamensis (Bioch, 1790) 8.1-8.5 Muglidae NE Lobotes surinamensis (Bioch, 1790) 8.1-8.5 Muglidae LC Lobotes surinamensis (Bioch, 1790) 8.1-8.5 Muglidae LC Lobotes surinamensis (Bioch, 1790) 8.1-8.5 Muglidae L	Trypauchen vagina (Bloch and Schneider, 1801)	9.1-11	Gobiidae	LC
Hyporhamphus quoyi (Valenciennes, 1847)25.125.5HemiramphidaeLCLactarius tactarius (Bloch and Schneider, 1801)4.1-5Lactarius tactarius (Bloch and Schneider, 1801)4.1-5Lactarius tactarius (Bloch and Schneider, 1801)4.1-5LeiognathidaeDDEquilites lineolatus (Valenciennes, 1835)5.1-5LeiognathidaeLCEquilites lineolatus (Valenciennes, 1835)5.1-6LeiognathidaeLCKaralla dussumieri (Valenciennes, 1835)6.1-7LeiognathidaeLCLeiognathidus equide (Forskal, 1775)9.19-5LeiognathidaeNELeiognathidus equide (Forskal, 1775)9.19-5LeiognathidaeNELeiognathidus equide (Forskal, 1775)5.1-7LeiognathidaeNELeiognathidus equide (Forskal, 1775)8.1-8.5LubinatiaeNELeiognathidus equide (Forskal, 1775)9.19-5LeiognathidaeNELeiognathidus equide (Forskal, 1775)8.1-8.5MugildaeLCLeiognathidus equideeLCScalaga schare	Hemiramphus sp. Cuvier, 1816	7.1-9	Hemiramphidae	
Lactarius (actarius (Bloch and Schneider, 1801) 4.1-5 Lactariidae NE Deveximentum insidiator (Bloch 1787) 4.1-5 Leiognathidae DC Equuittes disurder, 1874) 3.1-5 Leiognathidae NE Equuittes dineolatus (Valenciennes, 1835) 5.1-5.5 Leiognathidae LC Karalla daus (Ourier, 1829) 4.1-5 Leiognathidae LC Lacignathis merinatis (Valenciennes, 1835) 7.1-8 Leiognathidae LC Leiognathis due (Forsskal, 1775) 9.1-9.5 Leiognathidae NE Leiognathidus (Forsskal, 1775) 9.1-9.5 Leiognathidae NE Nuchequula biochii (Valenciennes, 1835) 5.7-5 Lobotts due to	Hyporhamphus quoyi (Valenciennes, 1847)	25.1-25.5	Hemiramphidae	LC
Deveximentum insidiator (Bloch 1787)4.1-5LeiognathidaeDDEquilites inclusitus (Guinther, 1874)3.1-5LeiognathidaeLCEquilites inclusitus (Valencinene, 1835)5.1-5.5LeiognathidaeLCEublekeria splendens (Cuvier, 1829)4.1-5LeiognathidaeLCKaralla daus (Cuvier, 1829)4.1-5LeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeNELeiognathida cuvias (Hamilton, 1822)4.1-5LeiognathidaeNELobotes surinamensis (Bloch, 1790)5.5-7.5LobotidaeLCLobotes surinamensis (Bloch, 1790)5.7-5.5LutylindaeLCLobotes surinamensis (Bloch, 1790)6.1-6.5MugildaeLCUpeneus Sp. Cuvier, 182916.1-16.5MugildaeLCVigeneus Sp. Cuvier, 182950.1-50.5MureanelaeLCStoophilon satheet (Hamilton, 1822)50.1-58MullidaeLCPeruders sp. Cuvier, 182961.1-6.5PeruferaeLCPeruders sp.	Lactarius lactarius (Bloch and Schneider, 1801)	4.1-5	Lactariidae	NE
Equilites elongatus (Günther, 1874)3.1 - 5LeiognathidaeLCEquilites lineolatus (Valenciennes, 1835)5.1 - 5.5LeiognathidaeLCKaralla daura (Cuvier, 1829)5.1 - 6LeiognathidaeLCKaralla daura (Cuvier, 1829)4.1 - 5LeiognathidaeLCKaralla daura (Cuvier, 1829)1.1 - 6LeiognathidaeLCLeiognathidaeLCLeiognathidaeLCLeiognathidaeLeiognathidaeNELeiognathidaeNELeiognathidaeLeiognathidaeNELeiognathidaeNELeiognathidaeLeiognathidaeNELeiognathidaeNELeiognathidaeS.5 - 7.5LobotidaeLCLLobotes surinamensis (Bloch, 1790)5.5 - 7.5LobotidaeLCLuiganus argentimaculatus (Forsskal, 1775)S0.1 - 16.5MuglidaeLCMugl cephalus Linnaeus, 17589.1 - 9.5MuglidaeLCVareenesco (Forsskal, 1775)S0.1 - 50.5MuraenidaeLCStrophidon sathete (Hamilton, 1822)S6.1 - 58MujteridaeLCPseudorhombus javanicus (Bleeker, 1853)2.1 - 3ParalichthyidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1 - 3ParalichthyidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1 - 23ParalichthyidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1 - 3ParalichthyidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1 - 3ParalichthyidaeLCPseudorhombus javanicus (Bleeker, 1853) <td>Deveximentum insidiator (Bloch 1787)</td> <td>4.1-5</td> <td>Leiognathidae</td> <td>DD</td>	Deveximentum insidiator (Bloch 1787)	4.1-5	Leiognathidae	DD
Équilites involution NE Leiognathidae NE Eubleeker's splenders (Cuvier, 1829) 5.1-6 Leiognathidae LC Karalla daus (Ouvier, 1829) 4.1-5 Leiognathidae LC Leiognathius brevins tris (Valenciennes, 1835) 7.1-8 Leiognathidae NE Leiognathius coulds (Harrillon, 1822) 4.1-5 Leiognathidae NE Leiognathius coulds (Harrillon, 1822) 4.1-5 Leiognathidae NE Lobotes surinamensis (Bloch, 1790) 5.5-7.5 Lobotidae LC Lubinus argentimeulatus (Forsskal, 1775) 8.1-8.5 Lutjanuidae NE Mugli cephalus Linnaeus, 1758 9.1-9.5 Mugli Cephalus Linnaeus, 1758 16.1-16.5 Mulli Ce Mugli cephalus Linnaeus, 1758 50.1-50.5 Muraenesocidae LC Strophidon sathet (Harnilton, 1822) 50.1-58 Mugli Ce LC Stophidon sathet (Harnilton, 1822) 50.1-58 Muraenesocidae LC Perupheris sp. Cuvier, 1829 81-8.5 Perupheridae LC Perupheris sp. Cuvier, 1829 2.1-2 Partichthyidae <t< td=""><td>Equulites elongatus (Günther, 1874)</td><td>3.1-5</td><td>Leiognathidae</td><td>LC</td></t<>	Equulites elongatus (Günther, 1874)	3.1-5	Leiognathidae	LC
Eubleckeria splendens (Cuvier, 1829)5.1-6LeiognathidaeLCKaralla daus (Luvier, 1829)4.1-5LeiognathidaeLCKaralla daus unieri (Valenciennes, 1835)6.1-7LeiognathidaeNELeiognathus peuviots (Valenciennes, 1835)6.1-7LeiognathidaeNELeiognathus ruconius (Hamilton, 1822)4.1-5LeiognathidaeNENuchegula bichi (Valenciennes, 1835)5.1-7LeiognathidaeNELobotes surinamensis (Bloch, 1790)5.5-7.5LobotidaeLCLuijanus argentimaculatus (Forsskal, 1775)8.1-8.5MugilidaeLCUngil cephalus Linnaeus, 17589.1-9.5MugilidaeLCUpeneus sp. Cuvier, 18296.1-6.5MulifaeLCWuraenesox cincreus (Forsskal, 1775)8.1-8.5MuraenesocidaeLCScolopsis vosmeri (Bloch, 1792)50.1-50.5MuraenesocidaeLCPeudorhombic sparance (Bloch, 1792)8.1-8.5NemipteridaeLCPeudohombic sparance (Bloch, 1792)8.1-8.5NemipteridaeLCPeudohombic sparance (Bloch, 1792)8.1-8.5PempheridaeLCPeudohombic sparance (Bloch, 1793)2.1-23ParalichthyldaeLCPeudohombic sparance, 1758)2.1-23PlotostalaeLCPeudohombic sparance, 1759)5.1-6ScolopaidaeLCPendperis sp. Cuvier, 18296.1-6.5PendperidaeLCPeudohombic scaber (Linnaeus, 1758)2.1-23PlotostalaeLCPeudohombic scaber (Linnaeus, 1758)1.1-12Scaleni	Equulites lineolatus (Valenciennes, 1835)	5.1-5.5	Leiognathidae	NE
Karalia daura (Cuvier, 1829)4.1-5LeiognathidaeLCKaralia dussumier (Valenciennes, 1835)7.1-8LeiognathidaeNCLeiognathus verviorsirs (Valenciennes, 1835)61-7LeiognathidaeNCLeiognathus ruconius (Hamilton, 1822)4.1-5LeiognathidaeNCNuchequula blochii (Valenciennes, 1835)5.1-7LeiognathidaeNCLobotes suinamensis (Bloch, 1790)5.57.5LobottadeLCLutjanus argentimaculatus (Forsskal, 1775)8.1-8.5LutjanuidaeLCChelon sp. Artedi 179316.1-16.5MugilidaeLCUpeneus sp. Cuvier, 18296.1-6.5MugilidaeLCValgi caphalus Linnaeus, 17589.1-9.5MugilidaeLCStraphidon sathete (Hamilton, 1822)50.1-50.5MuraenesocidaeLCStraphidon sathete (Hamilton, 1822)51-58OphichthidaeLCStraphidon sathete (Hamilton, 1822)8.1-8.5NerrigeriaLCStraphidon sathete (Hamilton, 1822)8.1-8.5Pengherias, 176LCPengheris sp. Cuvier, 18298.1-8.5PengheriasLCPrisodonphins boro (Hamilton, 1822)8.1-8.5PengheriasLCPresolophiltos stathete (Hamilton, 1822)8.1-8.5PengheriasLCPengheris sp. Cuvier, 18298.1-8.5PengheriasLCPengheris sp. Cuvier, 18298.1-8.5PengheriasLCPengheris sp. Cuvier, 18298.1-8.5PengheriasLCPengheris sp. Cuvier, 18298.1-8.5PengheriasLC	Eubleekeria splendens (Cuvier, 1829)	5.1-6	Leiognathidae	LC
Karalla dussumieri (Valenciennes, 1835)7.1-8LeiognathidaeLCLeiognathus brevirostris (Valenciennes, 1835)6.1-7LeiognathidaeNCLeiognathus ruconius (Hamilton, 1822)4.1-5LeiognathidaeNCLobotes surinamensis (Bloch, 1790)5.5-7.5LobotidaeLCLobotes surinamensis (Bloch, 1790)8.1-8.5LutjanidaeLCChelon sp. Artedi 179316.1-16.5MugilidaeLCChelon sp. Artedi 17936.1-6.5MugilidaeLCMugile caphalus Linnaeus, 17589.1-9.5MugiladeLCUpeneus sp. Cuvier, 18296.1-6.5MugilidaeLCScolopis vasmer (Bloch, 1792)56.1-58MuraenesocidaeLCScolopis vasmer (Bloch, 1792)8.1-8.5MuraenesocidaeLCPendphits sp. Cuvier, 18292.1-3ParalenstrikaeLCScolopis vasmer (Bloch, 1792)8.1-8.5PempheridaeLCPendphits sp. Cuvier, 18292.1-3ParalenstrikaeLCPendphits sp. Cuvier, 18292.1-3ParalenthidaeLCPendphits sp. Cuvier, 18292.1-24.5PendpheridaeLCPendphits sp. Cuvier, 18292.1-24.5PendpheridaeLCPendphits sp. Cuvier, 18292.1-24.5PendpheridaeLCPendphits sp. Cuvier, 18291.1-6PilxopehladaeLCPendphits sp. Cuvier, 18291.1-6PilxopehladaeLCPendphits sp. Cuvier, 18291.1-6PilxopehladaeLCPendphits sp. Cuvier, 18291.1-6Pilx	Karalla daura (Cuvier, 1829)	4.1-5	Leiognathidae	LC
Leiognathus evvirostris (Valenciennes, 1835)6.1-7LeiognathidaeNELeiognathus equula (Forsskal, 1775)9.1-9.5LeiognathidaeNELeiognathus ruonius (Hamilton, 1822)4.1-5LeiognathidaeNENuchequula blochii (Valenciennes, 1835)5.1-7LeiognathidaeNELobotes surinamensis (Bloch, 1790)5.5-7.5LobotidaeLCLutiganus argentimaculatus (Forsskal, 1775)8.1-8.5MugilidaeLCMugil celphalus Linnaeus, 17589.1-9.5MugilidaeLCUpeneus sp. Cuvier, 18296.1-6.5MullidaeLCStrophidon sathete (Hamilton, 1822)56.1-58MuraenesociadeLCStoolopsis sormer (Bloch, 1792)8.1-8.5NemiletridaeLCPenderson Summer (Bloch, 1792)8.1-8.5NemiletridaeLCPisodonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPisodonophis sorier (Bloch, 1792)8.1-8.5PempheridaeCCPempherids scaber (Linnaeus, 1758)2.1-23PatlechthyldaeLCPisodonophis sp. Socuvier, 18295.1-6PatlycephalidaeLCPisodonophis sp. Bloch, 17955.1-6PatlycephalidaeLCPisodonophis sp. Bloch, 17955.1-6PatlycephalidaeLCPisodonophis sp. Bloch, 17955.1-6PatlycephalidaeLCPisodonophis sp. Bloch, 17955.1-6PatlycephalidaeLCPisodonophis sp. Bloch, 17955.1-6ScatophagidaeLCPisodonophis sp. Bloch, 17955.1-6Scatophagidae </td <td>Karalla dussumieri (Valenciennes, 1835)</td> <td>7.1-8</td> <td>Leiognathidae</td> <td>LC</td>	Karalla dussumieri (Valenciennes, 1835)	7.1-8	Leiognathidae	LC
Leiognathus equula (Forsskal, 1775)9.1.9.5LeiognathidaeLCLeiognathus ruconius (Hamilton, 1822)4.1.5LeiognathidaeNENuchequula blochii (Valenciennes, 1835)5.1.7LeiognathidaeNELobotes suinamensis (Bloch, 1790)5.7.5LobotidaeLCLutjanus argentimaculatus (Forsskal, 1775)8.1-8.5LutjanidaeLCMugli cephalus Linnaeus, 17589.1-9.5MuglidaeLCMugli cephalus Linnaeus, 17589.1-9.5MullidaeLCMuraenesox cinereus (Forsskal, 1775)50.1-50.5MuraenesocidaeLCScolopsis vosmeri (Bloch, 1792)81-8.5NempteridaeLCScolopsis vosmeri (Bloch, 1792)56.1-58OhichthidaeLCPerudorhombus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPerudorhombus javanicus (Bleeker, 1853)2.1-23ParalichthyidaeLCPerudorhombus javanicus (Bleeker, 1853)2.1-23PlatycephalidaLCPerudorhombus javanicus (Bleeker, 1853)2.1-23PlatycephalidaeLCPistoperudus sp. Bloch, 17955.1-6PlatycephalidaeLCPistoperudus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPistoperus tardoore (Cuvier, 1829)5.1-6PlatycephalidaeLCPistoperus tardoore (Cuvier, 1829)5.1-6PlatycephalidaeLCPistoperus tardoore (Cuvier, 1829)5.1-6Scatophagus argus (Linnaeus, 1766)LCPistoperus tardoore (Cuvier, 1820)7.1-8SciaenidaeLC	Leiognathus brevirostris (Valenciennes, 1835)	6.1-7	Leiognathidae	NE
Leiognathus ruconius (Hamilton, 1822)4.1-5LeiognathidaeNENuchequula blochii (Valenciennes, 1835)5.1-7LeiognathidaeNELobotes surinamensis (Bloch, 1790)5.5-7.5LobotidaeLCLutjanus argentinaculatus (Forsskal, 1775)8.1-8.5LutjanidaeLCMugli cephalus Linneaus, 17589.1-9.5MuglidaeLCUpeneus sp. Cuvier, 18296.1-6.5MultidaeLCMuraenesoc cinereus (Forsskal, 1775)50.1-50.5MuraenesocidaeLCStrophidon sathet (Hamilton, 1822)56.1-58MuraeneidoeLCScolopsis vosmeri (Bloch, 1792)8.1-8.5NemipteridaeLCPendonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPendonophis boro (Hamilton, 1822)51.1-58OphichthidaeLCPendonophis boro (Hamilton, 1822)8.1-8.5PermpleridaeLCPendonophis boro (Hamilton, 1822)8.1-8.5PermpleridaeLCPendonophis boro (Hamilton, 1822)51.1-6PlatycephalidaeLCPendonophis boro (Hamilton, 1822)2.1-23PlatycephalidaeLCPendorid sp. Forskal, 17756.1-6.5PormacentridaeLCPiatycephalus sp. Bloch, 179551.7PlatycephalidaeLCPiotosus Ineatus (Thuberg, 1787)2.1-23PlotosidaeLCPelona ditchela valenciennes, 18478.1-8.5PristgasteridaeLCScatophagus argus (Linnaeus, 1766)51-6ScatophagudaeLCJohnius glaucus (Day, 1876)7.1-8Sciaenida	Leiognathus equula (Forsskal, 1775)	9.1-9.5	Leiognathidae	LC
Nuchequula blochii (Valenciennes, 1835)5.1-7LeiognathidaeNELobotes surinamensis (Bloch, 1790)5.5-7.5LobotidaeLCLutjanus argentimaculatus (Forsskal, 1775)81-8.5LutjanidaeLCMugil cephalus Linnaeus, 17589.1-9.5MugilidaeLCMugil cephalus Linnaeus, 17589.1-9.5MullidaeLCMuraenesox cinereus (Forsskal, 1775)50.1-50.5MuraenesocidaeLCStrophidon sathete (Hamilton, 1822)56.1-58MuraenidaeLCScolopsis vosmeri (Bloch, 1792)81-8.5PerniteriaLCPseudonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPseudonophis boro (Hamilton, 1822)51-76ParalichthyidaeLCPresodonophis boro (Hamilton, 1822)81-8.5PerniteriaLCPseudontombus javanicus (Bleek, 1853)2.1-3ParalichthyidaeLCPresodinombus javanicus (Bleek, 1853)2.1-23PlotosidaeLCPidrocephalus sp. Bloch, 17955.1-6PlatycephalidaeLCPidrocephalus sp. Rotch, 1787)2.1-23PlotosidaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius gaucus (Day, 1876)7.1-8SciaenidaeLCJohnius argue and itchela valenciener, 18471.1-12SciaenidaeLCPellona ditchela valencienere, 18471.1	Leiognathus ruconius (Hamilton, 1822)	4.1-5	Leiognathidae	NE
Lobotes surinamensis (Bloch, 1790) 5.57.5 Lobotidae LC Lutjanus argentimaculatus (Forsskal, 1775) 81.8.5 Lutjanudae LC Mugil caphalus Linnaeus, 1758 91.9.5 Mugilidae LC Mugin caphalus Linnaeus, 1758 61.6.5 Mullidae LC Muraenesox cinereus (Forsskal, 1775) 50.1.50.5 Muraenesocidae LC Strophidon sathete (Hamilton, 1822) 56.1.58 Muraenidae LC Pisodonophis boro (Hamilton, 1822) 56.1.58 Muraenidae LC Pisodonophis boro (Hamilton, 1822) 56.1.58 Ophichthidae LC Pisodonophis boro (Hamilton, 1822) 51.4.58 Pempheridae LC Pisodonophis boro (Hamilton, 1822) 21.1.3 Paralichthyidae LC Pempheris sp. Cuvier, 1829 81.8.5 Pempheridae LC Patycephalus sp. Bloch, 1795 51.6 Platycephalidae LC Platycephalus sp. Bloch, 1795 51.6 Platycephalidae LC Poltosus lineatus (Thunberg, 1787) 21.7.23 Platycephalidae LC Opisthoptar	Nuchequula blochii (Valenciennes, 1835)	5.1-7	Leiognathidae	NE
Lutjanus argentimaculatus (Forsskal, 1775)8.1-8.5LutjanidaeLCChelon sp. Artedi 179316.1-16.5MugilidaeLCMugil cophalus Linnaeus, 17589.1-9.5MugilidaeLCUpeneus sp. Cuvier, 182961.1-6.5MultraenescoidaeLCStrophidon sathete (Hamilton, 1822)56.1-58MuraenescoidaeLCScolopsis vosmeri (Bloch, 1792)8.1-8.5NemipteridaeLCPendhorbus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPergheris sp. Cuvier, 182981-8.5PempheridaeLCProstonophis boro (Hamilton, 1822)51.1-6PlatycephalidaeNEPengheris sp. Cuvier, 182981-8.5PempheridaeLCPostonophis boro (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 179551-6PlatycephalidaeLCPlotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefuf sp. Forsskal, 177561-6.5Scatophagus argus (Linnaeus, 1766)LCScatophagus argus (Linnaeus, 1766)51-6Scatophagus argus (Linnaeus, 1766)LCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius carutta Bloch, 179371-8SciaenidaeLCJohnius gaucus (Day, 1876)51-5.5SciaenidaeLCJohnius gaucus (Day, 1876)51-5.5SciaenidaeLCJohnius gaucus (Day, 1876)51-5.5SciaenidaeLCJohnius gaucus (Day, 1876)51-5.5SciaenidaeLC	Lobotes surinamensis (Bloch, 1790)	5.5-7.5	Lobotidae	LC
Chelon sp. Artedi 1793 16.1-16.5 Mugilidae Mugil cephalus Linnaeus, 1758 9.1-9.5 Mugilidae LC Muraenesox cinereus (Forsskal, 1775) 50.1-50.5 Muraenesocidae LC Strophidon sathete (Hamilton, 1822) 56.1-58 Muraenesica LC Scolopsis vosmeri (Bloch, 1792) 8.1-8.5 Nemipteridae LC Pisodonophis boro (Hamilton, 1822) 56.1-58 Ophichthidae LC Pseudorhombus javanicus (Bleeker, 1853) 2.1-3 Paralichthyldae LC Pempheris sp. Cuvier, 1829 8.1-8.5 Pempheridae C Caranmophites scaber (Linnaeus, 1758) 24.1-24.5 Platycephalidae NE Platycephalus sp. Bloch, 1795 5.1-6 Platycephalidae LC Potosus lineatus (Thunberg, 1787) 22.1-23 Plotosidae LC Abudefduf sp. Forsskal, 1775 6.1-6.5 Pomacentridae LC Opisthopterus tardoore (Cuvier, 1829) 5.1-6 Scatophagua gruis (Linnaeus, 1766) LC Scatophagus argus (Linnaeus, 1766) 5.1-6 Scatophagua gruitchelae LC	Lutjanus argentimaculatus (Forsskal, 1775)	8.1-8.5	Lutjanidae	LC
Mugil cephalus Linnaeus, 1758 9.1-9.5 Mugilidae LC Upeneus sp. Cuvier, 1829 6.1-6.5 Mullidae LC Muraenesox cinereus (Forsskal, 1775) 50.1-50.5 Muraenesocidae LC Strophidon sathete (Hamilton, 1822) 56.1-58 Muraenidae LC Pisodonophis boro (Hamilton, 1822) 56.1-58 Ophichthidae LC Pisodonophis boro (Hamilton, 1822) 51.1-58 Ophichthidae LC Pendorhombus javanicus (Bleeker, 1853) 2.1-3 Paralichthyidae LC Pendorhombus javanicus (Bleeker, 1853) 2.1-23 Plotosidae LC Plotosus lineatus (Thunberg, 1787) 2.1-6 Pomacentridae LC Opisthopterus tardoore (Cuvier, 1829) 5.1-7 Pristigasteridae LC Pellona ditchela Valenciennes, 1847 8.1-8.5 Pristigasteridae LC <td>Chelon sp. Artedi 1793</td> <td>16.1-16.5</td> <td>Mugilidae</td> <td></td>	Chelon sp. Artedi 1793	16.1-16.5	Mugilidae	
Upeneus p. Cuvier, 1829 6.1-6.5 Mulidae Muraenesox cinereus (Forsskal, 1775) 50.1-50.5 Muraenesocidae LC Strophidon sathete (Hamilton, 1822) 56.1-58 Muraenidae LC Scolopsis vosmeri (Bloch, 1792) 8.1-8.5 Nemipteridae LC Pisodonophis boro (Hamilton, 1822) 56.1-58 Ophichthidae LC Pseudorhombus javanicus (Bleeker, 1853) 2.1-3 Paralichthyidae LC Pseudorhombus javanicus (Bleeker, 1853) 2.1-3 Paralichthyidae LC Pempheris sp. Cuvier, 1829 8.1-8.5 Pempheridae NE Plotsous lineatus (Thunaeus, 1758) 24.1-24.5 Platycephalidae NE Plotosus lineatus (Thunaeus, 1775 5.1-6 Platycephalidae LC Opisthopterus tardoore (Cuvier, 1829) 5.1-7 Pristigasteridae LC Opisthopterus tardoore (Cuvier, 1829) 5.1-6 Scatophagidae LC Scatophagus argus (Linnaeus, 1766) 5.1-6 Scatophagidae LC Johnius galaucus (Day, 1876) 7.1-8 Sciaenidae LC Scatophag	Mugil cephalus Linnaeus, 1758	9.1-9.5	Mugilidae	LC
Muraenesox cinereus (Forsskal, 1775)50.1-50.5MuraenesocidaeLCStrophidon sathete (Hamilton, 1822)56.1-58MuraenidaeLCScolopsis vosmeri (Bloch, 1792)8.1-8.5NemipteridaeLCPisodonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPempheris sp. Cuvier, 18298.1-8.5PempheridaeCCaramcopites scaber (Linnaeus, 1758)2.1-23PlatycephalidaeNEPlatycephalius sp. Bloch, 17955.1-6PlatycephalidaeLCPotosus lineatus (Thunberg, 1787)2.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 17931.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCNibea macultat (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCNibea macultat (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCVolithes ruber (Bloch and Schneider, 1801)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4 </td <td>Upeneus sp. Cuvier, 1829</td> <td>6.1-6.5</td> <td>Mullidae</td> <td></td>	Upeneus sp. Cuvier, 1829	6.1-6.5	Mullidae	
Strophidon sathete (Hamilton, 1822)56.1-58MuraenidaeLCScolopsis vosmeri (Bloch, 1792)8.1-8.5NemipteridaeLCPisodonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPempheris sp. Cuvier, 18298.1-8.5PempheridaeKCGrammoplites scaber (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 17955.1-6PlatycephalidaeLCVotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCVibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCVibea maculata (Bloch and Schneider, 1801)6.1-7SciaenidaeLCVotieks ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCVibea maculata (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)1.1-10.5Scombridae	Muraenesox cinereus (Forsskal, 1775)	50.1-50.5	Muraenesocidae	LC
Scolopsis vosmeri (Bloch, 1792)8.1-8.5NemipteridaeLCPisodonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPempheris sp. Cuvier, 18298.1-8.5PempheridaeNEGrammoplites scaber (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 17955.1-6PlatycephalidaeNEPlotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeCOpishopterus tardoore (Cuvier, 1829)5.1-6Scatophagus eridaeLCScatophagus argus (Linnaeus, 1766)5.1-6Scatophagus eridaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCVibea maculata (Bloch and Schneider, 1801)6.1-7.5SciaenidaeLCVibea maculata (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLC <td>Strophidon sathete (Hamilton, 1822)</td> <td>56.1-58</td> <td>Muraenidae</td> <td>LC</td>	Strophidon sathete (Hamilton, 1822)	56.1-58	Muraenidae	LC
Pisodonophis boro (Hamilton, 1822)56.1-58OphichthidaeLCPseudorhombus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPempheris sp. Cuvier, 18298.1-8.5PempheridaeNEGrammoplites scaber (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 17955.1-6PlatycephalidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCVibea maculata (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)3.1-4Siganidae<	Scolopsis vosmeri (Bloch, 1792)	8.1-8.5	Nemipteridae	LC
Pseudorhombus javanicus (Bleeker, 1853)2.1-3ParalichthyidaeLCPempheris sp. Cuvier, 18298.1-8.5PempheridaeNEGrammoplites scaber (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 17955.1-6PlatycephalidaeLCPlotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCVibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)6.1-7SciaenidaeLCVibea ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCVibea ruber (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLC	Pisodonophis boro (Hamilton, 1822)	56.1-58	Ophichthidae	LC
Pempheris sp. Cuvier, 18298.1-8.5PempheridaeGrammoplites scaber (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 17955.1-6PlatycephalidaeLCPlotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLC	Pseudorhombus javanicus (Bleeker, 1853)	2.1-3	Paralichthyidae	LC
Grammoplites scaber (Linnaeus, 1758)24.1-24.5PlatycephalidaeNEPlatycephalus sp. Bloch, 17955.1-6PlatycephalidaeLCPlotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus pavus (Linnaeus, 1766)3.1-4SiganidaeLCSiganus formation (Linnaeus, 1766)3.1-4SiganidaeLC	Pempheris sp. Cuvier, 1829	8.1-8.5	Pempheridae	
Platycephalus sp. Bloch, 17955.1-6PlatycephalidaePlotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSiganidae (LCSiganidaeLCSiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLC	Grammoplites scaber (Linnaeus, 1758)	24.1-24.5	Platycephalidae	NE
Plotosus lineatus (Thunberg, 1787)22.1-23PlotosidaeLCAbudefduf sp. Forsskal, 17756.1-6.5PomacentridaeLCOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSiganidae (Forsskal, 1775)4.1-6SillaginidaeLC	Platycephalus sp. Bloch, 1795	5.1-6	Platycephalidae	
Abudefduf sp. Forsskal, 17756.1-6.5PomacentridaeOpisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Plotosus lineatus (Thunberg, 1787)	22.1-23	Plotosidae	LC
Opisthopterus tardoore (Cuvier, 1829)5.1-7PristigasteridaeLCPellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Abudefduf sp. Forsskal, 1775	6.1-6.5	Pomacentridae	
Pellona ditchela Valenciennes, 18478.1-8.5PristigasteridaeLCScatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeLCKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1- 10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Opisthopterus tardoore (Cuvier, 1829)	5.1-7	Pristigasteridae	LC
Scatophagus argus (Linnaeus, 1766)5.1-6ScatophagidaeLCJohnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeNEKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Pellona ditchela Valenciennes, 1847	8.1-8.5	Pristigasteridae	LC
Johnius carutta Bloch, 179311.1-12SciaenidaeLCJohnius glaucus (Day, 1876)7.1-8SciaenidaeNEKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Scatophagus argus (Linnaeus, 1766)	5.1-6	Scatophagidae	LC
Johnius glaucus (Day, 1876)7.1-8SciaenidaeNEKathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Johnius carutta Bloch, 1793	11.1-12	Sciaenidae	LC
Kathala axillaris (Cuvier, 1830)7.1-8SciaenidaeLCNibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1- 10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Johnius glaucus (Day, 1876)	7.1-8	Sciaenidae	NE
Nibea maculata (Bloch and Schneider, 1801)5.1-5.5SciaenidaeLCOtolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1- 10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Kathala axillaris (Cuvier, 1830)	7.1-8	Sciaenidae	LC
Otolithes ruber (Bloch and Schneider, 1801)6.1-7SciaenidaeLCPennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1- 10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Nibea maculata (Bloch and Schneider, 1801)	5.1-5.5	Sciaenidae	LC
Pennahia aneus (Bloch, 1793)4.1-5SciaenidaeLCRastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Otolithes ruber (Bloch and Schneider, 1801)	6.1-7	Sciaenidae	LC
Rastrelliger kanagurta (Cuvier, 1816)10.1-10.5ScombridaeLCSiganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Pennahia aneus (Bloch, 1793)	4.1-5	Sciaenidae	LC
Siganus canaliculatus (Park, 1797)2.1-4SiganidaeLCSiganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Rastrelliger kanagurta (Cuvier, 1816)	10.1-10.5	Scombridae	LC
Siganus javus (Linnaeus, 1766)3.1-4SiganidaeLCSillago sihama (Forsskal, 1775)4.1-6SillaginidaeLC	Siganus canaliculatus (Park, 1797)	2.1-4	Siganidae	LC
Sillago sihama (Forsskal, 1775) 4.1-6 Sillaginidae LC	Siganus javus (Linnaeus, 1766)	3.1-4	Siganidae	LC
	Sillago sihama (Forsskal, 1775)	4.1-6	Sillaginidae	LC

Countd.....

Solea ovata Richardson, 1846	3.1-4	Soleidae	LC
Sphyraena jello Cuvier, 1829	23.1-23.5	Sphyraenidae	LC
Sphyraena obtusata Cuvier, 1829	10.1-10.5	Sphyraenidae	LC
Pampus argenteus (Euphrasen, 1788)	4.1-5	Stromateidae	NE
Saurida sp. Valenciennes 1850	7.1-7.5	Synodontidae	
Pelates quadrilineatus (Bloch, 1790)	4.5-5.5	Terapontidae	NE
Terapon jarbua (Forsskal, 1775)	6.1-7	Terapontidae	LC
Terapon puta Cuvier, 1829	4.1-5	Terapontidae	NE
Terapon theraps Cuvier, 1829	5-5.5	Terapontidae	LC
Arothron sp. Müller, 1841	6.5-7.5	Tetraodontidae	
Lagocephalus inermis (Temminck and Schlegel, 1850)	8.1-10	Tetraodontidae	LC
Tripodichthys blochii (Bleeker, 1852)	4.5-6.5	Tetraodontidae	LC
Triacanthus biaculeatus (Bloch, 1786)	9.1-10	Triacanthidae	LC
Trichiurus lepturus Linnaeus, 1758	24.1-26	Trichiuridae	LC
Macrobrachium rosenbergii (de Man, 1879)	7.1-8	Palaemonidae	LC
Penaeus indicus Milne-Edwards, 1837	7.1-8	Penaeidae	NE
Penaeus monodon Fabricius, 1798	7.1-9	Penaeidae	NE
Penaeus semisulcatus de Haan, 1844	7.1-9	Penaeidae	NE
Penaeus canaliculatus (Olivier, 1811)	10.1-10.5	Penaeidae	NE
Metapenaeus dobsoni (Miers, 1878)	4.1-5	Penaeidae	NE
Metapenaeus monoceros (Fabricius, 1798)	6.1-7	Penaeidae	NE
Parapenaeopsis stylifera (H. Milne Edwards, 1837	5.1-6	Penaeidae	NE
Portunus pelagicus (Linnaeus, 1758)	3.1-4	Portunidae	NE
Portunus sanguinolentus (Herbst, 1783)	3.1-4	Portunidae	NE
Charybdis feriatus (Linnaeus, 1758)	1.1-3	Portunidae	NE
Charybdis lucifera (Fabricius, 1798)	4.1 -5	Portunidae	NE
Charybdis natator (Herbst, 1794)	5.1-6	Portunidae	NE
Miyakella nepa (Latreille in Latreille, Le Peletier, Serville and Guerin, 1828)	7.1-9	Squillidae	NE
Uroteuthis (Photololigo) duvaucelii (d'Orbigny [in Ferussac and d'Orbigny], 1835)	4.1-6	Loliginidae	DD
Loliolus hardwickei (Gray, 1849)	3.1-4	Loliginidae	DD
Perna viridis (Linnaeus, 1758)	2-2.1	Mytilidae	NE
Sepia sp. Linnaeus, 1758	2.1-3	Sepiidae	
Sepiella inermis (Van Hasselt, 1835)	2.1-4	Sepiidae	DD

LC - Least Concern, DD - Data Deficient, VU - Vulnerable, NE - Not Evaluated

In another study, CIFRI (2005) recorded the total annual landings by stake nets as 510.3 t in this estuary, which is lower than that of the present study, which may be due to the lower number of fishing days during that study, which was only 12 days, whereas the average number of fishing days during the present study was 21 days. The mean catch per net per day in the Chettuva Estuary was estimated to be 24.69 kg. Studies on the CPUE of different categories, *viz.* shrimps, crabs and fishes were 14.13, 1.66 and 8.89 kg, respectively.

The monthly average landings during the present study were estimated as 51.860 t per month. The landings (Fig. 2) varied from 27821 kg in August to 78640 kg in March. A maximum of 12.64% of the total annual landings were observed during March, followed by 10.98% in June, 10.62% in October and 10.59% in May and the other months contributed less than 10%. In Vembanad Lake, Kurup *et al.* (1993) recorded the highest landings by stake nets in January and the lowest in July, which is comparable with the findings of the present study; however, slight variations observed may be due to the vastness and environmental interactions associated with the Thanneermukkom salinity barrier in the Vembanad Lake ecosystem.

The catch rate of fishery resources varied from 13.29 kg in August to 30.29 kg in March (Fig. 3). The monthly variations in the CPUE of the shrimps and total resources followed the same trend and shrimps formed the major component of stake net landings in the Chettuva Estuary. A range of 7.5-18.1 was recorded as the average CPUE (kg unit⁻¹ day⁻¹) of stake net landings in different backwaters along the south-western coast of India (CIFRI, 2005), which is lower than that recorded during the present study. These low values may be due to the difference in sampling, as the studies conducted in different backwaters along the south-western coast of India were based on a guarterly survey. Moreover, fishermen were found to operate the nets more than once for a few days every month and the duration of fishing was approximately three hours, which may also have contributed to the higher CPUE during the present study. In another study, Jayawardane and Perera (2003) reported a mean catch rate of total resources as 24.7 kg per operation from Negombo Lagoon in Sri Lanka while studying the artisanal stake net fishery, which is in agreement with the findings of the present study, but the catch rate reported by these authors for shrimp (20.23 kg) was slightly higher than that reported in the present study, which may be due to differences in the types of ecosystems. However,



Fig. 2. Month-wise landings by stake nets in the Chettuva Estuary



Fig. 3. Month-wise CPUE of stake net landings in the Chettuva Estuary

Kobitha and Wickramarathe (2023) reported CPUE of 8-14 kg for the stake nets operating in Navanthurai Lagoon in northern Sri Lanka. An average catch rate of 62 kg unit⁻¹ day⁻¹ was recorded by Ali *et al.* (2013) from intertidal fixed stake nets operating along the Kuwait coast in Kuwait Bay, which is much higher than that reported in the present study, as these two findings are from different types of ecosystems.

Results of ANOVA carried out between months with respect to total resources, shrimps and fishes indicated that the variations in catch rates were significant (p<0.05). *Post hoc* tests were carried out, and the catch rates of total resources, shrimps and fishes between months were derived.

Post hoc tests between months revealed that the months for which significant variations (p<0.05) observed were almost the same for both total resources and shrimps. Additionally, the variations in the catch rates of total resources, shrimps and fishes between August and all other months were found to be significant (p<0.05).

Season-wise studies on landings indicated a maximum of 38.65% during the pre-monsoon season, followed by 35.02% during the postmonsoon season and production was minimal during the monsoon season. The minimum landings during the monsoon season may be due to heavy rainfall associated with turbulent freshwater discharge followed by damage to the erected poles and subsequent abandonment of fishing operations. While studying the exploited fishery resources of the Azhikode Estuary, Harikrishnan *et al.* (2011) reported the highest landings during the pre-monsoon period, followed by the post-monsoon period, and the lowest landings occurred during the monsoon season, as the peak season, has also been recorded by other researchers (Nandakumar, 2004; Boopendranath and Shahul, 2010) while studying the stake net fishery in Vembanad Lake.

There was a significant difference between seasons in the catch rates of total resources and shrimps, as indicated by one-way ANOVA (p<0.05), but the variation in the case of fishes was not significant. A *post hoc* test using catch rates of total resources and shrimps indicated that the variations between the post-monsoon and pre-monsoon seasons as well as between the pre-monsoon and monsoon seasons were significant (p<0.05), but those between the post-monsoon and monsoon and monsoon seasons were not significant.

Catch composition clearly indicated dominance of shrimps in all the months (Fig. 4). Among the total landings, an average of 58.72% were shrimps, followed by 35.79% by fishes and a minimum of 5.49% by crabs during the study period. Jyothilal *et al.* (2015) reported that shrimps contributed more than 60% of the total catch, followed by fishes (32%) in stake nets operating in Ashtamudi Lake, which also agrees with the present observations. Geethalakshmi *et al.* (2024) reported huge landings of shrimps constituting 65% in stake net fishery of Vembanad Lake.

Among shrimps, M. dobsoni (63.76%), M. monoceros (25.91%) and *P. indicus* (10.32%) and among fishes, silverbellies (30.74%), Ambassis gymnocephalus (23.89%), anchovies (17.89%) and catfish (13.65%) were the major components. In the stake net catch of the Ashtamudi Estuary, penaeids contributed 93% of shrimps (Jyothilal et al., 2015) and the major fish groups recorded were leiognathids, anchovies, catfishes and mullets (Kumar et al., 2023a), which is comparable with the findings of the present study. Jayawardane and Perera (2003) reported that shrimps, anchovies and silverbellies were the most important groups among the total stake net landings in Negombo Lagoon, Sri Lanka. While studying the shrimp fishery by stake nets in Cochin backwaters, Nandakumar (2004) also recorded *M. dobsoni* as the dominant species and *M. dobsoni*, P. indicus and M. monoceros as contributors to the shrimp fishery, and the maximum shrimp catch was recorded in February, with a minimum during July-August. Boopendranath and Hameed (2010) also observed M. dobsoni as the dominant component of the stake net catch and M. dobsoni, M. monoceros and P. indicus as major components in Vembanad Lake. The dominance of M. dobsoni in stake net fisheries was also noted by Jyothilal et al. (2015) in the Ashtamudi Estuary.



Fig. 4. Month-wise catch composition of stake net landings

Fig. 5 reveals that the catch rates in all the months were maximum for *M. dobsoni* followed by *M. monoceros* and *P. indicus*. The mean catch per net per day for *M. dobsoni, M. monoceros* and *P. indicus* were 8.81, 3.60 and 1.72 kg, respectively. The higher catch per net per day for *M. dobsoni* followed by that for *M. monoceros* and *P. indicus*, was also reported by Boopendranath and Hameed (2010) while analysing the stake net fishery in Vembanad Lake.

Station-wise studies indicated wide variations in landings (Fig. 6), which was mainly due to the variations in fishing effort at different stations. The average numbers of nets (units) operated per day at stations 1, 2, 3, 4 and 5 were 10, 14, 18, 18 and 33, respectively. Thus, a maximum production of 40% was contributed by Station 5, whereas it was minimal at Station 1.

The station-wise catch rates of different groups of fishery resources landed by stake nets were estimated and the values for the total resources were found to vary from 18.84 kg at station 4 to 28.74 kg at station 1. The trend in catch rates for both shrimps and total resources remained the same for all the stations, indicating the importance of shrimp catch on the fishery by stake nets in the Chettuva Estuary. Additionally, the catch rates were found to fluctuate at alternate stations in the case of total resources and shrimps, but they did not show much variation between stations in the case of fishes and crabs. The catch rate of shrimps was the highest at station 5 (17.42 kg), followed by station 1 (17.23 kg) and it was the lowest at station 4 (8.65 kg); this variation can be attributed to the magnitude of tides.

The species composition and catch rates in comparison with those of total shrimps at different stations are given in Fig. 7. Among shrimps, the catch rate was the highest for *M. dobsoni* at all the stations studied, and the same was the lowest for *P. indicus*. The catch rate of *M. dobsoni* varied from 5.21 kg at station 4 to 11.49 kg at station 5. The highest CPUE for *M. dobsoni* among shrimps was reported earlier by Nandakumar (2004), who studied the shrimp fishery of Cochin backwaters with stake nets.

One-way ANOVA of the catch rates of total resources, shrimps and fishes between different stations was carried out to determine the significant variations between stations. Results revealed that the variations with respect to total resources and shrimps were significant (p<0.05), but the variations in the case of fishes were not significant. *Post hoc* comparisons of the catch rates of



Fig. 5. Species-specific catch rates of shrimps in different months in stake net landings



Fig. 6. Station-wise landings by stake nets in the Chettuva Estuary



Fig. 7. Species-wise catch rates of shrimps at different stations in stake net landings

total resources and shrimps between stations were derived. The results of *post hoc* tests indicated significant variations (p<0.05) between similar stations in terms of catch rates of total resources and shrimps, except between Stations 2 and 3, where significant variations were observed for shrimps only. The variations in catch rates between stations may be attributed to fluctuations in tidal amplitude.

The study indicates that considerable quantities of fishery resources, especially shrimps, are being landed by stake nets in the Chettuva Estuary and the majority of them are juveniles, as evidenced by the modal length class observations. These juveniles of fishes and shrimps trapped in the net have no commercial value and they are mostly sun dried or discarded, thereby depleting the stock of the resources. Since estuaries and backwaters act as the backbone of marine fisheries, this indiscriminate exploitation of juveniles is a serious issue and have to be properly addressed. While studying the stake net fishery in the backwaters of Kerala, Thomas et al. (2008) reported that the sizes of the three main species of shrimps, viz. M. dobsoni, M. monoceros and P. indicus caught by stakenets are smaller than the size at first maturity and they opined that the fishing gear in its present form is harmful to fishery resources. The exploitation of juveniles by stake nets has also been reported previously by many workers (Vijayan et al, 2000; Vimalraj et al., 2014; Jyothilal et al., 2015; Muthupandi et al., 2020; Kumar et al., 2023a). The exploitation of juveniles is mainly due to the small cod end mesh size of the stake nets used. In the present study, the cod end mesh size was 8 mm and Kurup et al. (1993) reported that 90% of the stake nets operating in Cochin backwaters have a cod end mesh size of less than 13 mm, of which 47% are less than 8 mm. Kumar et al. (2023 a) observed a cod end mesh size range of 12-16 mm in stake nets operating in the Ashtamudi Estuary. While studying non-selective fishing gear in the Hooghly Matlah Estuary in West Bengal, Ramesan et al. (2009) reported that bagnets used by artisanal fishermen have a cod end mesh size of 10 mm and according to Ramesan (2019), non-selective and destructive estuarine set bagnets are restricted or banned in various places in West Bengal, as they capture the post--larvae and juveniles of various aquatic organisms. While studying the fisheries and environmental assessment of different backwaters on the south-western coast of India, CIFRI (2005) recommended an urgent need to restrict the mesh size of the stake net along with that of other gear to ensure sufficient time for the growth of young ones, and they suggested a minimum mesh size of 18 mm. Thomas et al. (2008) carried out a detailed study on the size of M. dobsoni. M. monoceros and P. indicus landed by stake nets operating with different cod end mesh sizes and proposed an optimum mesh size of 24 mm to minimise the fishing mortality of juvenile shrimps. In the present study, M. dobsoni, M. monoceros and P. indicus were also found to contribute to the shrimp fishery and since shrimps formed the major share of the stake net landings in this estuary, increasing the cod-end mesh size for the stake nets is recommended to minimise the adverse effects on the stocks of the fishery resources. As estuaries are considered nursery grounds for many finfishes and shellfishes, effective management measures must be taken for resource sustainability. However, conservation measures must be implemented through a democratic process by creating awareness and considering the views of fishermen and other stakeholders so that the measures can be successfully implemented.

Acknowledgments

The authors are thankful to Dr. A. Gopalakrishnan, former Director, ICAR-CMFRI, Kochi and to Dr. K. K. Joshi, former Head, Marine Biodiversity Division, ICAR-CMFRI, Kochi, for the encouragements and facilities provided for carrying out this work. The help and support rendered by the local fishermen in Chettuva during the study is greatly acknowledged.

References

- Ali, F. A., Mohsen, M. A. and James, M. B. 2013. Intertidal fixed stake net trap (Hadrah) fishery in Kuwait: Distribution, catch rate and species composition. *International Journal of Agricultural Science and Engineering*, 7 (12): 256-261. https://www.researchgate.net/publication/ 259827163.
- Amrutha, R. K. and Talwar, N. A. 2021. Catch composition in the coastal set bagnets of Hooghly-Matlah Estuary, West Bengal. J. Mar. Biol. Ass. India, 63(2): 114-117. https://doi.org/ 10.6024/jmbai.2021.63.2.2226-16.
- Bijoy Nandan, S. 2008. Current status and biodiversity modification in the coastal wetland ecosystems of India with objectives for its sustainable management. *Proceedings of Conserve-Vision Conference*, 02-04 July 2007, University of Waikato, Hamilton, New Zealand. www.waikato. ac.n/wtass/conserve-vision.
- Bijoy Nandan, S., Jayachandran, P. R. and Sreedevi, O. K. 2012. Temporal pattern of fish production in a microtidal estuary in the south-west coast

of India. Indian J. Fish., 59(2): 17-26. https://www.researchgate.net/publication/229079237.

- Boopendranath, M. R. and Shahul Hameed, M. 2010. Energy analysis of the stake net operations in Vembanad Lake, Kerala, India. *Fishery Technol.*, 47(1): 35-40. https://www.researchgate.net/publication/280035204.
- CIFRI 2005. Fisheries and environment assessment in selected backwaters on the south-west coast of India. Bulletin No.139, ICAR-Central Inland Fisheries Research Institute, Barrackpore, India, 69 p.
- CMFRI 2012. Rare species of sting ray caught in live condition off Chettuva, Thrissur. *CMFRI Newsletter Cadalmin*, 133. ICAR-Central Marine Fisheries Research Institute, Kochi, India, p. 12.
- Fischer, W. and Bianchi, G. 1984. FAO Species identification sheets for fishery purposes. Western Indian Ocean (Fishing Area 51), Vol. 4. Food and Agriculture Organisation of the United Nations, Rome, Italy.
- Geethalakshmi, V., Chandrasekar, V. and Nikita Gopal 2024. Stake net fishery of central Kerala Costs, returns and seasonality. *Fish. Technol.*, 61: 287-292.
- George, J. P., Selvaraj, G. S. D., Kaladharan, P., Naomi, T. S., Prema, D., Nandakumar, A., Geetha Antony, Jayasurya, P. K., Ansy Mathew, N. P. and Rajagopalan, M. S. 2002. Mangrove ecosystems in Kerala – Resources north of Cochin. *Mar. Fish. Infor. Serv., T&E Ser.*, 172: 1-3.
- Harikrishnan, M., Vipin, P. M. and Madhusoodana Kurup, B. 2011. Status of exploited fishery resources of Azhikode Estuary, Kerala, India. *Fish. Technol.*, 48(1): 19-24.
- Jayachandran, K. V., Tessa Thomas and Raji, A. V. 2008. Caridinian shrimp resources of Kerala waters (Decapoda, Atyidae). Proc. Indian Natl. Sci. Acad., 74(2): 47-50.
- Jayawardane, P. A. A. T. and Perera, H. A. R. E. 2003. Observations on the artisanal stake net fishery for shrimps in the Negombo Lagoon, Sri Lanka. *Fish. Manage. Ecol.*, 10: 41-50. https://doi.org/ 10.1046/j.1365-2400.2003.00308.x.
- Jyothilal, C. S., Bennopereira, F. G., Sumesh, C., Sachin, S. R. and Binilshijith, V. 2015. Stake net catch analysis of Ashtamudi Lake. Int. J. Aquac., 5(14): 1 -5.
- Kobitha, A. and Wickramaratne, I. U. 2023. Management aspects of Navanthurai and Karaingar Lagoon fishing villages, northern Sri Lanka. *Knowex Management*, 2(1): 16-34. https://doi.org/10.17501/26731010. 2023.2102.
- Kumar, A. A., Anvar Ali, P. H. and Sreekanth, G. B. 2023a. Finfish fishery of Ashtamudi Estuary, India - A Ramsar site of international significance. *Reg. Stud. Mar. Sci.*, 64: 1-13. https://doi.org/10.1016/j.rsma.2023. 103020.
- Kumar, A. A., Anvar Ali, P. H. and Sreekanth, G. B. 2023b. A comprehensive record of the fishery resources of a tropical Ramsar wetland: Ashtamudi Estuary, India. *Mar. Biodivers.*, 53(4):52: 1-19. https://doi.org/10.1007/ s12526-023-01354-z.
- Kurup, B. M., Sankaran, T. M., Rabindranath, P. and Sebastian, M. J. 1993. Seasonal and spatial variations in fishing intensity and gear-wise landings of the Vembanad Lake. *Fish. Technol.*, 30(1): 15-20.
- Laxmilatha, P., Velayudhan, T. S., Mohamed, K. S., Kripa, V., Radhakrishnan, P., Mathew Joseph and Jenny Sharma 2006. Bivalve resources of the Chettuva Estuary, Kerala. *Indian J. Fish.*, 53(4): 481-486.
- Leya, J., Manojkumar, B. and Prabhakaran, M. P. 2015. Anthropogenic impacts on the stake net fishery of Thevara-Venduruthy region, Vembanad Lake, Kochi, India. In: Menon, A. R. S., Nair, K. K. C., Pillai, N. G. K. and Rajalakshmi Subramaniam (Eds.), *Book of Abstracts World Ocean Science Congress 2015*, 05-08 February 2015, Kochi, India.

- Munro, I. S. R. 2000. *The marine and freshwater fishes of Ceylon*, Narendra Publishing House, New Delhi, India, 352 p.
- Muthupandi, K., Lakshme, G. V., Mariappan, S., Velmurugan, R., Felix, S., Balasundari, S., Lloyd, C. C. and Kalidoss, R. 2020. Comparative catching efficiency of traditional prawn fishing gears in Pulicat Lake of Tamil Nadu, India. *Indian J. Mar. Sci.*, 49(2): 303-310.
- Nandakumar, G. 2004. Shrimp fishery by stake nets in Cochin barmouth area with special reference to *Metapenaeus monoceros* (Fabricius). *Indian J. Fish.*, 51(4): 431-439
- Ramesan M. P., Pravin, P. and Meenakumari, B. 2009. Non-selective fishing gears and sustainability issues in the Hoogly-Matlah Estuary in West Bengal, India. Asian Fish. Sci., 22: 297-308. https://doi.org/10.33997/j. afs.2009.22.1.028.
- Remesan, M. P. 2019. Resource conservation in estuarine set bagnet fishery. In: Leela Edwin, Thomas, S. N., Remesan, M. P., Muhamed Ashraf, P., Baiju, M. V., Manju Lekshmi, N. and Madhu, V. R. (Eds.), *ICAR Winter School Manual - Responsible Fishing: Recent advances in resource and energy conservation*, 21 November – 11 December 2019, ICAR-Central Institute of Fisheries Technology, Kochi, India, pp. 303-312.
- Regi, S. R. and Bijukumar, A. 2012. Diversity of fish fauna from Veli-Akkulam Lake, Kerala, India. *Environ. Ecol.*, 30(4): 1381-1383.
- Rejna K. P., Rahana Moideenkoya, V. K. and Shabna V. C. 2015. Diversity of fish fauna in Kadalundi Estuary, Kozhikode, Kerala. *Species*, 12(36): 117-121.
- Remya, R. and Amina, S. 2018. Biodiversity status of fishes in Kayamkulam backwater, Kerala. *Indian J. Sci. Res.*, 20(1): 96-102.
- Shylaja, G., Kripa, V., Prema, D. and Abhilash, K. S. 2018. Assessment of marine debris in the stake net fisheries of Vembanad Lake, Kerala, India. J. Mar. Biol. Ass. India, 60(1): 91-96. https://doi.org/ 10.6024/ jmbai.2018.60.1.2044-14.
- Smith, M. M. and Heemstra, P. C. 1986. Smith's sea fishes. Springer Verlag, Berlin, Germany, 1048 p. https://doi.org/10.1007/978-3-642-82858-4.

- Sreedevi, P. R., Venkatachalam, U., Rajarajeswaran, J., Petrisia, J., Dhanabalan, S. K. and Venkatachalam, R. 2014. Comparative valuation of on-bottom and off-bottom mussel (*Perna viridis*) culture as a small scale enterprise, in Chettuva Estuary at Kerala, India. *World J. Fish Mar. Sci.*, 6(6): 487-493. https://doi.org/10.5829/idosi.wjfms.2014.06.06.84161
- Swapana, J., Inasu, N. D and Dalie, D. A. 2016. Variations in fish assemblage with reference to fluctuations in physiochemical parameters in Chettuva Estuary, Thrissur, Kerala. Int. J. Fauna Biol. Stud., 3(6): 04-10
- Swetha, K. C., Jayalakshmi, K. J. and Sreekanth, G. B. 2023. Fish community structure of two adjacent poorly known permanently open tropical estuaries Valapattanam and Dharmadam from the western coast of India. *Mar. Biodivers*, 53(4):56: 1-20. https://doi.org/10.1007/s12526-023-01365-w.
- Thomas, S. N., Edwin L. and Meenakumari, B. 2008. Stake net fishery: Significance and impact. *Infofish Int.*, 6: 57-61.
- Thomas, S. N., Vijayan, V., George Mathai and Varghese, M. D. 2008. Size selection of *Metapenaeus dobsoni* (Miers) in stake net cod-ends used in Cochin Backwaters. *Fish. Technol.*, 45(2): 131-136.
- Uskelwar, L. S., Nirmale, V. H., Bhosale, B. P., Metar, S. Y. and Chogale, N. D. 2017. Indigenous knowledge used in stake net (wan) fishery practiced along the Ratnagiri coast of Maharashtra. *J. Mar. Biol. Ass. India*, 59(2): 45-52. https://doi.org/10.6024/jmbai. 2017.59.2.1924-06.
- Vijayan, V., Edwin, L. and Ravindran, K. 2000. Conservation and management of marine fishery resources of Kerala State, India. *Naga ICLARM Q.*, 23(3): 6-9.
- Vimalraj, R. V., Raju, B., Soumya, W., Shibu, A., Lekshmi, S., Vardhanan, S. Y., Sruthi, S. and Radhakrishnan, T. 2014. Aquatic bioresources of Ashtamudi Lake, Ramsar site, Kerala. J. Aquat. Biol. Fish., 2(1): 297-303.
- Vinitha, M. S., Remya, V. K. and Jain, T. 2016. A preliminary study of seasonal variation in diversity and abundance of molluscs in Chettuva mangroves with special reference to hydrological parameters. *Imp. J. Interdiscip. Res.*, 2(12): 1343-1347.
- Vivekanand, B., Sijo Paul, Baby, K. G., Grinson George and Sathianandan, T. V. 2016. Mud bank fisheries at Chettuva. *Mar. Fish. Infor. Serv.*, *T&E Ser.*, 230: 35.