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Fisheries profile of Puthenvelikara backwaters of Vembanad Lake, Kerala, India

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Abstract

Vembanad Lake is the second largest brackish water lake in India and is known for its rich biodiversity. The study investigates the fish diversity, fishing methods, seasonal variation in species distribution, gear wise fish catch and fishermen profile at Puthenvelikara backwaters of Vembanad Lake. A total of 45 sampling events using gillnets, cast nets, stake net, hook and line and dip nets from January 2020 to March 2021 yielded 2231 individuals of 54 finfish species and seven shellfish species from 34 families, 13 orders and 50 genera. Fish abundance peaked during pre-monsoon season, and the lowest values were recorded in post monsoon season. Out of 37.66% finfishes around 37.50% was from *Etroplus suratensis* followed by Mullets (31.90%), catfishes (15.40%), *Ambassid* sp. (5.60%), *Scinaeid* sp. (5.20%) and others (4.40%). While Among crustacean resources, *Metapenaeus dobsoni* constitute 62.13% to the fishery followed by *Penaeus indicus* (15.84%), *Metapenaeus monoceros* (11.00%), *Macrobrachium idella* (2.96%), *Scylla serrata* (2.64%), *Macrobrachium rosenbergii* (2.20%), *Penaeus monodon* (1.83%) and others (1.40%). About 70% of the fishermen residing in that area are active fishermen, while the remaining operate the gear occasionally viz., once in a week. Moreover, percentage gear wise catch composition was calculated and recorded. Based on the duration of fishing trips, the fishermen are categorized as 1) 3 to 6 hours (77%), 2) whole day (15%) and 3) trips of more than a day (8%). The aquatic weed, *Eichhornia crassipes* affects greatly the livelihood of fisherwomen who rely on the bivalve fishing activity. The proliferation of aquatic weeds such as *Azolla pinnata* and *Nymphaea mexicana* also impacted the fishing operations by entrapping inside the fishing gears, which increases the cost of fishing operations.

Keywords: fisheries profile, fishing methods, catch composition, Puthenvelikara

Introduction

Vembanad is one of Kerala's biggest tropical wetland systems, overlaying 2,033 km² and bordered with the districts of Alappuzha, Kottayam, and Ernakulam (Kurup *et al.*, 1990) [9]. With a catchment vicinity of 14500 km², it is South India's 2nd greatest brackish water arrangement. Estuaries, tidal ponds, swamps, mangroves, and a component of the distinctive man-made property have notably improved the vicinity (Ajay, 2021) [1, 2, 3]. The Lake was also designated as a wetland of international significance under the Ramsar Convention in 2002 (GOI 2008) [6] and a critically vulnerable coastal region (Singh, 2016) [12] as a result of its environmental importance as an essential ecosystem service provider and a vital habitat for a diverse range of flora and fauna. The lake connects to the Arabian Sea in two places: Azhikode, which is at least 100 m wide and fairly deep, and Cochin, which is 450 m wide (Ajay *et al.*, 2021 and Ajay, 2021) [1, 2, 3]. The lake has been divided into two zones: a freshwater dominant southern zone and a saltwater dominant northern zone, owing to the construction of the Thanneermukkum barrage. The lake support wide range of fresh, brackish and marine water species that contain 150 fish species with 100 genera and 56 families (Ajay *et al.*, 2021) [1, 2, 3]. The region is noted for two fishery resources (Kurup *et al.*, 1990) [9], specifically black clam (*Villorita cyprinoides* Gray 1825) and Pearl spot (*Etroplus suratensis* (Bloch 1790)). The present study aims to investigate the Ichthyofaunal diversity and fishing profile of the Puthenvelikara backwaters, a part of the Vembanad Lake, Kerala, Southwest coast of India.

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Materials and Methods

Study site

Puthenvelikara is located on the banks of the Periyar River, Chalakudi and Kotapuram

lagoons. At Elentikara, the Chalakkudi river flows into the Periyar river. Lagoons are the result of natural forces such as tides. The total area of the Puthenvelikara village is 19.87 km² (Figure 1). An ancient belief is that the village was formed as a result of a flood (Veliettam Malayalam), and this belief is confirmed by the discovery of fossils of aquatic organisms in the village.

Sampling frame

Monthly/ Fortnight sampling was carried out in Puthenvelikara backwaters of Vembanad wetlands with the help of local fishermen using different types of nets like gillnet (24 to 65 mm), cast nets (10 to 60 mm), Chinese dip nets (12 to 14 mm), stake nets (Codend 10 mm), hook and line and hand picking etc. from January 2020 to March 2021. The design details of major fishing gears and crafts operating in that area were also gathered and represented according to FAO guidelines. Market value of major fish species were recorded in the table (Table 1). Gear wise fish catch and overall percentage wise species composition were identified and depicted as pie graphs. Fishes of appropriate size were collected and identified with the help of FAO catalogue. Variation in day time and night time fishing was investigated and properly recorded. Data were collected through field visits and personal interview with the fishermen and were scientifically recorded according to the guidelines.

Results and Discussion

Non- motorized and motorized wooden crafts having an overall length ranging from 5.5 to 9 meters and maximum depth range of 30 to 150 centimeters are used along the Puthenvelikara backwater system. The former one is made by scooping the inside of large wooden logs. These non-motorized canoes were equipped with an outboard engine having varying powers starting from 1.5 HP, 6 HP to 9 HP. Propulsion is by manual paddling (Paddle length varies from 1.2 to 1.5 m). Locally these non- motorized canoes are called as vanji and these can be made using variety woods like Anjili, cheeni, maavu, punna etc., (Ajay, 2021) [1, 2, 3].

Majority of the fishermen (69%) of Puthenvelikara village are active fishermen engaged in daily fishing activity. There are fishermen engages in fishing activity once in a week to daily basis. The fishers in Puthenvelikara village are thus classified based on the days spent for the fishing operations in a month and are given in table 3. The average length of the fishing trips are also analyzed and it shows that lion's share of the fishermen (77 percent) are dealing with fishing trips of duration 3 to 6 hours whereas around 15 percent of the fishermen are spending their whole day. The fishermen fishing for more than a day are very less (1%) in the village. The mean length of individual fishing operations are detailed in table 4.

Fish abundance peaked during pre-monsoon season, and the lowest were recorded in post monsoon season. *Mugil cephalus*, *Penaeus indicus*, *Etroplus maculatus*, *Etroplus suratensis* and *Ambassis ambassis* were found to be the dominant species in the catch especially in gill net and cast nets (Table 1). Out of 37.66% finfishes around 37.50% was from *Etroplus suratensis* followed by Mullets (31.90%), catfishes (15.40%), *Ambassid* sp. (5.60%), *Scinaeid* sp. (5.20%) and others (4.40%) (Figure 2a). While among crustacean resources, *Metapenaeus dobsoni* constitute 62.13% to the fishery followed by *Penaeus indicus* (15.84%), *Metapenaeus monoceros* (11.00%), *Macrobrachium idella*

(2.96%), *Scylla serrata* (2.64%), *Macrobrachium rosenbergii* (2.20%), *Penaeus monodon* (1.83%) and others (1.40%) (Figure 2b). Majority of fishermen in the village were using gill nets (67.20%), Chinese dip net (11.4%), cast net (9.30%), trap (3.2%), stake net (3.05%) and hook and line (2.40%) as dominant fishing gear (Figure 2c). Percentage gear wise catch details are explained in the below sections.

Fishing gears used along Puthenvelikara Backwaters

Gill net

Gill nets are the dominant fishing gear in the study zone (Figure 3a, 3b). Here the fishes are mainly trapped by four methods like gilling, snagging, wedging and entangling. During the study, Gill net showed significant relation with the species encountered in it. Out of two major varieties, large nets with a mesh size of 40 to 65 mm were utilized to catch *Etroplus suratensis*, *Mugil cephalus*, *Lutjanus argentimaculatus*, *Oreochromis niloticus*, *Horabagrus brachysoma*, *Epinephelus diacanthus*, *Carangoides malabaricus* etc. whereas small net with 24 to 36 mm mesh size were employed for targeting *Penaeus indicus*, *Penaeus monodon*, *Metapenaeus monoceros*, *Macrobrachium rosenbergii* etc. However, the major by catch in the gear were *Pseudetroplus maculatus*, *Leiognathus equulus*, *Eubleekeria splendens*, *Secutor insidiator*, *Ambassis*, *Horabagrus brachysoma*, *Mystus gulio*.

Locally these gear are known in various names viz. kanambu vala with a mesh size of 40 mm are used to target mullets whereas varying mesh size of 55 mm, 60 mm, 65 mm are called karimmen vala which target etroplus fishes. Additionally, larger mesh size of 80 mm net are used to target carps and are locally called as njandu vala. Technical specifications of both monofilament and multifilament shrimp gill nets (locally called chemeen vala) are given in the table 2. Usually these gears are operated and hauled after a short time period of 10 to 20 minutes. Because if it is set in water for a longer time, then unwanted low prized fishes like *Arius maculatus* can easily entrap inside it and finally can cause menace to fisherman during the catch separation from the net. Percentage catch composition of gill net is shown in figure 4a. Around 27.14% of the catch was contributed by mullets followed by sciaenids (15.11%), carangids (14.6%), catfishes (12.6%), prawns (11.7%) and other miscellaneous fishes (18.85%).

Cast net

Fishing with cast net is an oldest and efficient way of fishing in Kerala. Fishermen throws the net over the water surface where catch is expected. It is used to catch small to medium sized fishes. It was observed that only skilled persons with years of experience can effectively operate this type of gears. It had a dry weight of around 5 to 8 kilograms which has increased to 8 to 20 kilograms with catch (Figure 3c, 3d).

Out of two major varieties (both stringed and stringless), large nets with mesh size between 50 to 60 mm are used to catch fishes like *Etroplus suratensis*, *Mugil cephalus*, *Lutjanus argentimaculatus*, *Oreochromis niloticus*, *Horabagrus brachysoma*, *Epinephelus diacanthus* etc. whereas smaller net with 10 to 28 mm meshes used to target *Pseudetroplus maculatus*, *Leiognathus equulus*, *Eubleekeria splendens*, *Secutor insidiator*, *Ambassis ambassis*, *Penaeus indicus*, *Penaeus monodon*, *Metapenaeus monoceros*, *Macrobrachium rosenbergii* etc. There is significant improvement on the use of sinkers since fishermen began to use stainless steel hollow oval chains as sinkers instead of lead or galvanized irons. Due

to the high price and rusting of the material, the lead and GI sinkers are greatly replaced by hollow oval chains of Stainless steel. The use of stainless steel chain sinkers are efficient in their operation with better durability, corrosion resistance, and cost effectiveness (Ajay *et al.*, 2021) [1, 2, 3]. Percentage catch composition of cast net is shown in figure 4d. Around 54.5% of the catch was contributed by fishes followed by *Penaeus indicus* (22.12%), *Metapenaeus dobsoni* (15.6%), *M. monoceros* 3.16% and other prawns (4.62%).

Stake net

Stake nets are a type of stow net that is used in the artisanal sector around the world (Brandt, 1984). Filtration is used to catch fish in this passive stationary gear. The organisms that drift with the tide enter the net set against the current, and the catch is collected in the codend as the water filters through the gear. Usually 2 to 3 fishermen are operating the gear with non-motorized canoes ranging size from 5.5 to 9 meters. But for the initial installation of these stakes, a man power of five to six fishers working on two to three canoes are required.

Its structure, construction details and modifications in operation was early explained by Hridayanathan & Pauly (1993) [7], Thomas *et al.* (2007) [13], Hridayanathan, *et al.* (1990) [8] and Pauly (1991) [10]. Figure 3e depicts the design of stake nets used in the Puthenvelikkara backwater system. The mesh size of polyamide netting varied from 200 to 60 mm in the 3 front sections and from 18 to 12 mm in remaining sections upto the codend. Usually, the codend is constructed with a mesh size of 10mm. The twine size ranged from R635tex, R235tex and R155tex for 200 mm, 100 mm and remaining portions of the netting. These gears are quite heavy with a webbing weight of 14 kg, rope (Polypropylene material) weight of 1.6 kg and an overall mouth area of 41 m². These gears can be operated all the years. Out of two fishing seasons during the lunar month, the first period lasting 2 to 3 days occur prior to the new moon whereas the second period begins at full moon time where fishers used to operate the gear two times a day. Percentage catch composition of stake net is shown in figure 4b. Around 70% of the catch was contributed by *Metapenaeus dobsoni* followed by *M. monoceros* (12.3%), *Penaeus indicus* (9.12%), fishes (8.07%) and other prawns (0.51%).

Chinese Dip net

Chinese dip nets are one of the efficient fishing gear operated along the backwater of Kerala when high tide is prevalent. This gear mainly uses the principle of counter weight balance. It causes little damage to the environment and thus it is regarded as a traditional paramount source of income for the fishers who live along the Puthenvelikkara Backwaters of Vembanad lake Thomson (2003) [14]; Florence (2014) [5]; Rahman *et al.*, (2016). These are categorized in to small, medium and large ones according to their size. For the installation and setting of these gears, an initial investment of 1.25 lakh per unit, 2.25 lakh per unit and 2.5 lakh per unit

need to be paid for small, medium and large units respectively. Based on the labour cost, around 4 to 6 fishers are operating the larger ones whereas 1 or 2 fishers are necessary for a medium sized one.

These gears are mainly used to target penaeid prawns like brown shrimp, Indian prawn, King shrimp, Indian white shrimp and fishes including pearl spot, Anchovies, mullets, seabass, Lizard fish, Cat fish, milk fish, etc. Fishermen gets around 3 to 7 kgs of fishes per day under normal high tide conditions. Percentage catch composition of Chinese dip net is shown in figure 4c. Around 65.3% of the catch was contributed by *Metapenaeus dobsoni* followed by *Penaeus indicus* (15.9%), fishes (13.6%) *M. monoceros* (4.76%), and other prawns (0.44%).

Other types of fishing gears traditionally used in Puthenvelikkara Village are given in figure 5 viz.

- a) Hook and line with wooden pole
- b) Hook and line without wooden pole (Used to catch large fishes especially *Lates calcarifer*, *Epinephelus diacanthus* etc. Operated in deep waters)
- c) Vattola – used to store live shrimps. Also used for catching shoal of shrimps after untying the lower portion of webbing which is attached to the ring. Often used to store live fishes.
- d) Vattola – used to catch shoal of shrimps (Webbing made of nylon material).
- e) Etroplus ring/ Vattola
 - Ring thickness – 10 mm
 - Ring diameter – 70 cm
 - Webbing (Nylon) mesh size – 4 cm
 - Depth of webbing – 48 cm
 - Type of mounting – Stapping
 - Holding line length – 60 cm
- f) Three ropes are attached to the ring at equal distances and are fixed at one point which forms the holding line.
- g) Crab ring/ Vattola
 - Ring thickness – 8mm, 10 mm
 - Ring diameter – 70 cm
 - Webbing (HDPE) mesh size – 3 cm
 - Depth of webbing – 18 cm
 - Type of mounting – Stapping
 - Holding line length – 60 cm
- h) Three ropes are attached to the ring at equal distances and are fixed at one point which forms the holding line.
- i) Plastic jugs with upper cut – Used to hold shrimps in live condition while going for distant water fishing operation. Jugs were filled with backwater before introducing the shrimps.
- j) Small cage used for rearing large fishes like seabass, snapper etc.
- k) Scoop net used to collect and catch fishes and shrimps. Percentage catch composition of scoop net is shown in figure 4e. Here, around 96% of the catch was contributed by fishes followed by other prawns (2.7%), *M. monoceros* (0.5%) and *Penaeus indicus* (0.8%).

Table 1: Finfish and Shellfish Diversity with Market Trend along the Puthenvelikkara Back waters of Vembanad Lake, Kerala

Order	Family	Species	Common name	Abundance				habitat	Max. Length (cm)	Market price Rs/kg
				Oct to Jan	Feb to May	June to	Sept			
Perciformes	Pristolepidae	<i>Pristolepis rubripinnis</i> Britz Kumar	leaffish	*	*	*		●	13.6	—
		<i>Leiognathus dussumieri</i> (Valencienne, 1835)	dussumier's ponyfish	*	*	*		▲■	14	90- 155
	Leiognathidae	<i>Leiognathus equulus</i> (Forsskal, 1775)	Common ponyfish	*	*	*		●▲■	28	100-150
		<i>Eubleekeria splendens</i> (Cuvier, 1829)	Splendid ponyfish	*	*	*		▲■	17	90-175
		<i>Photopectoralis bindus</i> (Valenciennes, 1835)	Orangefinned ponyfish	*	*	*		▲■	11	110-185
		<i>Leiognathus brevirostris</i> (Valenciennes, 1835)	shortnose ponyfish	*	*	*		▲■	13.5	70- 200
		<i>Deveximentum insidiator</i> (Bloch, 1787)	pugnose ponyfish	*	*	*		■▲	10.5	135-220
		<i>Gazza minuta</i> (Bloch 1795)	Silver Bellies	*	*	*		■▲	14	200-230
	Cichlidae	<i>Pseudetroplus maculatus</i> (Bloch, 1795)	orange chromide	*	*	*		●▲	9.5	100-150
		<i>Etroplus suratensis</i> (Bloch, 1790)	pearl spot	*	*	*		▲	40	400-700
		<i>Oreochromis mossambicus</i> (Peters, 1852)	Mozambique Tilapia					●▲	39	150-200
	Ambassidae	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	Nile Tilapia					●▲	60	120-200
		<i>Ambassis ambassis</i> (Lacepede, 1802)	Commerson's Glassy	*	*	*		●▲■	15	40-75
		<i>Parambassis</i> sp.	Glassfish	*	*	*		●▲	17.5	45-80
	Gerridae	<i>Gerres limbatus</i> Cuvier, 1830	saddleback silver biddy	*	*	*		▲■	15	50-90
	Carangidae	<i>Caranx ignobilis</i> (Forsskål 1775)	Giant trevally	*	*	*		▲■	170	180-600
	Glossogobidae	<i>Glossogobius giuris</i> (Hamilton, 1822)	Tank goby	*	*	*		●▲■	50	150-175
	Lethrinidae	<i>Lethrinus</i> sp.	emperor fish	*	*	*		▲■	52	140-400
	Lutjanidae	<i>Lutjanus argentimaculatus</i> (Forsskal, 1775)	mangrove red snapper	*	*	*		●▲■	150	150-250
	Scatophagidae	<i>Scatophagus argus</i> (Linnaeus, 1766)	Spotted scat	*	*	*		●▲■	38	100-145
	Sillaginidae	<i>Sillago sihama</i> (Forsskål 1775)	Silver sillago	*	*	*		▲■	31	150-350
	Sciaenidae	<i>Johnius dussumieri</i> (Cuvier 1830)	Sin croaker	*	*	*		▲■	40	180-340
Anabantiformes	Anabantidae	<i>Anabas testudineus</i> (Bloch 1792)	climbing perch	*	*	*		●▲	25	125-235
	Channidae	<i>Channa striata</i> (Bloch, 1793)	Striped snakehead	*	*	*		●▲	100	345-450
		<i>Channa marulius</i> (Hamilton 1822)	Great snakehead	*	*	*		●	183	280-400
		<i>Channa punctata</i> (Bloch, 1793)	Spotted Snakehead					●▲	31	325-420
	Heteropneustidae	<i>Heteropneustes fossilis</i> (Bloch 1794)	Stinging catfish	*	*	*		●▲	31	450-600
	Nandidae	<i>Nandus nandus</i> (Hamilton, 1822)	Gangetic Leaffish	J1				●▲	20	125-200
Clupeiformes	Clupeidae	<i>Thryssa malabarica</i> (Bloch, 1795)	Malabar thryssa	*	*	*		▲■	17.5	75-110
		<i>Stolephorus indicus</i> (Van Hasselt, 1823)	Indian anchovy	*	*	*		▲■	15.5	200-330
		<i>Anodontostoma chacunda</i> (Hamilton, 1822)	Chacunda gizzard shad	*	*	*		●▲■	22	75-110
		<i>Nematalosa nasus</i> (Bloch, 1795)	Bloch's gizzard shad	*	*	*		●▲■	25.5	90-190
Siluriformes	Mystidae	<i>Mystus malabaricus</i> (Jerdon 1849)	Jerdon's Mystus	*	*	*		●▲	15	80-110
	Ariidae	<i>Arius maculatus</i> (Thunberg, 1792)	Spotted sea catfish	*	*	*		●▲■	80	95-175
	Siluridae	<i>Ompok malabaricus</i> (Valenciennes, 1840)	Goan catfish	*	*	*		●	51	135-200
	Bagridae	<i>Horabagrus brachysoma</i> (Günther, 1864)	Günther's catfish	*	*	*		●▲	45	50-100
Beloniformes	Hyporhamphidae	<i>Hyporhamphus xanthopterus</i> (Valenciennes, 1847)	Red-Tipped Half Beak					●▲■	15	150-255
		<i>Hyporhamphus limbatus</i> (Valenciennes 1847)	Congaturi halfbeak	*	*	*		●▲■	35	135-245
Mugiliformes	Belonidae	<i>Xenentodon canicula</i> (Hamilton 1822)	Freshwater garfish	*	*	*		●▲	40	150-300
	Mugilidae	<i>Mugil cephalus</i> Linnaeus 1758	Flathead grey mullet	*	*	*		●▲■	100	140-450
Pleuronectiformes	Cynoglossidae	<i>Liza tade</i> (Forsskål, 1775)	Green back mullet	*	*	*		●▲■	70	125-400
		<i>Cynoglossus macrostomus</i> Norman, 1928	Malabar tonguesole	*	*	*		●■	30	100-120
	soleidae	<i>Brachirus orientalis</i> (Bloch & Schneider, 1801)	Oriental sole	*	*	*		●▲■	38	250-355
Cypriniformes	Cyprinidae	<i>Dawkinsia filamentosa</i> (Valenciennes, 1844)	Black-spot barb	*	*	*		●▲	18	
		<i>Gibelion catla</i> (Hamilton 1822)	Catla	*	*	*		●▲	182	
		<i>Puntius sarana</i> (Hamilton, 1822)	Olive barb	*	*	*		●▲	42	
		<i>Puntius mahecola</i> (Valenciennes, 1844)	Mahecola barb	*	*	*		●	8.9	OR
		<i>Amblypharyngodon melettinus</i> (Valenciennes, 1844)	Attentive Carplet	*	*	*		●	8	
		<i>Labeo dussumieri</i> (Valenciennes, 1842)	Labeo	*	*	*		●	50	250-320
		<i>Labeo rohita</i> (Hamilton, 1822)	Rohu					●▲	200	240-280
		<i>Puntius amphibius</i> (Valenciennes, 1842)	Scarlet Banded Barb	J1				●	20	OR
Venerida	Cyrenidae	<i>Villorita cyprinoides</i> Gray 1825	Black clam	*	*			●▲		120-190
Elopiformes	Megalopidae	<i>Megalops cyprinoides</i> (Broussonet, 1782)	Indo-pacific tarpon	*	*	*		●▲■	150	150-280
Anguilliformes	Anguillidae	<i>Anguilla bicolor</i> (McClelland, 1844)	Short-Fin Eel					●▲■	123	275-390
Cyprinodontiformes	Apocheilidae	<i>Apocheilus lineatus</i> (Valenciennes, 1846)	Striped Panchax					●▲	10	OR

Decapoda	Penaeidae	<i>Penaeus indicus</i> Milne- Edwards, 1837	Indian white prawn	*	▲	18.4	280-400
		<i>Penaeus monodon</i> Fabricius, 1798	Giant tiger prawn	*	▲	33.6	350-450
		<i>Metapenaeus monoceros</i> (Fabricius, 1798)	Speckled shrimp	■	▲	15	250-300
	Palaemonidae	<i>Macrobrachium rosenbergii</i> (De Man, 1879)	Giant fresh water prawn	■	•▲	34	455-700
		<i>Macrobrachium idella</i> (Hilgendorf, 1898)	Freshwater Prawn	JI	●	33	455-700
	Portunidae	<i>Scylla serrata</i> (Forsskål, 1775)	Giant Mud Crab	JI	▲	28	300-750

Habitat: ● - Fresh water, ▲ - Brackish water, ■ - Marine; Monsoon: June–September; Post-monsoon: October–January; Pre-monsoon: February–May; Absence - *, Presence - *, Rarely seen - **, Less seen - І, Moderately seen - ІІ; ornamental important fishes – OR

Table 2: Technical specifications of shrimp Gill nets

Main webbing	PA multifilament	PA monofilament
Mesh size (in mm)	34 to 55	28 to 34
Twine type	PA monofilament	PA multifilament
Twine specifications	0.16 to 0.20 Ø	210x1x2 to 21x1x3
No of meshes in depth	50 to 60	100
Hanging coefficient (E)	0.5	0.5 to 0.53
No of meshes in length/unit	1500 to 2000	2000 to 3000
Hung length (in m)	25 to 55	28 to 50
Hung depth (in m)	2 to 3	2 to 3
Ropes		
Material	Polypropylene	Polypropylene
Head rope diameter (in mm)	4 to 6	4 to 6
Foot rope diameter (in mm)	4 to 8	4 to 8
Selvedge		
Mesh size (in mm)	70 to 100	60 to 70
Twine type	PA multifilament	PA multifilament
Twine specifications	210x4x3	210x2x3
No of meshes in depth	0.5 to 1	2
Floats and sinkers		
Float material	PVC	PVC
Floats per unit (in No.)	30 to 40	40 to 50
Float size (in mm)	60x20	50x10
Sinker material	Lead	Lead
Sinkers per unit (in No.)	60 to 80	60 to 80
Sinker weight (in g)	25	25

Table 3: Fishing Intensity

Fishing intensity	No. of fishers
Daily	207 (69.0)
3 to 5 days	66 (22.0)
2 to 3 days	16 (5.3)
1 to 2 days	5 (1.7)
Weekly	6 (2.0)

Figures in parentheses indicates percentage to total

Table 4: Average length of a fishing trip

Less than one hour	2 (0.7)
1 -3 hours	13 (4.3)
3 -6 hours	231 (77.0)
1 day	46 (15.3)
2 days	1 (0.3)
1 week	4 (1.3)
More than 1 week	3 (1.0)

Figures in parentheses indicates percentage to total

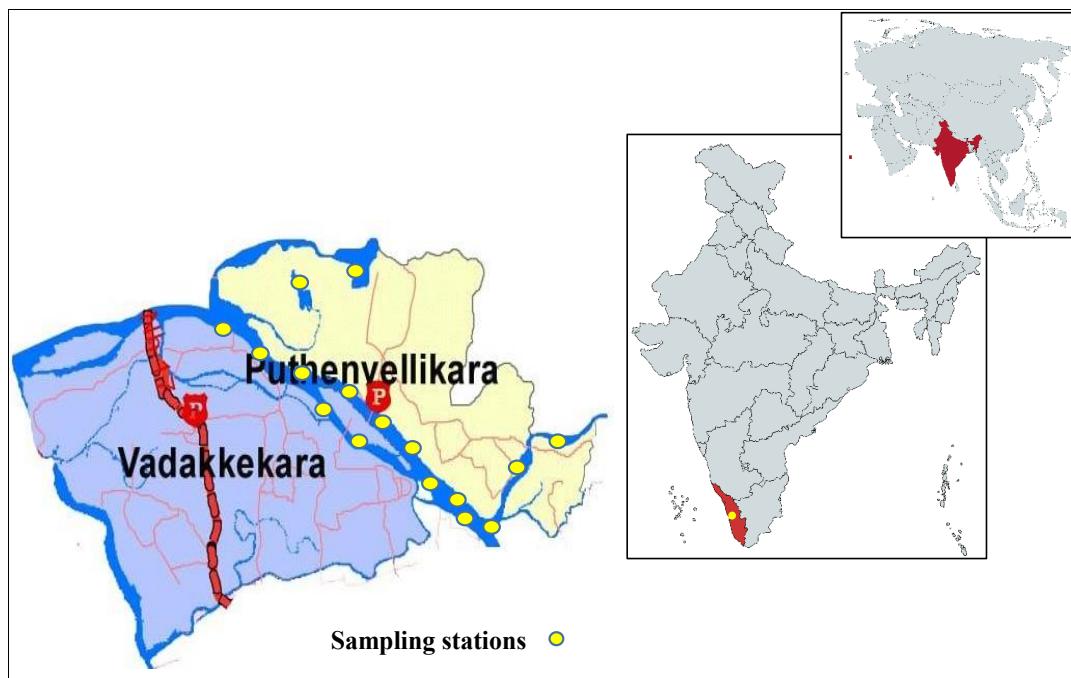


Fig 1: Map showing sampling stations

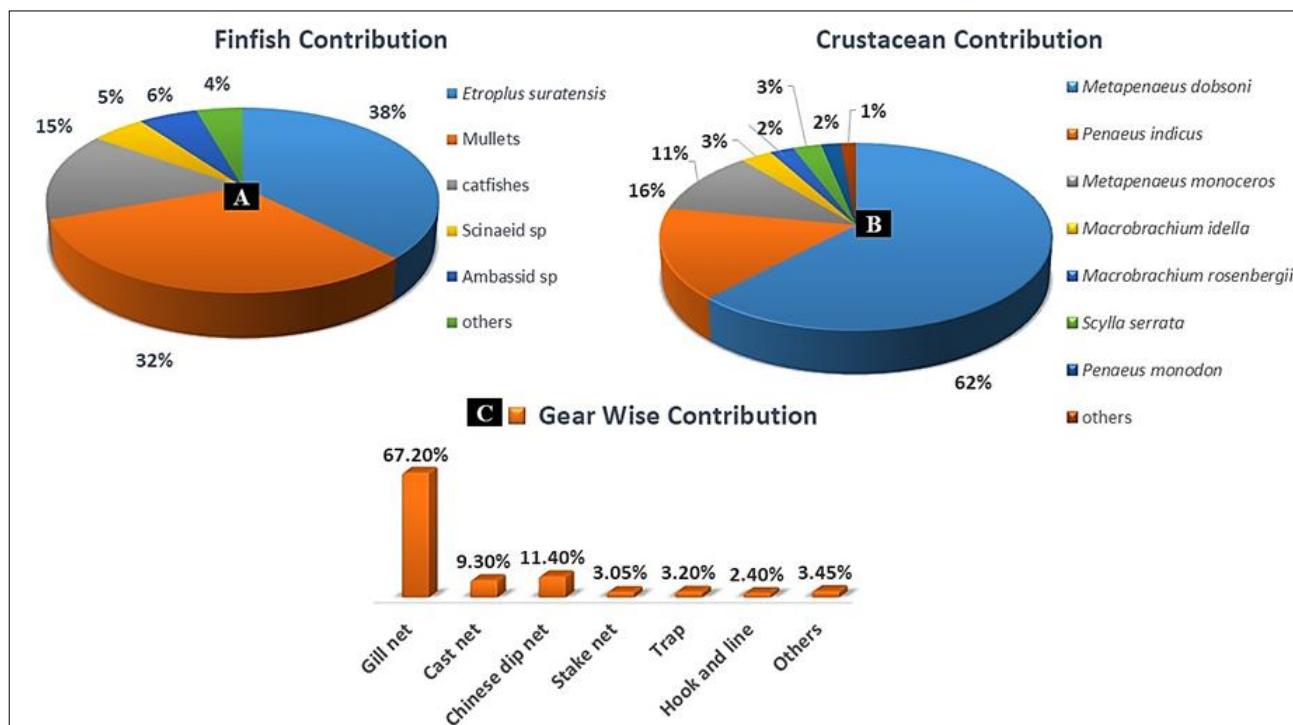


Fig 2: Percentage wise contribution of catches and gears

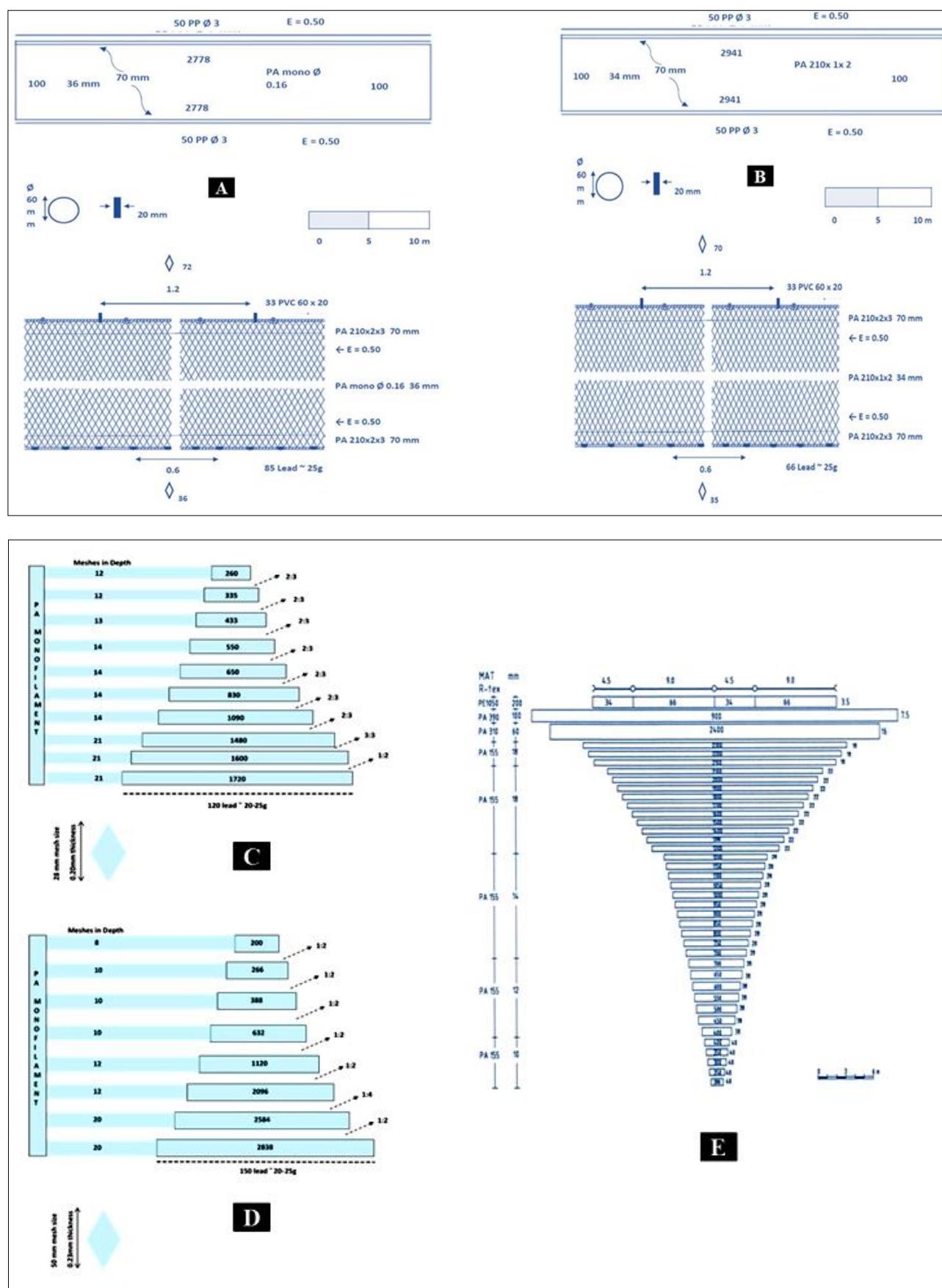


Fig 3: Design of fishing gears

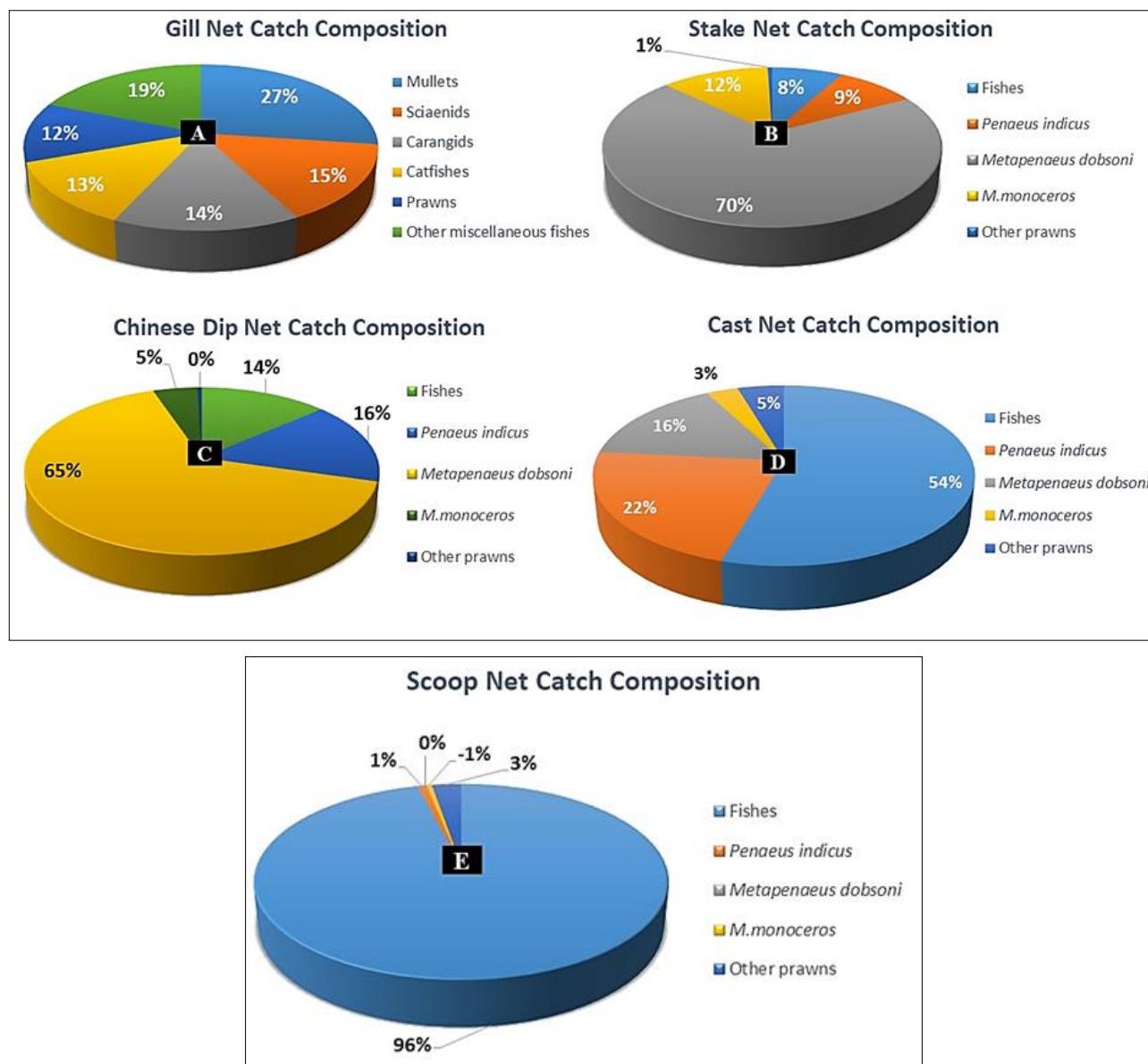
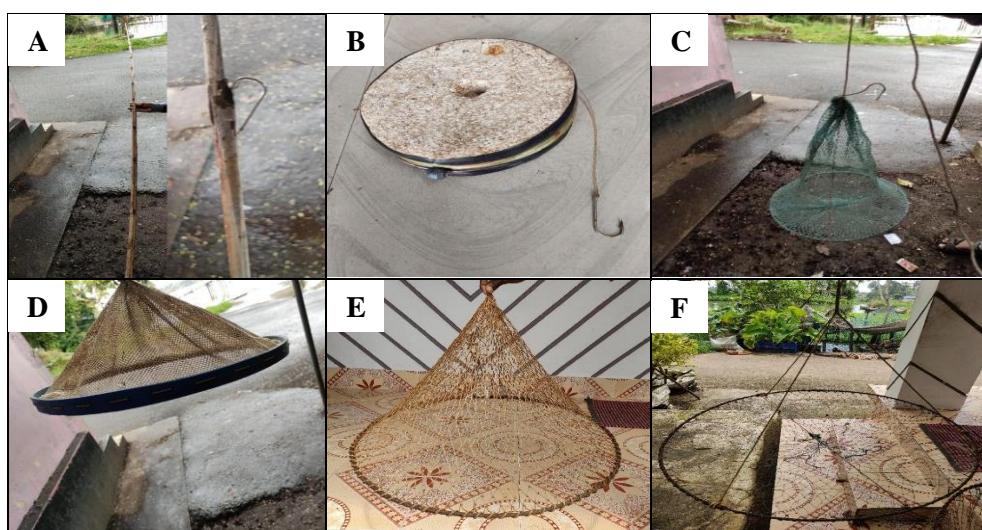
**Fig 4:** Catch composition of different fishing gears



Fig 5: Other fishing gears traditionally used along Puthenvelikkara Backwaters

Conclusion

The recorded data on the technical specifications, species diversity and energy utilization in Puthenvelikkara Backwaters would serve as a base line information for the technological modifications the method may go through in the coming years. Moreover, it opens the way towards the search for extinct species along the backwaters of Vembanad lake.

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Conflict of Interest

The authors declare that there are no conflict of interest.

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