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Author Affiliation:
[1]Centre for Aquaculture, Pathology Laboratory, Sathyabama Institute of Science and Technology, Chennai- 600119, Tamil Nadu, India
[2]Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Parangipettai - 608 502, Tamil Nadu, India

***Corresponding author:**
Ayyaru Gopalakrishnan,
Centre for Aquaculture, Pathology Laboratory, Sathyabama Institute of Science and Technology, Chennai- 600119, Tamil Nadu, India. Email: aquagopal@gmail.com

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Ethnographic Documentation of Traditional Barehand Fishing Practices and Occupational Health Hazards among the Tribe in the Pitchavaram Mangrove Regions, Southeast Coast of India

Vasanthan Koothan[1,2], Perumal Murugesan[2], Ayyaru Gopalakrishnan[2]*, Anisha Shafni John[1], Keerthika Ganesan[2], Vignesh Baskaran[2], Leo Luricson[2], Anirban Kundu[2]

ABSTRACT

This study examines ethnographic evidence of barehand fishing, a traditional fishing practice among the Irulas of the Pitchavaram mangrove community in southeastern India, with a focus on associated occupational health and safety concerns. Qualitative and participatory research methods, including direct observation, interviews, group discussions, and participant observation, were employed to document various aspects of the practice, including seasonal patterns, habitat use, target species, fishing techniques, and occupational hazards. Barehand fishing is primarily conducted during low tides in shallow mangrove habitats such as creeks, pools, and root clusters to harvest small fish, crabs, and molluscs for subsistence purposes. Although both men and women participate in the activity, men are more commonly engaged under physically demanding conditions. The practice relies heavily on fishers' tactile abilities and indigenous ecological knowledge, with minimal use of protective equipment. Fishers reported several occupational risks, including cuts and puncture wounds, bites, skin infections, physical injuries, falls, and occasional encounters with venomous organisms. The findings highlight the significance of indigenous knowledge in sustaining traditional fishing practices while emphasizing the need to address occupational health and safety concerns among mangrove-dependent fishing communities.

Keywords: Traditional fishing practices, Barehand fishing, Indigenous knowledge, Irula tribe, Sustainable livelihoods.

1. INTRODUCTION

Fish and fisheries constitute an essential component of global food systems and play a critical role in ensuring food security, nutrition, livelihoods, and socioeconomic

development. Fish serves as a valuable source of high-quality protein, essential fatty acids, minerals, and micronutrients necessary for human health, while fisheries contribute significantly to employment generation, income opportunities, and ecological sustainability (Holmlund & Hammer, 1999; Mozaffarian & Rimm, 2006; Mohanty et al., 2019). Globally, fisheries support millions of people through livelihood opportunities and contribute substantially to food and nutritional security, particularly among rural and coastal communities (Roos et al., 2007; Beveridge et al., 2013; FAOSTAT, 2018).

Improvements in traditional fishing gear and techniques have evolved over generations to efficiently target species by adapting to hydrological conditions, seasonal variations, fish behavior, and locally available materials (Eyo & Akpati, 1995; Hussain et al., 2016). Traditional fisheries are generally characterized by low energy inputs, reliance on intensive local knowledge systems, and a primary focus on subsistence fishing; consequently, they tend to exert comparatively lower environmental impacts than commercial fisheries (Raju et al., 2016; Kechu & Pankaj, 2023). Therefore, understanding traditional fishing gears and practices is essential for sustainable fisheries management and conservation strategies (Rao et al., 2016). In India, although traditional fishery technologies are widely practiced among several tribal communities, research documenting these practices remains relatively limited (Raju et al., 2016; Karga et al., 2020).

Indigenous ecological knowledge encompasses the cumulative body of knowledge, practices, and beliefs developed through long-term interactions between communities and their surrounding environment. Increasing attention has been directed toward its role in biodiversity conservation and ecosystem governance (Nakashima et al., 2012; Ban et al., 2018; Artelle et al., 2019; Björkvik et al., 2021). Several studies have demonstrated that incorporating indigenous perspectives into conservation frameworks can enhance ecological outcomes and improve resource management practices (Ovung et al., 2022). In India, traditional fishing practices frequently involve the use of plant-based piscicides, indigenous fish traps, and hand fishing methods utilizing biodegradable materials (Dominic & Ramanujam, 2012; Dutta et al., 2019).

Ethnographic studies from eastern India have highlighted that traditional fishing practices integrated with local rituals, cultural beliefs, and seasonal calendars contribute to the preservation of both biodiversity and cultural heritage (Hussain et al., 2016; Bagra & Das, 2010; Bam & Nimasow, 2025). Studies further indicate that indigenous communities such as the Ao, Sumi, and Galo adapt their fishing techniques to specific microhabitats and species behaviors through ecologically sustainable approaches (Kechu & Pankaj, 2023; Bam & Nimasow, 2025). However, increasing modernization, technological interventions, and destructive practices such as chemical fishing pose substantial threats to the continuity of traditional ecological knowledge and associated riverine practices (Ovung et al., 2022; Imchen & Joglekar, 2017).

Despite extensive research on traditional fishing systems and community-based fisheries, relatively little attention has been given to physically intensive fishing methods such as barehand fishing and their associated occupational health implications. Certain indigenous fishing practices expose fishers to multiple hazards, including deep-water conditions, sharp substrates, strong currents, prolonged breath-holding, and encounters with potentially dangerous aquatic organisms (Bam & Nimasow, 2025). Additionally, fishers are often exposed to microorganisms and environmental stressors that may increase the risk of occupational illnesses and injuries. The relationship between indigenous fishing practices and occupational health therefore warrants greater research attention (Ovung et al., 2022).

Mangrove ecosystems are among the most biologically productive environments and are characterized by unstable substrates, dense root systems, tidal fluctuations, and rich biodiversity. Communities inhabiting these ecosystems largely depend on traditional fishing practices for subsistence and livelihood generation. However, fishing activities conducted in mangrove environments without adequate protective measures may increase vulnerability to injuries, infections, venomous animal encounters, and musculoskeletal strain, despite requiring substantial ecological knowledge, specialized skills, and adaptive strategies.

Therefore, the present study aims to ethnographically document traditional barehand fishing practices among the Irula tribe of the Pitchavaram mangrove ecosystem on the southeast coast of India and assess the occupational health hazards associated with these practices. The study contributes to the preservation of indigenous knowledge systems, supports sustainable fisheries governance, and provides insights for developing culturally appropriate occupational health interventions.

2. METHODOLOGY

Study Area

This research work was conducted in the Pitchavaram mangrove forest system located at the southeast coast of India, within the district of Cuddalore, in the state of Tamil Nadu (Fig. 1). Pitchavaram mangroves represent one of the biggest and prominent mangrove forest

systems of India; such mangroves have tidal creeks, mudflats, estuaries, along with abundant growth of various types of mangrove plants including Rhizophora, Avicennia, and Bruguiera trees. The environmental conditions present in this area are tropical marine but are also influenced by monsoon winds. Hence, such environmental conditions provide the best opportunity for biological productivity and different forms of aquatic lives. The local people residing in the Pitchavaram mangrove forest are known as the Irula Tribe. Their livelihood mainly depends on fishing and crab harvesting. Most of the fishing activities performed by Irula Tribe are considered to be artisanal and based on traditional ecological knowledge. One of the common fishing practices among the Irulas is the practice of fishing by hands in shallow tidal creeks, muddy ponds, and root areas of mangrove plants where the fish can be found hidden in the low tide period.

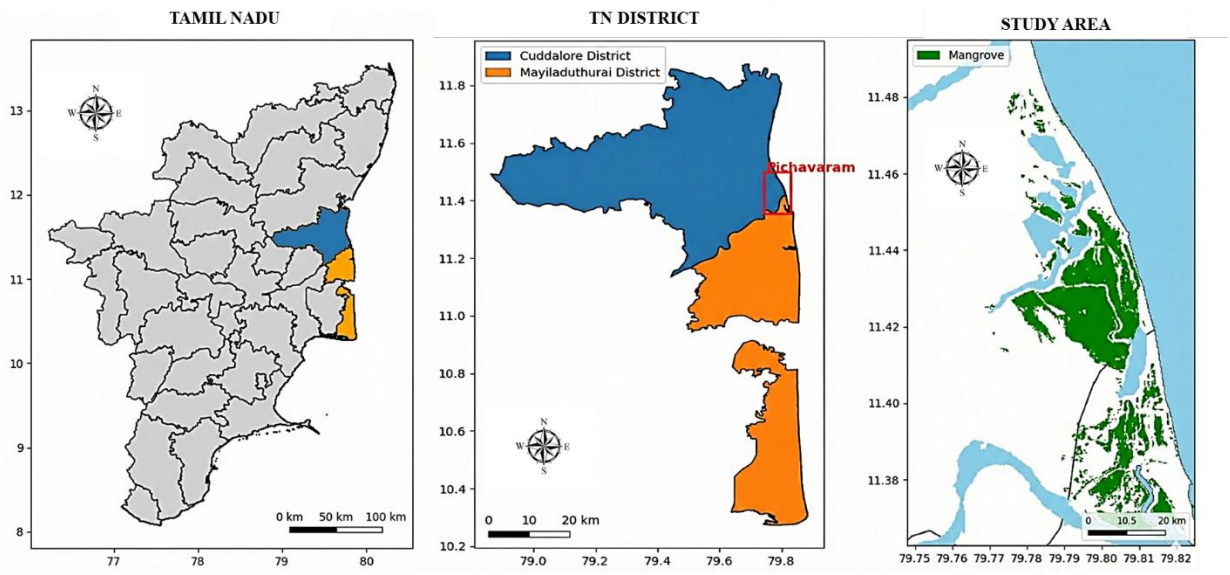

Figure 1. Geographical location of the Pitchavaram mangrove study area in Tamil Nadu, Southeast Coast of India.

Data collection

The methods used in the process of data gathering included ethnographic techniques that were qualitative and involved participation through various forms such as direct observation, semi-structured interviews, informal talks, and participant observation during fishing practice sessions. Purposeful sampling was utilized in choosing and interviewing experts among Irula fishermen and people within the community having traditional skills on fishing. Information was collected concerning fishing seasons, fishing places, fish types, dangers of fishing jobs, incidences of injuries, and practices used for safeguarding themselves from harm (Bam & Nimasow 2025). Information including operation procedures, body posture, manipulation of hands, and interaction with the environment was recorded.

3. RESULTS

Socio-Demographic Profile

The fishing exercise that was done included both males and females from the Irula population, thus showing an inclusive involvement in fishing for survival. The males were often seen venturing deeper into muddy passages and conducting probing exercises in root-rich areas, meaning that they had much physical effort to deal with (Fig.2). The females mainly engaged in fishing through shallow water areas and banks of the water body where they performed fishing activities (Fig.3). The fishermen and fisherwomen did not have any equipment apart from wearing appropriate clothing that would protect them from the mud water. There were no gloves and proper foot wears for the fisher people which show that they depend on direct touch when conducting their fishing activities. They worked both individually and in groups in the process of catching fish.

Figure 2. Male members of the tribes engaged in traditional barehand fishing in the Pitchavaram regions. (A) Fisher partially submerged while manually probing for fish in shallow water. (B) Active hand searching in muddy substrates within mangrove creeks. (C) Fisher displaying captured catch following manual harvesting. (D) Harvested fish carried in traditional woven baskets. (E) Manual capture activity in root-dense mangrove habitat during low-tide conditions.

Spatial and Seasonal Patterns

The method of barehand fishing was commonly performed in shallow creeks of mangroves, intertidal pools, brackish waters, and places abundant with roots where fish gather during low tides. The process of fishing took place for the majority of the year except for the monsoon period due to strong currents and high tides that made fishing difficult. The practice of fishing is done during low tide times and preferably on narrow streams where currents are weak, allowing proper hand movements.

Target Species

The fish catches were mainly of small- to medium-sized species and molluscs as well as crustaceans. Organisms caught included fish species from the estuary as well as mud crabs that could be easily found through tactile sampling in microhabitats. Fish catches were mainly meant for home consumption, while any excesses were occasionally sold or bartered locally (Table 1). Names of organisms were scientifically identified and checked against standard marine taxonomies, while vernacular names represent their local names in Tamil, as indicated by fishermen.

Occupational Health Hazards

Barehand fishing put fishers at many different risks including physical dangers since there was direct exposure of their bodies to the substrate, roots, and other living creatures underwater. Some of the most common injuries experienced by fishers include cuts, scratches, and punctures as a result of coming into contact with sharp shells, broken roots, and fish spines. Fishers also had to contend with bites and pinches from crabs and other small fish as they manually catch their prey. Extended periods of swimming through

murky water would expose fishers to skin irritations and infections as well as fungi where there are open wounds. The instability of the muddy surface would contribute to slips and loss of balance as well as muscle strains. Repeated bending and crouching would cause fishers to suffer from lower back pain and joint pains as well. Stings and bites from venomous and stinging creatures were not uncommon.

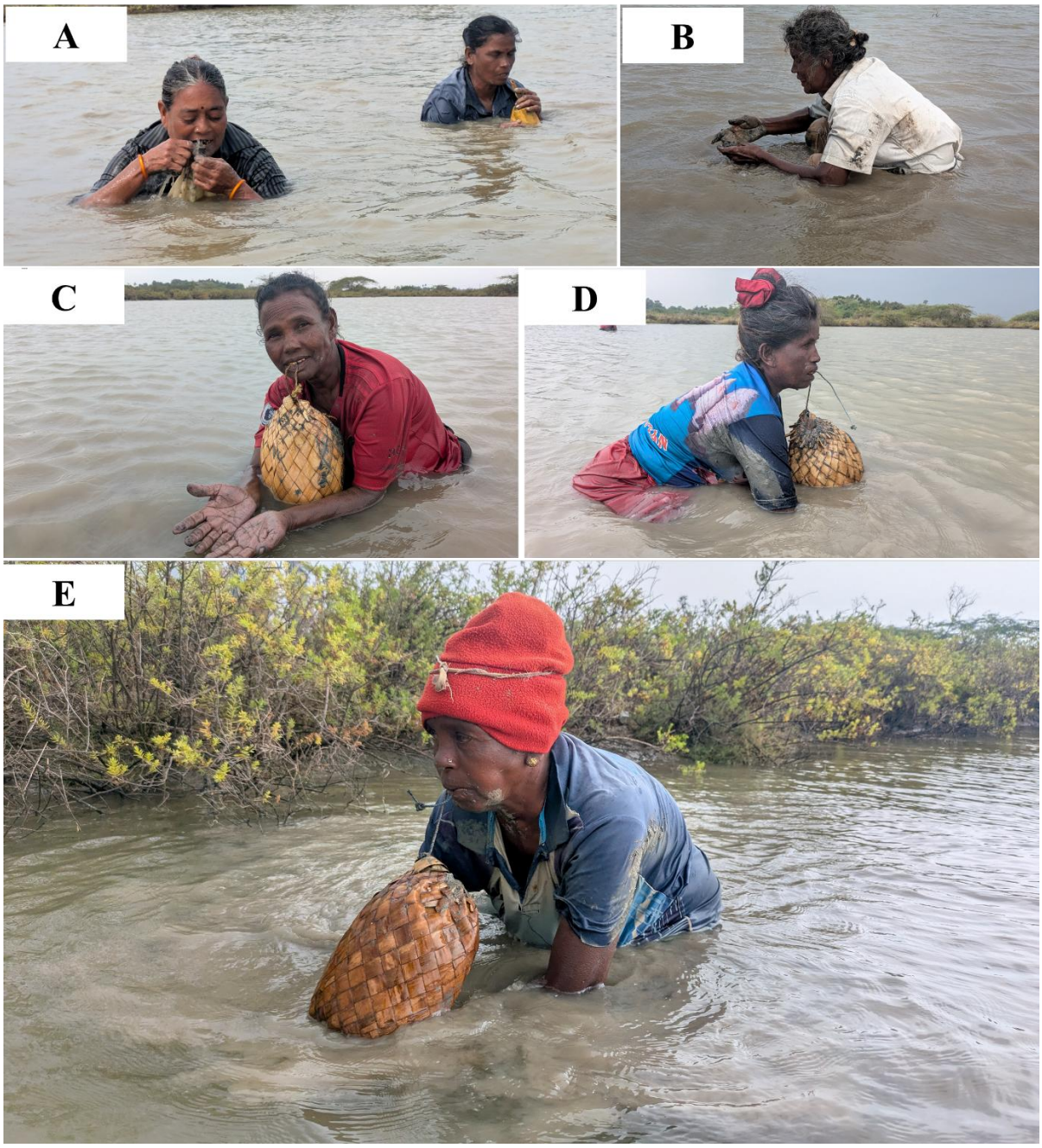

Figure 3. Female members of the tribes engaged in traditional barehand fishing activities. (A) Women partially submerged while manually probing for shrimp in shallow water. (B) Hand sorting and tactile examination of captured organisms in muddy substrates. (C) Fisher displaying harvested catch using a traditional woven basket. (D) Post-capture handling and temporary storage of catch during continued fishing. (E) Active manual searching within root-dense mangrove habitat under low-tide conditions.

4. DISCUSSION

The present study demonstrates that barehand fishing among the Irula tribe represents a highly specialized subsistence strategy rooted in embodied skills, indigenous ecological knowledge, and long-term adaptation to mangrove ecosystems. Similar observations have

been reported among traditional fishing communities in India and northeastern India, where fishing practices are strongly influenced by seasonal hydrological variations, microhabitat characteristics, and fish behavior (Hussain et al., 2016; Kechu & Pankaj, 2023; Rao et al., 2016; Bam & Nimasow, 2025). The selection of shallow creeks, root-dense habitats, and low-tide conditions by the fishers reflects an adaptive strategy aimed at maximizing fishing efficiency while minimizing physical risks, a pattern also reported in previous studies of small-scale fisheries (Eyo & Akpati, 1995; Rao et al., 2016).

Table 1. The species listed represent organisms documented during ethnographic field observations of traditional barehand fishing practices among the Irula community in the Pitchavaram mangrove ecosystem.

S. No	Scientific name	Common Name	Vernacular Name
FIN FISHES			
1.	*Himantura uarnak*	Honeycomb stingray	Thirukkai
2.	*Elops machnata*	Tenpounder	Ullahti / Ulahti
3.	*Thrysoidea macrura*	Longtail eel	Vilangu, Kulivi pambu,
4.	*Muraenesox bagio*	Pike conger	Katta-paambu meen
5.	*Stolephorus indicus*	Indian anchovy	Nethili / Kozhuva
6.	*Ilisha kampeni*	Indian ilisha	Ola meen / Kampeni
7.	*Megalops cyprinoides*	Indo-Pacific tarpon	Mooran kendai / Morankendai
8.	*Chanos chanos*	Milkfish	Paalkendai
9.	*Mystus gulio*	Estuarine catfish	Aaral / Aara
10.	*Plotosus canius*	Grey eel-catfish	Theluva
11.	*Liza parsia*	Goldspot mullet	Chirayakandai / Madavai
12.	*Mugil cephalus*	Grey mullet	Madavai meen
13.	*Strongylura leiura*	Banded needlefish	Oosi meen
14.	*Hemiramphus far*	Barred Halfbeak	Mural / Mural Meen
15.	*Platycephalus indicus*	Flathead	Tharai meen
16.	*Lates calcarifer*	Barramundi/Seabass	Koduva / Kalanji
17.	*Ambassis commersoni*	Glass perch	Kannaadi meen
18.	*Epinephelus tauvina*	Greasy grouper	Kalavaai
19.	*Epinepheluscaeruleopunctatus*	Blue-spotted grouper	Kalavaai (pulli)
20.	*Sillago sihama*	Silver whiting	Kelakkan / Kelanga
21.	*Alectis indicus*	Indian threadfin jack	Parai
22.	*Caranx sexfasciatus*	Bigeye trevally	Vellai paarai
23.	*Gnathanodon speciosus*	Golden trevally	Manjal paarai
24.	*Carangoides oblongus*	Oblong trevally	Siru-paarai
25.	*Selaroides leptolepis*	Yellowstripe scad	Choo Parai
26.	*Megalaspis cordyla*	Torpedo scad	Kilichai / Kilisai
27.	*Mene maculata*	Moonfish	Kannadi karak
28.	*Gazza minuta*	toothed ponyfish	Kaaraipodi
29.	*Gazza achlamys*	Smalltoothed ponyfish	Karal / Kaara
30.	*Leiognathus splendens*	Splendid ponyfish	Kullikarai/Podi meen
31.	*Leiognathus blochii*	Twoblotch ponyfish	Killikarai
32.	*Leiognathus dussumieri*	Dussumier's ponyfish	Verikarai
33.	*Deveximentum insidiator*	Pugnose ponyfish	Ottu Karal
34.	*Lutjanus fulviflamma*	Dory snapper	Pulli Sankara
35.	*Lutjanus johni*	Golden snappe	Karuvalai
36.	*Lutjanus lutjanus*	Bigeye snapper	Kuruvi Sankara
37.	*Lutjanus russelli*	Russell's snapper	Sankara meen
38.	*Gerres abbreviatus*	Short silver biddy	Uduvan

39.	*Gerres filamentosus*	Whipfin silver biddy	Oodan
40.	*Pomadasys maculatus*	Spotted Grunter	Korukkai
41.	*Lethrinus nebulosus*	Spangled emperor	Valameen
42.	*Eleutheronema tetradactylum*	Indian Salmon	Pozhakkala/Kaala
43.	*Upeneus sulphureus*	Yellow goatfish	Navarai
44.	*Drepane punctata*	Spotted sickle fish	Pulli Arivalmeen
45.	*Terapon jarbua*	Crescent grunter	Keechan
46.	*Terapon puta*	Spiny cheek grunter	Kovakeechan
47.	*Terapon theraps*	Tiger perch	Kutta Keetchan
48.	*Etroplus suratensis*	Pearl spot	Kari meen/Setha kutty
49.	*Oreochromis mossambicus*	Mozambique tilapia	Jilapi meen
50.	*Boleophthalmus boddarti*	Mudskipper	Chettru Uluvai
51.	*Ephippus orbis*	Batfish	Thiravi
52.	*Platax teira*	Longfin batfish	Vavval Meen
53.	*Scatophagus argus*	Spotted scat	Pulli Ilathi
54.	*Siganus canaliculatus*	Seagrass rabbitfish	Oora
55.	*Siganus javus*	Streaked rabbitfish	Ootta
56.	*Sphyraena barracuda*	Barracuda	Seela
57.	*Pampus chinensis*	Chinese pomfret	Karappuvavel
58.	*Cynoglossus arel*	Arel tongue sole	Naakku meen
59.	*Cynoglossus puncticeps*	Spotted tongue sole	Pulli naakku meen
60.	*Cynoglossus semifasciatus*	Banded tongue sole	Kodu naakku meen
61.	*Triacanthus biaculeatus*	Spined tripodfish	Mullu Klathai
62.	*Lactoria cornuta*	Horned Boxfish	Kombu pettai meen
63.	*Tetrosomus gibbosus*	Humpback boxfish	Paarai Petti Meen
64.	*Arothron immaculatus*	White-spotted puffer	Oodhu Meen
65.	*Lagocephalus lunaris*	Lunartail puffer	Pillaichai fish
66.	*Chelonodon patoca*	Milkspotted puffer	Umaththamandai
67.	*Glossogobius giuris*	Bar eyed Goby	Uluvai
SHELL FISHES			
68.	*Scylla serrata*	Gaint mud crab	Kazhi Nandu
69.	*Scylla olivacea*	Orange Mud Crab	Varu Nandu
70.	*Scylla tranquebarica*	Purple Mud Crab	Settru Nandu
71.	*Portunus pelagicus*	Blue swimming crab	Olakkal Nandu, Neela nandu
72.	*Portunus sanguinolentus*	Three spot swimming crab	Mukkannu nandu, Kaan Nandu
73.	*Portunus reticulatus*	Reticulate swimming crab	Nila Nandu
74.	*Charybdis feriatus*	Crucifix crab	Siluvai Nandu
75.	*Charybdis natator*	Ridged swimming crab	Vari Nandu
76.	*Charybdis lucifera*	Portunid crab	Karu nandu
77.	*Charybdis annulata*	Banded legged swimming crab	Santharu Nandu
78.	*Sesarma brockii*	Mangrove crab	Pachai Nandu
79.	*Thalamita crenata*	Mangrove Swimming Crab	Keeri crab
80.	*Pseudosesarma edwardsii*	Tree climbing crab	Marameri Nandu
81.	*Parasesarma bengalense*	Bengal mangrove crab	Kandal Nandu
82.	*Pseudohelice annamalai*	Annamalai estuarine crab	Thillai Nandu, Parangipettai nandu
83.	*Fenneropenaeus indicus*	White Shrimp	Vella Eral
84.	*Penaeus monodon*	Giant Tiger Prawn	Puli Eral
85.	*Penaeus semisulcatus*	Green Tiger Shrimp	Pachai Vari Eral

86.	*Metapenaeus dobsoni*	Kadal Shrimp	Chemakkara Eral
87.	*Metapenaeus monoceros*	Speckled Shrimp	Valucha Eral
88.	*Macrobrachium rosenbergii*	Giant Freshwater Prawn, Scampi	Aattu Eral
89.	*Macrobrachium equidens*	Rough River Prawn	Kooni Eraal, Aathu Eral
90.	*Macrobrachium idella*	Slender River Prawn	Aattuperal Eral
91.	*Acetes japonicus*	Akiami Paste Shrimp	Kooni Eral, Sodi Eral
92.	*Acetes sibogae*	Alamang Shrimp	Podi Eraal, Chinna Eral
93.	*Acetes indicus*	Jawla Paste Shrimp	Chenna Kunni Eral
94.	*Anadara (Tegillarca) granosa*	Blood cockle	Ratha Matti, Kali Matti
95.	*Meretrix casta*	Painted hard clam	Matti, Kakka
96.	*Meretrix meretrix*	Asiatic hard clam	Matti, Vari matti
97.	*Sunetta scripta*	Scribbled sunetta	Kadal kakka, Vazhukku matti
98.	*Sunetta meroe*	Pure Sunetta	Aazhi Matti
99.	*Katelysia opima*	Baby clam	Matti, Kakkaivai
100.	*Paphia textile*	Textile venus clam	Kliinjal Matti
101.	*Paphia malabarica*	Malabar venus clam	Vella aali, Matti
102.	*Donax scortum*	Asian wedge clam	Vettukkili Matti,Matti
103.	*Donax cuneatus*	Triangular wedge clam	Kadal mookku matti
104.	*Donax faba*	Bean donax	Kozhi Sippi, Matti
105.	*Donax spinosus*	Spiny donax	Korukkai, matti
106.	*Modiolus metcalfei*	Yellow banded horse mussel	Kaaka Achi, matti
107.	*Perna viridis*	Green mussel	Pachai Sippi, Pachai Matti
108.	*Mytella strigata*	Charru mussel	Kaaka Matti, Kaaka Aazhi
109.	*Perna indica*	Brown Mussel	Kadalaka, sippi

The observed gender-specific roles are consistent with ethnographic accounts of indigenous fishing communities where labor division is shaped not only by gender but also by physical demands, resource availability, and household responsibilities (Hussain et al., 2016; Ovung et al., 2022). Male fishers generally undertake activities in deeper and more physically demanding areas, whereas women predominantly engage in fishing activities within relatively shallow and less challenging microhabitats (Imchen & Joglekar, 2017). Such labor distribution reflects an adaptive mechanism that optimizes household participation and resource utilization.

Barehand fishing, as documented in the present study, appears to have relatively lower ecological impacts and aligns with broader characteristics of indigenous fisheries, which are often associated with selective harvesting methods, low energy requirements, and the use of non-invasive and environmentally sustainable practices (Raju et al., 2016; Dutta et al., 2019; Dominic & Ramanujam, 2012). Previous studies have emphasized the role of indigenous ecological knowledge in biodiversity conservation and ecosystem governance (Nakashima et al., 2012; Ban et al., 2018; Artelle et al., 2019; Björkvik et al., 2021). Therefore, documentation of such indigenous practices contributes not only to the preservation of cultural heritage but also provides valuable insights for sustainable fisheries management and conservation planning.

Despite these ecological and cultural advantages, barehand fishing poses substantial occupational health risks to fishers. The occurrence of cuts, puncture wounds, injuries, microbial infections, musculoskeletal disorders, and occasional envenomation reported in this study is consistent with findings from other studies involving physically demanding indigenous fishing practices (Ovung et al., 2022; Bam & Nimasow, 2025). Prolonged exposure to contaminated water, repetitive body postures, and direct contact with rough substrates increase vulnerability to skin-related and musculoskeletal disorders, particularly in the absence of protective equipment (Velvizhi & Gopalakrishnan, 2017; Venugopal et al., 2024).

The normalization and acceptance of occupational hazards within indigenous communities, coupled with limited awareness regarding long-term health consequences, may contribute to underrecognized and cumulative health burdens among fishers. Such challenges are not unique to the present study area but are commonly reported among fishing communities engaged in informal and subsistence-based economies (Ovung et al., 2022). Consequently, interventions aimed at improving occupational health should adopt culturally sensitive approaches that integrate traditional practices rather than relying solely on external technological solutions.

From a governance perspective, incorporating indigenous knowledge systems into fisheries management frameworks can improve the legitimacy, effectiveness, and sustainability of resource management strategies (Ban et al., 2018; Artelle et al., 2019; Ovung et al., 2022). Ethnographic investigations can play a crucial role in recognizing indigenous communities as custodians of ecological knowledge and informing conservation initiatives in mangrove ecosystems. Future studies should focus on quantifying injury prevalence and health outcomes, while also evaluating the effectiveness of preventive measures under emerging pressures such as environmental change and occupational transitions.

5. CONCLUSION

This study documents the traditional practice of barehand fishing among the Irula community of the Pitchavaram mangrove ecosystem, highlighting its dependence on indigenous ecological knowledge, specialized tactile skills, and adaptive strategies developed in response to dynamic tidal and environmental conditions. The practice serves as an important subsistence activity and reflects the close interaction between local communities and their surrounding ecosystems. Although barehand fishing possesses cultural significance and demonstrates relatively low ecological impact, it also exposes fishers to multiple occupational health risks, including injuries, bites, infections, musculoskeletal strain, and other physical health complications associated with prolonged exposure to muddy and tidal environments. These findings emphasize the need to preserve indigenous knowledge systems while promoting culturally appropriate occupational health and safety measures to improve the well-being of traditional fishing communities.

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Author Contributions

This manuscript has been read and approved by all the authors. Each of the authors believes that this manuscript represents honest work done by us.

Informed consent

Not applicable.

Conflicts of interests

The authors declare that they have no conflicts of interest, competing financial interests or personal relationships that could have influenced the work reported in this paper.

Ethical approval & declaration

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Data and materials availability

Every data that supports the findings of this research are embedded in the manuscript.

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