



International Journal of Research Publication and Reviews

Journal Homepage: www.ijrpr.com ISSN 2582-7421

Spatial Pattern of Fish-Catching Techniques in Major Eastern Coastal States of India

Gulafshan, Tariq M. Usmani, Baby Neehat

Aligarh Muslim University

ABSTRACT

Over 77% of global fish production is now used for direct human consumption. India is third in fish production. In India, fish consumption is an important sector. It contributes about 6.3% of global fish consumption, significantly impacting the Indian economy. Fish have been the primary source of food since primitive times. Techniques for capturing fish vary depending on the species but have changed little over the centuries. Today, traditional methods coexist with industrial techniques, with nets, traps, and fishing rods being widely used. Major fish-producing regions are located on coasts, rivers, lakes, and ponds. These are essential sources for fish production in India's major eastern Coastal areas like Andhra Pradesh, West Bengal, Tamil Nadu, etc. Fish capturing techniques vary with different fish species. The present paper attempts to explain all fish-catching techniques in other eastern coastal states of India. Because India is a large country, it has climatic variability over different places, which affects the types of fish, and the amount of production for that fish-catching technique also varies. We will find standard fishing techniques, such as gill net, net fishing, Thermocol raft, fishing gears, hook and line, box traps, etc. The nature of the topic is theoretical and descriptive. The work is based on secondary data source. The data was collected from secondary sources like google.com, wikipedia.com, research gate, and books by various authors, such as Richard, Thomas J., Menu Tan War, and different research papers.

KEYWORDS: Eastern Coastal regions, Fish species, Fish production and consumption, Fish-catching techniques, Fishing challenges and issues, Secondary data sources.

Introduction

Fish is one of the most essential food Resources. Over 77% of global fish production is now used for direct human consumption—a significant increase from the past decade. Initially, fish consumption primarily involved fresh fish, followed by processed products like canned fish. While a large portion is consumed directly, some fish is also processed into fishmeal and fish oil. Fisheries and aquaculture are essential food-producing sectors in India; they provide nutritional security to the food basket, contribute to agricultural exports, and engage The fisheries sector supports 14 million people engaged in various activities, utilizing diverse resources ranging from deep seas to mountain lakes. Since independence, the country has experienced continuous and sustained growth in fish production, contributing about 6.3% of global fish production. The sector accounts for 1.1% of the Gross Domestic Product (GDP) and 5.15% of agricultural GDP. Currently, total fish production stands at 10.1 million metric tons, with nearly 65% coming from the inland sector and a similar proportion from culture fisheries. India's fisheries sector plays a vital role in the country's economy, generating valuable foreign exchange and providing employment to millions. It also serves as a crucial livelihood source for a significant portion of the economically disadvantaged population. Fisheries are an integral part of India's local economy, making the country the fourth-largest producer of fish globally and the second-largest in inland fish production. India's share in global fish production has risen from 3.2% in 1981 to 4.5%, highlighting the sector's growing significance. As a result, fisheries hold a key position in India's socioeconomic development.

The Indian fisheries and aquaculture are necessary sectors of agriculture. arp is the most important freshwater species farmed in India, while shrimp from the brackish water sector contributes significantly to overall production. The three major Indian carp—**catla** (*Catla catla*), **rohu** (*Labeo rohita*), and **mrigal** (*Cirrhinus mrigala*)—account for **over 90% of total Indian aquaculture production**. Among catfish, the **Philippine catfish**, known as *magur* (*Clarias batrachus*), has received considerable attention, while the **stinging catfish**, *Singhi* (*Heteropneustes fossilis*), is cultivated to some extent in swamps and derelict water bodies, particularly in the eastern states. The leading fish-producing states on India's eastern coast are Andhra Pradesh, West Bengal, and Tamil Nadu. To examine the primary techniques used for fish capture in the central-eastern coastal states of West Bengal, Andhra Pradesh, and Tamil Nadu. To analyze the significant challenges in fish catching within these regions.

Study area:

The study areas are major fish-producing areas of eastern coastal states, including Tamil Nadu, Andhra Pradesh, and West Bengal (Fig. 1). Andhra Pradesh: Andhra Pradesh is India's leading fish-producing region at 34.5%. Therefore, The climate is a key factor influencing the state's surface and

groundwater potential, as well as its overall water yield.. As per the 2018 reports, AP led 34.54 lakh tons of total fish production.^[2] **West Bengal** is a state in eastern India, situated between the Himalayas and the Bay of Bengal. Despite having a relatively short coastline of approximately 64 km, it is the second-largest fish-producing state in India, contributing 18.42% to the country's total fish production..^[3] **Tamil Nadu**: Tamil Nadu enjoys prominence in commercial fish production and farming. Fish like Rohu, Snakehead, Catla, and Tilapia are in demand from here. The total output from Tamil Nadu is about 8.82 lakh tons.^[4]

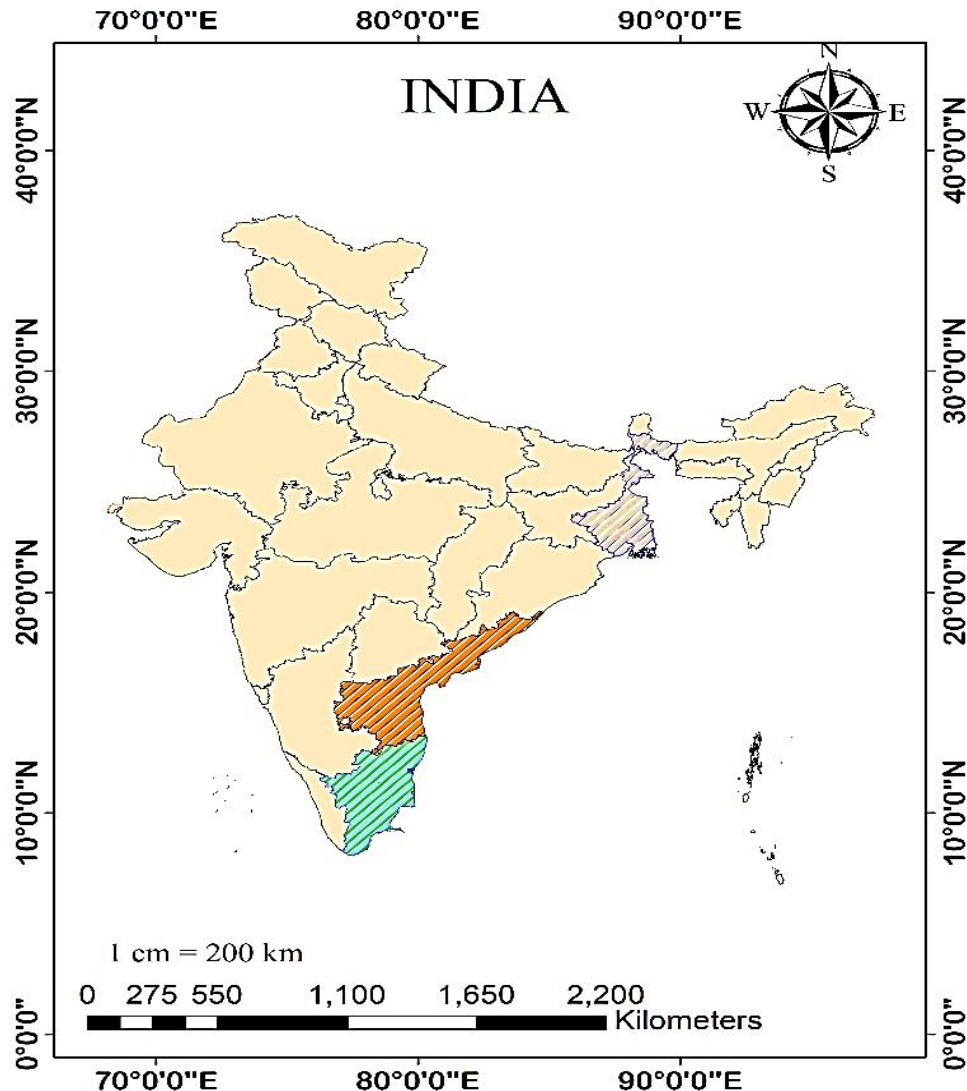


Fig.1 Locational Map of the Study Area

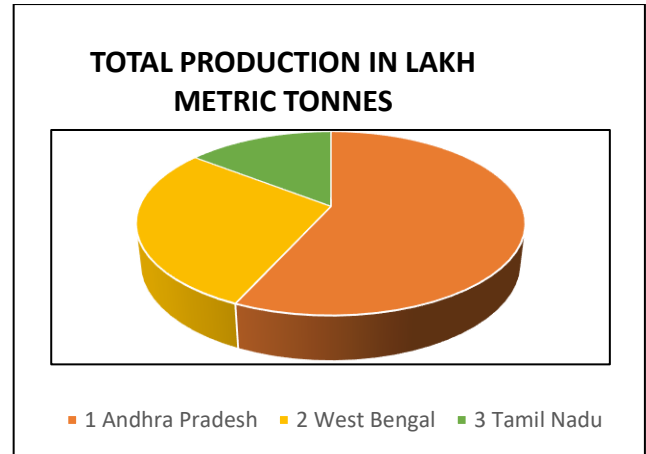
Data sources and methodology:

The present paper is secondary source data based. The topic is "Spatial pattern of fish catching techniques in eastern coastal states of India," and the nature of the subject is theoretical and descriptive. The data was collected from secondary sources like google.com, wikipedia.com, research gate, and books by various authors, such as Richard, Thomas J., Menu Tan War, and different research papers.

Major Fishing Regions In Eastern Coastal States Of India: ^[4]

Fishing is the staple diet of many parts of India, and fish consumption is high. Thus, we have a list of three central fish-producing states in eastern India that will help you understand why people consume it. Fish consumption has various health benefits, and most people's diet depends on fish consumption. West Bengal, Andhra Pradesh, and Tamil Nadu are central fishing-producing states in eastern India. Andhra Pradesh, West Bengal and Tamil Nadu.

	STATES	TOTAL PRODUCTION (LAKH METRIC TONS)
1.	Andhra Pradesh	34.5
2.	West Bengal	17.42
3.	Tamil Nadu	8.82



Andhra Pradesh Lake Koleru.

Andhra Pradesh is the fourth-largest state in India by area, covering 275,845 km² of India's total area of 3,287,250 km², and the fifth-largest by population, with 84,655,533 people out of a total of 1,210,193,422. Like many other Indian states, it is home to numerous rivers, with the Godavari and Krishna rivers being key contributors to the state's fish production. The state's groundwater resources, surface water, and climate all play a significant role in its fishing industry, with the climate alone contributing 34.5% to the sector. ^[2]

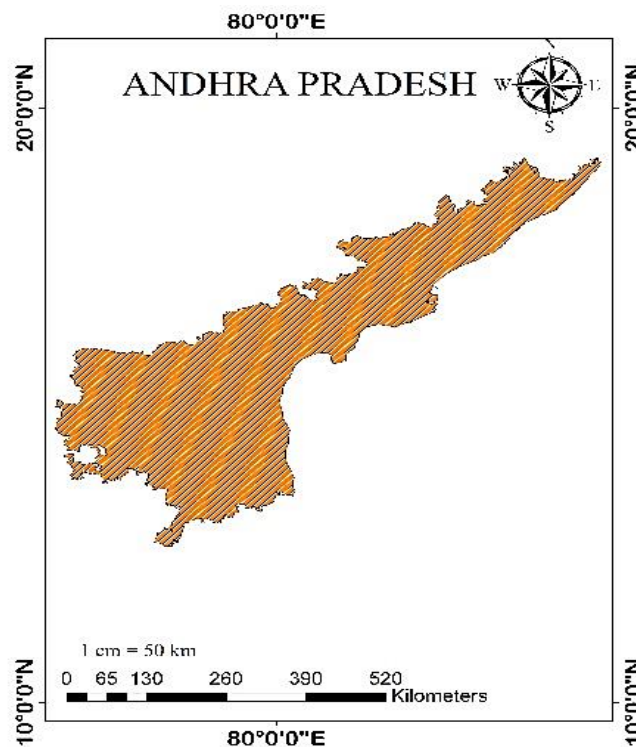


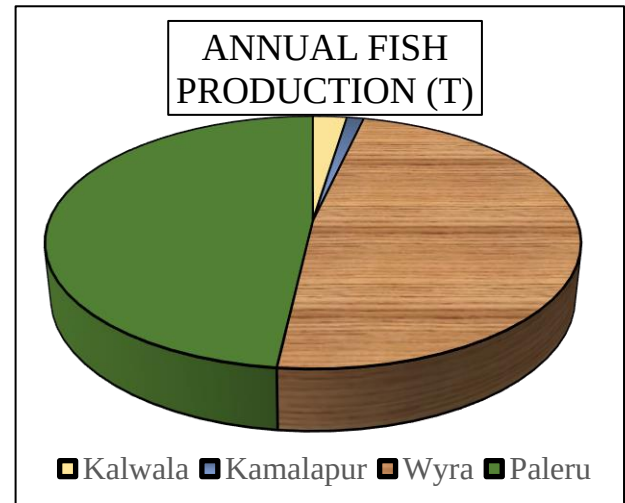
Fig. 2 Map of Andhra Pradesh

Major Fishing Regions of Andhra Pradesh

Total length of Andhra Pradesh is 7,516 kilometers of India's coastline; the mainland coastline length is about 5,422 kilometers. With a 1,214.7 kilometers-long coastline, which is approximately 23% of the country's total mainland coastline ^[2], Andhra Pradesh boasts the second-longest coastline in India, stretching 974 km along the eastern peninsular coast, which accounts for 12% of the country's total coastline. The state is equipped with a significant number of water bodies, including 98 small reservoirs, 2,800 tanks, 32 medium reservoirs, and seven large reservoirs, totaling a surface water area of 458,507 hectares. Among these, Visakhapatnam district has the highest number of reservoirs, with 20, followed by Rangareddy, Prakasam, Nellore, and Karimnagar districts, each with 10 reservoirs. ^[14]

		ANNUAL FISH PRODUCTION (T)
1	Kalwala	3.0
2	Kamalapur	1.5
3	Wyra	60.0
4	Paleru	60.0

Table 2. Reservoirs of Andhra Pradesh



Primary Fishing Techniques Use In Andhra Pradesh Lake Koleru ^[5]

A. Fishing Craft

Fishing craft used in traditional and local practices exhibit a variety of innovative designs, each tailored to its specific environment. One such craft is the **Dhoni**, a long dug-out canoe, made from the basal part of a Palmyra tree trunk, is locally known as “**Thati Dhoni**.” It measures approximately 3 to 4 meters in length, with an internal diameter of 0.5 meters. The trunk is longitudinally scooped out to create space for seating and storing the captured fish. Another commonly used craft is the **Plank-built boat**. The Plank-built boat is spindle-shaped and constructed by joining high-quality wooden planks with iron nails. To ensure the joints are leakproof, coal tar is applied, making these boats reliable for rowing. They come in both small and large sizes and are widely used on lakes. Additionally, **Thermocolrafts** offer a simple yet effective design. These rafts are particularly popular among children aged 10 to 15 years. They are made by tying together thermocol boxes and slices with nylon ropes to create a platform approximately 4 to 5 meters long and 1 meter wide. Lightweight and easily maneuverable, these rafts are primarily used for setting and collecting traps, transporting catch, and capturing fish near the lake shore. Together, these fishing crafts exemplify the resourceful and adaptive techniques employed in local fishing practices.

B. Fishing Gear

Fishing in Lake Kolleru is a longstanding tradition, employing a range of indigenous techniques adapted to the lake’s unique ecological conditions and diverse fish species. One of the oldest methods is **Galamu (Hook and Line)**, where fishermen use bait tied to a metal hook attached to a strong nylon thread, with the other end connected to a bamboo pole. This technique is primarily used for subsistence fishing, providing food for the fishermen's families. Another method, **Dadikattu (Fish Screens)**, Fishing in Lake Kolleru is a longstanding tradition, practiced between October and February when the water level is high. It employs a range of indigenous techniques adapted to the lake’s unique ecological conditions and diverse fish species. One common method involves constructing a bamboo screen, approximately 100 meters long, across the lake, with traps set in rows on either side to catch fish effectively. A common fishing device in the region is the **Mavu (Box Trap)**, which entices fish into an enclosure designed to guide them into the trap. Variations of the box trap include **Moora Bethu Mavu**, a significant type with vertical openings along its height, and **Ingilayi Mavu**, which targets smaller fish with a modified design. Another method, **Odhe (Cover Basket)**, involves a conical bamboo basket used in shallow waters during dry seasons when water levels are minimal. Its design allows for efficient fish trapping by covering them in restricted spaces. More substantial fishing gear includes the **Lagudu Vala (Drag Net)**, is another widely used technique which is highly effective for capturing schools of wild fish. This method involves encircling specific lake regions and dragging the net to gather fish, making it particularly suitable for large water bodies like Lake Kolleru. Lastly, the **Moppa Vala (Gill Net)** is a passive, rectangular fishing gear used in both shallow and deep regions of the lake. Smaller gill nets are set in water depths of 1–2 meters, while larger ones are deployed in deeper areas ranging from 2 to 4 meters. These traditional fishing techniques reflect the rich heritage and adaptive strategies of local fishing communities.

C. Indigenous Fishing Methods Used For Fishing In Lake Kolleru ^[5]

Traditional fishing methods in Lake Kolleru reflect the ingenuity and adaptability of local communities. One of the oldest techniques is **Grouping (Hand-Picking)**, practiced during the summer in shallow waters where the lake's depth is less than 0.5 meters. With skill and practice, fishermen catch fish directly with their hands, requiring no tools or devices. Another seasonal method, **Doddi Fishing (Dewatering)**, is conducted during the dry season. Fish congregate in deeper "doddi" areas of the lake, making it easier for fishermen to capture them, often by hand-picking the remaining fish after partial dewatering. **Kampagudu**, a Fish Aggregating Device (FAD), is an innovative approach that attracts and aggregates fish, facilitating efficient harvesting. This method enhances resource management by aligning fish harvesting with market demand, thereby increasing catch rates, reducing production costs, and supporting resource sustainability. Another indigenous technique, **Gaya**, is particularly suitable for summer when water levels decrease. In this

method, motor pumps are used to dewater larger and deeper areas of the lake, allowing fishermen to harvest fish throughout 30 to 45 days. These time-tested methods highlight the resourcefulness of the fishing communities in optimizing their practices to suit environmental and market conditions.

West Bengal:

West Bengal, located in eastern India between the Himalayas and the Bay of Bengal, is one of the most densely populated states in the country. Despite having a relatively short coastline of approximately 64 km, the state boasts an extensive network of inland water bodies that support both capture and culture fisheries. Around 85,000 fishermen rely on marine fishing, either wholly or partially, for their livelihood in two coastal districts. West Bengal contributes approximately 18.42% of India's total fish production.^[3]



Fig. 4 Map of West Bengal

Primary Fish-Catching Techniques Used In West Bengal.^[6]

Traditional fishing practices in India showcase a rich diversity of techniques and gears, each uniquely designed to suit specific aquatic environments and fish species. One of the most common gears is the **Berjal**, a nylon net used during the harvest of stocked fishes such as Indian major carps (*Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*) and exotic carps (*Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, *Cyprinus carpio*). This method also catches smaller species like *Parambassis ranga* and *Chanda nama*, with yields ranging from 200 g to 1 kg per day. Another popular gear is the **Cast Net (Khapla Jal)**, a falling net used in vegetation-free or open areas, especially during monsoons, with catches up to 20–30 kg daily.

The **Push Net (Khuchni Jal)** is simple yet effective for capturing small fish in weed-infested shallow waters. It features a triangular bamboo frame with a fine-meshed net and operates year-round. Similarly, **Hook and Line (Borshi)** involves hand line fishing using a nylon or cotton twine attached to a flexible bamboo rod with a baited hook. The **Lantern Net (Chak Jal)**, a conical net fitted inside a bamboo frame, and the **Lift Net (Bhasal Jal)**, a square nylon net attached to crossed bamboo frames, are also commonly used, the latter manually operated for catches in shallow waters.

Traps like the **Cover Pot/Plunge Basket (Polo)** and **Box Trap (Ghuni)** are ingeniously designed using bamboo and coir or nylon threads. The bell-shaped *Polo* trap is ideal for capturing fish by hand, while the rectangular *Ghuni* box trap features openings that guide fish inside. Similarly, the **Spindle Trap (Chai)**, spindle-shaped and anchored below water, is effective for prawns and small fish when set in series.

The **Gill Net (Phasa Jal)** is a long wall of nylon netting with panels suspended between floats and sinkers, operated overnight by one or two fishermen. The **Dhaon Borshi** is a drifting long line with multiple hooks suspended from wooden floats, enhancing efficiency for larger-scale fishing. These indigenous fishing methods, tailored to the behavior of fish and the characteristics of water bodies, highlight the expertise and resourcefulness of traditional fishing communities in sustaining livelihoods and preserving their heritage.

TAMIL NADU

Tamil Nadu is located in the southeastern part of the Indian Peninsula, bordered by Karnataka and Andhra Pradesh to the north, the Bay of Bengal to the east, the Indian Ocean to the south, and Kerala to the west. The state can be broadly divided into two natural regions: 1. The coastal plains of South India. 2. The hilly western region. The coastal plains form a broad strip of land that runs parallel to the coast, gradually rising inland. Tamil Nadu's coastal region is further subdivided into the Coromandel Plains, which include the districts of Kancheepuram, Thiruvallur, Cuddalore, and Vellore. The state has 13 coastal districts, 25 coastal blocks, and 591 marine fishing villages, with Nagapattinam being one of its key coastal districts.^[7]



Fig 4 Map of Tamil Nadu

Major Fishing Regions In Tamil Nadu^[7]

Tamil Nadu has a significant number of marine and inland fishing villages, particularly in the coastal blocks of Sirkazhi and Keelaiyur. This study was conducted in these two blocks, located in the Nagapattinam district of Tamil Nadu. Three coastal towns—Agara Perunthottam, Nayyarakuppam, and Vellapallam—were selected for the study based on their fish production levels.

Major Fishing Techniques Use In Tamil Nadu^[7]

Six traditional fishing practices were documented in the three villages of Nagapattinam district. Pair, Katcha, Ootha, and Sorati are primarily used for inland fishing, while Catamaran is employed in marine fisheries. In **Remand (Muthupet village)**, two traditional fishing methods—**Catamaran** and **Karaivalai**—were recorded.

Traditional fishing techniques in India utilize a range of innovative tools made from natural and locally available materials, reflecting the ingenuity and resourcefulness of fishing communities. The **Pari** is an indigenous bamboo fishing basket with two openings: a wide top opening, approximately 45 cm in diameter, and a partially closed bottom with a small hole. Designed for placement in flowing water, it allows fish to jump into the basket and enter the

bottom portion through small holes. Similar in design but used in rice fields, the **Katcha** is another conical bamboo basket. Unlike the *Pari*, it has a single opening for fish entry and no bottom opening, making it ideal for fish collection in shallow, stagnant waters.

The **Ootha**, also conical-shaped and crafted from thin bamboo sticks tied around a 15 cm iron ring, is versatile and effective in running and stagnant water bodies, featuring broad and small round openings. **Sorati** is utilized for crab collection in rice fields. This tool combines an iron rod with a cycle pedal handle to disturb crab nests, prompting the crabs to emerge for manual collection.

The **Karaivalai**, a traditional coir fishing net, is commonly used in marine settings. It consists of three components: *Boya (buoy)*, *puri* (net), and stones for weighting. The *boya* floats atop the net while the stones keep it submerged. This net is typically employed up to 1 km into the sea and is left for about an hour before retrieval, with fishermen venturing out in the morning for its use. These traditional methods, adapted to diverse environments, reflect local fishing communities' sustainable practices and cultural heritage.

Significant Issues Faced In Fish Catching: ^[8]

Marine systems today face several challenges that impact fish production, exploitable stocks, global biodiversity, trophic structures, habitat quality, and the local composition of fish communities. These issues stem from both direct exploitation, affecting fish, habitats, and other organisms, as well as from broader environmental factors linked to the atmospheric, terrestrial, and coastal environments. In freshwater ecosystems, significant concerns include flow regulation and obstruction by dams, catchment fragmentation, pollution, habitat alterations, management issues, and the introduction of exotic fish species. Additionally, changes to nursery areas for rearing fish exacerbate these problems, threatening the health and stability of freshwater fish populations.

Problems of exploitation

Data from the Food and Agriculture Organization of the United Nations (FAO) indicates that 47% of fish stocks are already exploited to their maximum sustainable limits. In comparison, 18% are reported as over-exploited, and 10% have been depleted. These statistics underscore the FAO's clear call for a reduction in fishing pressure on a significant portion of the world's fisheries to ensure their long-term sustainability.

Problems in fisheries due to environmental change

As in many places, the environment is not stable, occupied by fish, but characterized by natural and anthropogenic changes. Variation in the natural environment challenges fishery managers; for example, El Nio events in the Pacific have significantly impacted fisheries. It has anthropogenic effects on fisheries. Issues of environmental change have an impact on the whole field of fish exploitation, conservation, restoration, and management. For example, since most fish species occur in waters on the continental shelves, many feed or breed in shallow marine environments where climate affects them. Climate is already recognized as one of the strongest influences on the growth, assemblage composition, and abundance of juvenile fish during their residency in estuarine or coastal waters, with consequences for recruitment, production, and nutrient flux.

Exotic fish introductions – accidentally and on purpose

Exotic fish species cause various problems. Fish can cause applied ecological issues, particularly as alien species. Fishes have sometimes been accidentally introduced outside their normal range, for example, in ship ballast, while purposeful introductions are more common. The intentions for introducing exotic fish are biocontrol, aquaculture, addition to recreational fisheries, use as bait, and the release of former companion animals.

Unfavorable habitat and fragmentation

Compounding the potentially harmful effects of Unfavorable habitat and fragmentation changes in habitat character also has significant implications. In freshwater flow regulation, insensitive catchment management and alterations to riparian or in-river habitats are perceived As dominant sources of change. In addition, some barriers, such as dams, can remove, fragment, and isolate fish populations and affect survival and fitness by disrupting the typical patterns of migration of fishes. The exploited water resources will increasingly affect some geographical regions rich in aquatic species but currently poorly known ecologically. Alterations in river discharge and sediment transport have consequences for near-shore marine systems.

Conclusion:

The above studies show that fish-catching techniques in all three states (Andhra Pradesh, West Bengal, Tamil Nadu) of the Eastern coastal plain of India use different fish-catching methods. They do not use a similar process except for some standard techniques, such as the Gill net and box trap. the spatial patterns of fish catching techniques in the eastern coastal states of Tamil Nadu, Andhra Pradesh, and West Bengal exhibit notable differences, shaped by regional ecological conditions, cultural practices, and socio-economic factors. **Tamil Nadu** relies heavily on both marine and inland fishing methods, with a diversity of traditional techniques such as the use of catamarans for marine fisheries and various bamboo-based gear for inland fishing, reflecting the state's extensive coastline and rich fishing heritage. **Andhra Pradesh** features a combination of inland and coastal fishing practices, with a focus on techniques suited to the unique conditions of the Krishna and Godavari river deltas, where both freshwater and brackish water fisheries thrive. **West Bengal** showcases a distinct approach, heavily influenced by its vast network of inland water bodies and short coastline. The state's reliance on fish capture from its estuarine regions and the use of passive fishing methods like gill nets and traps are more prominent. These regional variations in fish catching techniques illustrate the adaptive strategies employed by local fishing communities in response to the diverse aquatic ecosystems along India's eastern coast, highlighting the importance of preserving these traditional practices for sustainable fisheries management.

References

- Dr. C. Thomson Jacob, Dr. V.V Sagun, Dr. B. Meenakumari... Indian Council for Agricultural Research, New Delhi.
- K. N. Prudhvi Raju, K. N. Prudhvi Raju, Shraban Sarkar.....(2014), Spec.Publ.Geol.Soc.India, NO.3, 2014, Surface Water Resources and River Systems of Andhra Pradesh Department of Geography, Faculty of Science, Banaras Hindu University, Varanasi – 221 005.
- Bay of Bengal program for fisheries development in Madras, „India November 1990; www.adamrains.com/wp-content/uploads/indiawire.png
<https://theindianblog.in/top-10-states-india/top-10-fish-producing-states-in-india/>
- C.H. Sebastian Raju, J. Chandra Sekhara Rao, K. Govinda Rao... (2016) Fishing methods, use of Indigenous knowledge and traditional practices in fisheries management of Lake Kolleru, Journal of Entomology and Zoology Studies; 4(5): 37-44
- K. M. Sandhya, Aparna Roy, M. A. Hassan (2019) Traditional Fishing Gears, Fish Catch and Species Composition of Selected Floodplain Wetlands of Lower Gangetic Plains, West Bengal, India Article; <https://www.researchgate.net/publication/332631090>
- Rathakrishnan, Ramasubramanian, Anandaraja... Traditional fishing practices followed by fisher folks of Tamil Nadu, Indian Journal of Traditional Knowledge Vol. 8 (4), October 2009, pp. 543-547
- S. J. ORMEROD* Current issues with fish and fisheries: editors overview and Introduction, Journal of Applied Ecology 2003 40,204–213