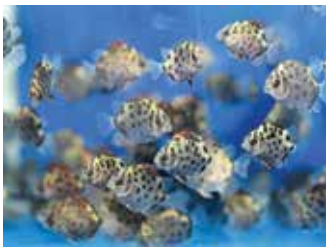
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Editor,
Fish Tech Digest



From the desk of Dean…

Dear esteemed Authors and Readers

It gives us immense pleasure to present this special issue of Fish Tech Digest, dedicated to the fisheries wealth, aquatic ecosystems, and coastal communities of Kanniyakumari District. Located at the southernmost tip of India, Kanniyakumari is blessed with diverse marine and inland aquatic resources that support livelihoods, biodiversity, and economic development.

This issue features insightful articles on the Ramsar wetlands of Vembannur and Suchindram–Theroor, the rich seaweed resources of Cape Comorin, and the vital role of Thengaipattinam Fishing Harbour in the marine fish export chain and coastal economy. Together, these contributions highlight the district's unique ecological and fisheries significance.

We are particularly pleased to showcase articles contributed by the faculty and students of St. Devasahayam Institute of Fisheries Science and Technology (DIFST), reflecting the institution's commitment to fisheries education, research, innovation, and sustainable development.

As the Blue Economy gains momentum, Kanniyakumari stands as a model where natural resources, traditional knowledge, scientific research, and community participation converge to create opportunities for sustainable growth. We hope this issue inspires readers to appreciate, conserve, and responsibly utilize these valuable aquatic resources for future generations.

I extend my heartiest congratulations to all the authors for their invaluable contributions. Your insights significantly enrich our collective academic knowledge and will undoubtedly inspire future research pathways. I trust that this issue of Fish Tech Digest will serve as a highly inspiring and practical resource for you all, as we continue to uphold our institutional benchmark for excellence in fisheries education, research, and community extension.

Best regards,
Prof. S. Felix
Chief Editor
Fish Tech Digest

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Ramsar Wetlands of Kanniyakumari: Fisheries and Ecological Perspectives

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Abstract

Wetlands are among the most biologically productive and ecologically significant ecosystems on Earth, yet they remain among the most threatened. Kanniyakumari District, situated at the southernmost tip of India where three major water bodies converge, hosts two internationally recognized Ramsar sites the Vembannur Wetland Complex and the Suchindram Theroor Wetland Complex both designated in 2022. This article presents a comprehensive perspective on the ecological characteristics, fish diversity, water quality parameters, biodiversity, and socio-economic significance of these two wetlands. A comparative analysis reveals that while Vembannur functions as a small, seasonally dynamic irrigation tank with moderate fisheries potential, the Suchindram Theroor Complex is a large, perennial, multi-reservoir system supporting approximately 40 fish species and serving as a globally significant wintering ground along the Central Asian Flyway. Both wetlands sustain rural livelihoods through irrigation, fisheries, and aquatic resource utilization, while facing escalating threats from pollution, encroachment, and climate variability. The study underscores the urgent need for community-based conservation, scientific fisheries management, and integrated policy frameworks to ensure the long-term ecological integrity and livelihood security these wetlands provide.

Keywords: Ramsar sites, Kanniyakumari, Wetland fisheries, biodiversity and Sustainable livelihoods.

Introduction:

Wetlands are among the most productive ecosystems on Earth, playing a vital role in maintaining ecological balance, supporting biodiversity, and providing livelihoods. Recognizing their global importance, the Ramsar Convention was adopted in 1971 for the conservation and wise use of wetlands. India, as a signatory to the convention, has made significant progress in wetland conservation. **As of February 2026, India has 98 designated Ramsar sites**, the highest in Asia, covering over **1.36 million hectares**. This remarkable growth from just 26 sites in 2013 reflects the country's strong commitment to environmental protection and sustainable development. Recent additions include wetlands such as **Patna Bird Sanctuary (Uttar Pradesh)** and **Chhari-Dhand (Gujarat)**, highlighting the ecological diversity across regions. Among Indian states, **Tamil Nadu holds the highest number of Ramsar sites**, emphasizing its rich wetland diversity,

especially in coastal and inland ecosystems. These wetlands are crucial habitats for migratory birds along the Central Asian Flyway and support a wide range of aquatic flora and fauna. Important sites in Tamil Nadu include **Gulf of Mannar Biosphere Reserve**, **Vedanthangal Bird Sanctuary**, **Point Calimere Wildlife and Bird Sanctuary**, and **Pallikaranai Marsh**.

Ramsar Wetlands in Kanniyakumari

Kanniyakumari district, located at the southernmost tip of India, is ecologically unique due to the confluence of the **Arabian Sea, Bay of Bengal, and Indian Ocean**. The district supports diverse ecosystems, including wetlands, estuaries, and coastal habitats.

Notably, Kanniyakumari hosts **two Ramsar sites designated in 2022**:

- **Vembannur Wetland Complex** – The first Ramsar site in the district, important for irrigation, groundwater recharge, and bird habitats.

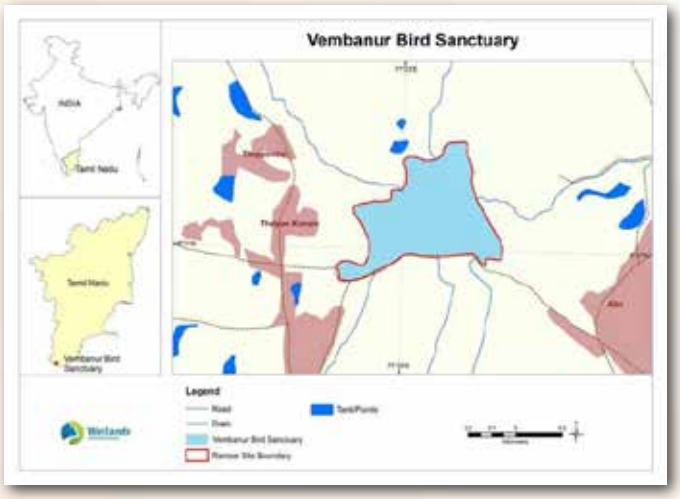


Fig.1: Vembannur Wetland Complex
(Source: Ramsar Sites Information Service, 2022)

- **Suchindram Theroor Wetland Complex** – A key inland wetland that serves as a major wintering ground for migratory birds and forms part of the Suchindram–Theroor–Managudi Conservation Reserve.

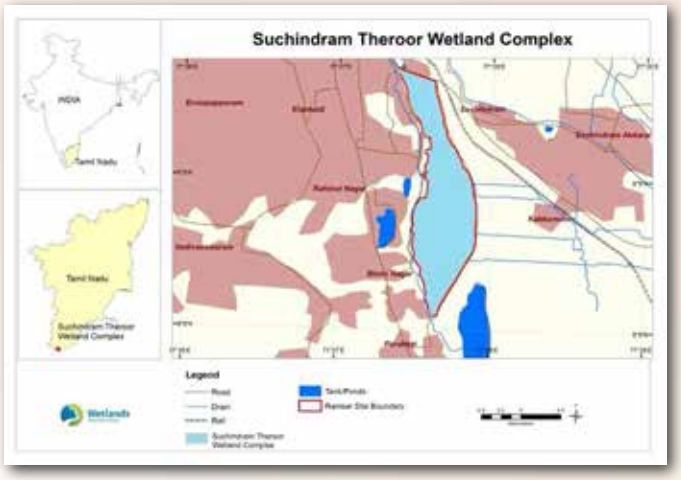


Fig. 2: Suchindram Theroor Wetland Complex
(Source: Ramsar Sites Information Service, 2022)

These wetlands play a crucial role in supporting **migratory waterfowl**, maintaining hydrological balance, and sustaining local livelihoods. They are also part of the **Central Asian Flyway**, making them internationally significant for bird conservation.

I. Vembannur Wetland Complex

The Vembannur Wetland Complex is a small yet ecologically significant human-made freshwater tank located near Vembannur village in the Rajakkamangalam Block of Kanniyakumari District. Spanning approximately 20 hectares, it is one of the smallest Ramsar sites in India and was designated in 2022 under the Ramsar Convention as a wetland of international importance. Historically, the tank is believed to have been constructed during the reign of the Pandyan king Veeranarayana, serving as a crucial irrigation structure connected to the Pazhayar River through the Therrakal Canal system. The wetland continues to play a vital role in collecting valley drainage and supporting agriculture in the fertile Nanchil region.



Fig.3: The Vembannur Wetland Complex – Ramsar Site

Ecologically, the wetland is a shallow, nutrient-rich freshwater ecosystem influenced by seasonal monsoon cycles, leading to fluctuations in water levels and habitat conditions. It falls within the tropical moist deciduous forest zone of the Malabar Coast and supports diverse aquatic vegetation such as lotus, water lilies, Hydrilla, water hyacinth, and cattails. The presence of rare plant species further enhances its ecological importance. The wetland also forms part of an Important Bird and Biodiversity Area, providing habitat for several waterbirds including the Indian River Tern, Grey Pelican, Garganey, and Spotted Greenshank. Resident birds such as jacanas, moorhens, and swamphens commonly breed here, supported by floating vegetation that offers safe nesting grounds.

Socio-economically, the Vembannur Wetland Complex supports irrigation for more than 2,000 hectares of agricultural land, sustaining over 1,000 families. It provides fish resources, drinking water, and helps regulate floods and droughts while maintaining the local microclimate. Its Ramsar designation has enhanced its potential for eco-tourism, conservation funding, and scientific research, thereby strengthening both environmental protection and community livelihoods.

II. Suchindram Theroor Wetland Complex

The Suchindram Theroor Wetland Complex is a larger and more complex wetland system located near Suchindram town between Nagercoil and Kanyakumari in Tamil Nadu. It consists of two main reservoirs Theroor Kulam and Suchindram Kulam and was designated as a Ramsar site in 2022. The wetland is also part of the Suchindram–Theroor–Managudi Conservation Reserve established under the Wildlife Protection Act, 1972. Its history dates back over a thousand years, with references in 9th-century inscriptions, and like Vembannur, it is associated with the irrigation systems developed during the reign of the Pandyan king Veeranarayana.

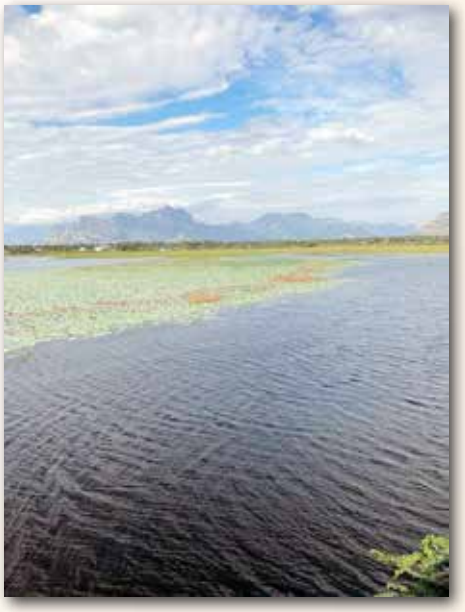




Fig. 4: Suchindram Theroor Birds Sanctuary (Ramsar Site)

Ecologically, this wetland complex is highly dynamic and diverse, comprising permanent and seasonal freshwater lakes, marshes, and man-made water storage systems. It lies within the Kodaiyar river drainage system and plays a crucial role in regulating water flow, groundwater recharge, and nutrient cycling. The site supports rich macrophyte diversity, with dozens of aquatic plant species across different ecological groups such as floating, submerged, and emergent vegetation. Its strategic location at the southernmost end of the Central Asian Flyway makes it an important wintering and staging ground for migratory birds.

The biodiversity of the Suchindram Theroor Wetland Complex is exceptionally high, with around 250 bird species recorded, including numerous migratory and threatened species. It supports over 100 species of wetland birds, a wide variety of plants, and about 40 species of fish. The wetland serves as a critical habitat for migratory waterbirds and is recognized globally for its role in avian conservation.

From a socio-economic perspective, the wetland is indispensable to local communities, supporting irrigation for approximately 800 hectares of farmland and sustaining nearly 75% of the surrounding population. It is widely used for fish culture, lotus cultivation, and other livelihood activities, while also attracting researchers, birdwatchers, and students. However, the wetland faces increasing threats from pollution, urbanization, eutrophication, and habitat loss, which pose challenges to its long-term ecological stability.

Comparative Analysis of Fish Diversity and Water Quality Parameters in Two Ramsar Wetlands

The Vembannur Wetland Complex is a small, human-made freshwater irrigation tank of about 20 hectares, characterized by seasonal, monsoon-dependent water availability and shallow, stagnant to slow-moving conditions. The wetland exhibits typical tropical environmental parameters, including warm temperatures, slightly alkaline pH, moderate dissolved oxygen, and nutrient-rich (eutrophic) conditions. Dense aquatic vegetation such as lotus, Hydrilla, and water hyacinth supports fish breeding but can also restrict fishing activities. Fish diversity is moderate, with common species like *Catla catla*, *Labeo rohita*, *Oreochromis mossambicus*, and *Channa* species. Fisheries are mainly traditional capture-based, resulting in low to moderate productivity, and serve as a supplementary livelihood. However, the wetland has good potential for development through scientific fish culture practices despite constraints like seasonal drying and weed infestation.

In contrast, the Suchindram Theroor Wetland Complex is a large, interconnected wetland system with perennial water supply and semi-lotic conditions that ensure continuous water exchange. It maintains relatively stable environmental parameters, including neutral to slightly alkaline pH, stable dissolved oxygen levels, and moderate nutrient richness, which favor higher biological productivity. The wetland supports diverse aquatic macrophytes and a rich fish fauna of about 40 species, including *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Oreochromis* species, *Channa* species, and *Etroplus suratensis*. Fisheries in this system include both capture and culture practices, leading to moderate to high productivity and making it a major source of livelihood for local communities. Despite challenges such as pollution, eutrophication, and urban pressure, the wetland has strong potential for sustainable fisheries intensification and conservation-oriented management.

Comparison of Wetlands: Vembannur Wetland vs Suchindram Theroor Wetland

S. No.	Particulars	Vembannur Wetland Complex	Suchindram Theroor Wetland Complex
1	Nature of Wetland	Small, human-made freshwater irrigation tank	Large, multi-reservoir freshwater wetland system
2	Area	~20 hectares	Larger, interconnected wetland complex
3	Water Regime	Seasonal; monsoon dependent	Perennial; regulated inflow from reservoirs
4	Hydrology	Shallow, stagnant to slow-moving water	Semi-lotic system with continuous water exchange
5	Water Depth	Shallow	Moderate depth with seasonal variation
6	Temperature	Warm tropical (seasonally variable)	Relatively stable tropical conditions
7	pH	Slightly alkaline (productive waters)	Neutral to slightly alkaline
8	Dissolved Oxygen	Moderate; may fluctuate seasonally	Relatively stable and suitable for fish growth
9	Nutrient Status	Nutrient-rich (eutrophic tendency)	Moderately nutrient-rich (productive system)
10	Aquatic Vegetation	Dense (lotus, Hydrilla, water hyacinth, cattails)	Highly diverse macrophytes (floating, submerged, emergent)
11	Fish Diversity	Moderate (typical freshwater species)	High (~40 species recorded)
12	Common Fish Species	Catla (*Catla catla*), Rohu (*Labeo rohita*), Tilapia (*Oreochromis mossambicus*), Murrel (*Channa* spp.)	Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), Tilapia (*Oreochromis* spp.), Murrel (*Channa* spp.), Pearl spot (*Etroplus suratensis*)
13	Fish Production System	Capture fisheries (traditional)	Capture + culture fisheries (stocking practiced)
14	Productivity	Low to moderate	Moderate to high
15	Breeding Grounds	Supported by dense vegetation	Extensive nursery and breeding habitats
16	Plankton Availability	Moderate (seasonal variation)	High (supports higher trophic levels)
17	Fisheries Livelihood	Supplementary activity	Major livelihood source
18	Irrigation Link	Supports agriculture; indirect nutrient input	Strong linkage with agriculture and water management
19	Constraints	Seasonal drying, weed infestation, limited area	Pollution, eutrophication, urban pressure
20	Development Potential	High scope for scientific fish culture	Scope for sustainable intensification and conservation

Way Forward

The conservation and sustainable management of the Vembannur Wetland Complex and the Suchindram Theroor Wetland Complex require a comprehensive and integrated approach that combines ecological protection with livelihood enhancement. Strengthening legal and institutional frameworks is essential, particularly by reinforcing the conservation reserve status of the Suchindram–Theroor–Managudi Complex through stricter buffer zone regulations and land-use control measures. Establishing dedicated wetland management committees with representation from the Forest Department, Fisheries Department, local governing bodies, and community stakeholders will ensure coordinated and effective governance. From a fisheries perspective, both wetlands possess considerable untapped potential that can be enhanced through scientifically planned fish stocking programs using native species such as *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, and *Etroplus suratensis*. However, such interventions must be preceded by proper carrying capacity assessments to maintain ecological balance. Simultaneously, the implementation of long-term water quality monitoring systems is crucial, with regular assessment of physicochemical and biological parameters. Measures to control pollution, including the regulation of agricultural runoff and prevention of solid waste dumping, must be strictly enforced. Effective management of invasive species, particularly water hyacinth (*Eichhornia crassipes*), is also necessary to protect fish habitats and maintain adequate dissolved oxygen levels. Mechanical removal, biological control, and community participation in biomass utilization can transform this challenge into an opportunity. Community-based wetland management should be prioritized by actively involving local fishing communities, including women and marginalized groups, in conservation activities, capacity building, and sustainable livelihood practices. Incorporating traditional ecological knowledge into formal management plans will further strengthen these efforts. Additionally, the promotion of eco-tourism and environmental education can enhance awareness and generate alternative income sources while ensuring minimal ecological disturbance. Developing birdwatching facilities, interpretation centres, and guided educational programs will support conservation goals. Strengthening research and academic collaborations with universities, fisheries institutions, and government agencies will facilitate long-term monitoring of biodiversity, fish populations, and socio-economic conditions, thereby informing evidence-based management strategies. Considering the impacts of climate change, adaptive measures such as rainwater harvesting, desilting of wetlands, restoration of feeder channels, and maintenance of buffer vegetation are necessary to improve hydrological resilience. Finally, integrating these wetlands with national and state-level initiatives like the National Plan for Conservation of Aquatic Ecosystems and the Pradhan Mantri Matsya Sampada Yojana will provide financial and technical support for sustainable development. Overall, a balanced approach that integrates conservation, fisheries development, community participation, and policy support is essential for ensuring the long-term sustainability of these ecologically and economically important wetlands.

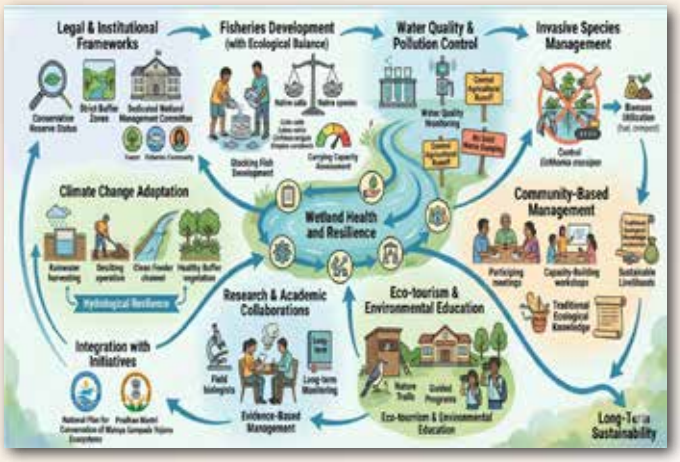


Fig.5: Vembannur and Suchindram Theroor Wetland Management Plan

Conclusion

The Vembannur Wetland Complex and the Suchindram Theroor Wetland Complex, designated as Ramsar wetlands in 2022, represent ecologically invaluable systems at the southernmost tip of peninsular India. Though differing in scale, hydrology, and productivity, both wetlands share a common legacy as ancient irrigation structures that have evolved into biodiversity-rich ecosystems of international importance. Together, they sustain diverse assemblages of fish, birds, aquatic vegetation, and invertebrates, while simultaneously supporting the water needs, food security, and livelihoods of thousands of rural households in Kanniyakumari District. The comparative assessment highlights that the Suchindram Theroor Wetland Complex holds exceptional ecological and economic significance due to its perennial hydrology, higher fish diversity (around 40 species), and its strategic position as the southernmost wintering ground along the Central Asian Flyway. In contrast, the Vembannur Wetland Complex, despite its relatively small size, exemplifies how even a modest freshwater tank can sustain notable biodiversity and provide essential ecosystem services when effectively managed, thereby serving as a model for community-based wetland conservation. However, both wetlands are increasingly threatened by anthropogenic pressures such as agricultural runoff, solid waste pollution, invasive macrophyte proliferation, unregulated fishing practices, and urban encroachment. These challenges are further intensified by climate variability, which affects water availability and disrupts ecological processes, including fish breeding cycles. Without timely, science-based management interventions and strong institutional support, the ecological integrity of these wetlands and the livelihoods they sustain may be significantly compromised. The Ramsar designation should therefore be viewed not as a final achievement but as a critical starting point. It provides both an opportunity and a responsibility to implement effective conservation strategies, strengthen community participation, and ensure accountable governance. Safeguarding these wetlands is not only an environmental necessity but also a long-term investment in the socio-economic well-being, cultural heritage, and ecological resilience of the people of Kanniyakumari District.

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