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Marine Fisheries Information Service Technical & Extension Series

The Marine Fisheries Information Service, Technical & Extension Series (MFIS) is a quarterly publication of ICAR-Central Marine Fisheries Research Institute disseminating latest research information on marine fisheries and mariculture in India. Research based technical articles, reporting significant new information, knowledge and understanding of marine fisheries and ecosystems as well as new concepts/technologies in marine fish nutrition, hatchery and larval rearing, fish pathology, fish health management, application of genetics in fish conservation and farming, sea farming technologies, seafood trade and fisheries governance are published. To see all issues since 1978, visit:

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Green mussel spat produced in the mussel hatchery
Photo credit: Anil, M.K.

Marine Fisheries Information Service Technical and Extension Series envisages dissemination of information on marine fishery resources based on research results to the planners, industry and fish farmers and transfer of technology from laboratory to the field.

Marine Fisheries Information Service
Technical & Extension Series

From the Editorial Board

Warm greetings to all our esteemed readers

The National Fisheries Policy 2020 (NFP) of India has stressed need to reach a vibrant blue economy driven growth target of around US$11–12 billion of marine fish exports, increasingly focussing on a diverse basket of processed, higher-value seafood. For this, investments in developing facilities like hatcheries, offshore cage farms, Recirculatory systems, depuration and processing infrastructure for value addition, product branding and traceability processes are vital. The bivalves which have a high niche market potential in domestic and export markets are likely to benefit from India's first multi-species mollusc hatchery technology developed by ICAR-CMFRI. It gives hope to mussel farmers frequently struggling with an erratic wild seed supply chain to shift to a regular supply of quality hatchery produced mussel seed for farming. Fisheries Management Plans are crucial for sustainable fisheries and require a strong foundation of data on the numerous fishery resources in all regions of the Indian EEZ. The current issue of MFIS highlights these aspects along with several notes of interesting observations from the marine fisheries sector.

Marine Fisheries Information Service
Technical & Extension Series

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Lead Article

India's first mussel hatchery established by ICAR-CMFRI under the Pradhan Mantri Matsya Sampada Yojana

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The Pradhan Mantri Matsya Sampada Yojana (PMMSY) project titled 'Development of Pilot-Scale Open-Sea Eco-Mussel Farms in India – A Blue Growth Project', with a total sanctioned fund of ₹152 lakhs, represents an important step towards strengthening sustainable aquaculture and promoting the blue economy in India. The main objective of the project was to develop pilot-scale open-sea mussel farming systems supported by hatchery-produced seed, thereby increasing production, improving value addition and supply chains thus creating livelihood opportunities, and thereby reducing fishing pressure on this important mollusc in their wild habitats. Under this initiative, the ICAR-Central Marine Fisheries Research Institute established a mussel hatchery at Vizhinjam during 2025–26. Although primarily designed for mussel seed production, the facility has been developed as a multi-species hatchery capable of producing seed of green mussel (*Perna viridis*), brown mussel (*Perna indica*), edible oyster (*Crassostrea madrasensis*), pearl oyster (*Pinctada fucata*) and clam (*Paphia malabarica*). A notable achievement is the successful hatchery production of Asian green mussel and Indian brown mussel, which has not been realised earlier at this scale. This addresses a major constraint in bivalve farming, namely the dependence on seasonal and location-specific wild seed availability.

The hatchery is supported by a well-planned infrastructure covering all stages of seed production. The laboratory is equipped for routine as well as advanced operations, including strip spawning of oysters, induced spawning, and scope for future work such as ploidy manipulation. A dedicated broodstock conditioning facility has been developed with separate tanks for mussels, oysters

and clams. These systems can be operated under recirculating aquaculture system (RAS) or controlled flow-through mode, with provision for continuous feeding using mixed microalgal cultures. Temperature regulation is ensured through an integrated chiller system, which is critical for maturation and spawning.

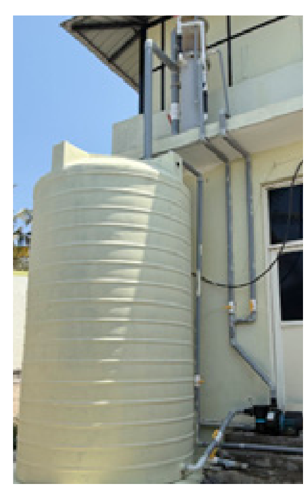
A key component of the hatchery is the photobioreactor-based microalgal production unit for large-scale culture of feed organisms such as *Isochrysis, Nannochloropsis, Chaetoceros, Pavlova, Dicrateria* and *Tetraselmis*. These algae are provided at different larval stages, either individually or in combination, depending on size and nutritional requirements. Another significant achievement was the expansion of the photobioreactor system, which increased the microalgal production capacity to more than 1,500 litres per day, ensuring a reliable supply of live feed for hatchery operations. This system ensures reliable feed availability and supports continuous larval rearing and spat production.

Photobioreactor based microalgae production

Laboratory set-up in the hatchery

Broodstock facility

Larval rearing section in the hatchery



Seawater filtration facilities

Larval rearing is carried out in multiple systems, including 2-tonne and 5-tonne FRP tanks for static rearing and cylindro-conical tanks for higher-density culture under flow-through conditions. Additional tanks are available for the production of shell-attached spat in edible oysters. Micronursery systems with upwelling and downwelling designs have also been established for efficient spat rearing and conditioning.

Seawater quality management has been given due importance. The system includes provision for chlorination (or ozonation), followed by dechlorination, foam fractionation, cartridge filtration and UV treatment before use in rearing systems. This multi-stage treatment ensures a stable and contamination-free environment for larval development.

Seed Production and Field Application

During its initial phase of operation, the hatchery produced approximately 15 million clam seeds, 1.4 million mussel seeds and 0.1 million oyster seeds. These have been distributed to stakeholders, particularly in Maharashtra, supporting farming activities and strengthening seed availability. The seed production during the last quarter of 2025 is summarised below:

Species	D-shape larvae produced	Spat produced	Utilization
Green mussel (*Perna viridis*)	3.7 million	1.2 million	Transferred to nursery and supplied to farmers
Brown mussel (*Perna indica*)	1 million	0.2 million	Used for farming after nursery rearing
Clam (*Paphia malabarica*)	30 million	15 million	10 million used for ranching in Ashtamudi
Oyster (*C. madrasensis*)	0.6 million	0.1 million	Supplied to farmers

As part of resource enhancement, 10 million hatchery-produced clam seeds were ranched in Ashtamudi Lake at the request of Department of fisheries, Govt. of Kerala, following encouraging results from earlier releases. Fishermen have reported noticeable improvements in the fishery, indicating the effectiveness of hatchery-based interventions.

Down-weller Room with clam spat in silos

Clam fishermen participating in the clam ranching programme in Ashtamudi Lake

Distribution of the clam spat for ranching in Ashtamudi Lake, Kollam, Kerala by Dr. K. K. Appukuttan (Retd.) Former Head of Molluscan Fisheries Division in ICAR-CMFRI

Packed yellow-foot clam spat

Field Technology and Innovations

A galvanised iron (GI) raft suitable for semi-protected marine environments was designed and deployed at Thankassery Bay, Kollam. A major bottleneck in open-sea mussel farming has been the availability of suitable floats. Under this project, mussel floats were developed indigenously, reducing dependence on imports and lowering the cost of farming systems. Using these floats, longline farming trials have been initiated, including at Kanyakumari, demonstrating the feasibility of open-sea mussel farming under Indian conditions.

Mussel raft at Thankassery Bay, Kollam

Mussel harvest from raft

Long line fabrication with indigenously developed floats

Tying of the seeded branch lines on the mussel long line unit

Mussel Long line deployed at Kanyakumari

Stakeholder engagements and visits

The progress of the project has been reviewed by senior officials from the Government of India and allied agencies. Neethu Prasad, Joint Secretary, Department of Fisheries, Government of India, along with Bijay Kumar Behera, CEO, National Fisheries Development Board, visited the Vizhinjam Regional Centre and reviewed the hatchery and associated facilities. The team appreciated the progress and the potential for wider adoption.

Ms. Neethu Prasad, Joint Secretary, Dept. of Fisheries, Govt. of India visited the hatchery

Ms. Chelsasini V., Director of Fisheries, Govt. of Kerala, visited the hatchery

At the state level, Smt. Chelsasini V., Director of Fisheries, Government of Kerala, along with other officials, visited the hatchery to discuss the development of similar facilities at Kannur. Discussions also included the possibility of establishing a bivalve depuration unit in Kasaragod district with technical support from ICAR-CMFRI, which would help improve product quality and market value. Shri George Kurian, Hon' Minister of State for Fisheries, Government of India, also visited the facility and reviewed the progress of the project.

Shri George Kurian, Hon'ble Minister of State for Fisheries, Government of India, during his visit to the hatchery.

Future Prospects

Beyond seed production, the hatchery provides a platform for advanced work such as the development of triploid and tetraploid oysters, which can improve growth performance and yield. The combination of hatchery-based seed production, field nursery systems and open-sea farming technologies represents a significant step towards establishing a reliable and scalable bivalve aquaculture sector in India. With continued support and field validation, this approach can contribute substantially to coastal livelihoods, resource sustainability and the overall growth of the blue economy.

Acknowledgement

The authors gratefully acknowledge the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, for the financial support provided under the Pradhan Mantri Matsya Sampada Yojana (PMMSY), which enabled the successful implementation of this project.

Brief Communications

Temporal trends and recent patterns in marine fish landings of Tamil Nadu and Puducherry

Eldho Varghese*, J. Jayasankar, K. Vinod, M. Rajkumar, K. R. Veera Venthan, Somy Kuriakose, K. G. Mini, Sindhu K. Augustine, Sijo Paul, R. Manjeesh, V. K. Manu and V. Sreepriya

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Tamil Nadu, located along the southeast coast of India with a coastline of about 1,070 km, supports one of the largest, most diversified, and technologically advanced marine fisheries in the country. According to the CMFRI Marine Fisheries Census and Fisheries Statistics of India (CMFRI–FSI–DoF, 2020), the state comprises over 570 marine fishing villages and nearly 350 fish landing centres, serviced by a large fleet of mechanised, motorised, and non-motorised crafts, with mechanised units forming the dominant segment. Tamil Nadu consistently ranks among India's leading marine fish-producing states and sustains a complex multi-species fishery encompassing pelagic and demersal finfishes, crustaceans, and molluscs. The scale of operations, fleet modernisation, and resource diversity make the state a critical contributor to national marine fish production, coastal livelihoods, and export earnings, as well as an important region for examining long-term trends, seasonal dynamics, and structural changes in marine fisheries.

Puducherry, though limited in geographical extent, supports an active marine fishery along a coastline of approximately 45 km on the southeast coast of India. As reported in the CMFRI Marine Fisheries Census and Fisheries Statistics of India 2016, the Union Territory has around 40 marine fishing villages and nearly 20 fish landing centres, operated by a relatively small but predominantly mechanised fishing fleet, with fewer motorised and non-motorised crafts. Fishing activities are largely confined to nearshore and continental shelf waters and target a diverse assemblage of pelagic fishes, demersal resources, crustaceans, and cephalopods. Marine fisheries data for both Tamil Nadu and Puducherry are generated using the standardised, time-tested multi-stage stratified random sampling methodology developed by the ICAR–Central Marine Fisheries Research Institute (ICAR-CMFRI), which serves as the national framework for marine fisheries assessment. Under this system, trained field investigators conduct systematic sampling at selected fish landing centres following scientifically designed schedules, ensuring statistically robust, consistent, and reliable estimates of catch, fishing effort, and species composition. This conventional data collection framework has been further strengthened in both regions through the implementation of the Fish Catch Survey and Analysis (FCSA) system, an integrated, end-to-end digital platform for data capture, validation, processing, and automated derivation of indicators required for fish stock assessment (Mini *et al*., 2023). It enables near real-time monitoring of landings, fishing effort, and spatial fishing patterns, incorporates built-in quality control protocols, and supports standardised, reproducible analytical workflows, thereby substantially enhancing the efficiency, transparency, and scientific rigor of marine fisheries monitoring and long-term assessment. This study evaluates the long-term dynamics of marine fish landings in Tamil Nadu and Puducherry over a fifteen-year period (2010–2024), along with a detailed analysis of recent trends during 2022–2024, in order to capture evolving patterns in production, fishing structure, and species composition across these two fisheries systems.

Long-term trends in marine fish landings of Tamil Nadu (2010–2024)

The overall production trend of marine fish landings of Tamil Nadu exhibited a clearly fluctuating trend over the period under consideration. In the initial years, there was a phase of consistent growth, culminating in a peak production of 7.75 lakh t in 2019. This high point was followed by a sharp decline in the early 2020s, which was largely attributed to disruptions caused by the COVID-19 pandemic (Fig. 1). Subsequently, the sector entered a short phase of relative stability before showing signs of recovery. By 2022, landings rebounded to 7.22 lakh t, reflecting a partial revival of fishing operations and market conditions. Despite this recovery, the overall pattern continued to alternate between periods of increase and decline. This ongoing variability suggested the influence of multiple factors such as changes in fish stock availability, variations in fishing effort, and operational conditions affecting the fisheries sector.

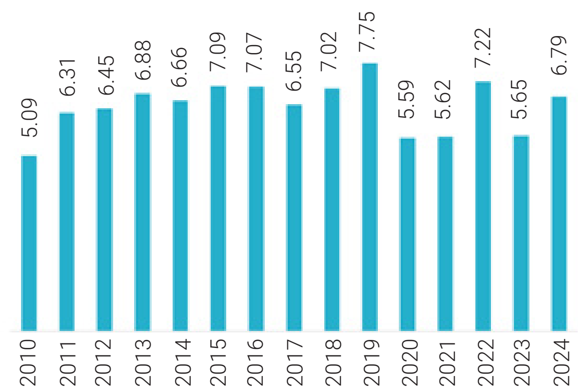

Fig. 1. Marine fish landing trends (lakh tonnes) in Tamil Nadu during 2010–2024 period.

Seasonal pattern of landings indicated that in most years, the first (January–March) and third (July–September) quarters tended to exhibit relatively stronger landings, reflecting favourable fishing conditions and higher operational activity during these periods. The second quarter (April–June) generally presented moderate levels, consistent with seasonal patterns and regulatory restrictions such as monsoon–related fishing bans that may have affected effort. The fourth quarter (October–December) often showed a recovery phase, although its performance varied considerably between years depending on post-monsoon conditions and resource availability. Notably, certain years demonstrated simultaneous peaks across multiple quarters, suggesting episodes of enhanced stock abundance or increased fishing effort. Conversely, some years reflected sharp decreases in one or more quarters, indicative of climatic impacts, reduced effort, or management interventions (Fig. 2).

Sector-wise trends indicated that the mechanised sector overwhelmingly dominated the landings, maintaining a stable and substantial share throughout the period, reflecting its advanced technological capacity, higher fishing effort, and greater operational range (Fig. 3). The motorised sector provided a moderate but variable contribution, with noticeable fluctuations that likely corresponded to changes in coastal resource availability, seasonal fishing intensity, and economic factors influencing fishing operations. In contrast, the

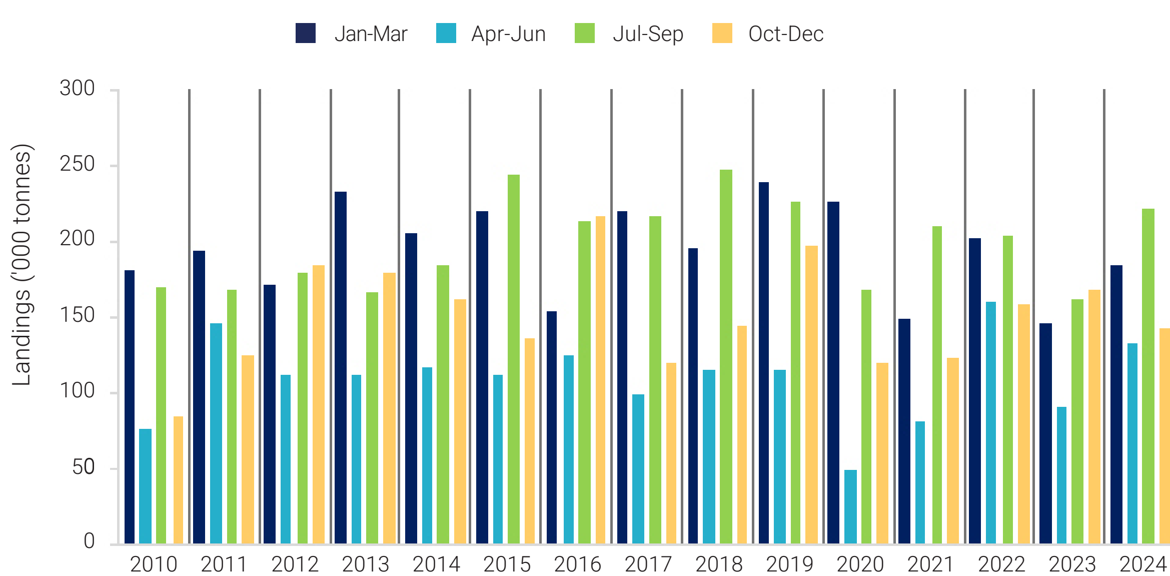

Fig. 2. Quarterly distribution of landings (in thousand tonnes) during 2010- 2024 periods in Tamil Nadu

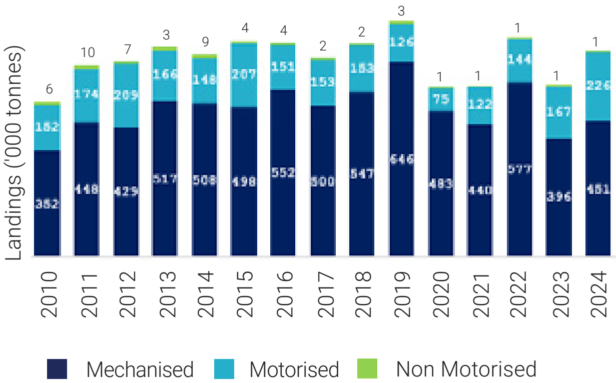

Fig. 3. Sector-wise fish landings (in thousand tonnes) during 2010–2024 period in Tamil Nadu

non-motorised sector contributed only a very small fraction of the total landings and exhibited a gradual decline over the years, indicative of the decreasing dependence on traditional craft and the sector's limited capacity to compete with more modernised fleets.

Species group composition of marine fish landings in Tamil Nadu during 2010–2024 revealed a clear and consistent dominance of pelagic resources forming the largest component of the catch every year (Fig. 4). Demersal resources constituted the second major group, although their contribution fluctuated noticeably across the years, reflecting variations in fishing pressure, stock distribution, and related factors on the continental shelf. Crustaceans contributed a smaller yet significant share, showing periodic increases that may have been related to favourable recruitment and targeted fishing effort. Molluscs, though representing the smallest portion of the landings, displayed intermittent peaks that indicated occasional increases in availability or

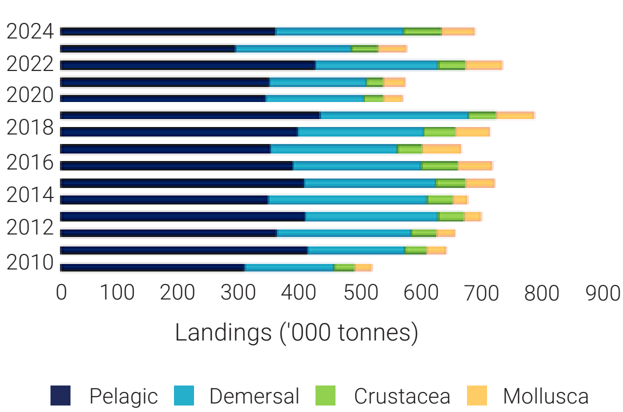

Fig. 4. Assemblage-wise marine fish landings (in thousand tonnes) during 2010–2024 period in Tamil Nadu

enhanced exploitation during certain years. While the overall structure of the landings remained broadly consistent, with pelagic species leading and molluscs contributing the least, the relative proportions of each group varied over time. The pattern underscored the importance of balanced management across all resource groups to ensure long-term sustainability.

Trends in the species composition of marine landings in Tamil Nadu showed noticeable changes, with some groups exhibiting periodic peaks while others declined gradually (Fig. 5). Lesser sardines contributed significantly in multiple years, with phases of higher landings followed by moderate levels, reflecting natural year-to-year variation. Silverbellies remained an important component of the catch, though their contribution showed a gradual decline in recent years. Cephalopods displayed a rising trend from around 2016 onwards, stabilising thereafter at moderate levels. Oil sardine exhibited pronounced fluctuations, with certain years recording very high landings, contrasted by notably

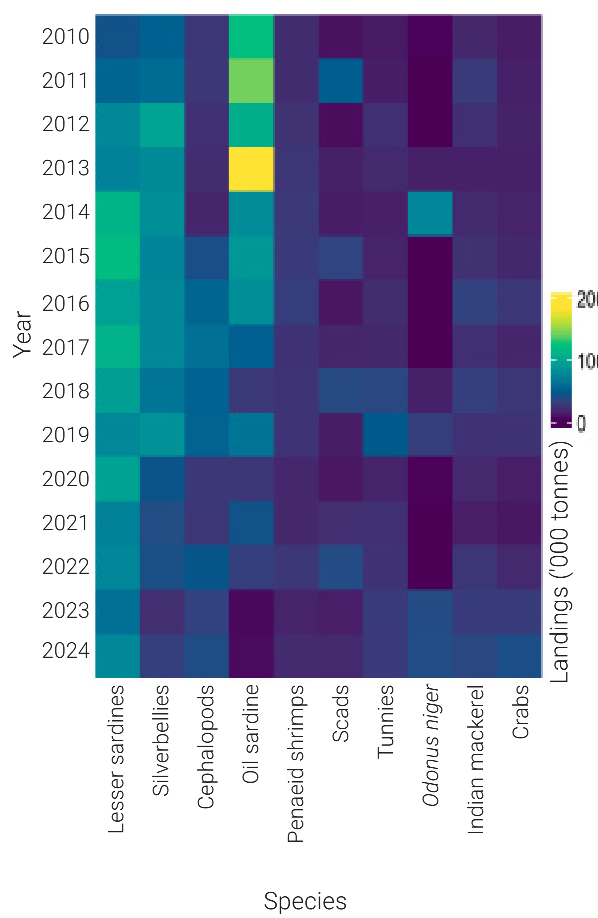

Fig. 5. Major fishery resources landed (2010–2024) in Tamil Nadu

low availability during 2023 and 2024. Penaeid shrimps showed relatively steady contributions with occasional peaks. Scads and tunnies exhibited considerable year-to-year variation, with occasional surges in their landings. *Odonus niger* stood out due to its distinctly irregular landing pattern, marked by notable spikes in 2014 and again in 2019 when unusually high catches were recorded in the state, compared to its low and sporadic landings during the rest of the period.

Recent trends in marine fish landings in Tamil Nadu (2022–2024)

Noticeable fluctuations, highlighting the dynamic and multi-species nature of the state's fisheries were evident. Following a relatively high level of production in 2022, there was a marked decline in 2023, which was then followed by a moderate recovery in 2024. These variations likely corresponded to changes in fishing intensity and seasonal resource availability across the years. Despite these fluctuations, Tamil Nadu continued to maintain a significant share in India's total marine fish production, supported by its extensive mechanised fleet and diverse fishing operations. Annual landings revealed a consistent seasonal rhythm, with higher landings typically observed during the first and third quarters that corresponded to peak fishing seasons when favourable conditions supported increased activity and resource availability. The second quarter generally reflected a decline, aligning with the monsoon-related lull or fishing restrictions, while the fourth quarter maintained moderate but steady production levels. Although year-to-year fluctuations were evident, particularly with lower yields in 2023 and recovery in 2024, the overall pattern remained stable, underscoring Tamil Nadu's well-established seasonal cycle of marine fish landings and the sustained efficiency of its fishing operations. During 2022–2024, the craft-wise composition of marine fish production in Tamil Nadu clearly reflected the dominant role of the mechanised sector, which continued to be the primary contributor despite year-to-year fluctuations in landings. The motorised sector exhibited a gradual increase over this period, particularly in 2024, indicating the expanding participation of small and medium-scale fishers operating motorised crafts. In contrast, the non-motorised sector contributed only marginally, underscoring the limited role of traditional, non-powered fishing units in the state's marine fisheries. A clear pattern emerged in the species group composition of marine fish production in Tamil Nadu during 2022–2024, with pelagic resources forming the dominant share of total landings despite some fluctuations. The demersal group also remained a significant and stable component, comprising bottom-dwelling species such as croakers, threadfin breams, and perches. Crustaceans, mainly penaeid shrimps and crabs, contributed at moderate levels with some variability over the years. Molluscs, including squids and cuttlefish, maintained a steady presence throughout the period, reinforcing their consistent role in the overall species composition. Lesser sardines and oil sardine remained important contributors to the overall landings, although oil sardine showed a sharp decline after 2022. Cephalopods maintained a strong and consistent presence, underscoring their continued importance in the fishery. Indian mackerel

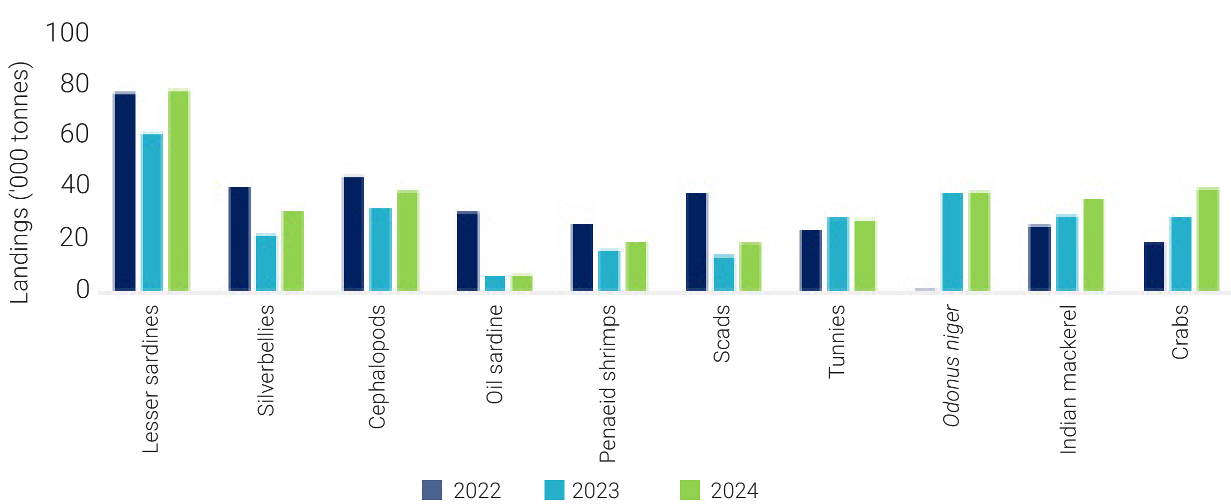

Fig. 6. Major fishery resources landings (in thousand tonnes) 2022 –2024 period in Tamil Nadu

recorded a notable increase in 2024, emerging as one of the key contributors, while tunas showed relatively stable contributions over the period (Fig. 6). In contrast, scads exhibited clear variability, with a sharp decline in 2023 followed by a partial recovery in 2024. Penaeid shrimps and crabs represented important crustacean resources, displaying moderate fluctuations across the years. *Odonus niger* showed a marked rise in 2023 and 2024, indicating a noticeable shift in species composition during the later part of the period.

Long-term trends in marine fish landings of Puducherry (2010–2024)

Overall production trend of the marine fish landings of Puducherry exhibited a fluctuating trend over the period under review. Beginning from relatively low levels in the initial years, landings increased sharply to reach a peak of 0.79 lakh t in 2015, reflecting a phase of heightened fishing activity and improved availability (Fig. 7). This peak was followed by a clear decline, with landings decreasing steadily over the subsequent years, indicating a period of reduced output. In the later years, a partial recovery became evident, with landings stabilising and showing gradual improvement. However, the production levels did not fully return to the peak observed in 2015, highlighting the continued variability in the overall trend.

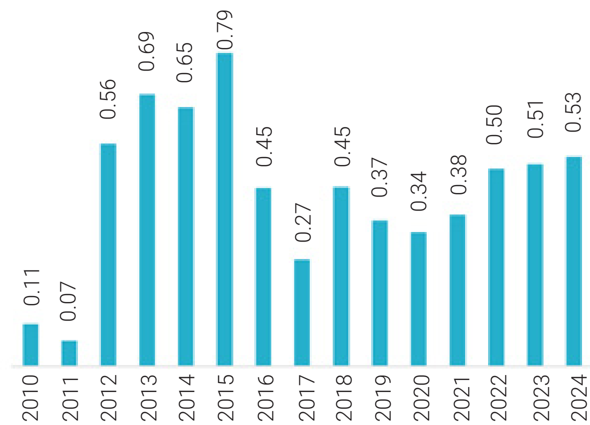

Fig. 7. Marine fish landing trends (lakh tonnes) in Puducherry during 2010–2024 period.

Seasonal pattern of landings in Puducherry showed a highly variable pattern across the years, marked by strong seasonality and pronounced inter-annual fluctuations (Fig. 8). The third quarter consistently emerged as the most productive period, with several years showing distinct peaks, indicating favourable monsoon-related fishing conditions and enhanced resource availability during this season. The second and fourth quarters contributed moderately, though their levels varied widely from year to year, reflecting differences in fishing effort and seasonal resource distribution. The first quarter generally recorded the lowest landings, yet occasional spikes suggested episodic increases in effort or the availability of specific resource groups. Over time, the

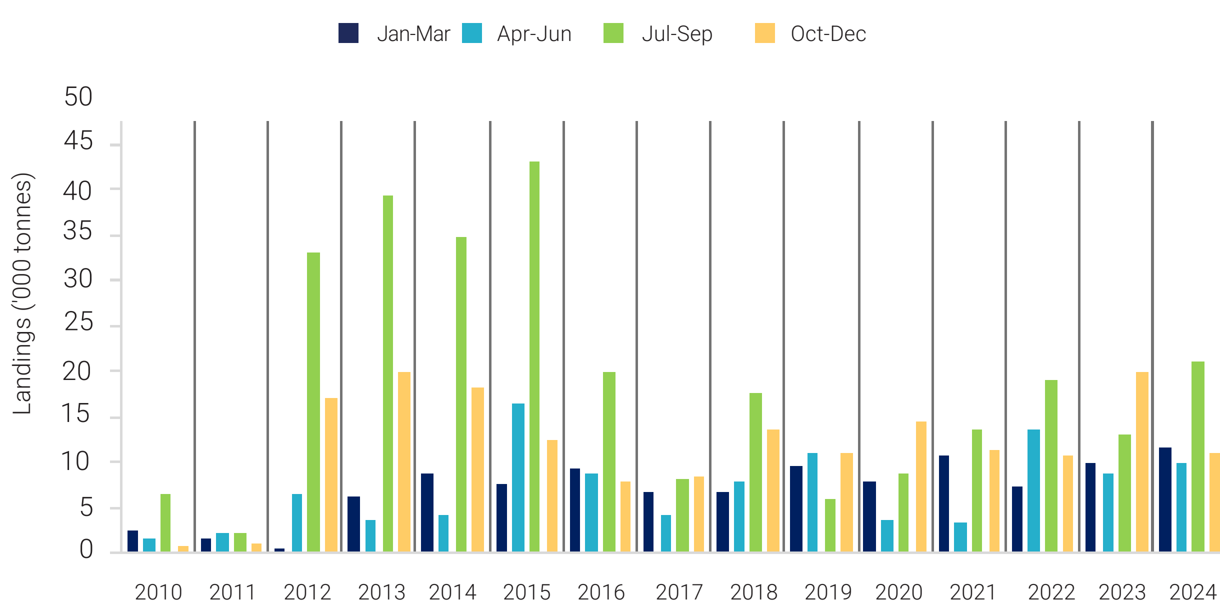

Fig. 8. Quarterly distribution of landings (in thousand tonnes) during 2010–2024 periods in Puducherry.

pattern transitioned from a few years dominated by exceptionally high third-quarter landings to a more balanced distribution in recent years, where contributions from all quarters appeared comparatively steadier.

The sector-wise contribution to marine fish landings in Puducherry showed a clear dominance of the mechanised fleet throughout the period, with particularly pronounced peaks during the mid-2010s (Fig. 9). These elevated landings reflected periods of high fishing intensity, favourable resource availability, or expansion in mechanised operations. The subsequent years showed a notable decline, followed by a gradual recovery. The motorised sector, though much smaller in scale, displayed considerable variability, with recent years showing substantial increases that suggested targeted exploitation of nearshore resources or shifts in fishing effort. The non-motorised sector contributed only marginally and remained relatively stable, reflecting its limited capacity and localised fishing range.

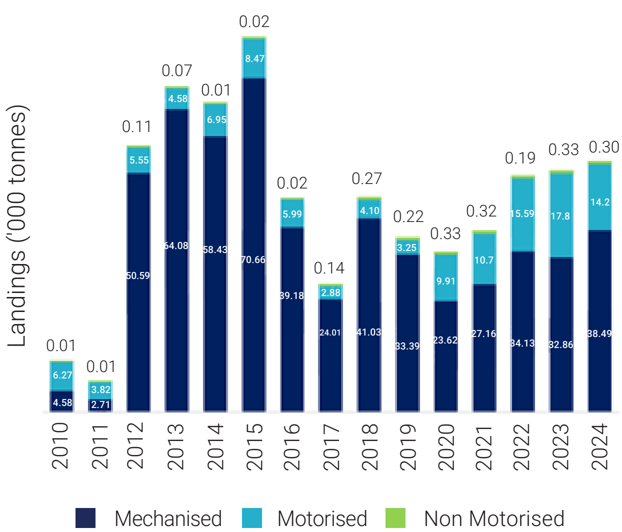

Fig. 9. Sector-wise fish landings (in thousand tonnes) during 2010–2024 period in Puducherry

Species group composition indicates that in the early years (2010–2011), overall landings were very low across all groups, with only marginal contributions from pelagic, demersal, crustacean, and molluscan resources. A sharp rise became evident from 2012 onwards, culminating in a peak around 2015, where pelagic resources contributed the largest share, followed by substantial inputs from demersal and molluscan groups. Crustaceans also showed a noticeable increase during this phase, though their share remained comparatively moderate (Fig. 10). Following this peak, a declining trend was observed between 2016 and 2020, with reductions seen across all major groups but with pelagic resources retaining its leading position despite the overall drop in landings. Demersal resources remained the second most important component, though at reduced levels, while crustaceans and molluscs fluctuated at lower magnitudes. From 2021 onwards, a gradual recovery was visible, with all groups showing improved contributions. Pelagic resources again dominated the composition, while demersal, crustacean, and molluscan groups displayed moderate and relatively stable shares.

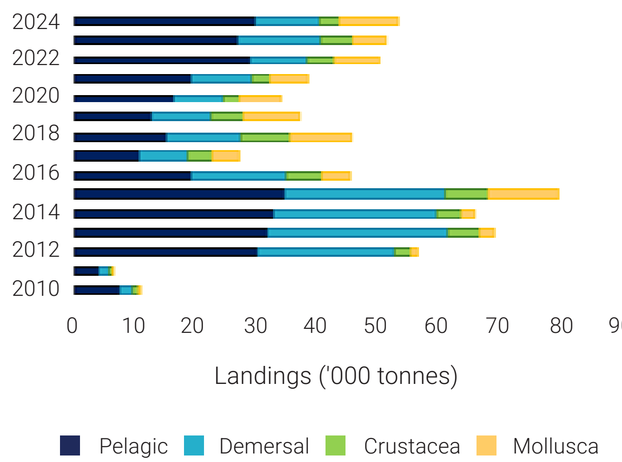

Fig. 10. Assemblage-wise marine fish landings (in thousand tonnes) during 2010–2024 period in Puducherry

Cephalopods stood out as one of the most dynamic groups, showing pronounced peaks interspersed with moderate phases, indicating fluctuating yet significant contributions to the fishery. Penaeid shrimps and scads exhibited moderate but variable landings, with noticeable increases during the period from 2015 to 2018 (Fig. 11). Silverbellies displayed a striking trend, with very high contributions in the early 2010s followed by a sharp decline and subsequent stabilisation at much lower levels. Ribbonfish, crabs, and lizardfishes maintained relatively steady contributions overall, although each showed occasional spikes reflecting episodic increases in landings. Lesser sardines were prominent in the early years but declined considerably in the later period. Indian mackerel contributed at moderate levels throughout, with a gradual increasing tendency in recent years. Threadfin breams remained consistent at low-to-moderate levels. Oil sardine exhibited marked fluctuations, with periods of high landings followed by sudden declines. Snappers, while contributing only a small share, showed slight increases in recent years.

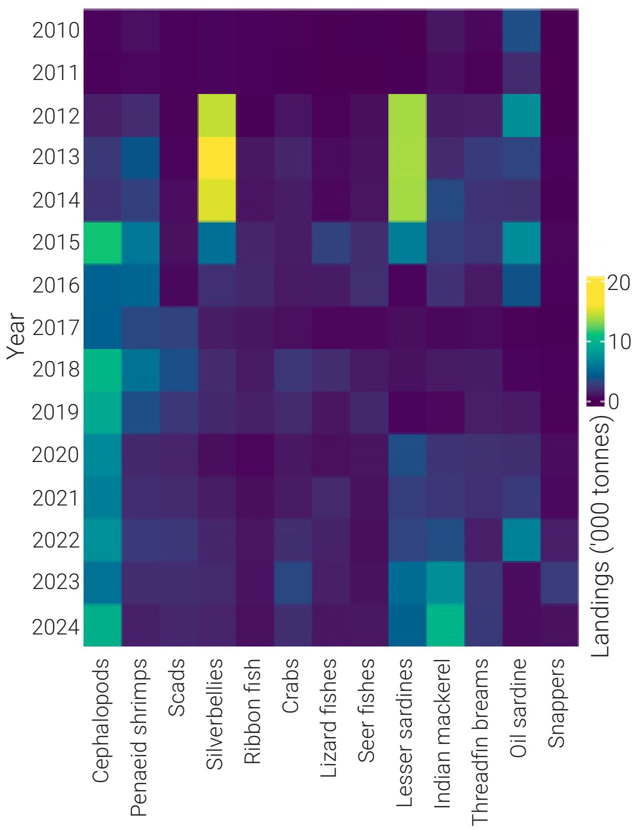

Fig. 11. Major fishery resources landed (2010–2024) in Puducherry

Recent trends in marine fish landings in Puducherry (2022–2024)

The marine fish production of Puducherry during 2022–2024 showed a gradual but steady increase over the three-year period indicating improvement in fishing activity and resource availability along the region's coast. The quarterly distribution of marine fish production in Puducherry during 2022–2024 reflected the overall production showed a gradual increase, and the seasonal rhythm remained consistent, highlighting both stability and a slight upward trend in Puducherry's marine fishery. The sector-wise contribution highlighted the continued dominance of the mechanised sector while the non-motorised sector had the limited role of traditional, non-powered fishing units in the regional fishery. A consistent dominance of pelagic resources, which formed the largest share of total landings across all three years although there was a slight decline in overall production in 2023 compared to 2022 was recorded. Demersal resources constituted the second-largest component and remained relatively stable throughout the period, with a slight rise observed in 2023 and 2024. Crustaceans contributed a smaller share compared to pelagic and demersal groups, but showed a gradual increase over the three years while molluscan resources displayed moderate contributions with some variability, showing a slight dip in 2023 followed by an increase in 2024. The species-wise composition from 2022 to 2024 highlighted a diverse, small-scale fishery dominated by pelagic species and cephalopods (Fig. 12). Other species, including scads, silverbellies, ribbonfish, tunas, lizard fishes, seer fishes, threadfin breams, and snappers, contributed smaller but consistent shares, indicating a mixed-species fishery.

The integrated assessment of long-term and recent trends in marine fish landings across Tamil Nadu

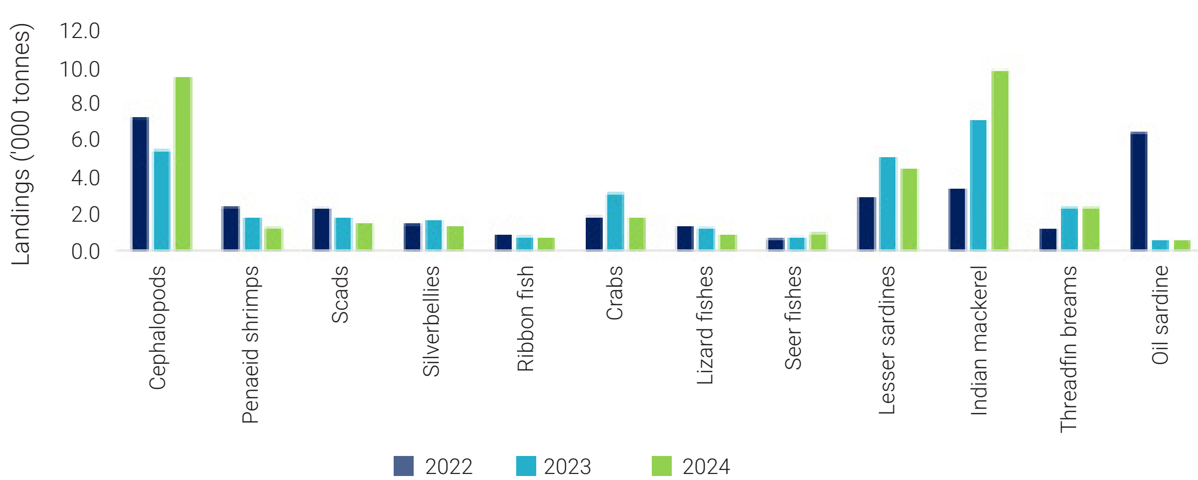

Fig. 12. Major fishery resources landings (in thousand tonnes) 2022–2024 period in Puducherry

and Puducherry highlighted two interlinked yet distinct fisheries systems characterised by variability, seasonality, and evolving operational structures. Tamil Nadu continued to sustain a large, diversified, and mechanised-dominated fishery, with high overall production supported by pelagic resources and cephalopods, despite experiencing notable fluctuations, including the pandemic-related decline around 2020 and a subsequent partial recovery. The seasonal pattern of landings remained consistent, with peak contributions aligning with established fishing cycles. In contrast, Puducherry represented a smaller-scale fishery that showed pronounced cycles of increase, decline, and gradual recovery, with recent years indicating modest improvement in production levels. Across both regions, mechanised fishing remained the principal mode of operation, while motorised crafts gained importance and non-motorised units contributed minimally. Resource composition continued to be dominated by pelagic groups, with demersal resources, crustaceans, and molluscs providing stable supplementary contributions. At the species level, the trends reflected variability in individual groups alongside steady contributions from key resources such as cephalopods, Indian mackerel, shrimps, and crabs. Taken together, the findings indicated fisheries systems that were adaptive and productive, yet marked by increasing variability, underscoring the importance of continued monitoring, effective management, and sustained efforts to ensure long-term stability and productivity along the southeast coast of India.

Acknowledgement

This work was conducted under ICAR-CMFRI in-house research project *"Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries of Tamil Nadu & Puducherry (SFD/IAF/13)"* with data used for this analysis collected under the in-house project *"Geo-referenced Marine Fisheries Resources Information System for Indian EEZ Based on Enhanced Survey Protocols and Methodological Platforms for Stock Assessment, Modelling and Forecasting (FRAEED/GIS/01)"*.

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Brief Communication

Trends in marine fish landings along the Andhra Pradesh Coast: A fifteen-year analysis with recent updates

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Andhra Pradesh, with a coastline of about 1,053 km spanning 12 coastal districts, has a long tradition of marine fishing that has evolved from small-scale artisanal operations to modern, technology-driven fisheries. Over the decades, this transformation has significantly strengthened the marine fisheries sector of the state. Andhra Pradesh presently supports 533 marine fishing villages and 234 marine fish landing centres, reflecting the strong socio-economic dependence of coastal communities on marine resources (CMFRI-FSI-DoF, 2020). The state witnessed substantial growth in marine fish production during the early and mid-2010s, reaching a record landing of 3.42 lakh tonnes in 2014. However, the sector has experienced notable fluctuations in recent years, emphasising the need to analyse long-term production trends and recent developments in the fishery. Marine fisheries data from landing centres were generated using survey methodology based on a two-stage stratified random sampling design with trained data collectors (Fisheries Harbours based) with expertise in species identification, who visit landing centres according to schedules generated under the sampling design. The system ensures reliable monitoring of fisheries resources across spatial and temporal scales. Continuous improvements have further enhanced data quality, including the adoption of digital platforms such as the Fish Catch Survey and Analysis (FCSA) 2.0 application, which enables near real-time recording of landings and supports improved fisheries management and stock assessment (Mini *et al*., 2023). The inclusion of estimated fishing-ground geolocations supports spatial estimation of catch per unit effort and biomass, contributing to the National Marine Fisheries Data Centre (NMFDC). This article examines long-term trends in marine fish landings along the Andhra Pradesh coast during the last fifteen years (2010–2024) and provides a focused assessment of the most recent three years (2022–2024) to understand emerging patterns in production, fishing practices and species composition.

Long-term trends in marine fish landings (2010–2024)

Overall, the marine fish production in Andhra Pradesh trend during 2010–2024 exhibited an initial phase of growth followed by fluctuations and a gradual decline in recent years. The yield increased steadily from 2.41 lakh t in 2010 to reach a peak of 3.42 lakh t in 2014, reflecting a period of enhanced productivity (Fig. 1). Following this, production declined considerably, reaching 1.92 lakh t in 2016, one of the lowest levels recorded recently. Although moderate improvements were observed in some years such as 2019 and 2021, the fishery did not return to the earlier peak levels. During the most recent years, production remained relatively modest and eventually declined further to 1.75 lakh t in 2024, indicating a continuing downward trend in marine landings. These trends highlight increasing variability in fishery productivity and underline the need for strengthened monitoring and management of marine resources.

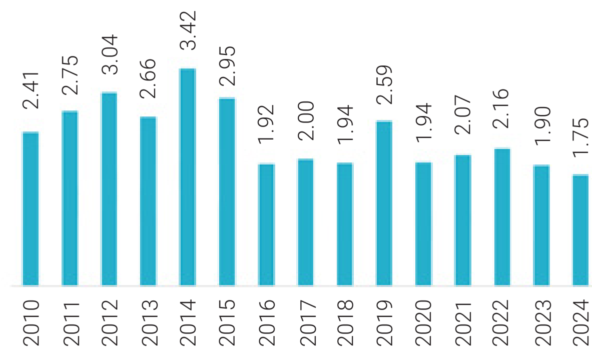

Fig. 1. Marine fish landing trends (lakh tonnes) in Andhra Pradesh during 2010–2024 period.

The quarterly landings pattern of Andhra Pradesh shows a clear and consistent seasonal structure throughout the period (Fig. 2). The first quarter (January–March) generally dominates the annual production, indicating more favourable fishing conditions or higher resource availability during this season, while the second quarter (April–June) remains the weakest phase, likely due to seasonal constraints such as weather conditions or fishing regulations. The third (July–September) and fourth (October–December) quarters contribute moderately and show relatively stable behaviour, sometimes alternating in their relative importance but always remaining between the first and second quarters. Although interannual fluctuations are evident, the overall seasonal pattern remains remarkably stable over time, and the same structure continues to persist in the recent years, suggesting that the fundamental seasonal dynamics of the fishery in the state have not undergone any major change.

From 2010 to 2012, mechanised fishing craft showed a phase of gradual growth, but from 2013 onward they began to fluctuate and eventually declined steadily towards 2024 (Fig. 3). Motorised craft, on the other hand, increased noticeably from 2010 and reached their highest presence around 2014. Although they experienced ups and downs in the following years, they continued to remain a prominent category through to 2024. In contrast, non-motorised craft displayed a continuous decline

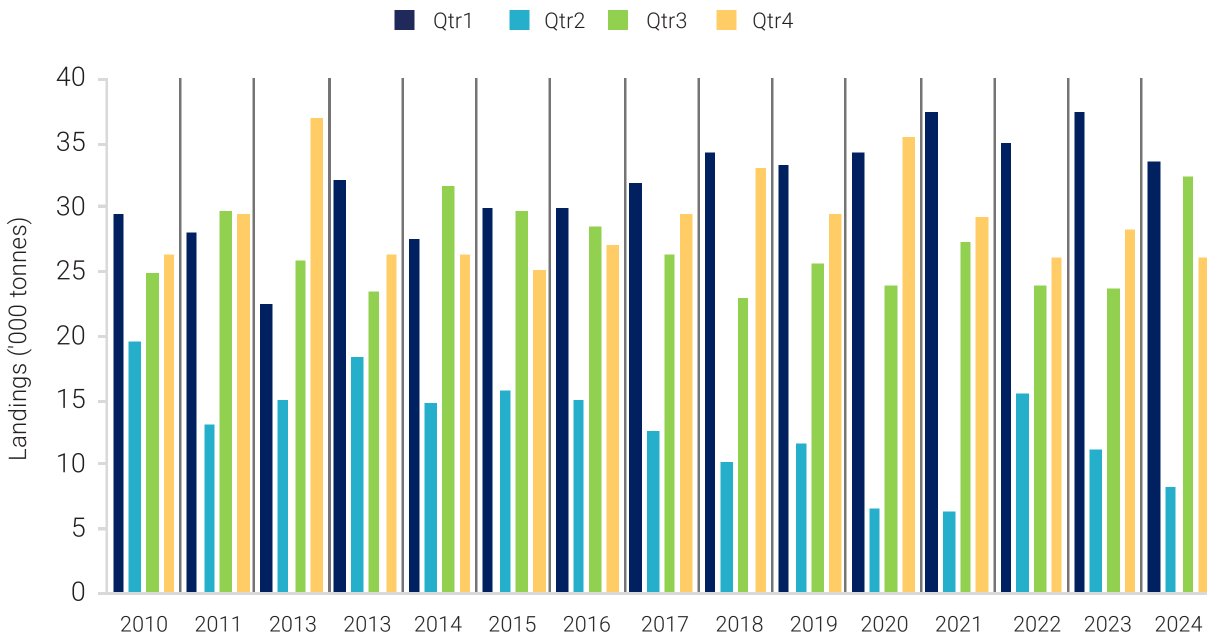

Fig. 2. Quarterly distribution of landings (in thousand tonnes) during 2010–2024 periods in Andhra Pradesh

right from 2010, with their numbers dropping significantly by the end of the period in 2024. Overall, the data reflects a clear transition over time from traditional non-motorised craft to more advanced motorised and mechanised fishing practices showcasing gradual modernisation within the sector.

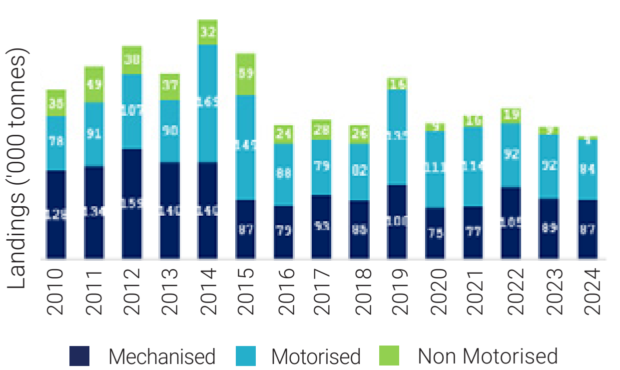

Fig. 3. Sector-wise fish landings (in thousand tonnes) during 2010–2024 period in Andhra Pradesh

From 2010 to 2024, the fisheries production trend of Andhra Pradesh shows clear fluctuations across pelagic, demersal, crustacea, and mollusca resources (Fig. 4). Pelagic species continued to contribute the largest share throughout the period, showing a noticeable rise in the early years before gradually declining in the later part of the timeline. Demersal resources remained more stable, with only moderate ups and downs, indicating relatively steady availability of bottom-dwelling species. Crustacea, which include economically important prawns and crabs, showed strong performance in the initial years but experienced a slow downward trend later, possibly due to changes in aquaculture output, disease issues, or export

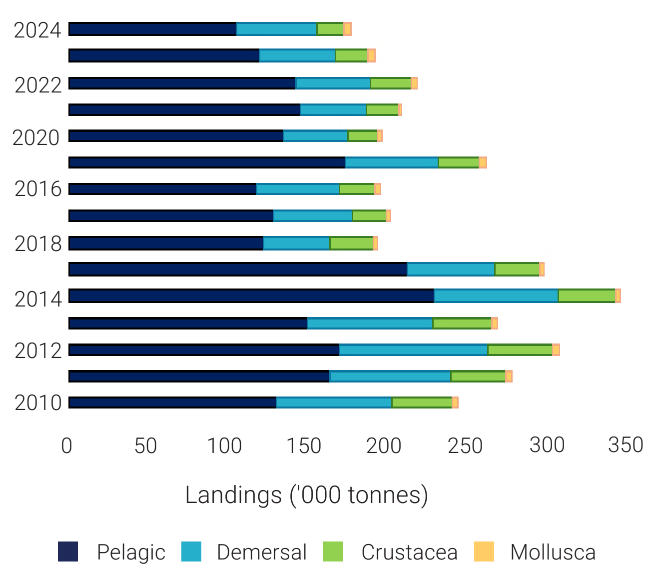

Fig. 4. Assemblage-wise marine fish landings (in thousand tonnes) during 2010–2024 period in Andhra Pradesh

market demand. Mollusca remained a small but consistent component of the marine fishery, with very minor variations over the years. Overall, while Andhra Pradesh has continued to maintain a strong position in marine fisheries, the visible decline in some categories over recent years highlights the importance of sustainable resource management, better stock assessment, and continued support to both capture fisheries and aquaculture to ensure long-term productivity. From 2010 to 2024, the catch trends of major marine species in Andhra Pradesh reveal considerable fluctuations, with certain species showing periodic highs while others declined gradually (Fig. 5). Lesser sardines showed varying contributions, with notable rises around the mid-2010s followed by sharp declines in recent years. Indian mackerel demonstrated gradual growth from 2010, reaching a peak around the mid-decade, but later exhibited inconsistent trends. Ribbonfish catches increased initially up to around 2012–2014 but showed a gradual decline thereafter. Penaeid prawns remained relatively stable during the early years but experienced fluctuations in the latter half of the period, without major increases after 2015. Anchovies displayed a mixed pattern, with moderate levels during the early years, minor declines around the mid-decade, and inconsistency toward 2024. Croakers showed a gradual downward trend overall, with minor fluctuations but no significant recovery in later years. Tunnies experienced varied contributions, with some increases in the early and mid-2010s, but their numbers declined or stabilised at lower levels towards the end of the period. Oil sardine catches fluctuated considerably, with low presence in the early 2010s, a sharp rise around 2020–2021, followed by moderate levels in subsequent years. Overall, the data suggests species-specific variability influenced by seasonal dynamics, fishing practices, and changing ecosystem conditions.

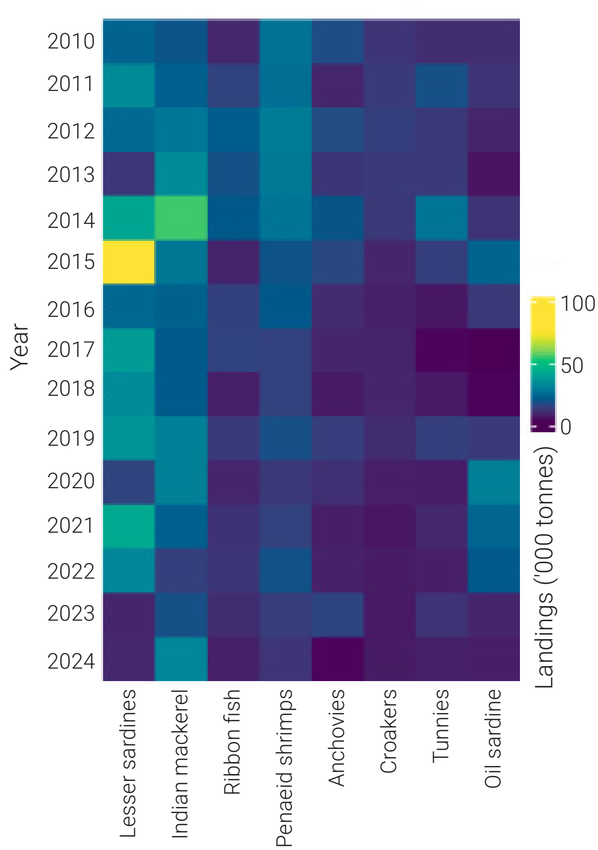

Fig. 5. Major fishery resources landed (2010–2024) in Andhra Pradesh

Recent trends in marine fish landings (2022–2024)

The marine fish production of Andhra Pradesh during 2022–2024 shows a gradual decline in overall yield. After recording a relatively higher production level in 2022, the total landings decreased steadily in the following two years. This downward trend suggests a phase of reduced fishing intensity or possible variations in resource availability along the coast. Despite the decline, the state continues to maintain a significant share of marine fish production, supported mainly by mechanised and motorised sectors. The trend indicates the need for sustained management and monitoring to ensure stability and long-term sustainability of the marine fishery resources in Andhra Pradesh. The quarterly trend of marine fish production in Andhra Pradesh from 2022 to 2024 reflects clear seasonal variability, with production generally peaking during the first and third quarters. These periods likely correspond to favourable fishing conditions and higher resource availability, whereas the second quarter consistently shows lower landings, aligning with seasonal restrictions or reduced fishing activity during the monsoon period. The fourth quarter maintained moderate yields, indicating continued but slightly reduced fishing operations toward the end of the year.

The craft-wise composition of marine fish production in Andhra Pradesh during 2022–2024 highlights the continued predominance of the mechanised sector, which remained the principal contributor to total landings. The motorised sector maintained a strong and stable presence, reflecting the active participation of small and medium-scale fishers using motorised crafts along the coast. In contrast, the non-motorised sector showed a clear decline, indicating the ongoing shift away from traditional fishing methods toward more efficient, engine-powered operations. The species group composition of marine fish production in Andhra Pradesh during 2022–2024 shows a consistent dominance of pelagic resources, though with a gradual decline in their overall contribution over the three years. This suggests a reduction in the abundance or catch rates of key pelagic species such as sardines, mackerels, and anchovies. The demersal component remained relatively stable, indicating sustained exploitation of bottom-dwelling species like croakers and perches. Crustaceans, mainly penaeid prawns and crabs, showed a modest but noticeable decrease, while molluscan resources, though minimal in volume, maintained a steady presence. Lesser sardines and oil sardines, traditionally dominant in the state's pelagic catches, showed a clear decline over the period, while Indian mackerel exhibited a sharp increase in 2024, emerging as one of the key contributors in the recent year (Fig. 6). Ribbonfish and tunnies maintained moderate and relatively stable contributions, reflecting consistent availability in the catches. Penaeid prawns continued to form an important part of the demersal and crustacean component, though with slight year-to-year fluctuations. Anchovies showed irregular trends, peaking in 2023 before declining again, while croakers contributed steadily across all three years.

The analysis of marine fish landings in Andhra Pradesh over the past 15 years, together with the recent three-year trends, reveals a clear transition from a period of high productivity in the early and mid-2010s to increasing variability and a gradual decline in recent years, culminating in the lowest recorded yield in 2024. Despite this overall decline, the seasonal pattern of the fishery has remained remarkably stable, with consistent dominance of the first quarter and reduced activity during the monsoon-affected second quarter, indicating the strong influence of environmental and operational seasonality. The sector has undergone significant structural changes, marked by a steady shift from non-motorised to motorised and mechanised fishing craft, reflecting ongoing modernisation of fishing operations. Pelagic resources continue to dominate the landings, but the recent decline in traditionally important species such as lesser sardines and oil sardines, along with increasing variability in other key groups, suggests possible changes in stock availability and ecosystem conditions, even as species like Indian mackerel show recent gains. Overall, while Andhra Pradesh remains a major

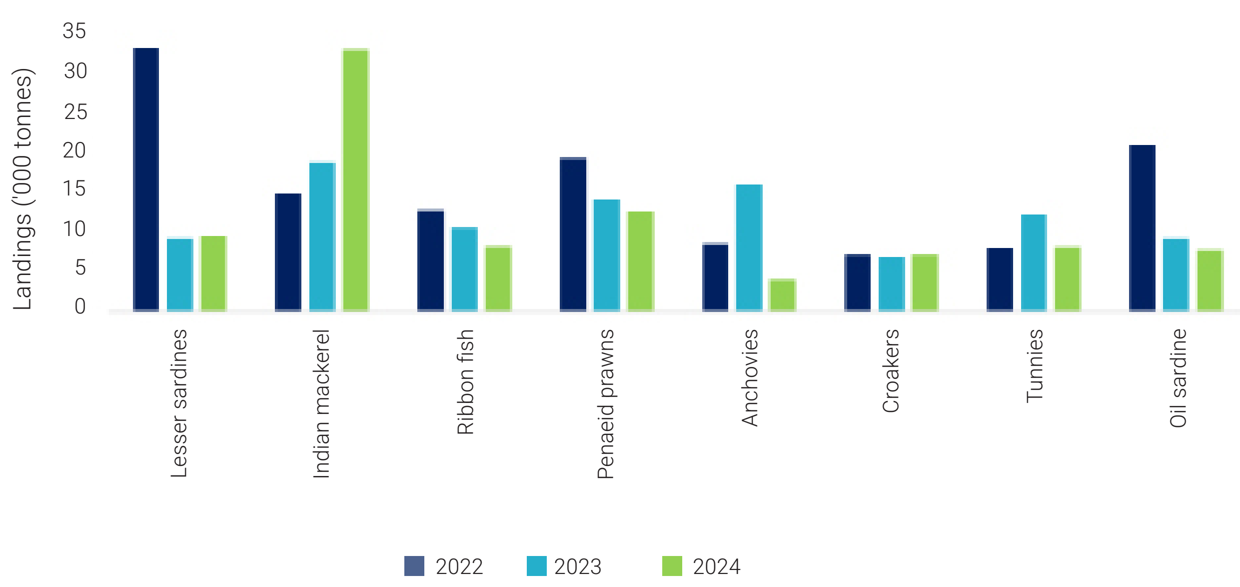

Fig. 6. Major fishery resources landings (in thousand tonnes) 2022–2024 period in Andhra Pradesh

marine fish-producing state, the observed downward trends and shifts in species composition highlight the need for strengthened monitoring, improved stock assessment, and adaptive, ecosystem-based management to ensure the long-term sustainability and resilience of its marine fisheries.

Acknowledgements

This work was conducted under ICAR-CMFRI in-house research project *"Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to Inform Management Decisions for Marine Fisheries of Andhra Pradesh"* (FFD/IAF/11). The data used for this analysis were collected under the project *"Geo-referenced Marine Fisheries Resources Information System for Indian EEZ Based on Enhanced Survey Protocols and Methodological Platforms for Stock Assessment, Modelling and Forecasting"* (FRAEED/GIS/01).

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Brief Communication

An overview of status, trends, and management of the Hilsa shad fishery along the West Bengal Coast

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Hilsa shad, *Tenualosa ilisha* (Hamilton, 1822), is an anadromous, euryhaline, and commercially significant pelagic clupeid widely distributed in the Indo-West Pacific region, with major fisheries in Bangladesh, India, and Myanmar (Dutta *et al*., 2021). As a highly valued food fish in Bangladesh and eastern India, particularly in West Bengal, hilsa fishery provides livelihoods to millions of people in this region. The species is widely distributed across marine, estuarine, and riverine habitats in the Bay of Bengal. Nutritionally, hilsa is considered excellent because of its protein, lipid and omega-3 fatty acid content, essential for human health. Its seasonal availability, particularly during the monsoon spawning migration, drives high consumer demand and premium market prices, reinforcing its socio-economic and cultural importance. West Bengal records the highest hilsa landings among Indian maritime states, highlighting need for fisheries management to ensure ecological sustainability, food security, and the preservation of cultural heritage.

Taxonomic notes on hilsa and hilsa-like fishes

Hilsa and hilsa-like fishes belong to the family Dorosomatidae, within which the genera *Tenualosa* and *Hilsa* include morphologically similar species that are frequently confused/misidentified in fishery landings (Fig. 1). This can lead to inaccuracies in catch statistics and stock assessments, particularly in multi-species fisheries occurring in the Bay of Bengal. *Tenualosa ilisha* (Hamilton, 1822) is the most economically important species and is characterised by a moderately deep, laterally compressed body with 30–33 well-developed abdominal scutes. The head length constitutes about 28–32% of standard length, and the top of the head lacks longitudinal fronto-parietal striae. A distinct median notch is present in the upper jaw. Gill rakers are fine and numerous, typically numbering 100–250 on the lower limb of the first gill arch. The caudal fin is moderate in length (25–31% of standard length). A conspicuous dark blotch occurs behind the gill opening, followed by a series of small spots along the flank are distinguishing characters. *T. ilisha* closely resembles *T. toli* (Valenciennes, 1847), which differs in having a shorter head (22–27% of standard length), a longer caudal fin (31–34% of standard length), fewer gill rakers (60–100), 28–30 abdominal scutes, and the absence of flank spots. Both species share a notched upper jaw, a feature that distinguishes them from most other clupeids, except *Hilsa kelee* (Cuvier, 1829), which is identifiable by the presence of numerous longitudinal striae on the top of the head (Whitehead, 1985; Psomadakis *et al*., 2029). Ecologically, *T. ilisha* Inhabits in marine, estuarine, and freshwater environments and undertaking long upstream spawning migrations. In contrast, *T. toli* is predominantly marine with limited estuarine occurrence. *H. kelee* is smaller, mainly marine, and occasionally enters estuaries but does not exhibit extensive spawning migrations (Whitehead, 1985; Psomadakis *et al*., 2029). Accurate taxonomic discrimination among these species is essential for dependable fishery statistics, robust stock assessments, and effective conservation-oriented management of hilsa resources.

Hilsa fishery of West Bengal coast

The hilsa fishery along the West Bengal coast shows a clear declining trend in landings over the past 17 years (2007–2024), despite considerable fluctuations in fishing effort. From the graph, hilsa landings peaked in 2010 and 2016, exceeding 15,000 t during these years, but thereafter declined sharply to below 5,000 t after 2018 (Fig. 2). The dashed red trend line indicates a consistent downward trajectory in total landings, reflecting a progressive depletion of the stock. Fishing effort (represented by the purple line) fluctuated widely, with notable peaks around 2008–2010, 2013, and 2017, suggesting increased fishing pressure during these years. However, even with fluctuating or high effort, the corresponding catch levels did not show proportional increases, implying a decline in catch per unit effort (CPUE) and possible signs of overexploitation. The recent years (2019–2024) are characterised by low landings

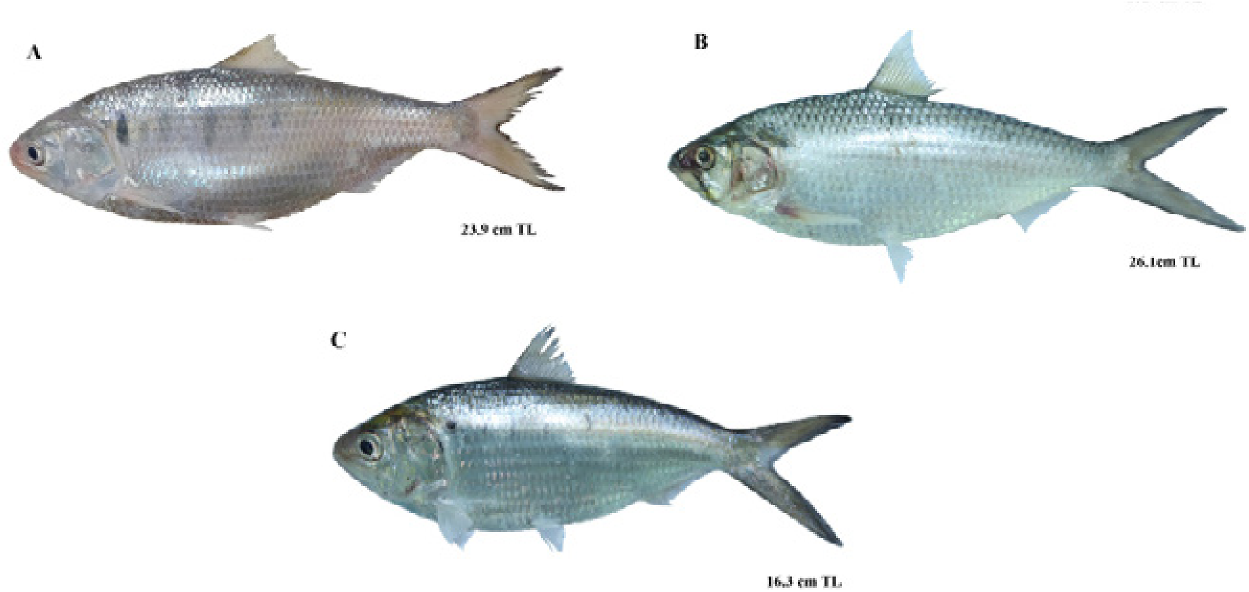

Fig. 1. Lateral view of fresh specimens of (A) *Tenualosa ilisha* (Hamilton, 1822), 23.9 cm TL; (B) *Tenualosa toli* (Valenciennes, 1847), 26.1 cm TL; and (C) *Hilsa kelee* (Cuvier, 1829), 16.3 cm TL

(<3,000 t) and reduced effort, suggesting diminishing returns and potential economic strain on the fishers targeting this resource. The decoupling between effort and yield over time highlights biological and environmental stress on the hilsa stock likely linked to juvenile fishing, spawning ground degradation, altered river flow regimes, and climatic variability affecting migration and recruitment. Overall, the data suggest that the hilsa fishery in West Bengal is in a declining phase, showing symptoms of overfishing and reduced stock productivity. Without effective enforcement of mesh-size regulations, seasonal bans, and habitat protection measures, the long-term sustainability of this fishery and the livelihoods of dependent fishing communities remain at risk.

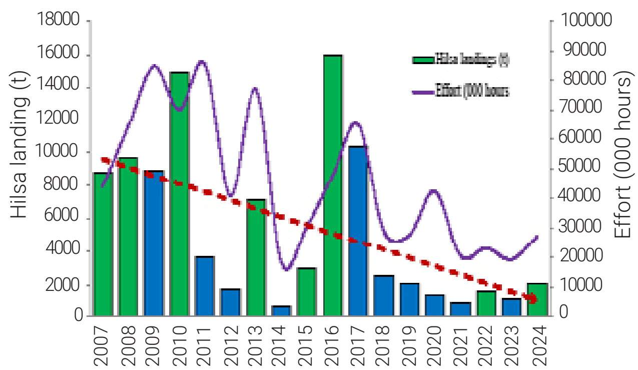

Fig. 2. Hilsa landing along the West Bengal Coast (2007–2024)

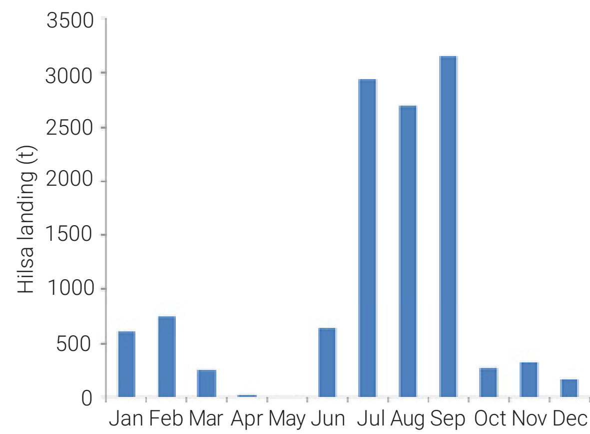

Fig. 3. Monthly landing of hilsa along the West Bengal Coast (2024)

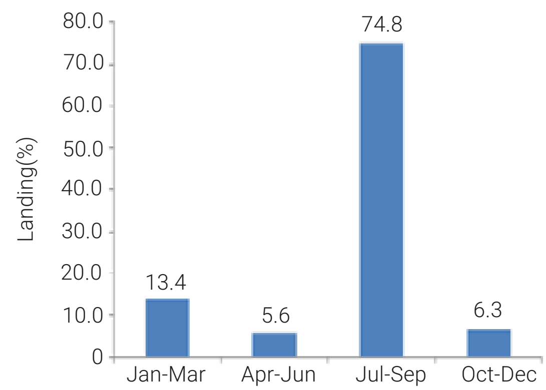

Fig. 4. Quarter-wise landing (%) of hilsa along the West Bengal Coast (2024)

The monthly catch pattern indicates a distinct seasonal trend, with hilsa landings concentrated primarily during the monsoon months (July to September). The highest catch was recorded during the July - September period, together contributing over 74.8% of the annual hilsa landings (Fig. 3). This period coincides with the major upstream spawning migration of *T. ilisha* from the coastal waters into the estuarine and riverine stretches, facilitated by increased freshwater inflow and moderate salinity conditions. In contrast, landings were minimal between April and May, marking a natural lean period likely due to the pre-monsoon fishing ban (15 April–15 June) and the offshore distribution of mature hilsa shoals. Smaller but noticeable catches occurred during January–February (590-736 t) and again in October-December (163-313 t), representing minor migratory pulses and residual post-spawning stocks in the coastal waters (Fig. 4). Overall, the 2024 monthly trend highlights the strong monsoonal dependency of hilsa fishery in West Bengal, emphasising its seasonal and migratory nature. Effective management of this fishery thus requires strict enforcement of seasonal fishing bans, mesh-size regulations, and protection of spawning grounds during peak migration months to ensure sustainable exploitation and stock replenishment.

Sector-wise landings

Sector-wise, the landings indicate the dominance of the mechanised fishing fleet reflecting the increasing modernisation of the fishery along the West Bengal coast (Fig. 5). Mechanised trawlers and gillnetters operating in the coastal regions have become the primary contributors to hilsa catches due to their higher efficiency, wider operational range, and

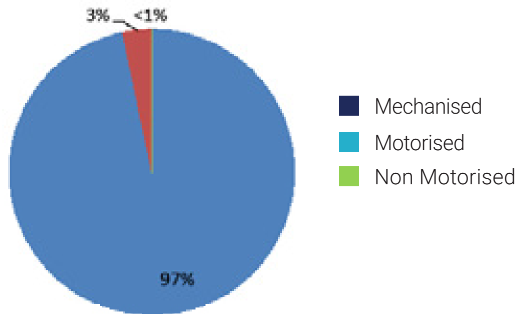

Fig. 5. Sector-wise landings of hilsa along the West Bengal Coast (2024)

advanced gear technology. The motorised artisanal fleet, using smaller boats mostly with inboard engines, contributes marginally (3%), mainly in the nearshore waters, where traditional fishing practices persist. Non-motorised craft, once significant in the past, have nearly disappeared from the hilsa fishery, reflecting a technological shift driven by increased competition and declining catch per unit effort (CPUE). This trend highlights a shift from traditional to commercialised fishing, potentially leading to increased fishing pressure and reduced access for small-scale fishers. While mechanisation enhances productivity, it also intensifies exploitation, especially during peak migratory periods, raising sustainability concerns. The near-total dominance of mechanised landings underscores the need for effort regulation, equitable resource access, and targeted conservation measures to balance economic efficiency with ecological and social sustainability.

The gear-wise landings composition highlights the predominant role of mechanised gillnetters (MGN), contributing highest (69%) to the *T. ilisha* landings along the West Bengal coast. Gillnets are highly effective in targeting adult hilsa during their migratory movements between the estuary and coastal waters, particularly in the monsoon months (July–September). Their widespread use across mechanised and motorised sectors underscores their efficiency but also raises sustainability concerns due to the capture of sub-adult fish and lack of selectivity. The multi-day trawlers or multi-day trawl net (MDTN), though contributing moderately (11%), are mainly operated in nearshore waters and often overlap spatially with gillnet operations, increasing fishing pressure on the stock. The "other mechanised gears" (MOTHS) category, comprising combinations gears (17%)

Fig. 6. Hilsa landings from gillnets at Digha Mohana, West Bengal

(Fig. 7). The negligible contribution from inboard gillnetter (IBGN) and inboard bag netter (IBBN) reflects the declining use of traditional gears, which historically played an important role in estuarine and coastal hilsa catches. Overall, the dominance of gillnets and their extensive deployment during peak migration periods indicates a high level of exploitation intensity. This pattern underscores the urgent need for gear regulation, such as enforcing minimum mesh sizes (>90 mm), restricting fishing during spawning migrations, minimise juvenile bycatch and ensure the long-term sustainability of the hilsa fishery in West Bengal.

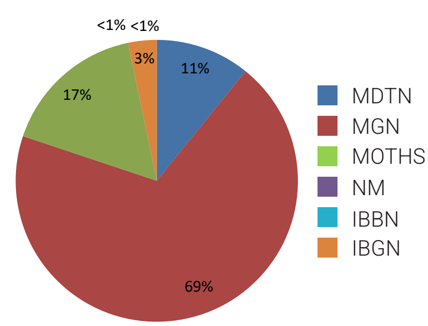

Fig. 7. Gear-wise landings of hilsa along the West Bengal Coast (2024)

The length–frequency distribution of *Tenualosa ilisha* (Hilsa) revealed total length (TL) varying between 13.7 cm and 60.4 cm (mean 31.4 cm) and corresponding total weight (TW) ranging from 26.1 g to 2473 g (mean 425.7 g) (Fig. 8). The size distribution was unimodal with majority of individuals distributed between 25 cm and 40 cm TL, indicating the dominance of sub-adult and adult fishes in the sampled population mostly due to the coverage of its coastal and marine habitats and its riverine habitat not sampled. Smaller size groups (<20 cm) were sparsely represented, suggesting limited juvenile occurrence in the sampled populations. The presence of larger individuals (>50 cm) in moderate numbers reflects the occurrence of mature brooders during their migratory phase. Overall, the distribution indicates an active recruitment and a healthy representation of multiple age classes, though the predominance of mid-sized groups highlights the need for continued monitoring to prevent growth overfishing and to ensure the sustainability of hilsa stocks along the West Bengal coast.

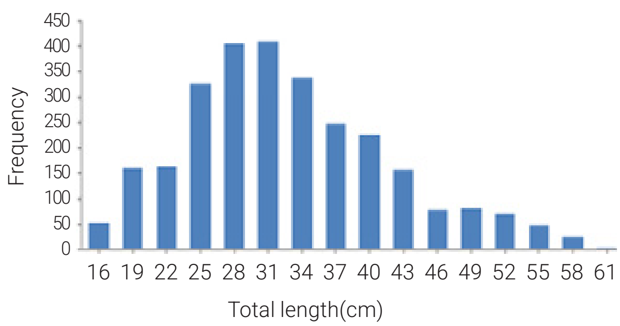

Fig. 8. Length–frequency distribution of *T. ilisha* along the West Bengal Coast

Some of the key fishery management measures already in place and those proposed based on the study reported here, are as follows.

The Government of West Bengal, Fisheries Department, through Notification No. 718 Fish/C-I/9R-3/2012 (Part-I) dated April 4, 2013 and published in the Kolkata Gazette (Extraordinary) on April 9, 2013, issued a series of regulations to conserve and manage hilsa (*T. ilisha*) stocks in the state's marine and estuarine waters under the West Bengal Marine Fisheries Regulation Act, 1993 (West Ben. Act IX of 1993). The order introduces five major restrictions aimed at protecting hilsa landings and their critical habitats:

- Mesh size regulation: The use of monofilament gill nets with mesh size below 90 mm is strictly prohibited for hilsa fishing in the state's territorial waters to prevent the capture of juveniles and undersized fish.
- Ban on juvenile catching (Jatka/Khoka Hilsa): The use of bag nets, scoop nets, lift nets, and small-meshed gill nets (below 1 inch) to catch juvenile hilsa (below 23 cm in length) in estuarine and bay-mouth areas is banned from February to April every year, protecting young fish during their seaward migration.
- Minimum legal size (MLS) enforcement: Catching, transporting, marketing, or possessing hilsa smaller than 23 cm is prohibited throughout the state to ensure sufficient recruitment into the spawning stock.
- Ban on bottom trawling: To safeguard shallow marine habitats essential for hilsa growth and survival, bottom trawling within the 12 nautical mile zone of the continental shelf is completely banned.
- Seasonal fishing ban during breeding: To promote natural spawning, catching hilsa of any size is banned for five days before and after the full moon period between 15 September and 24 October each year, the peak breeding season in the Bay of Bengal region.

Collectively, these measures aim to ensure sustainable management and long-term conservation of hilsa resources, which hold high ecological, economic, and cultural importance for West Bengal. The notification represents a critical policy step toward ecosystem-based fisheries management and the protection of marine biodiversity along the northern Bay of Bengal coast. The observations in this study indicate that the fishery is under stress, while not collapsed. The indicators (declines in catch, smaller average size, and juvenile over-exploitation) suggest that without strong fishery management rules, the resource and the fisher-livelihoods are at risk. Some recommended actions are

- Strengthen enforcement of existing regulations: mesh size, closed seasons, minimum legal size (MLS).
- Implement effort control: limit number of boats/nets targeting hilsa specifically.
- Monitor and protect critical habitats (spawning

grounds, migration routes, and estuarine nurseries).

- Socio-economic support to hilsa fishers during the ban period: diversification, value-addition, gear improvements, cooperative management.
- Research & monitoring: better data on stock, migration, spawning, recruitment to inform adaptive management.
- Continuous monitoring and periodic stock assessment.
- Establishment of an Indian Ocean Hilsa Commission (IOHC) to enable coordinated, science-based management of the transboundary hilsa (*T. ilisha*) fishery across the Indian Ocean region.

Acknowledgements

The research was supported by the Indian Council of Agricultural Research, Department of Agricultural Research and Education, Government of India. This work was carried out under the in-house project: *Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries of Odisha & West Bengal (SFD/IAF/12)*.

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Brief Communication

Rare records of reef-associated fishes from the West Bengal coast

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Surgeonfishes (family Acanthuridae) and angelfishes (family Pomacanthidae) are primarily associated with coral reefs and rocky habitats in tropical and subtropical seas. Although many species have wide geographic distributions, their occurrence outside reef environments is relatively infrequent and is seldom documented from turbid, soft-bottom coastal regions. The northern Bay of Bengal is characterised by strong riverine influence, high turbidity, and predominantly sandy-silty substrates, conditions that differ markedly from typical reef habitats (Shetye *et al*., 1996; Michels *et al*., 2003). As a result, reef-associated fishes are rarely encountered in routine fishery landings along the West Bengal coast, and available records from this region remain sparse. When such taxa are encountered, reliable identification is essential, as several species exhibit close morphological similarity with congeners and undergo marked ontogenetic colour changes that may lead to misidentification (Randall, 2001; Allen *et al*., 1998). During examination of commercial trawl landings from the West Bengal coast, three reef-associated species: *Acanthurus xanthopterus* Valenciennes, 1835, *Acanthurus bariene* Lesson, 1831, and *Pomacanthus annularis* (Bloch, 1787) were recorded. The present account provides detailed morphometric and meristic data, diagnostic characters, and colour descriptions based on fresh material. These records represent rare occurrences from a non-reef, turbid coastal environment in the northern Bay of Bengal and contribute additional verified distributional information for the ichthyofauna of the region.

Taxonomic notes

Morphometric measurements and meristic counts were recorded following standard ichthyological methods (Hubbs *et al*., 2004). Identification of surgeonfishes (*Acanthurus spp*.) was based on diagnostic characters, including body proportions, caudal-peduncle spine morphology, and fin-ray counts, following published taxonomic descriptions (Randall, 2001; Heemstra *et al*., 2022). Identification of the angelfish (*Pomacanthus* sp.) was confirmed using body shape, fin configuration, and opercular spine characters as described in standard taxonomic literature (Allen *et al*., 1998; Heemstra *et al*., 2022). The specimens were collected from commercial trawl landings at Digha Mohana (21°36'58.33" N; 87°29'56.86" E), West Bengal, during the post-fishing-ban period (2024–2025) (Fig.1). The fishes were caught in coastal waters at depths of approximately 25–30 m. Morphometric measurements were expressed as percentages of standard length (SL). Immediately after collection, specimens were preserved in crushed ice and transported to the Fish Biology Laboratory, Digha Regional Station of ICAR–CMFRI, for detailed taxonomic examination. Fresh specimens were photographed prior to preservation to document coloration and pigmentation. Meristic counts were recorded using magnification where necessary. Proportional morphometric measurements and meristic counts are presented in Table 1.

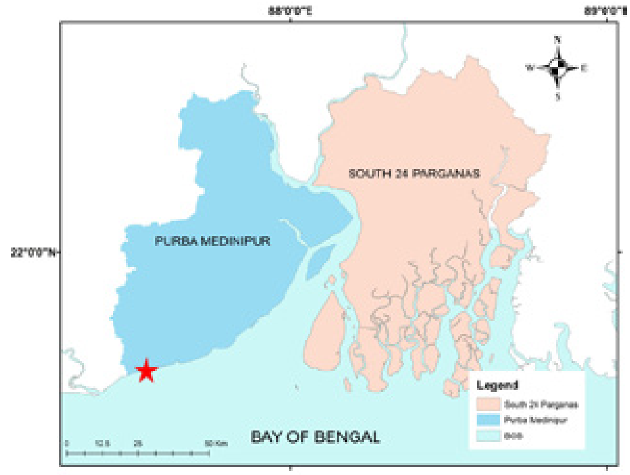

Fig. 1. Map showing the sampling location (red star) of three reef-associated fish species from the West Bengal coast

Table 1. Proportional measurement of *A. xanthopterus, A. bariene,* and *P. annularis* expressed as a percentage of standard length

Morphometric measurements	*A. xanthopterus* n = 1	*A. bariene* n = 1	*P. annularis* n = 1
Standard length (mm)	262	293	302
Head length	26.9	24.9	26.0
Pre-orbital length	17.2	16.2	9.4
Post-orbital length	5.5	4.8	12.3
Eye Diameter	5.0	5.2	5.2
Snout Length	18.0	16.4	9.1
Sub-orbital depth	17.5	17.7	7.5
Inter Orbital Width	8.9	8.4	8.9
Upper jaw length	6.7	6.3	7.6
Predorsal length	28.4	20.7	27.5
Preanal length	46.3	40.9	60.3
Prepelvic length	30.1	24.6	29.6
Pre-Pectoral length	23.9	19.9	24.6
Pectoral fin length	27.8	25.0	27.6
Pelvic spine length	11.1	11.9	13.9
Pelvic Fin length	21.0	24.5	31.0
Dorsal-fin base	67.6	71.1	69.5
Second dorsal-fin spine	8.5	6.8	5.2
Last dorsal-fin spine	15.0	13.4	16.2

Longest dorsal-fin soft ray	17.6	17.7	66.3
Anal fin base length	50.5	47.7	43.6
Second anal-fin spine	11.1	7.8	12.6
Third anal-fin spine	11.6	9.1	16.3
Longest anal-fin soft ray	17.6	15.1	18.8
Caudal-peduncle length	10.5	9.1	6.7
Caudal-peduncle depth	11.7	11.0	13.4
Caudal-fin length	39.5	44.0	17.8
Caudal concavity	19.7	24.3	0.0
Caudal-spine length	5.8	8.1	0.0
Groove in front of eye length	5.2	7.5	0.0
Body Depth	49.3	45.8	69.2
Body width	13.5	13.2	13.1
Opercular spine length	-	-	13.6
Meristic counts			
Dorsal Fin Rays	IX, 27	VIII, 27	XIII, 22
Pectoral Fin Rays	17	17	18
Anal Fin Rays	III, 24	III, 25	III, 22
Principal Caudal Fin Rays	16	16	16
Pelvic Fin Rays	I, 5	I, 5	I, 5
Anterior gill-rakers	6	8	5
Posterior gill-rakers	11	14	13
Total gill-rakers	17	22	18
Upper jaw Teeth	20	20	-
Lower jaw teeth	19	20	-

Acanthurus xanthopterus Valenciennes, 1835

Yellowfin surgeonfish (Fig. 2)
Order: Acanthuriformes (surgeonfishes)
Family: Acanthuridae (surgeonfishes)

Material examined: 1 ex., 262 mm SL, Digha Mohana (21°36' 58.3272"N 87°29' 56.8644"E), West Bengal, trawl, 25–30 m, sandy silt, 11 July 2024.

Distinctive Characters: Dorsal-fin rays IX,27; anal-fin rays III,24; pectoral-fin rays 17; pelvic-fin rays I,5; principal caudal fin rays 16; gill rakers 17 in total, comprising 6 on the upper limb and 11 on the lower limb of the first gill arch; mouth with 20 teeth in upper jaw and 19 in lower jaw. Body moderately deep, body depth contained about 2.0 times in standard length, and covered with minute scales. Dorsal profile of head convex. Mouth small, with a single row of fixed, closely arranged, spatulate teeth with denticulate margins on both jaws (Fig. 2a). Caudal-peduncle spine small, its length contained about 4.7 times in head length. Caudal fin deeply emarginated, caudal concavity contained about 5.1 times in standard length. Stomach gizzard-like.

Colour: Body bluish grey. A broad yellow band present anterior to the eye, extending irregularly posteriorly to the lower margin of the eye. Dorsal and anal fins with a blue-grey band along the base, followed by four to five alternating longitudinal bands of pale blue and dull yellow. Distal one-third of pectoral fins yellow. Caudal fin bluish grey, with a whitish transverse band at the base of the caudal peduncle. Caudal-peduncle spine socket edged with yellow and surrounded by a broad blue area. Pelvic fins with rays distinctly darker, appearing brown, and membranes bluish.

Fig. 2. *Acanthurus xanthopterus*, 262 mm SL, fresh, Digha Mohana, West Bengal

Fig. 2a. *Acanthurus xanthopterus* showing spatulate teeth with denticulate margins on both upper and lower jaws

Acanthurus bariene Lesson, 1831

Roundspot surgeonfish (Fig. 3)

Material examined: 1 ex., 293 mm SL, Digha Mohana (21°36' 58.3272"N 87°29' 56.8644"E), West Bengal, trawl, 25–30 m, sandy silt, 11 July 2024.

Distinctive Characters: Dorsal-fin rays VIII,27; anal-fin rays III,25; pectoral-fin rays 17; pelvic-fin rays I,5; principal caudal fin rays 16; gill rakers 22 in total, comprising 8 on the upper limb and 14 on the lower limb of the first gill arch; mouth with 20 teeth each in upper and lower jaw. Body moderately deep, body depth contained about 2.2 times in standard length, covered with minute scales. Forehead strongly convex. Mouth small, bearing a single row of fixed, closely set, spatulate teeth with denticulate margins on both jaws (Fig. 3a). Caudal-peduncle spine well developed, its length about 3.1 times in head length. Caudal fin lunate, caudal concavity contained about 4.1 times in standard length. Stomach gizzard-like.

Colour: Body marked with alternating, irregular longitudinal bands of orange-brown and pale blue. Head yellowish brown, ornamented with small orange-yellow spots and irregular markings on the cheeks. A rounded black spot, edged with blue and measuring nearly two-thirds of the eye diameter, present just posterior to the eye, followed by a diffuse orange-yellow vertical bar. Margin of gill opening black; mouth white. Caudal-peduncle spine socket edged with black. Dorsal and anal fins predominantly yellow, each with a bright blue line along the base and a blue marginal band with a few blue lines near the fin edge. Caudal-fin lobes orange-yellow, shading outwardly to pale blue, with the central portion of the fin dark brown, and a white band at caudal-fin base. Pectoral fin blackish blue, becoming yellowish over the upper two-thirds. Pelvic fin blackish, grading to yellowish near the base.

Fig. 3. *A. bariene*, 293 mm SL, fresh, Digha Mohana, West Bengal

Fig. 3a. *A. bariene* showing spatulate teeth with denticulate margins on both upper and and lower jaws

Pomacanthus annularis (Bloch, 1787)

Blue-ring angelfish (Fig. 4)
Order: Acanthuriformes (surgeonfishes)
Family: Pomacanthidae (Angelfishes)

Material examined: 1 ex., 302 mm SL, 1432 g TW, Digha Mohana (21°36' 58.3272"N 87°29' 56.8644"E), West Bengal, trawl, 25–30 m, sandy silt, 11 July 2025.

Distinctive Characters: Dorsal-fin rays XIII,22; anal-fin rays III,22; pectoral-fin rays 18; pelvic-fin rays I,5; caudal fin rays 16; gill rakers 18 in total, comprising 5 on the upper limb and 13 on the lower limb of the first gill arch. Body oblong, very deep and laterally compressed, body depth contained about 1.4 times in standard length; a prominent spine presents at the angle of the preopercle, the preopercular spine distinctly grooved; soft portions of dorsal and anal fins round; caudal fin rounded; mouth small, furnished with numerous, well-developed, elongate needle-like tooth bands on both jaws (Fig. 4a); body and head covered with ctenoid scales.

Colour: Head and body yellowish brown, marked with several bright blue, curved bands radiating from the pectoral-fin base and extending onto the soft dorsal and anal fins and the caudal peduncle region. A conspicuous blue ring present above the upper margin of the opercle. Head with two horizontal blue stripes, the upper stripe passing through the mid-eye level and the lower stripe positioned just below the eye. Tip of dorsal fin elongated and yellowish. Pectoral fins yellow. Pelvic fins with rays distinctly darker, appearing orange to brown, with transparent membranes. Caudal fin white, edged with a yellow margin.

Fig. 4. *Pomacanthus annularis* (Bloch, 1787), 302 mm SL, fresh, Digha Mohana, West Bengal.

Fig. 4a. Close-up views of jaw dentition: Pomacanthus annularis exhibiting numerous, well-developed, elongate needle-like tooth bands on both jaws.

Remarks

The Yellowfin surgeonfish *Acanthurus xanthopterus* exhibits pronounced ontogenetic colour changes, which increase the likelihood of misidentification. It is most often confused with *A. mata* (Cuvier, 1829) and *A. dussumiere* Valenciennes, 1835, but can be distinguished by the presence of four longitudinal blue bands and a blue-grey band at the base of the dorsal and anal fins and the yellow colour of the outer one-third of the pectoral fin (Randall, 2001; De Bruin *et al*., 1995). The Roundspot surgeonfish *Acanthurus bariene* closely resembles *A. dussumiere* but is readily separated from congeners by a distinct, round black spot immediately posterior to the eye, which constitutes its most reliable diagnostic character (Randall, 2001). The Blue-ring angelfish *Pomacanthus annularis* is most frequently confused with the emperor Angelfish *P. imperator* (Bloch, 1787); however, it is clearly distinguished by the conspicuous blue ring above the opercle and curved blue bands radiating from the pectoral-fin base (Heemstra *et al*., 2022). The marked juvenile-to-adult colour transformation observed in both species further contributes to frequent confusion.

Conclusion

The occurrence of *Acanthurus xanthopterus, A. bariene,* and *Pomacanthus annularis* along the West Bengal coast represents rare and noteworthy records, as these taxa are typically associated with coral reef and rocky habitats. Their capture from highly turbid, soft-bottom environments of the northern Bay of Bengal at depths of 25–30 m through commercial trawling is likely incidental and may reflect post-larval dispersal, ontogenetic or seasonal movements, or displacement driven by prevailing oceanographic conditions. Although each species was represented by a single specimen, such records constitute valuable additions to regional ichthyofaunal inventories and underscore the ecological connectivity between reef and adjacent non-reef coastal ecosystems. The present findings highlight the importance of fishery-dependent monitoring in documenting uncommon or extralimital occurrences and provide baseline data that improve understanding of species distributions, habitat use, and biogeographic patterns along the West Bengal coast and the wider Bay of Bengal.

Acknowledgements

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Brief Communication

Calcified gastropod operculum: A symbol of luck and prosperity

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Calcified opercula of marine gastropod range from thin and flat, rigid flat to thickened; lid-like structures composed primarily of calcium carbonate that seal the shell's aperture upon retraction. These heavily mineralised plates serve as defensive armor against predators attempting to breach the shell and provide a hermetic seal that significantly mitigates water loss. Additionally, they shield soft tissues from extreme environmental stressors, including high temperatures and intense UV radiation. Like the mantle, the opercular pad deposits consecutive layers of material to form the operculum. The calcified operculum can be also categorised into two main categories.

1) Paucispiral: The structure is slightly elongated, showing few coils and an inferior nucleus; this opercular type is prevalent in Neritimorpha and mesogastropod/Caenogastropoda.

2) low multispiral: The structure exhibits few spiral coils and slightly inferiorly displaced nucleus; this form of operculum is common in some Neritimorpha, basal Caenogastropoda and Vetigastropoda. The outer, exposed side of the operculum is typically smooth

Turbo sp., Outer and inner view of low multispiral calcified operculum and Gomati Chakra in various dimension for sale

and strongly convex or domed. It is often glossy, with colored, swirling, or patterned designs. The inner side, which faces the snail's foot, is flat, white, and often reveals the spiral growth lines (suture lines).

Natica sp., outer and inner view of paucispiral calcified operculum

The low multispiral calcified operculum with spiral coils is considered as a symbol of luck and prosperity in Hindu Culture. Living species (about 164 recognised species) coming under Turbinidae possess a thick, spirally-coiled calcareous operculum. Turbinate gastropods are distributed globally in various habitats including rocky, sandy and seagrass beds predominantly in calcareous habitats from the intertidal zone to at least 500m depth at tropical to polar latitudes. The heavily calcified opercula of turban snails (Turbinidae) are sold as Sudarshan Chakra Stone/Gomati Chakra/ Gomati stone/ Vishnu Chakra in spiritual shop or shell craft outlet particularly in religious city of India like Dwarka, Tirupathi, Rameswaram, Ujjain etc.

Individual sacred chakra stones are available in various dimensions, categorised as small (up to 1.5 cm), medium (1.5-2.5 cm), and large (exceeding 2.5 cm). These items are organised in separate trays for retail sales. Prices of the Gomati chakra is fixed based on the sizes or diameter of the disc. This Gomati Chakra is also used to make various kind of jewelry pieces such as necklaces, bracelets, pendant, and rings. Gomati chakras are also used to make various shell craft items such as tree, pyramid, ball, etc. Prices of the Gomati Chakras and shell craft items will vary place to place.

In India, main species which can contribute to this Gomati Chakra are *Turbo (Turbo) petholatus, T. argyrostomus, T. bruneus, T. intercostalis* and *T. marmoratus* etc. Owing to its protected status under the Wildlife (Protection) Act, 1972, *T. marmoratus* cannot be utilised for the Gomati Chakra. Due to the low incidence of these specific turbinates at Indian landing sites, Gomati chakras are likely imported from international sources, often categorised under general shell imports. The largest, thickest operculum are found in *T. marmoratus* (diameter > 5 cm; thickness > 1.5 cm). Within a single species, opercular thickness is greater in populations inhabiting tropical waters compared to those in cold-temperate regions.

Brief Communication

Chavakkad: A globally recognized breeding ground for threatened guitarfish species

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The coastal waters of Chavakkad, including Chettuva estuary located in Thrissur district, Kerala, serve as a critical habitat for the breeding and sustenance of several threatened guitarfish species. This ~10 km stretch of shallow coastal waters is linked to the Chettuva estuary, which is fed by the Karuvannur, Kecheri, and Puzhakkal rivers. The continuous freshwater influx, combined with nutrient-rich waters from convective mixing and eutrophication during the monsoon, creates an ideal environment for marine biodiversity. Recognized as an Important Shark and Ray Area (ISRA), by the IUCN Species Survival Commission (SSC), it supports diverse benthic species, including three guitarfishes facing extinction risk.

Map showing Chavakkad, Kerala

Ecological significance of the area

The Chavakkad coastal belt, extending from inshore zones to depths of 20 meters, is characterized by:

- Sandy beaches that offer suitable substrates for benthic species.
- Mangrove ecosystems, with high biodiversity including *Rhizophora mucronata* and *Bruguiera*

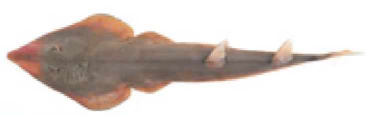
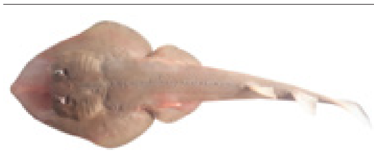
cylindrica, which provide shelter and nursery grounds.

- Mudbanks, which form during the monsoon (June–July) and enhance primary productivity due to nutrient influx and convective mixing.

This combination of physical, chemical, and biological factors makes Chavakkad a unique ecological niche along the southeastern Arabian Sea.

Key Guitarfish Species of Conservation Concern Along the Chavakkad Coast

The Chavakkad coast serves as an important breeding and nursery ground for three globally threatened guitarfish species, highlighting its significance for marine conservation and management.

	Species	Conservation Status & Habitat	Key Significance
	Stripenose Guitarfish (*Acroteriobatus variegatus*)	IUCN Status: Critically Endangered Habitat: Restricted to shallow coastal waters along sandy beaches.	One of the rarest guitarfish species in the region. Frequently observed along the Chavakkad coast during the post-monsoon season, indicating its importance as a breeding and nursery habitat.
	Bengal Guitarfish (*Rhinobatos annandalei*)	IUCN Status: Critically Endangered Habitat: Found in shallow and moderately deeper waters near estuarine areas	A range-restricted species largely confined to the Arabian Sea Large Marine Ecosystem (LME) and the Bay of Bengal LME. The Chavakkad coast serves as an important habitat for this threatened species.
	Widenose Guitarfish (*Glaucostegus obtusus*)	Wild Life (Protection) Amendment Act, 2022: Schedule I IUCN Status: Critically Endangered Habitat: Prefers sandy and muddy substrates near estuaries.	Critical breeding populations have been documented in the Chettuva region.

Reproductive patterns and field observations (2020–2022)

Stripenose Guitarfish

- Breeding Season: November to December.
- Mature Individuals: Nine mature individuals, including eight females (65–70 cm TL), were observed. Four pregnant females with 5–6 near-term embryos.
- Habitat: Prefers the shallow coastal waters influenced by estuarine outflows.

Bengal Guitarfish

- Breeding Season: November to December.
- Mature Females: Sixteen mature females (76–84 cm total length, TL) were recorded with 10–11 near-term embryos each.
- Neonates: Observed neonates measured 18–21 cm TL, matching the species' known size-at-birth (20 cm TL).
- Habitat: Neonates were frequently seen in shallow (0–2 m depth) sandy habitats near the Chettuva estuary.

Widenose Guitarfish

- Breeding Season: October to December.
- Mature Individuals: Eleven mature individuals, including five pregnant females (89–92 cm

TL), were documented, each carrying 5–6 near-term embryos.

- Neonates: Two neonates (19–20 cm TL) were recorded during this period in shallow waters.
- Significance: The consistent observation of neonates indicates Chavakkad coast as a crucial nursery area.

Global recognition and conservation implications

The Chettuva estuary and the adjacent Chavakkad coast in Thrissur district, Kerala, have gained global recognition as a critical breeding and nursery ground for threatened guitarfish species. This recognition was formalized through the publication of the *Chavakkad ISRA Factsheet*, an internationally endorsed assessment developed with substantial scientific inputs from ICAR-CMFRI (IUCN SSC Shark Specialist Group, 2023). It highlighted the global importance of protecting and conserving this unique marine ecosystem. Guitarfishes and wedgefishes contribute only 0.15% of the total elasmobranch landings in Thrissur district which includes the Chettuva region, currently under focus. Between 2020 and 2022, other elasmobranch species recorded in the landings from this area included *Scoliodon* spp., *Rhizoprionodon* spp. (Requiem sharks), *Sphyrna lewini* (Scalloped hammerhead), *Alopias* spp. (Thresher sharks), *Himantura uarnak* (Honeycomb stingray), and *Mobula birostris* (Giant manta). The IUCN SSC Shark Specialist Group has recognized Chavakkad as an Important Shark and Ray Area (ISRA), emphasizing the need for safeguarding breeding grounds through community engagement and sustained research and monitoring. Local artisanal fishers and recreational anglers play a crucial role in monitoring guitarfish populations by regularly reporting sightings of mature and juvenile guitarfishes during the post-monsoon season, especially in areas close to the Chettuva estuary. Interviews with fishers have corroborated scientific observations, emphasizing the importance of community engagement in conservation efforts.

Effective conservation strategies hinge on long-term monitoring of guitarfish populations and their habitats along with studies on population dynamics, reproductive cycles, and habitat preferences which provide critical data to formulate protective measures. Integrating community knowledge with scientific research further strengthens the conservation framework, ensuring that strategies are both culturally appropriate and ecologically effective.

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Harvest patterns of Black clam in the Vembanad Lake, Kerala

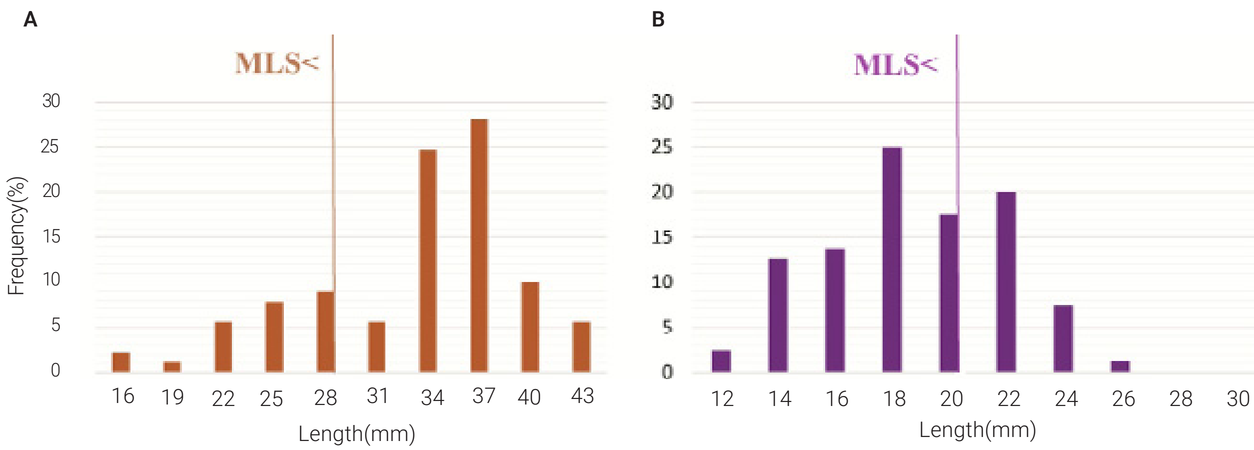

Fig. 1. Size frequency distribution of Black clam *Villorita cyprinoides* from Vembanadu lake (A: Kundanoor region; B: Vaduthala) during post monsoon (2025)

Vembanad Lake, the longest lake in India and the largest in the state of Kerala, supports a vital fishery for the Black clam, *Villorita cyprinoides* (J. E. Gray, 1825), and providing livelihoods for more than 6,000 fishermen. *V. cyprinoides*, is the most important clam species in India contributing more than three-quarters of the clam landings in the country. In response to the recent reports of intensive harvesting of Black clam, *Villorita cyprinoides*, in the Kundanoor and Vaduthala regions of Vembanad Lake during the post monsoon period (September and November 2025), a rapid field survey was conducted in the regions to assess the nature of exploitation. Representative random samples of Black clam were collected from the fishing grounds and analysed for size composition to evaluate compliance with the Minimum Legal Size (MLS) regulations.

In the Kundanoor region high abundance and harvesting of *V. cyprinoides* started during late August 2025 and about 70 fishers were involved throughout August and September 2025. The fishery was supported by clams of 20-45 mm size with the dominance of 30-35 mm size group. Size analysis revealed that more than 75% of the collected clams were above the MLS of black clam (>20 mm). The elevated level of fishing in this region is a direct result of last year's spatfall. In the Vaduthala (Korumkotta) region high abundance and harvesting of *V. cyprinoides* started during late August 2025 and about 70 fishers harvested throughout November and December 2025. The fishery was supported by clams of 20-45 mm size with the dominance of 30-35 mm size group. Size analysis revealed that more than 71% of the collected clams were below the MLS of black clam (<20 mm).

Field observation indicated that fishers from distant locations, such as Chempu, Vaikom, and Panavally have been drawn to this region and actively fished in the black clam beds of Kundanoor and Vaduthala as a source of livelihood. This influx of migrant fishers is primarily attributed to the presence of only juvenile clams in their traditional fishing grounds, which they are largely refraining from harvesting.

These observations highlight contrasting exploitation dynamics within closely located clam beds in the Vembanad Lake, emphasising the need for site-specific monitoring and enforcement of MLS regulations, to ensure the long-term viability of the black clam population.

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Accidental catch of protected Widenose guitarfish released by the fisherfolk of Karwar, Karnataka

Widenose guitarfish release at Majali, Fish Landing Centre

Widenose guitarfish release at Aligadda fish landing centre, Karwar

In September 2025, during routine visits to fish landing centres, researchers from the ICAR- CMFRI observed two instances of incidental entanglement of the Widenose guitarfish, a species protected under Schedule I of the Indian Wildlife (Protection) Act, 1972, following the 2022 amendment, due to a significant decline in its population. These incidents highlight the ongoing challenges in conserving such vulnerable species and the crucial role of awareness among the fisher communities.

The first incident occurred on 18th September 2025, during a visit to the Majali fish landing centre, where the accidental capture of two Widenose guitarfish (*Glaucostegus obtusus* (Müller & Henle, 1841)) in a gillnet landing was observed by the authors. Both specimens were mature females, measured 60 cm and 78 cm total length (TL) and were still alive at the time of landing. The fisherwomen were unaware of the protected status of the species, intended to sell the fish in the local market. Dr. Mahesh, accompanied by Mr. Nagaraj M. Durgekar, supportive staff, seized the opportunity to raise awareness among other fisherwomen present at the beach. They emphasised the protected status of the species and encouraged the community to refrain from selling such fish, and convinced the fisherwomen to release them back to sea. They also urged that any accidentally caught guitarfish in the future should be released back into the sea.

A week later, on 26 September 2025, another unintended entanglement of a Widenose guitarfish occurred at Aligadda beach, Karwar. The fishermen who were aware of the protected status of the species promptly reported the incident to the ICAR-CMFRI. This opportunity was used to reinforce the protection status of the species among other fishermen at the landing centre and assist the fishermen in releasing a mature female measuring 107 cm back into the sea. To date the largest recorded specimen of this species, measuring 114 cm, was found off the coast of Goa. Dr. Mahesh noted that it is encouraging to see fishermen responding positively to awareness efforts and voluntarily releasing protected species. He mentioned similar incidents in the past year, where two Widenose Guitarfish were released alive in Gokarna and Karwar, following awareness campaigns by CMFRI staff.

Originally, ten elasmobranch species were protected under Schedule I of the Wildlife (Protection) Act, 1972. In 2022, nine more species were added to this list, including: Bowmouth guitarfish, Clubnose guitarfish, Widenose guitarfish, Giant manta ray, Reef manta ray, Bottlenose wedgefish, Smoothnose wedgefish, Giant freshwater whipray and Dwarf sawfish. These species are now protected from capture, landing, or trade along the Indian coastline. Among them, the Widenose guitarfish is a small coastal elasmobranch, typically found in shallow waters and estuaries. It is vulnerable to incidental catch in gillnets, single-day trawlers, hook-and-line gear, and shore seine operations.

The conservation of the Widenose guitarfish is part of CMFRI's broader initiative to protect elasmobranch species along India's coasts. Dr. Mahesh emphasised the importance of vigilance among fishers: any live accidental catch of a protected species must be released immediately, and dead specimens must be reported to the nearest Forest Department or State Fisheries Department. He emphasised that under no circumstances should there be any sale or trade of these species, even if they are found dead post-landing. In conclusion, he reiterated the urgent need to enhance awareness about the newly protected species under the Wildlife Protection Act and called upon the fishing community to support conservation efforts by safely releasing any such species caught unintentionally.

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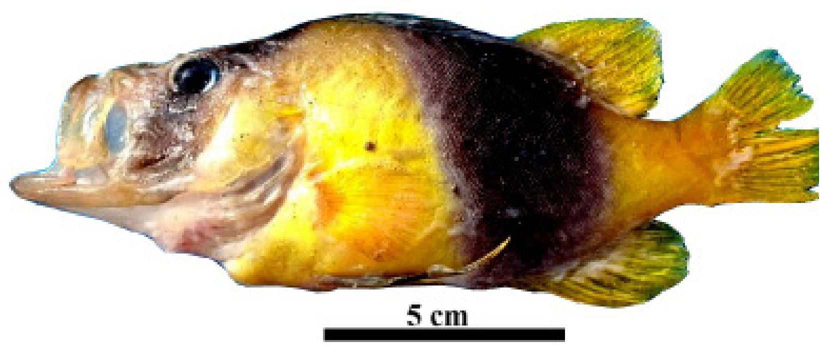
Occurrence of the Barred soapfish off Kovalam, Tamil Nadu

The Barred soapfish *Diploprion bifasciatum* Cuvier, 1828, family Liopropomatidae of order Perciformes is a coral reef–associated species widely distributed in the Indo-Pacific region. Records of *Diploprion* species from the Indian coast are scarce. A single specimen of *D. bifasciatum* were collected from off Kovalam (12°47'42"N; 80°15'43"E, Tamil Nadu (southeast coast of India), on 14 August 2025. The specimen was captured using a bottom-set gillnet (56 mm mesh size) at a depth of 12 m.



Barred soapfish *Diploprion bifasciatum*

The specimen measured 184 mm in total length. The body is compressed and moderately deep; the mouth is oblique with a convex interorbital space and is protrusible, with villiform teeth present on the premaxilla. The lateral line is more strongly convex anteriorly than posteriorly. The margins of the preopercle, subopercle, and interopercle are serrated. The caudal fin is rounded. Pelvic fins are elongate, with their tips reaching the spinous portion of the anal fin. A deep notch separates the spinous and soft portions of the dorsal fin, with the third dorsal spine being the longest. The pelvic fins are dark with a slight yellowish tinge. Scales are ctenoid and shallowly embedded in the skin, and are absent on the preorbital region of the head. The body is light yellowish in colour, with two prominent dark bands: the first, narrow band extends from the nape to the branchiostegal region, and the second, broader band runs from the anterior dorsal spines to the anal region.

The species has previously been recorded in India from the Andaman and Nicobar Islands (Rajan and Sreeraj, 2015), Odisha (Barman *et al*., 2007; Pati *et al*., 2018), Gulf of Mannar (Tamil Nadu) (Murugan and Namboothri, 2012), the Lakshadweep Islands (Prabhakaran *et al*., 2013), and the Gulf of Kutch, Gujarat (Vadher *et al*., 2024). This record represents an additional distributional data point for *Diploprion bifasciatum* along the southeast coast of India. The observed morphological characters and colouration are consistent with earlier descriptions, confirming the taxonomic identity of the specimen. The occurrence of this species in shallow reef-associated waters off Kovalam contributes new baseline data of this poorly documented soapfish serranidae in Indian waters and highlights the need for further targeted surveys.

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Incidental occurrence of *Aequorea* jellyfish in ring seine landings

On 21 August 2025, at the Azheekal Fisheries Harbour of Kollam district, all ring seine boats reported an unusually large catch of *Rastrelliger kanagurta* (Cuvier, 1816) (Indian mackerel) accompanied by a significant number of jellyfish belonging to the genus *Aequorea*. These jellyfish were intermixed with the mackerel, causing considerable difficulties for the fishermen. Extensive manual effort was required to separate the jellyfish from the fish, leading to delays in the routine auction process at the harbour. Additional labour was needed for sorting, which in turn increased operational costs. Consequently, the overall profit from the day's fishing activities was significantly reduced.

In addition to complicating sorting operations, the jellyfish caused several other operational challenges. Their presence in large numbers clogged the ring seine nets, reducing their filtering efficiency and hampering effective fishing. The labour-intensive task of separating jellyfish from the catch required significant time and effort, and several fishermen reported skin irritation after direct contact with the jellyfish. In some instances, portions of the catch had to be discarded due to the difficulty in separating the fish from the jellyfish and the discomfort caused by handling them. Moreover, the considerable weight of the jellyfish, often brought in along with seawater, placed stress on the nets, leading to damage that required repair and, in some cases, resulted in lost fishing days. Although the occurrence of *Aequorea* jellyfish is often seasonal, their simultaneous appearance with valuable fish landings such as mackerel disrupts post-harvest handling and marketing. This, in turn, negatively affects the income and economic stability of the ring seine fishery. Regular monitoring of jellyfish swarms is therefore essential to better understand their frequency, intensity, and impact on coastal fisheries and dependent fishing communities.

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