



Comprehensive Annual Summary Report 2026 – ICAR-CMFRI

Evidence Supporting Data Collection and Biological Monitoring

Karnataka Small Pelagic Purse Seine Fishery Improvement Project (FIP)

1. Establishment of a Landing Monitoring System for Target Species

1.1 Institutional Framework and Recruitment of Enumerators:

A structured marine fish landing monitoring system has been established and implemented by the **ICAR-Central Marine Fisheries Research Institute (CMFRI)** under the national marine fisheries data collection programme. This monitoring framework ensures systematic, standardized, and scientifically validated collection of fisheries data from landing centres along the Karnataka coast.

Enumerators responsible for data collection are recruited through a **national-level competitive examination conducted by the Indian Council of Agricultural Research (ICAR), New Delhi**, followed by an interview-based selection process. Selected candidates are appointed as technical staff and deputed to ICAR institutes, including CMFRI regional centres.

Following recruitment, enumerators undergo specialized training at CMFRI covering:

- Identification of marine fish species through **marine fish taxonomy training**
- Characteristics of major and minor fish landing centres
- Fishing craft and gear operations
- Standardized fisheries data collection methodologies
- Digital data entry using **GPS-enabled electronic tablets**

This training ensures that enumerators are capable of collecting accurate and standardized fisheries data consistent with national fisheries monitoring protocols.



The establishment of this trained enumerator network provides the institutional foundation required for **reliable monitoring of marine fish landings and fisheries statistics generation** along the Karnataka coast.

1.2 Standardized Methodology for Fisheries Data Collection

Marine fish landing data are collected using the **Stratified Random Sampling (SRS) methodology**, which has been developed and standardized by ICAR-CMFRI for national marine fisheries monitoring. This methodology is widely accepted as the official statistical framework for estimating marine fish production in India.

The SRS methodology incorporates the following key elements:

Stratification of the Coastline

The Indian coastline is divided into maritime states and fishing regions, forming statistically defined strata that represent different fishing zones.

Selection of Representative Landing Centres

Within each stratum, representative landing centres are selected based on:

- fishing intensity
- species diversity
- regional importance
- operational characteristics of fishing fleets

Random Selection of Sampling Days

Sampling days are selected using random number techniques to ensure unbiased temporal representation of fishing activity.

Collection of Catch and Effort Data

On each sampling day, enumerators record detailed information including:

- species-wise catch composition



- fishing craft and gear used
- fishing effort and trip characteristics
- operational details of fishing units

Digital Data Recording and Transmission

Since 2017, the monitoring programme has been fully digitized. Enumerators use **GPS-enabled tablets and web-based applications** to record catch data directly at landing centres. The collected information is transmitted to the **central CMFRI database server in Kochi** for processing and analysis.

Statistical Expansion and Estimation

The collected sample data are expanded using statistical raising factors to generate:

- landing centre level estimates
- district level estimates
- state level production estimates
- national marine fish production statistics

Through this standardized methodology, CMFRI produces **species-wise and region-wise marine fish production estimates**, which serve as the official reference data for fisheries management and policy formulation in India.

Ensuring Sustainability...

1.3 Operational Implementation along the Karnataka Coast

The fisheries monitoring system was initially piloted at selected landing centres along the Karnataka coast and was subsequently expanded to cover **both major and minor fish landing centres** across the state.

At present, the system is fully operational and provides continuous monitoring of fish landings in Karnataka. The system generates:

- quarterly marine fish landing statistics
- annual production estimates
- species-wise catch composition data



These datasets provide essential scientific inputs for:

- fisheries stock assessment
- evaluation of fishery performance
- development of fisheries management measures
- policy planning and resource sustainability initiatives.

The implementation of this monitoring framework ensures that **reliable fisheries data are available to support sustainable management of the purse seine fishery and associated pelagic resources.**

2. Biological Sampling of Key Target Species

2.1 Objectives of the Biological Sampling Programme

In addition to catch monitoring, CMFRI has implemented a biological sampling programme aimed at generating scientific information required for **fish stock assessment and population dynamics analysis.**

The biological sampling programme focuses on major small pelagic species commonly captured in purse seine fisheries along the Karnataka coast, including:

- Indian oil sardine (*Sardinella longiceps*)
- Indian mackerel (*Rastrelliger kanagurta*)
- Scads (*Decapterus* spp.)
- Bullet tuna and little tuna (*Auxis* spp., *Euthynnus affinis*)
- Other sardine species (*Sardinella* spp.)

These species represent the primary components of purse seine landings and therefore play a critical role in evaluating stock status and fishery sustainability.

2.2 Sampling Methodology

Biological sampling was conducted **in situ at major fish landing centres such as Mangalore and Malpe**, which are key landing hubs for purse seine fisheries along the Karnataka coast.



Sampling activities were carried out from **January to August 2025**, covering landings from purse seine, ring seine, and trawl fisheries.

For each sampled fish specimen, the following biological parameters were systematically recorded:

- total length
- body weight
- sex and sex ratio (male:female)
- gonadal maturity stages (immature, mature, gravid, spent)

These parameters provide critical information on:

- growth patterns
- reproductive cycles
- spawning seasons
- size structure of fish populations

The collected biological datasets form an important scientific basis for stock assessment modelling and evaluation of fish population dynamics.

2.3 Biological Characteristics of Major Pelagic Species

Analysis of the biological samples revealed important reproductive and population characteristics of key pelagic resources.

For **Indian oil sardine (*Sardinella longiceps*)**, sampled individuals ranged from **119–187 mm in length with a mean length of approximately 146 mm**. The observed sex ratio was approximately **1:1.2**, with **47.3% of individuals in mature stage and 45.2% in spent stage**, indicating active spawning during the sampling period.

For **Indian mackerel (*Rastrelliger kanagurta*)**, sampled individuals ranged from **101–268 mm with an average length of approximately 205 mm**, and a sex ratio of **1:1.3**. Approximately **65% of individuals were recorded in the spent stage**, indicating that peak spawning had occurred during the sampling period.



Additional biological observations were recorded for several commercially important species including:

- *Sardinella gibbosa*
- *Sardinella albella*
- *Megalaspis cordyla*
- *Decapterus russelli*
- *Decapterus macrosoma*

These datasets provide detailed information on **length distribution, maturity stages, and seasonal reproductive patterns**, which are essential inputs for fishery stock assessment models.

2.4 Species Composition of Purse Seine Landings

Comprehensive in-situ sampling conducted during **January–December 2025** revealed that the purse seine fishery along the Karnataka coast is dominated by small pelagic species.

The major components of purse seine landings included:

- **Indian mackerel (*Rastrelliger kanagurta*) – 33.1%**
- **Indian oil sardine (*Sardinella longiceps*) – 16.7%**
- **Tuna species collectively – 18.0%**, including *Euthynnus affinis*, *Auxis thazard*, *Thunnus albacares*, and *Auxis rochei*
- **Narrow-barred Spanish mackerel (*Scomberomorus commerson*) – 10.2%**

Other species recorded in smaller proportions included:

- *Trichiurus lepturus*
- *Decapterus russelli*
- *Megalaspis cordyla*
- *Sardinella gibbosa*
- *Selar crumenophthalmus*

These results confirm that **small pelagic schooling fish dominate the purse seine fishery in Karnataka**, which is consistent with the ecological characteristics of the fishery.



2.5 Seasonal Variability in Catch Composition

Seasonal variations in species composition were also observed during the sampling period. Purse seine catches collected during January–August 2025 were dominated by:

- *Sardinella longiceps* (31.1%)
- *Rastrelliger kanagurta* (23.1%)
- *Trichiurus lepturus* (10.9%)
- *Thryssa* spp. (8.8%)
- *Decapterus* spp. (approximately 10%)

Ring seine and trawl samples displayed different catch compositions, reflecting variations in fishing gear selectivity and operational fishing grounds.

These observations highlight the importance of continuous monitoring to understand **seasonal shifts in species abundance and fishery dynamics**.

3. Contribution to Fisheries Management and FIP Objectives

The combined implementation of the **Landing Monitoring System** and the **Biological Sampling Programme** provides robust scientific data required for evidence-based fisheries management.

The datasets generated through these monitoring programmes contribute directly to:

- fish stock assessment studies
- evaluation of fish population dynamics
- identification of spawning periods
- monitoring of size structure of fish stocks
- analysis of seasonal catch composition trends

These outputs support the objectives of the **Karnataka Small Pelagic Purse Seine Fishery Improvement Project (FIP)** by providing scientifically validated information required for:

- improved fisheries monitoring
- informed management decisions
- sustainable utilization of pelagic fish resources
- long-term conservation of fish stocks.



4. Conclusion

The fisheries monitoring and biological sampling programmes conducted by ICAR-CMFRI along the Karnataka coast represent a significant advancement in the scientific understanding of small pelagic fisheries.

The **Landing Monitoring System**, supported by trained enumerators, standardized sampling methodologies, and digital data reporting tools, ensures the availability of reliable fisheries statistics.

Simultaneously, the **Biological Sampling Programme** provides critical information on species composition, size distribution, maturity stages, and reproductive dynamics of key pelagic resources.

Together, these initiatives provide a strong scientific foundation for **stock assessment, sustainable fisheries management, and the implementation of improvement actions under the MarinTrust Fishery Improvement Project (FIP)**.

