

ACCOUNTING FOR MARINE FISHERIES, AQUACULTURE, FISH PROCESSING AND FISH PROVISIONING SERVICES

MoSPI Seminar

Data for Sustainable Development: India's Environment Accounts
and Its Role in Policy and Decision Making

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Indian Fisheries: A GLANCE

Total fish production (2019-20)	13.4 Million Metric tonnes (Mt)
Marine (2019-20)	3.72 Million Mt
Inland (2019-20)	10.43 Million Mt
Contribution of fisheries to GVA (2018-19 at Current prices)	Rs. 2,12,915 crores
Fisheries GVA as % of total GVA	1.24 %
Fisheries GVA as % of total Agri. GVA	7.28%
Export of fishery products (2019-20)	1.28 Million Mt
Export value of fishery products (2019-20)	Rs. 46,663 crores

Accounting for Fisheries, Aquaculture & Allied Sectors

Scope of the presentation

- Identification of sectors and sub-sectors, including un-tapped activities that fall within the purview of fisheries & aquaculture in Blue Economy (I am not talking about other non-fishery/non-aquaculture sectors which could be part of the Blue Economy).
- Insights on sources of data and other information related to accounting purposes.

Overview of the presentation

- Fisheries & aquaculture accounting vis-à-vis Blue Economy definition
- Broad coverage of sectors and sub-sectors
- Data status in fisheries, aquaculture and post-harvest sectors
- Techno-economics of marine fisheries & mariculture enterprises (for input accounting)
- Other relevant points
- Conclusions

The Blue Economy Context

Working Definition of Blue Economy (Working Group of EAC-PM)

“Blue economy refers to exploring and optimizing the potential of the oceans and seas which are under India’s legal jurisdiction for socio-economic development while preserving the health of the oceans. The Blue Economy links production and consumption to capacity and envisages an integrated approach to economic development and environmental sustainability. It covers both the marine, that is offshore resources, as well as the coastal, that is onshore resources.”

Interpretation of coverage for marine fisheries, aquaculture/mariculture and allied sectors

- What do the terms ‘offshore’, ‘coastal’, ‘on-shore’ refer to, in this context?
- What is the overall jurisdiction of Blue Economy in terms of geographic entities/coverage as well as activities?
- Whether inland freshwater fishing and aquaculture (beyond the scope of ‘onshore’) be part of Blue Economy Accounting?
- Whether the entire marine fish value chain (from landing till the fish reaches consumers) as well as fishing related industries be part of Blue Economy accounting irrespective geographic boundaries?

The Blue Economy Context - Interpretations

Generally accepted definitions of common fisheries related terms

- Nearshore or coastal fisheries– **within 12 nm from the shoreline (territorial waters)**
- Off shore fisheries - **12 nm to 200 nm**
- Internal waters fishery– **Fishery associated with estuaries/ backwaters/ creeks/ lagoons, etc.**
- Distant water fisheries- **Beyond 200 nm, i.e., Areas Beyond National Jurisdiction (ABNJ) and High Seas.**
- Deep sea fisheries in high seas – **trawls, lines operating in high seas for fishing at depths below 200 m.**
- On-shore fisheries – **Fisheries /aquaculture taking place on the shore (not water) within reasonable distance from the shoreline towards landside (different countries have different jurisdiction for this).**

For practical purposes, Blue Economy may include:

- Fish harvest/culture/post-harvest/allied activities taking place in the sea within legal jurisdiction
- Other goods and services with origin elsewhere, but for use in the seas.
- Other goods and services produced / originated in the sea, but for use elsewhere.

Jurisdiction/Boundaries for Blue Economy

Sector/sub-sector/Activity	Geographic coverage/Boundary/Jurisdiction
Fish harvest/culture in the sea/water	Within EEZ / or such internationally accepted/allocated boundaries (ABNJ) /Internal waters including estuaries/backwaters/creeks/lagoons etc. (Inland fishing /aquaculture in other water bodies need not be included).
Fish harvest/culture/post-harvest/allied activities in the shore (on-shore)	Within designated 'fishing villages' close to the shore (3477 as per Marine Fisheries Census, 2016)
Other goods and services with origin elsewhere, but for use in the seas	No particular geographic boundary
Other goods and services produced / originated in the sea/water but for use elsewhere	EEZ or such internationally accepted/allocated boundaries (e.g.: India has been allocated a site of 150,000 km ² (58,000 sq mi) in Central Indian Ocean Basin (CIOB) by the United Nation's International Seabed Authority (ISA) for deep sea mining)/Internal waters including estuaries/ backwaters/ creeks/ lagoons etc.
Fish/fish products /other marine products value chains	No particular geographic boundary

Broad coverage of sectors/sub-sectors

I. Marine fisheries, aquaculture and fish seed collection

- Harvesting of marine fish, crustaceans and molluscs
- Harvesting of fish, crustaceans, molluscs from internal waters (estuaries/ backwaters/ creeks/ lagoons, etc.)
- Mariculture (culture of marine fish and shell fish in cages, seaweed culture, ornamental fish culture, mussel/oyster culture, crab fattening, pearl culture, etc.) in sea
- Mariculture in internal waters
- Collection of seeds of fish, crustaceans and, molluscs
- Gathering of other wild marine organisms (sponges, pearls, corals, algae, etc.)
- Fish seed production (marine and freshwater) in on-shore hatcheries
- On-shore marine /freshwater aquariums

II. Fishing allied activities/services

- Wholesale of fish/fish seeds/fishmeal/fish feed, etc.
- Retail sale of fish/fish seeds/fishmeal/fish feed, etc.
- Wholesale/ retail of fishing / fish culture related inputs (ice, fuel, fishing gear, other communication/navigation/safety equipment, cages, etc.)
- Services of fishing labourers on-board
- Services of various fishery intermediaries (auctioneers, fish vendors, traders, allied labourers, etc.)
- Making and repairing of nets
- Export and import of fish and associated activities/services
- Other services associated with fishery (insurance, credit, welfare assistance, etc.)

Broad coverage of sectors/sub-sectors

III. Fishing/fish culture related industries

- Ice plants
- Fuel dispensing for fishing/ other allied activities
- Fishing vessel manufacturing/ repairing
- Fishing gear manufacturing
- Manufacture of other auxiliary equipment (Fish finder/sonar/navigation/communication equipment, safety gear, on-board fish processing equipment, etc.)
- Manufacture of fish feed concentrates
- Cold chain related industry
- Manufacture of Fish cage/floats/mooring equipment
- Artificial reef manufacture and installation
- Sport-fishing enterprise

IV. Fish processing industries

- Fish/shellfish peeling/ pre-processing industry
- Fish canning/drying industry
- Freezing plants
- Domestic and Export oriented fish/shellfish processing / value addition industry
- Fish extraction plants/industry
- Fishmeal industry
- Fish waste utilization/other products (e.g. chitin, chitosan, etc.) industry
- Self-help groups/small-scale units dealing with processed fish-based products.

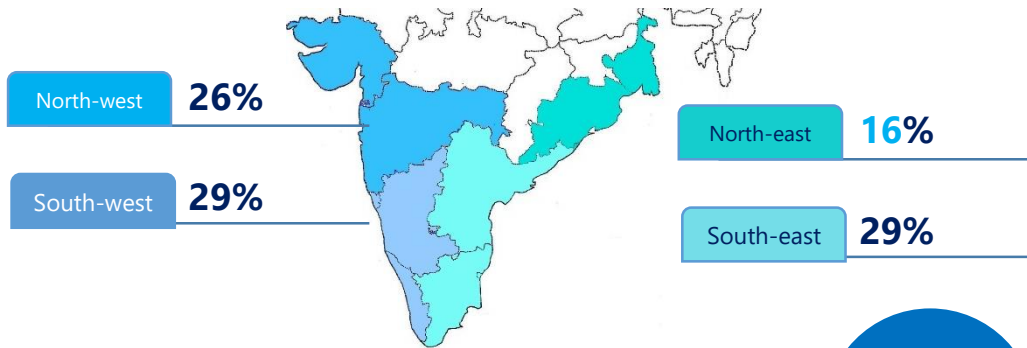
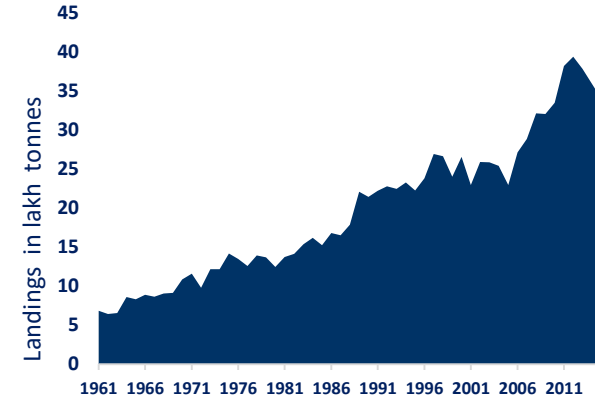
Marine Capture Fisheries - Fishery Resource Monitoring by ICAR-CMFRI, Kochi

Marine Fish Landings

6068 km
Coastline

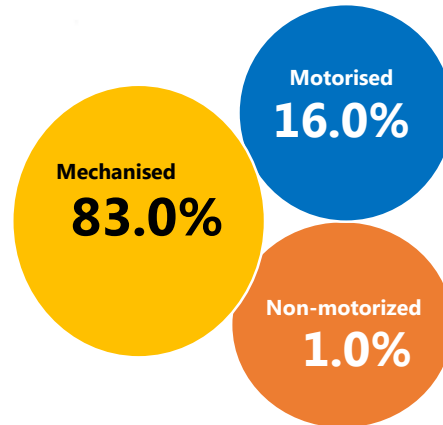
9 Maritime states

2 Union Territories



2.73 million tonnes in 2020

54% pelagic
29% demersal
11% crustacean
6% mollusc



MAJOR RESOURCES 2020 (tonnes)

Lesser sardines	215676
Scads	73816
Indian mackerel	180216
Penaeid prawns	186586
Cephalopods	161004
Non-penaeid prawns	100781
Threadfin breams	122835
RIBBON FISHES	143711
Anchovies	145033
CROAKERS	117698

Marine Fisheries Data Collection

India is one among few countries where a system based on sampling theory is used to collect marine fish catch statistics.

Information on:

- catch
- effort
- biological aspects
- socio-economic aspects

1947

Initiated the process of collection of data on marine fish catch, effort, biological parameters etc.

1957

Pilot surveys along the Malabar coast by IASRI based on a three stage stratified sampling

1959

Initiated marine fish landings data collection along the west coast through stratified multistage sampling design

1961

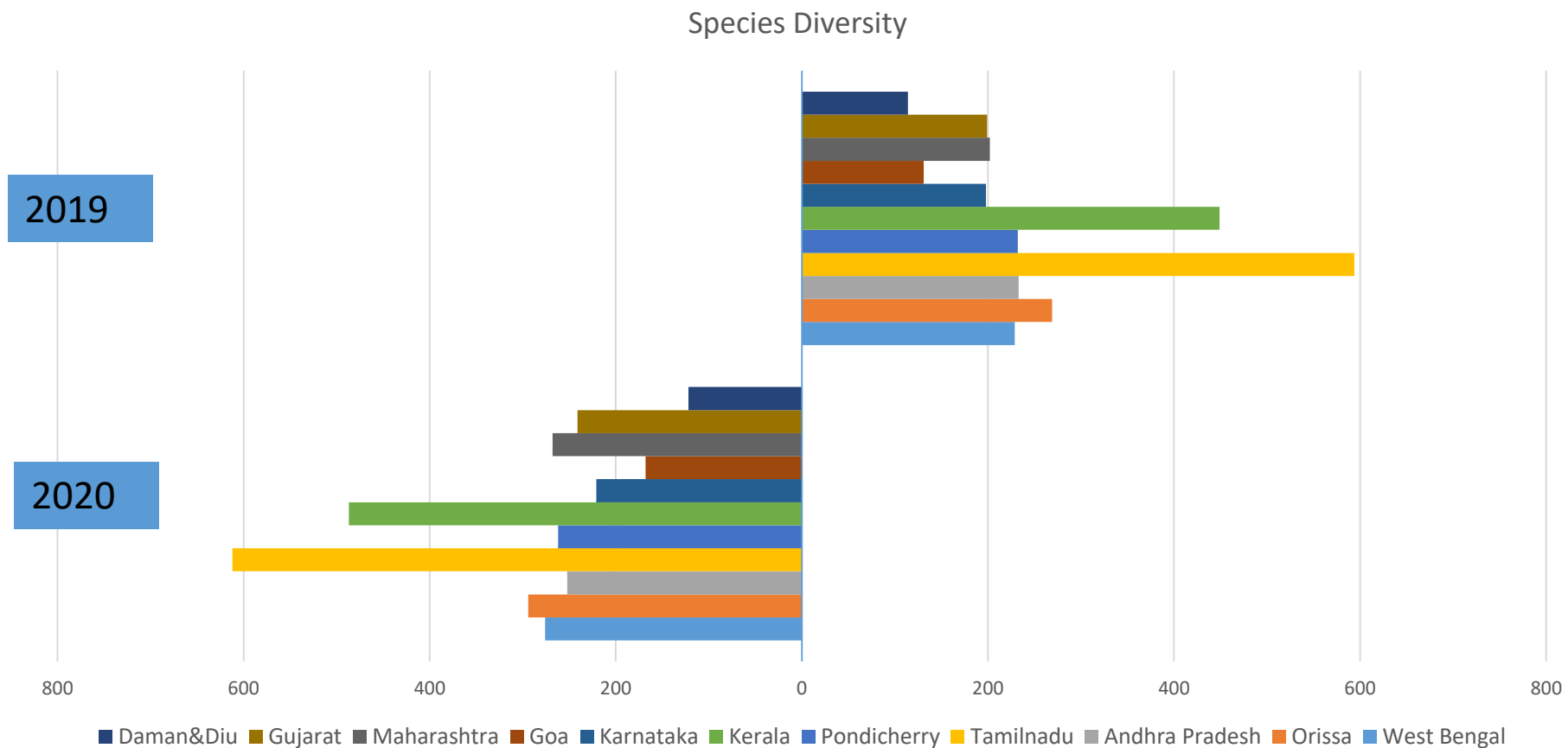
The stratified multistage random sampling design for the entire coast became operational

1972

Sampling scheme evaluated by independent statistical experts (NIO)

Slide Courtesy: Head, FRAE Division, ICAR-CMFRI

Species diversity

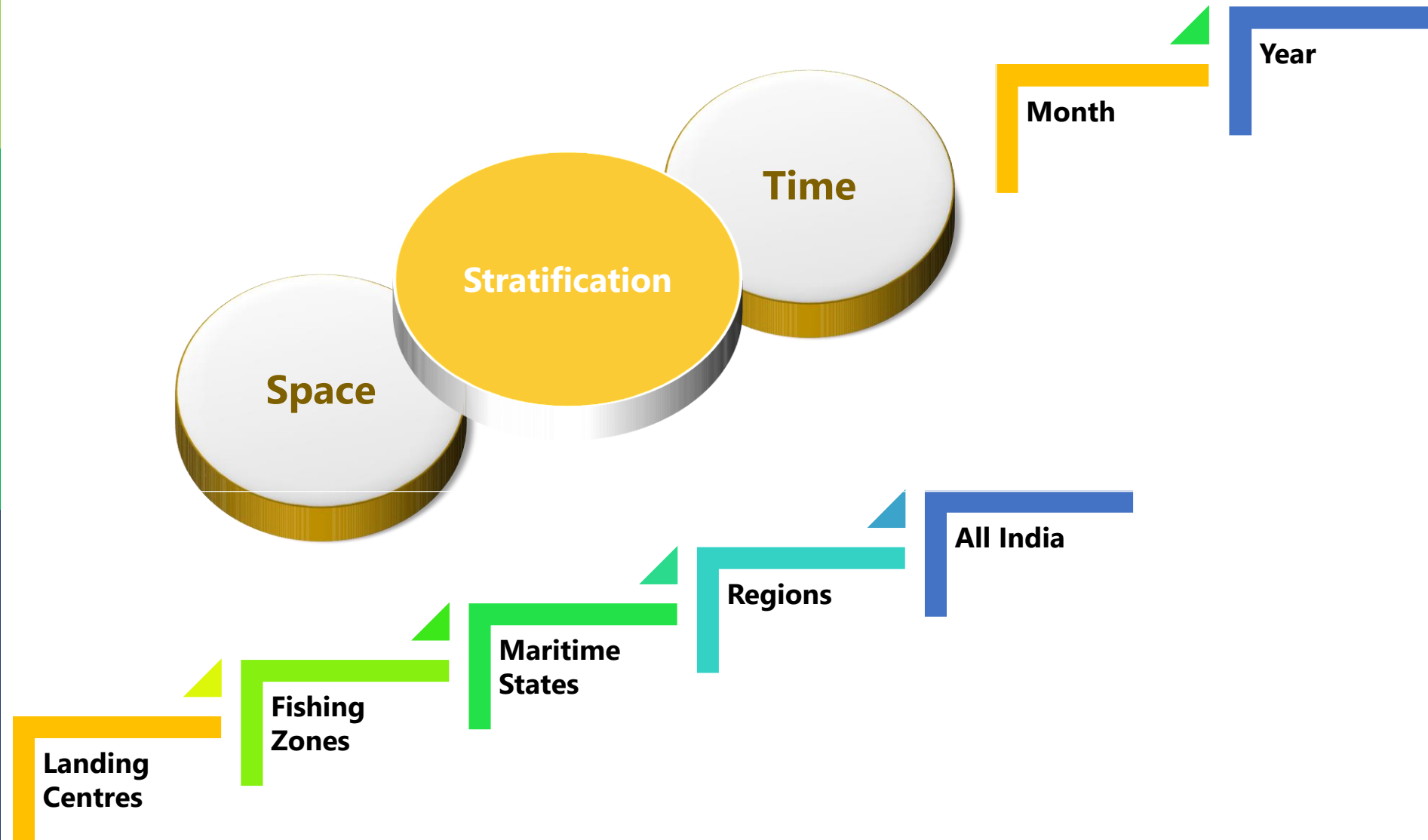


number of species

Slide Courtesy: Head, FRAE
Division, ICAR-CMFRI

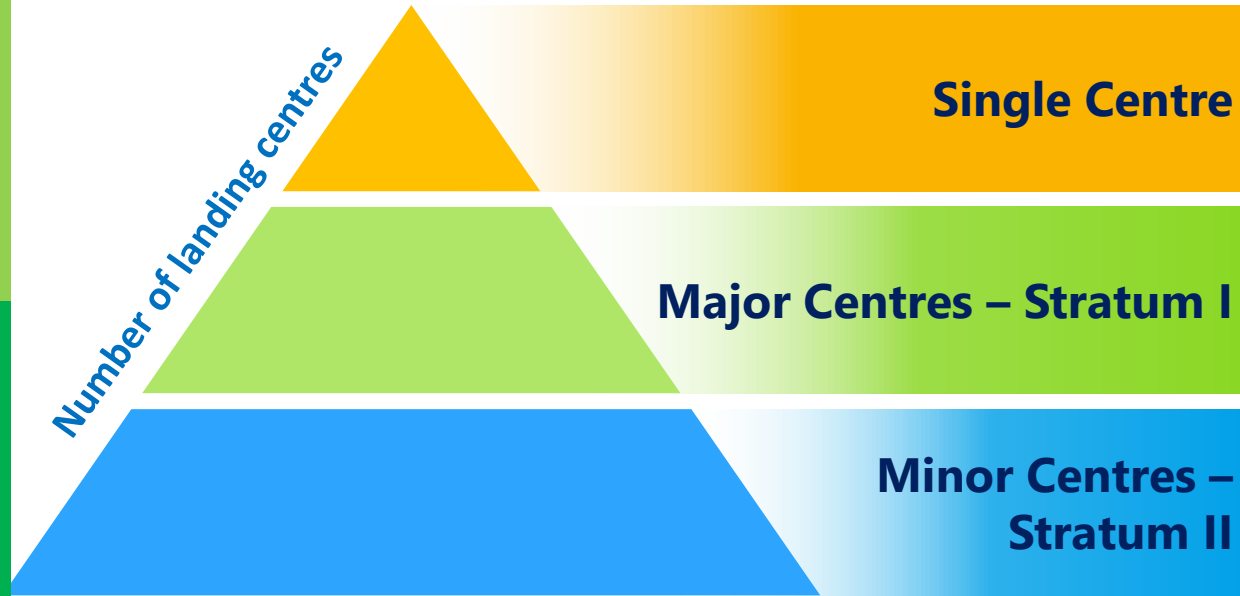


Stratified Multistage Random Sampling Design



Slide Courtesy: Head, FRAE
Division, ICAR-CMFRI

Fishing zone



- ★ Sampling is performed within geographical areas referred as fishing zones
- ★ Varying number of fish landing centres fall under fishing zones
- ★ **Single centre zones - Landing centres with relatively high intensity of fishing activity**

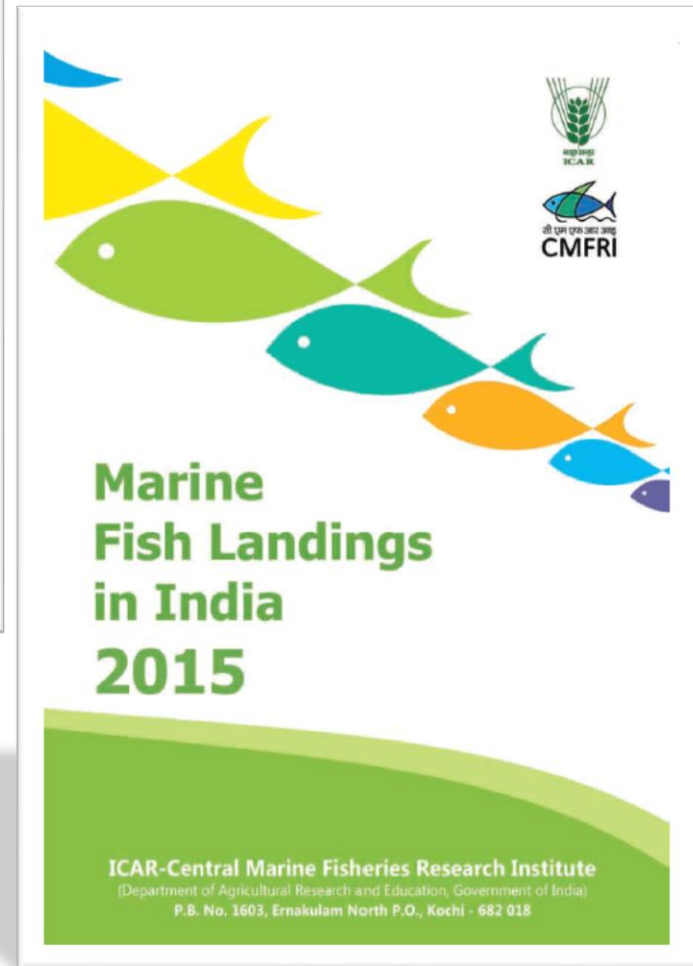
Slide Courtesy: Head, FRAE
Division, ICAR-CMFRI

Stratification over Space

Criteria for stratification within fishing zones

- ★ variation in fishing intensity
- ★ type of fishing craft and fishing method
- ★ Number of fishing crafts





Slide Courtesy: Head, FRAE Division, ICAR-CMFRI

All India Marine Fisheries Census

Census

Funded by DADF



Statistical portrait of marine fisher-folk residing in the marine fishing villages of all the 9 maritime states and 2 union territories of India



- Fishermen population size and structure at micro level
- Educational, socio-religious status of fisher-folk
- Gender-wise occupation in fishing & allied activities
- Craft and gear owned by fisher-folk
- Craft and gear in the fishery
- Infrastructure facilities in villages

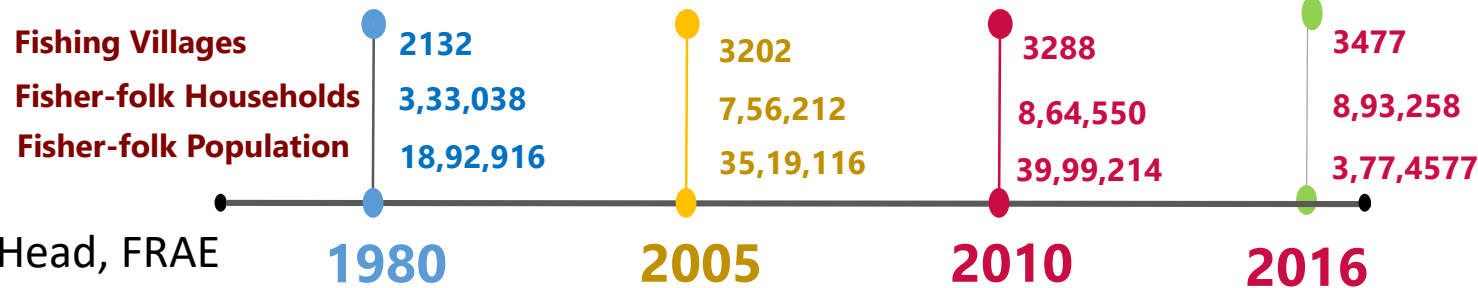
Landing Centres / Harbours

1281



- Fishery Infrastructure facilities in villages

- Boat yards
- Cold storages
- Ice plants
- Freezing plants
- Processing plants
- Curing yards
- Peeling sheds
- Extraction plants
- Fish meal plants
- Other



Slide Courtesy: Head, FRAE Division, ICAR-CMFRI

Profile of fisher folk population and changes over time, India

Particulars	1980	2005	2010	2016
Number of fishermen villages	2,132	3,202	3,288	3,477
Number of fish landing centres	1,438	1,332	1,511	1,265
Number of fishermen households	3,33,038	7,56,212	8,64,550	8,93,258
Households below poverty line	NA	NA	523691 (60.5%)	6,00,890 (67.2%)
Traditional fisher households	NA	NA	7,89,679	8,18,491
Share of occupied fishers in non-fishing sector (%)		4.8	3.8	5.2
Total fisher folk population	18,92,916	35,19,116	39,99,214	37,74,577

Data Courtesy: Head, FRAE
Division, ICAR-CMFRI

Occupational profile of fisher folk population, India, 2016



Sl. No.	Activity	Number	Share (%)
1	Fishing & fish seed collection	927081	60.7
2	Marketing of fish	210237	13.8
3	Making/repairing net	54663	3.6
4	Curing/ processing	48292	3.2
5	Peeling	46158	3.0
6	Laborer	116481	7.6
7	Others	45914	3.0
8	Other than fishing	79583	5.2
9	Total occupied	1528409	100.0

Composition of Fishing Crafts possessed by Marine fishermen, India

Type of crafts	1980	2005	2010	2016
Mechanized		35806	72559	42656
	9289			
Motorized		52971	71313	95957
Non-motorized	134741	96661	50618	25689
Total	144030	185438	194490	164302

Input costs and revenue for major selected fishing fleets in India, 2018-19

(Rs. Lakhs per annum)

Item	Trawler, Chennai	Trawler, Kakinada	Gillnetter, Chennai	Purse seiner, Mangalore	Ring seiner (IBM), Kochi
Fuel/lubricants	21.3	13.5	11.1	136.6	26.3
Other inputs	16.8	2.9	7.6	15.8	19.3
Labour wages	61.5	10.5	10.8	78.7	93.1
Vessel maintenance cost	24.1	16.7	27.6	44.7	12.6
Total annual operational cost	123.7	43.5	57.1	275.8	151.4
Gross annual revenue (VOP)	148.0	65.1	68.7	320.6	185.3
Input cost (fuel + other inputs) as share of gross revenue (%)	25.7	25.1	27.2	47.5	24.6
Total operational costs as share of gross revenue (%)	83.6	66.8	83.1	86.0	81.7

Source: van Anrooy et al, 2020, FAO Report on Techno-economic performance review of selected fishing fleets in Asia

Input costs and revenue for cage farming in India, 2019

(Rs. per crop)

Item	Open Sea cage Farming			Coastal water Cage Farming	
	Cobia	Asian Seabass	Silver Pompano	Sea bass+ Pearl spot	Tilapia
Inputs (seed + feed + other)	2,35,000	3,00,000	3,83,600	2,09,700	4,06,500
Labour wages*	57,000	57,000	57,000	62,000	1,09,000
Annual fixed cost	83,429	83,429	83,429	27,200	32,000
Total annual operational cost	375,429	4,40,429	5,24,029	2,98,900	5,47,500
Gross annual revenue (VOP)	7,20,000	10,00,000	7,00,000	6,26,800	12,00,00
Input cost as share of gross revenue (%)	32.6	30.0	54.8	33.4	33.8
Total operational costs as share of gross revenue (%)	52.1	44.0	74.8	47.6	45.6

Source: Aswathy et al, 2020, CMFRI Special Publication No. 134; *Including harvesting expenses
Average crop duration: 6-8 months (one crop/year)

Input costs and revenue for bivalve (green mussel) and seaweed farming in India (Rs. per crop)

Item	Green mussel	Seaweeds (<i>Kappaphycus sp.</i>)
Inputs (seed + other)	18,050	9,000
Labour wages*	8,450	9,000
Annual fixed cost	4,500	27,000
Total annual operational cost	31,000	45,000
Gross annual revenue (VOP)	1,19,000	1,82,400
Input cost as share of gross revenue (%)	15.2	4.9
Total operational costs as share of gross revenue (%)	26.0	24.6

Source: Parappurathu et al, 2017, *AERR* (30); Johnson, 2020, *Indian Farming*, 70 (11); *Including harvesting expenses.

Green mussel: Average crop duration- 5-6 months; one crop per year; Given data pertains to a unit of 200 seeded ropes.

Seaweeds: Average crop duration- 45 days per cycle; 4 cycles / year; Given data pertains to 30 seaweed rafts/year.

Other relevant points for accounting

- Presently there are no survey mechanisms / credible estimates for inland capture fish production.
- It may be thought to bring about separate estimates for inland capture and inland aquaculture production.
- Existing inconsistencies/lack of coverage of emerging sectors in NIC framework may be addressed.
- Household consumer expenditure survey framework for fish needs updating given the increase in variety of cultured fish in the food basket (The present survey schedule has a broad category (fish, prawn), which may be further subdivided).
- The Situation assessment survey of agricultural households in India is mostly confined to crop/ AH farmers. This may be enhanced to cover fish farmers and marine fishers.

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Thank You