

CMFRI Data Collection System for Marine Fish Landings Estimation



Dr. T.V. Sathianandan

Principal Scientist & Head

Fishery Resources Assessment Division

ICAR-Central Marine Fisheries Research Institute

Kochi - 682018

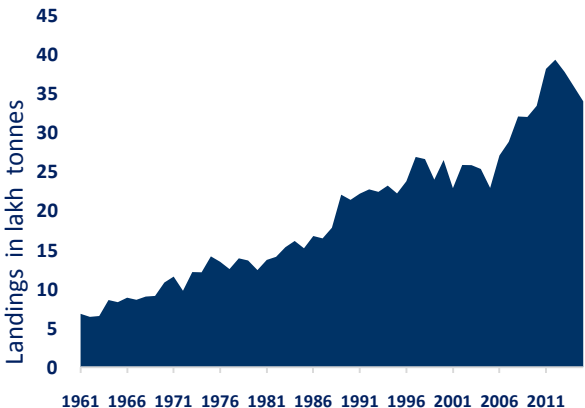
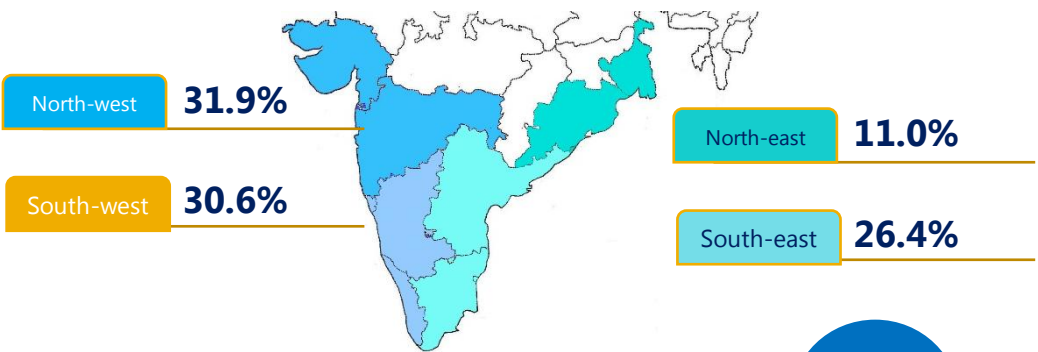
Marine Capture Fisheries - Fishery Resource Monitoring

Marine Fish Landings

6068 km
Coastline

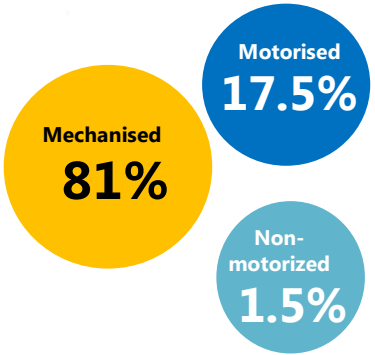
9 Maritime states

2 Union Territories



3.63 million tonnes in **2016**

51.3% pelagic
29.9% demersal
12.2% crustacean
6.6% mollusc



MAJOR RESOURCES 2016 (lakh tonnes)

Oil sardine	2.45
Indian mackerel	2.41
Cephalopods	2.31
Penaeid prawns	2.04
Ribbon fishes	2.00
Lesser sardines	1.87
Threadfin breams	1.66
Croakers	1.66
Other perches	1.62
Non-penaeid prawns	1.58

Why monitoring of resources ?

Marine fisheries resources are invisible, frequently migrating and easily affected by the changes in the sea. These characteristics make it unique and complex and hence difficult to monitor, manage and intervene.

- ◉ **Productivity of the seas**
- ◉ **The availability of fish at given point of time**
- ◉ **The fishing effort expended**
- ◉ **Accessibility and vulnerability of the resources**
- ◉ **A number of natural factors**

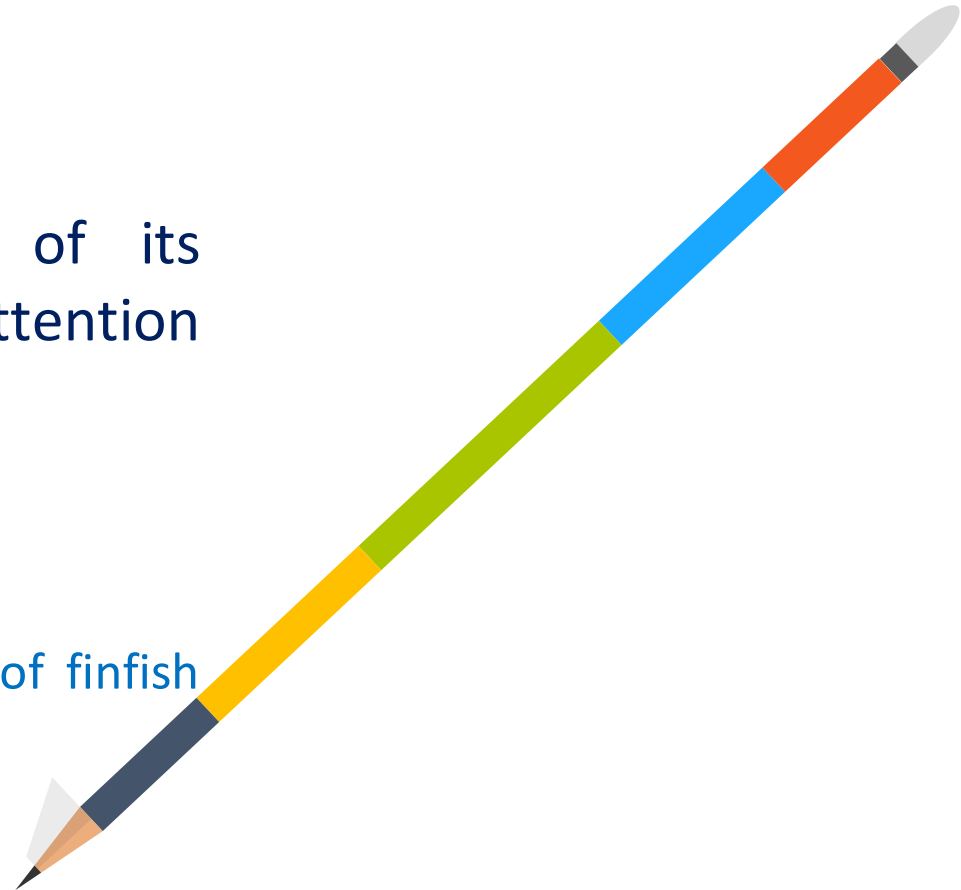




Monitoring and assessment of marine fisheries resources - Role of CMFRI

During the first half of the seven decades of its existence, the CMFRI devoted its research attention towards

- ★ the estimation of marine fisheries landings and effort,
- ★ taxonomy of marine organisms and the
- ★ bio-economic characteristics of the exploited stocks of finfish and shellfish.



Monitoring and Assessment of Marine Fishery Resources



Information on

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

Essential requirements for
assessing the exploited stock

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.

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

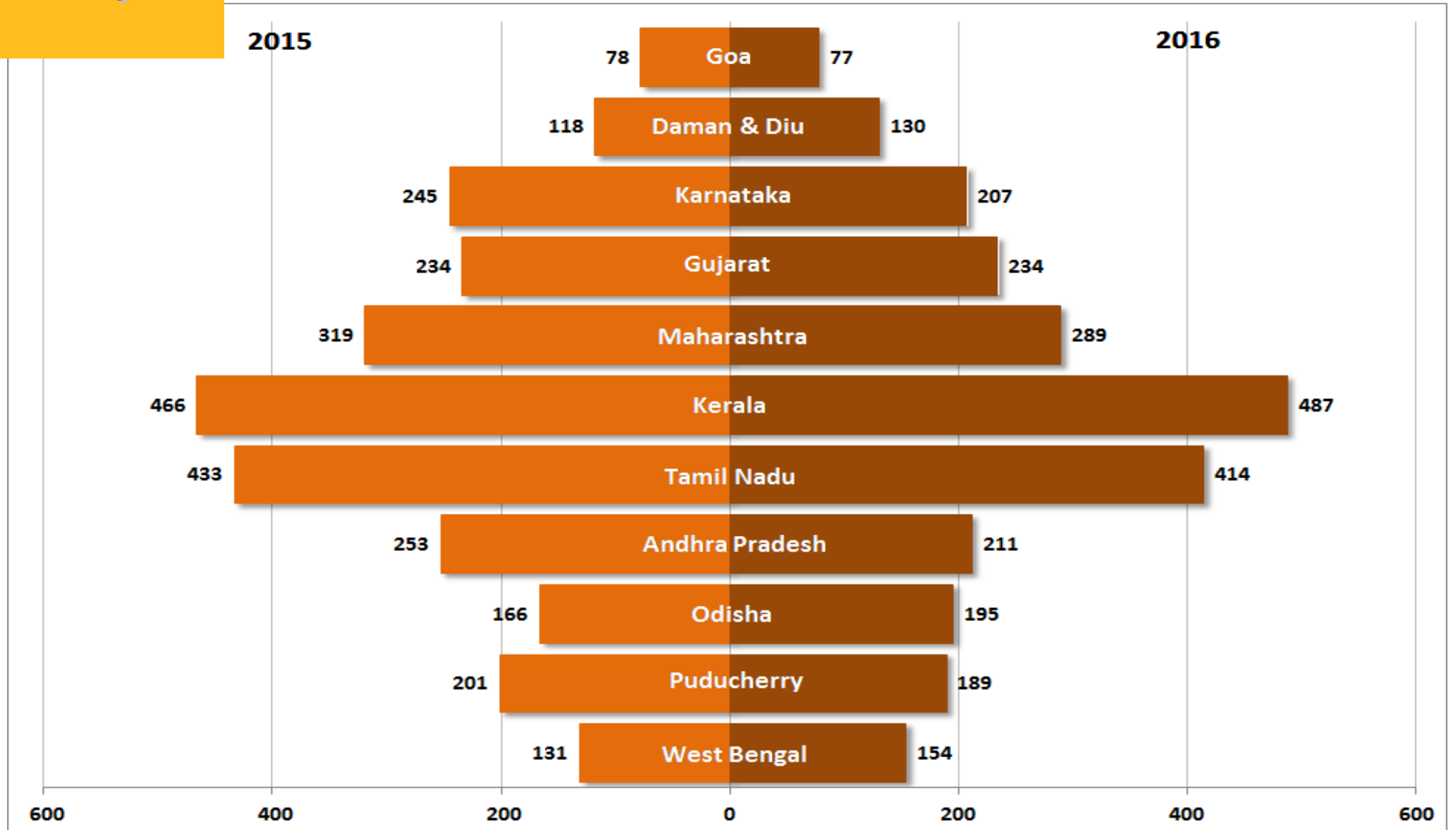
Sampling scheme evaluated by independent statistical experts (NIO)

Why Sampling ?



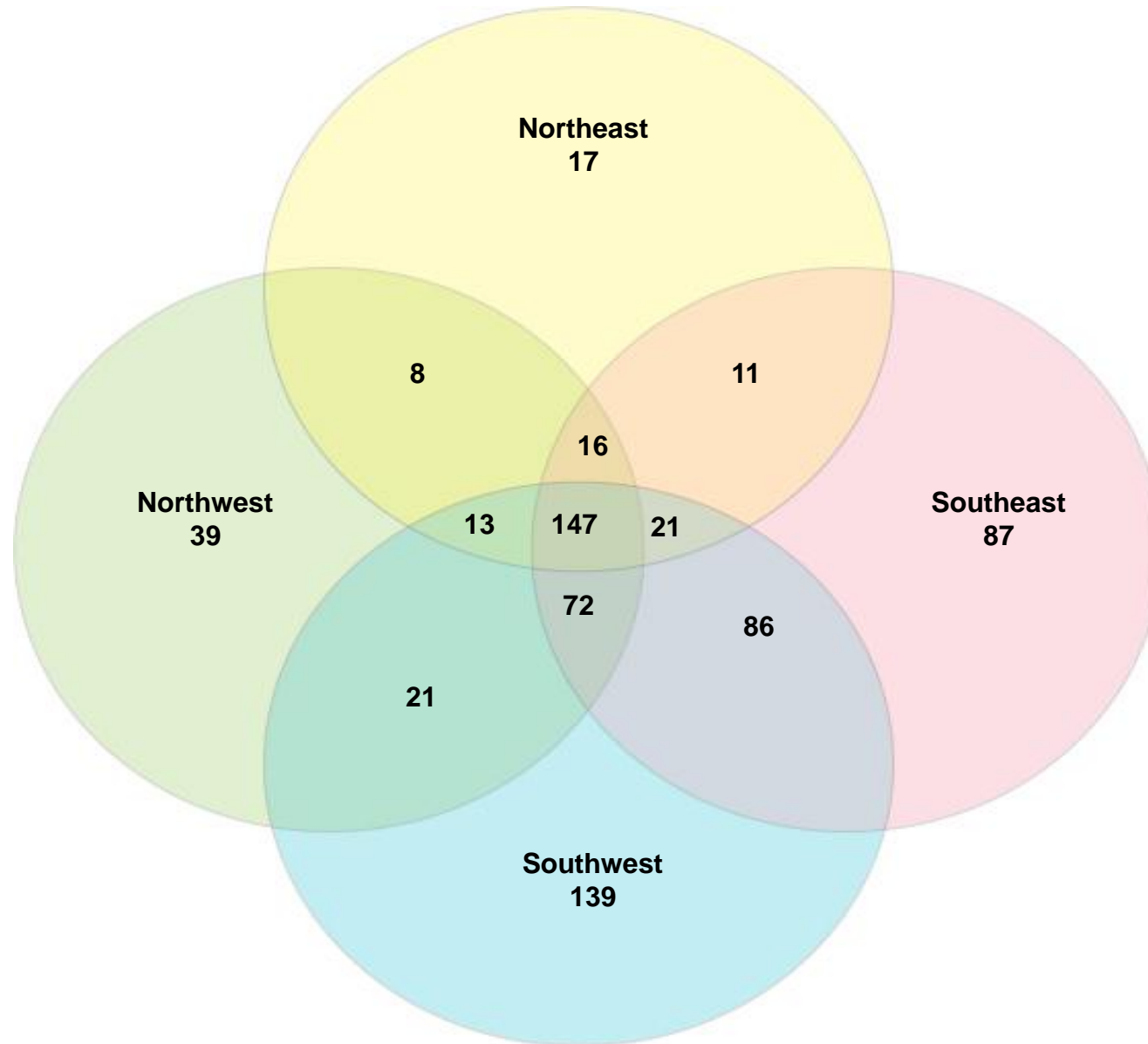
- ▣ Fish landings take place all along the coast line in 1341 landing centres including fisheries harbours during day and night through out the year
- ▣ In 2016, there were 72,93,000 boat trips in the landing centres to be enumerated for arriving at exact landings figure.
- ▣ We require 4,86,000 man days/year for complete enumeration
- ▣ A scientifically valid sampling scheme is the only feasible way for estimating fish landings and fishing effort

Species diversity

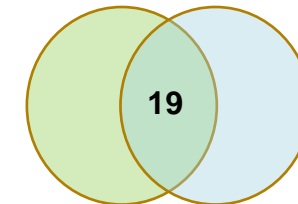
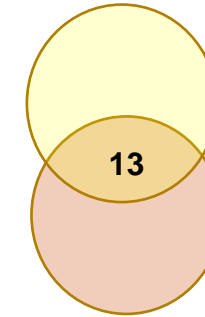


number of species

Regionwise distribution of species (count)



2016



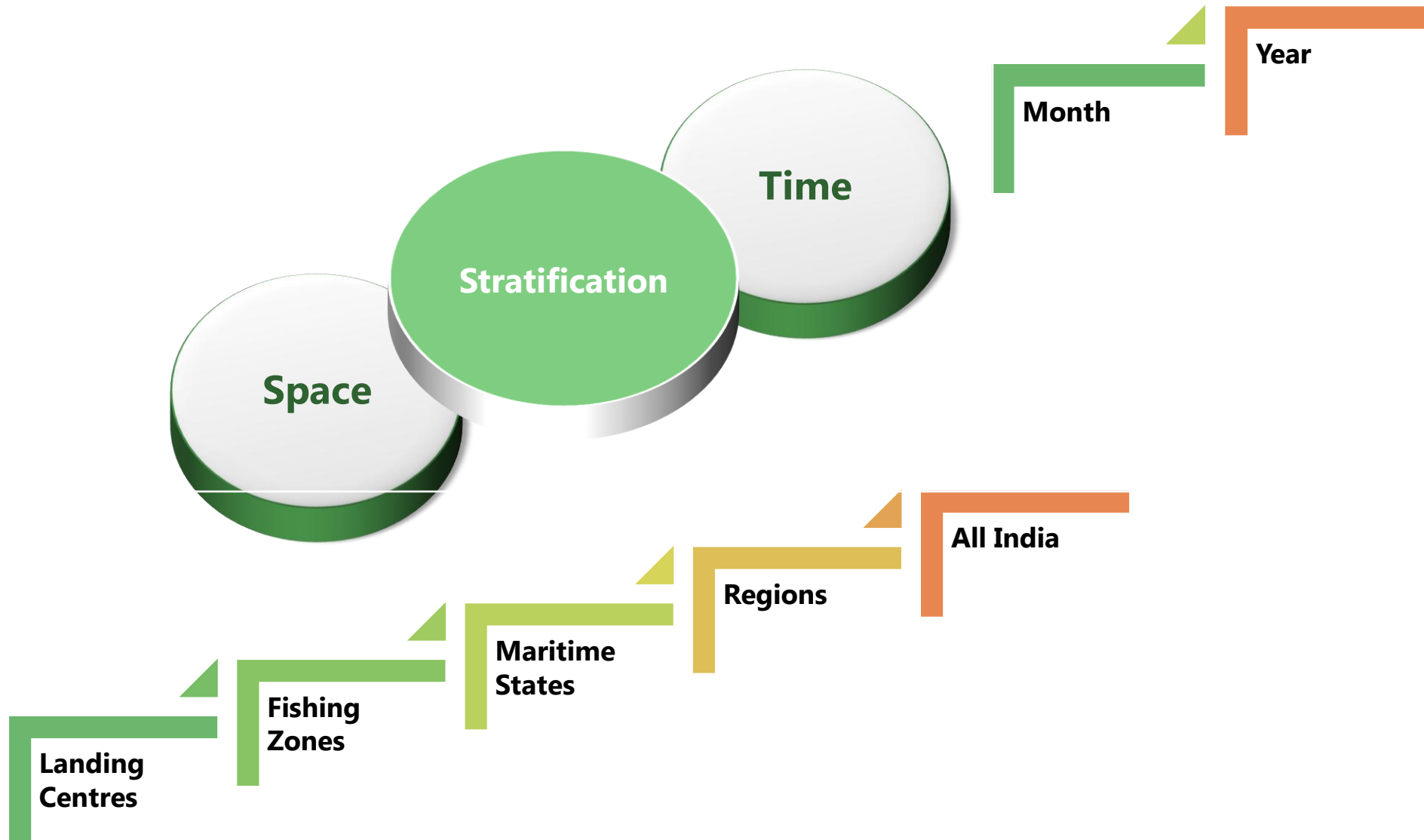
Total: 709

- ▣ **Input for assessing the status of exploited marine fishery resources of Indian EEZ through the in-house research projects of the Institute**
- ▣ **Estimation of Potential Yield and Optimum Fleet Size for each maritime state as part of revalidation of Potential Yield for the committee constituted by Ministry of Agriculture**
- ▣ **Preparation of trawl ban policy for the committee constituted by Ministry of Agriculture**
- ▣ **Formulate replies for starred questions raised in Parliament and State Legislative Assembly.**
- ▣ **Inputs for research activities of Students and Researchers of other Institutes and Universities.**
- ▣ **Data dissemination to different organizations on demand for planning and developmental activities along the coastal region.**
- ▣ **Access of daily catch and price information to public through FishWatch available in www.cmfri.org.in**

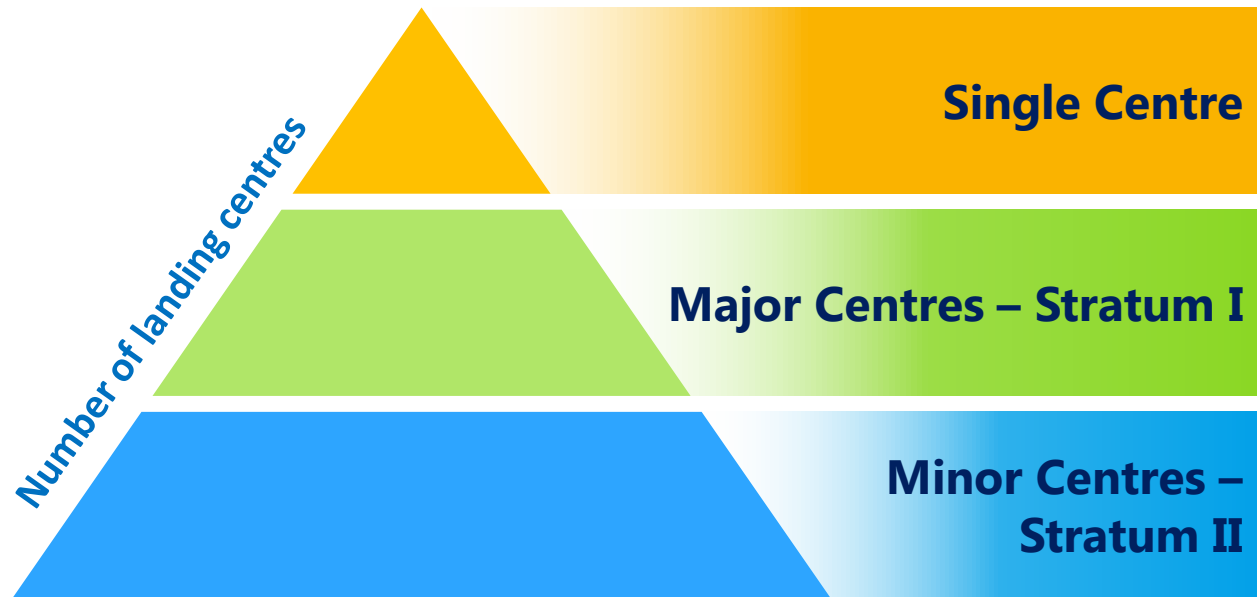
Advantages of the data collection system

- ▣ **Strong statistical footing**
- ▣ **Carried out by an unbiased research agency ensuring uniformity and consistency**
- ▣ **Full fledged methodological review mechanism with major relooks as and when required**
- ▣ **Enumeration is carried out by trained dedicated staff with expertise in species identification**
- ▣ **Information collected at individual species level and stored in database for fast and easy retrieval**
- ▣ **As multi-species and multi-gear fishery prevailing in India, Log sheet system of data collection followed in temperate regions are not feasible.**

Stratified Multistage Random Sampling Design



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**

Criteria for stratification within fishing zones

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

Recording of Fish Landings





Species identification



Work programme schedules for data collection are sent every month from HQ to field staff.
Data received is centrally processed at HQ.

WORK
Programme



from headquarters



Headquarters, Kochi

11

Regional Research Centres

17

Field Centres

Data quality check through periodic field inspections



Marine Fish Landings

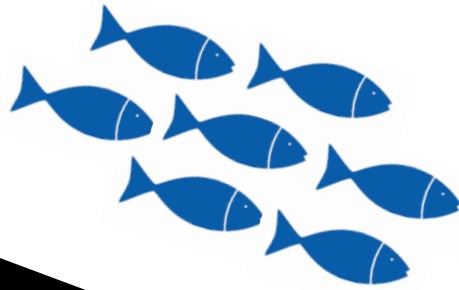
12%

Minor Landing Centres



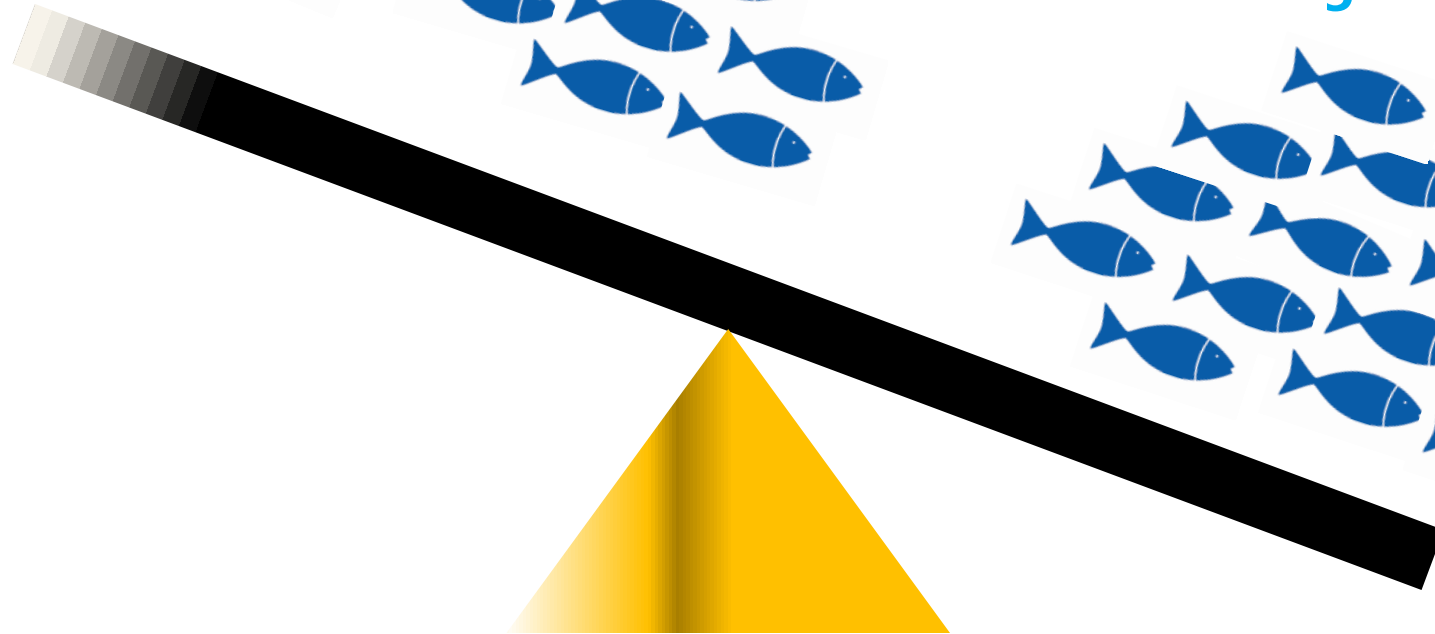
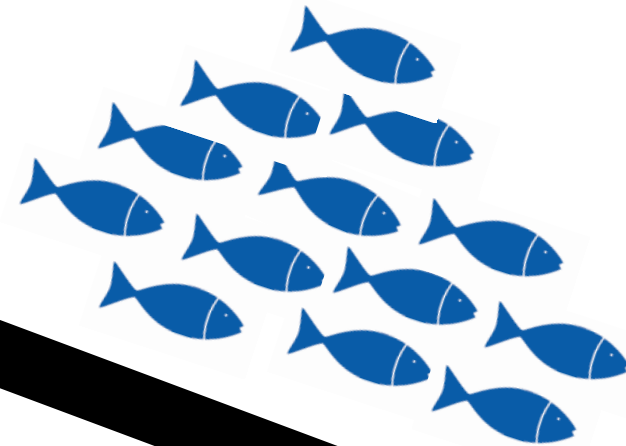
31%

Major Landing Centres



57%

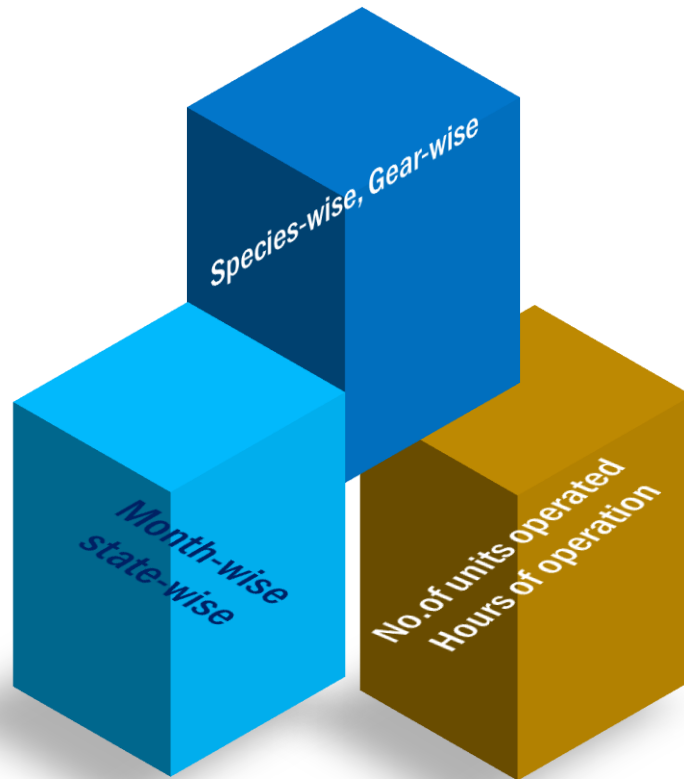
Single Centre



State/UT	Coastal Length	No. of fishing zones	No. of landing centres	Sampling coverage (%)		
				Single centre zones	Major centres	Minor centres
West Bengal	158	3	57		2.68	1.77
Odisha	480	5	58	1.49	1.79	3.03
Andhra Pradesh	974	14	233	7.03	2.32	2.16
Tamil Nadu	1076	18	398	2.88	1.37	0.97
Puducherry	45	1	25			
Kerala	590	10	189	8.69		3.51
Karnataka	300	7	92	7.57	2.04	
Goa	104	2	34		3.11	
Maharashtra	720	8	158	6.78	1.30	0.96
Gujarat	1600	6	92	2.69	5.15	1.08
Damen & Diu	21	1	5		1.4	
Total	6068	75	1341	5.30	2.35	1.77
Error %				5 - 8	15 - 20	12 - 18

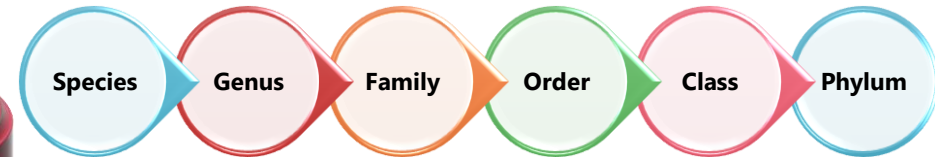
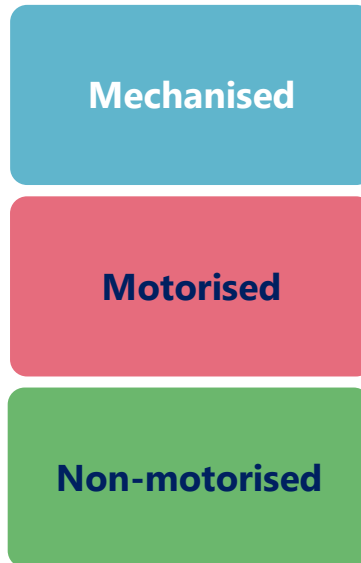
**Sampling coverage
&
Sampling Error**

National Marine Fisheries Data Centre



- ❖ Individual species level estimates on landings
- ❖ Fishing gear/craft wise landings & fishing effort
- ❖ Fishing zone, district, state, region, national resolutions
- ❖ Monthly estimates for every year
- ❖ Historic information from 1950 onwards





01

Fishing zones
75

02

Districts
33

03

States+ UTs
9 + 2

04

Regions
4

Database - Estimated Marine Fish Landings and Fishing Effort

Indian Council of Agricultural Research
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

English | हिन्दी

REGIONAL / RESEARCH CENTRES + MARINE CAPTURE FISHERIES + MARICULTURE + BIODIVERSITY + MARINE BIOTECHNOLOGY + FISHERY ENVIRONMENT + FISHERY ECONOMICS & EXTENSION

Database on Indian marine fish catch and effort

Example data sheet in NMFDC

Species ID	Species	2007	2008	2009	2010	2011	2012
0001	Chiloscyllium sp.	538	2876	11291	8881	158343	155726
0002	Chiloscyllium indicum	91313	96541	87840	241685	3633	
0003	Chiloscyllium griseum					31892	111014
0005	Nebrius sp.	381174	306200	66312	3273	1000	1044
0006	Nebrius ferrugineus	2938	2182	7942	25816	2271	203419
0011	Alopias sp.					113157	8711
0016	Alopias pelagicus						11512
0021	Alopias superciliosus	47090	101648	174859	15290	128312	
0023	Alopias vulpinus		930		18046	13552	31279
0025	Isurus sp.		1670				
0026	Isurus paucus						
0035	Halaelurus sp.	13668840	11400529	14098443	9090209	10757225	6669222
0036	Halaelurus hispidus	80600	3647		18000		7284346
0040	Carcharhinus sp.		14919				3542391
0044	Carcharhinus altimus			129018	298892	306346	523934

HOME • FISH CATCH ESTIMATES

Navigation links: Home, About Us, Director's Message, Research Projects, CMFRI in Media, Library and Publications, Museum, Related Links, Latest Research Findings, Fish Catch Estimates, Fished Taxa Listing, Right to Information, Training Courses, Job Opportunities, Tenders, Patents.

Database

Microsoft Access

Table Tools: Fields, Table

File Home Create External Data Database Tools Fields Table

View Paste Copy Cut Filter Filter Ascending Descending Advanced Refresh All Save Spelling Find Go To Replace Size to Fit Form Windows Window Text Formatting

Tables: AssemGroupSp, bivalves, DistZone, DistZone_Guj_From2010, DistZone_Guj_Profile, effort, Gears, Groups2, Groups2Names, iotctmp, iotctmp2, iotctmp3, Kachch_old_2007-8-9-11, klzones, LargePelagics, months, Production, sp_genus, spcntable, Species2014, spnew, sptmp

Production

ZoneID	Mon	Year	GearID	SpecID	Yield	State
K9	01	2007	NMBSGN	0001	78	6
K9	02	2007	OBN	0001	280	6
K9	11	2007	NMBSGN	0001	180	6
NDK	03	2008	MDTN	0001	97	6
NDK	06	2008	MDTN	0001	196	6
NDK	06	2008	MTN	0001	105	6
K8	08	2008	NMGN	0001	664	6
TN17	07	2008	OBN	0001	1814	4
TN17	04	2009	OBN	0001	277	4
CFH	01	2009	MDNHL	0001	3826	6
K9	08	2009	NMBSGN	0001	16	6
K9	09	2009	NMBSGN	0001	2100	6
K9	12	2009	NMBSGN	0001	3798	6
K9	02	2009	MTN	0001	1274	6
TN17	08	2010	OBN	0001	6926	4
K8	09	2010	NMGN	0001	25	6
K8	12	2010	MTN	0001	1302	6
K9	09	2010	NMBSGN	0001	630	6
K8	11	2011	MTN	0001	63	6
K9	11	2011	NMBSGN	0001	360	6
NDK	11	2011	MDTN	0001	114	6
TN15	03	2011	OBN	0001	364	4
K8	03	2012	MTN	0001	403	6
K9	10	2012	NMBSGN	0001	93	6

Record: 1 of 629243

spnew

S_CODE	SPECIES
0001	CHILOSCHYLUM
0002	C. INDICUM
0003	C. GRISEUM
0005	NEBRIUS
0006	N. FERRUGINEUS
0010	RHINODON
0011	R. TYPUS (=RHINODON TYPUS)
0015	STEGOSTOMA
0016	S. FASCIATUM
0020	ALOPIAS
0021	A. PELAGICUS
0022	A. SUPERCILIOSUS
0023	A. VULPINUS
0025	ISURUS
0026	I. OXYRINCHUS
0027	I. PAUCUS
0035	HALAELURUS
0036	H. HISPIDUS
0037	H. QUAGGA
0040	CARCHARINUS
0041	C. ALTIMUS
0042	C. AMBLYRHYNCHOIDES
0043	C. AMBOINENSIS
0044	C. BREVIPINNA

Record: 1 of 1715

Webpage

Web based application software

for
online data collection and estimation of landings



- Developed web application for online data entry from landings centers using electronic tablets and centralized processing and retrieval of marine fish landings data at headquarters through the database server.

FCSA

Application

Admin

Reports

Reports » All India Landings » All India Landings

CENTRAL MARINE FISHERIES RESEARCH

(Indian Council of Agricultural Research)

Fishery Resources Assessment Division

Post Box No. 1603, Ernakulam North P.O., Cochin - 682 018

All India Landings statewise (in tonnes)

Group83_Code	Group83	01-West Bengal	02-Orissa	04-Tamilnadu	06-Kerala	08-Goa
1	ELASMOBRANCHS					
2	Sharks	42.18	137.7		1012.048	
3	Skates				21.018	12.18
4	Rays		82.58		588.307	
5	Eels	15.914			10.091	
6	Catfishes	43.025	772.5		2.545	
7	CLUPEIDS					
8	Wolf herring	15.48	38.4		4.104	
9	Oil sardine	2200			4119.484	
10	Other sardines	111.035	310	282.583	1425.981	
11	Hilsa shad	3389.207	92.4			

Phone:0484-2392905 (Per), 0484-2394867 (PBX), 0484-2394909 (Fax), Email: frad@cmfri.org.in

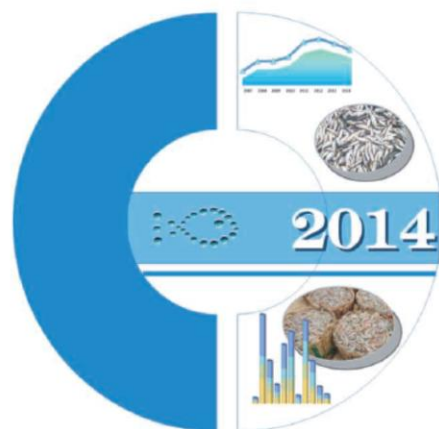
Page 1 of 11

Marine Fish Landings in India 2013



Central Marine Fisheries Research Institute
Indian Council of Agricultural Research
Ernakulam North P.O., P.B. No. 1603, Kochi - 682 018
Kerala, India

Marine Fish Landings in India



Fishery Resources Assessment Division
ICAR - Central Marine Fisheries Research Institute
Kochi | Kerala | India



Marine Fish Landings in India 2015

ICAR-Central Marine Fisheries Research Institute
(Department of Agricultural Research and Education, Government of India)
P.B. No. 1603, Ernakulam North P.O., Kochi - 682 018



CMFRI Booklet No : 6/2017

Marine Fish Landings in INDIA 2016

ICAR-Central Marine Fisheries Research Institute
(Department of Agricultural Research and Education, Government of India)
P.B. No. 1603, Ernakulam North P.O., Kochi - 682 018

Issue of multiple estimates of marine fish landings in India

Zeller et al. (2015)

Appendix II: India mainland catch reconstruction

RECONSTRUCTION OF INDIA'S MARINE FISH CATCH FROM 1950-2010⁸

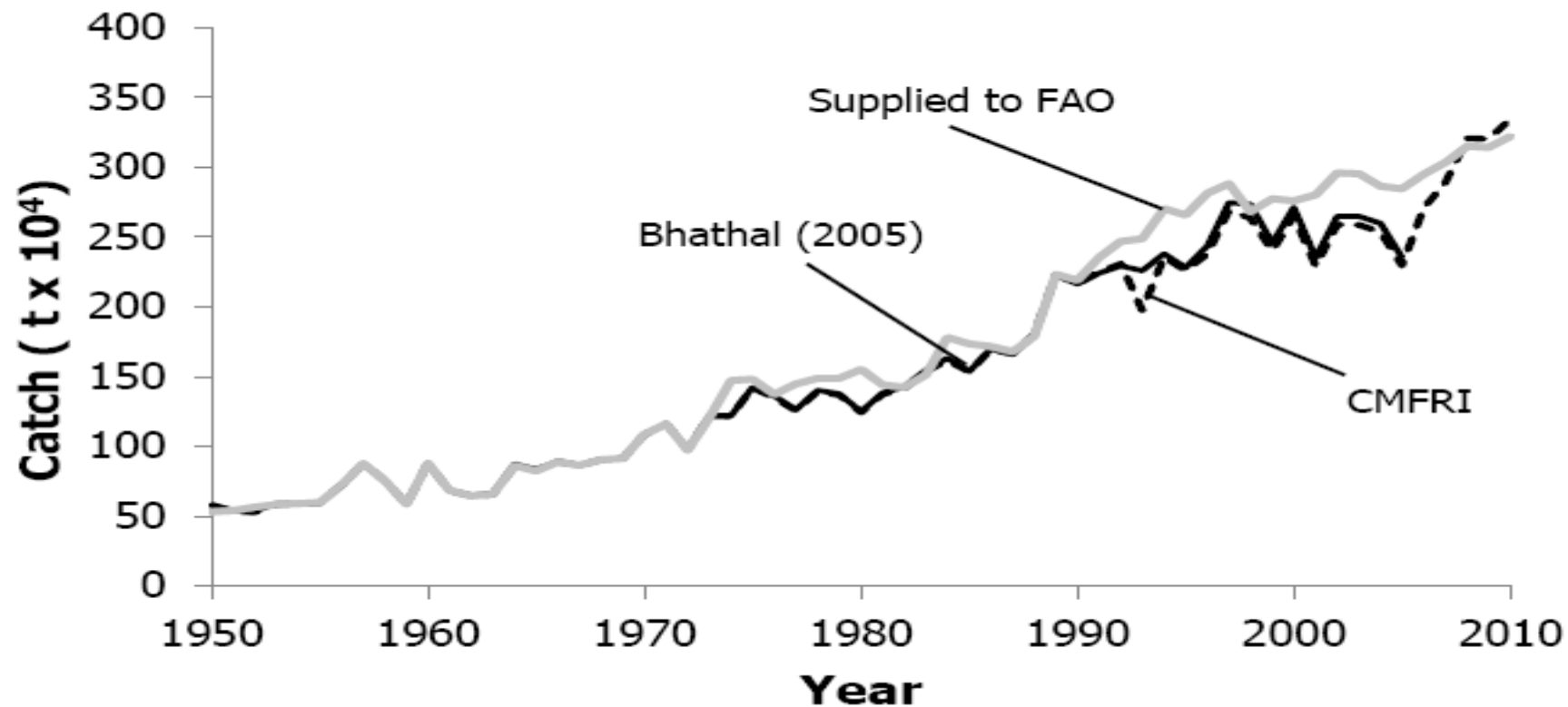
Claire Hornby, Brajgeet Bhathal, Daniel Pauly and Dirk Zeller

*Sea Around Us, University of British Columbia,
2202 Main Mall, Vancouver, BC, V6T 1Z4, Canada*

c.hornby@fisheries.ubc.ca, b.bhathal@fisheries.ubc.ca, d.pauly@fisheries.ubc.ca,
d.zeller@fisheries.ubc.ca

“Discrepancies have been observed between the reported FAO catch statistics and national data presented by the CMFRI”

Comparison of India's official ("Supplied to FAO") and national catch statistics (CMFRI; dashed line) from 1950-2010, with previously estimated marine catch (dark solid line labelled "Bhathal (2005)") from 1950-2005 (Bhathal 2005b).

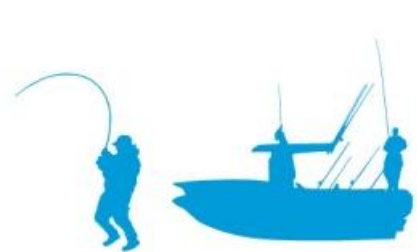


Suggested Options

1. The marine fish landings estimates made by CMFRI maybe recognized as the national statistics and the current data collection from the maritime states is dispensed off
 - CMFRI will provide all necessary data to DOFs for their use and dissemination to DADF
 - The State's data collection mechanism be devoted for inland fisheries and aquaculture which is currently inadequate
2. The CMFRI plans and supervises the data collection of the DOFs leading to a single data collection system and estimate with higher taxonomic resolution – several logistic problems are foreseeable



**THANK
YOU**



Selection of Primary Stage Units

- ✧ A month is divided into 3 groups, each of 10 days.
- ✧ From the first five days of a month, a day is selected at random,
- ✧ Then, the next 5 consecutive days are automatically selected.

Time strata	Days in a month									
1	1	2	3	4	5	6	7	8	9	10
2	11	12	13	14	15	16	17	18	19	20
3	21	22	23	24	25	26	27	28	29	30



Selection of Primary Stage Units

- ✧ From this, three clusters of two consecutive days are formed.
- ✧ In the remaining ten day groups, the clusters are systematically selected with an interval of 10 days.

Time strata	Days in a month									
1	1	2	3	4	5	6	7	8	9	10
2	11	12	13	14	15	16	17	18	19	20
3	21	22	23	24	25	26	27	28	29	30

Period of Observation



Period	Duration
Period 1	1200 to 1800 hours on 1 st day
Period 2	0600 to 1200 hours on 2 nd day
Period 3	1800 hours to next morning 0600 hours

Primary Stage Unit
Landing centre day

Second Stage Unit
Fishing boats

Selection of Second Stage Units

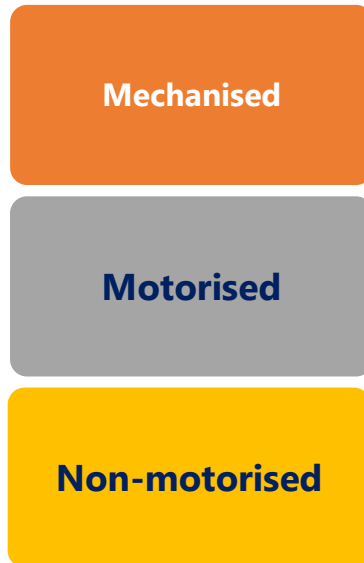
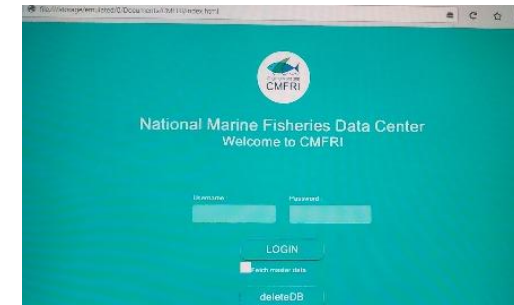
- **Not practical to record the catches of all fishing units (boats) landed**
- **Sampling of the units becomes essential**



Fishing unit - Secondary stage unit



Number of boats landed	Fraction to be observed
Less than or equal to 15	100 %
Between 16 and 19	First 10 and the balance 50 %
Between 20 and 29	1 in 2
Between 30 and 39	1 in 3
Between 40 and 49	1 in 4
Between 50 and 59	1 in 5 and so on



01

Fishing zones
75

02

Districts
33

03

States+ UTs
9 + 2

04

Regions
4

Distribution of the landing centres over the coastline of maritime states



Replace table –
with state-wise
info

District	Length of Coastline (in km)	Number of landing centres
Thiruvananthapuram	78	52
Kollam	37	19
Alappuzha	82	14
Ernakulam	46	19
Thrissur	54	23
Malappuram	70	12
Kozhikode	71	21
Kannur	82	12
Kasaragod	70	16
Total	590	188

Forms used

C		Fishery St	
NA CEN CONSOLIDATE		Name of l	
No.....	Zone	Date	
Work progr	Month	Period of observation	
Month & ye	Period →		
	Centre	Serial No.	Time of landing
1.		1	
2.		2	
3.		3	
4.		4	
5.		5	
6.		6	
7.		7	
8.		8	
9.		9	
Timings : 12		10	
To		11	
Shr		12	
		13	
Copy to:		14	
1. Scientist		15	
2. The Fiel		16	
3. _____		17	
		18	
		19	
		20	
		21	
		22	
		23	
To		24	
The		25	
F.R.		26	
C.M.		27	
Rec		28	
		29	
		30	
Place :		31	
Date :		32	
		33	
Remarks			

1. Account of the fisheries in the zone as a whole for the month. (This should cover commencement/closure of important fishery.

2. Comparative assessment of catch with that of previous month

3. Relative abundance of different species of fish in different nets

4. Occurrence of Juveniles of commercially important species

5. Any unusual phenomenon such as bumper catch of fish and prawns, large scale mortalities, diesel shortage agitations, cyclones etc.

6. Information on the capture of marine mammals like whales and dugong and marine turtles.

7. Additional points, if any.

Name and signature of the Assistant

Place :
Date :

**NATIONAL MARINE LIVING RESOURCES DATA CENTRE
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE (ICAR), COCHIN- 18
DAILY RECORD OF CATCH AND EFFORT OF SMALL MECHANIZED FISHING CRAFT**

Fishery Survey Form 2
Trawler (A) /Gillnetter (B) /Longliner (C)
/Dolnetter (D)/Country craft
with O.B.(E).

State District one atre
Date Period..... ber of units landed No. of units selected
State of sea ate of sky ection of wind

Serial number	Allotted No. of selection of units examined	Name and/or craft number	Type of craft		Type of gear		Length of craft	Horse power	Absence from shore			Fishing ground			No. of hauls	Duration of actual fishing (hrs. & mts)	Man power employed	Av. Trawling speed in case of trawler (km/hr)	Name, code and weight (kg) of fish landed										Total
			Name	Code	Name	Code			Dep. Time & Date	Arr. Time	Duration of absence (hrs)	Distance (km) from shore	Direction from L.C.	Depth (m)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Special attention : Report incidental catch/stranding of cetaceans and turtles with details															Price in Rs per Kg														

Remarks

Name and signature

State District Zone Vire
 Date Period Number of shore seines/other units landed No. of units selected
 State of sea State of sky Direction of wind
 Name of vessel Name of skipper Name of observer

[illegible]

Remarks

Name and signature of observer

NATIONAL MARINE LIVING RESOURCES DATA CENTRE
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE (ICAR), COCHIN- 18
DAILY RECORD OF CATCH AND EFFORT OF SMALL MECHANIZED FISHING CRAFT

State District Line
Date Period ber of units landed No. of units selected
State of sea State of sky Direction of wind
.....

Serial number	Allotted No. of selection of units examined	Name and/or craft number	Type of craft		Type of gear		Length of craft	Horse power	Absence from shore			Fishing ground			No. of hauls	Duration of actual fishing (hrs. & mins)	Man power employed	Av. Trawling speed in case of trawler (km/hr)	Name, code and weight (kg) of fish landed															
			Name	Code	Name	Code			Dep. Time & Date	Arr. Time	Duration of absence (hrs)	Distance (km) from shore	Direction from L.C.	Depth (m)																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					
Special attention : Report incidental catch/stranding of cetaceans and turtles with details															Price in Rs per Kg																			

Remarks

NATIONAL MARINE LIVING RESOURCES DATA CENTRE
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE (ICAR), COCHIN-18
DAILY RECORD OF CATCH AND EFFORT OF SMALL MECHANIZED FISHING CRAFT

Serial number	Serial number of the unit selected	Name, code and weight (Kg) of fish landed																					
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	2																						
Price in Rs. Per Kg																							

SAMPLING

Coverage (%)

