

# PRESENT AND FUTURE SCENARIO OF INDIAN MARINE FISHERIES

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ICAR



# Outline

- Present status of Indian fisheries
- Description of different fisheries
- Marine fisheries mgmt in India
- Status of mariculture
- Issues faced
- Future plans for development

# Profile of Indian Marine Fisheries

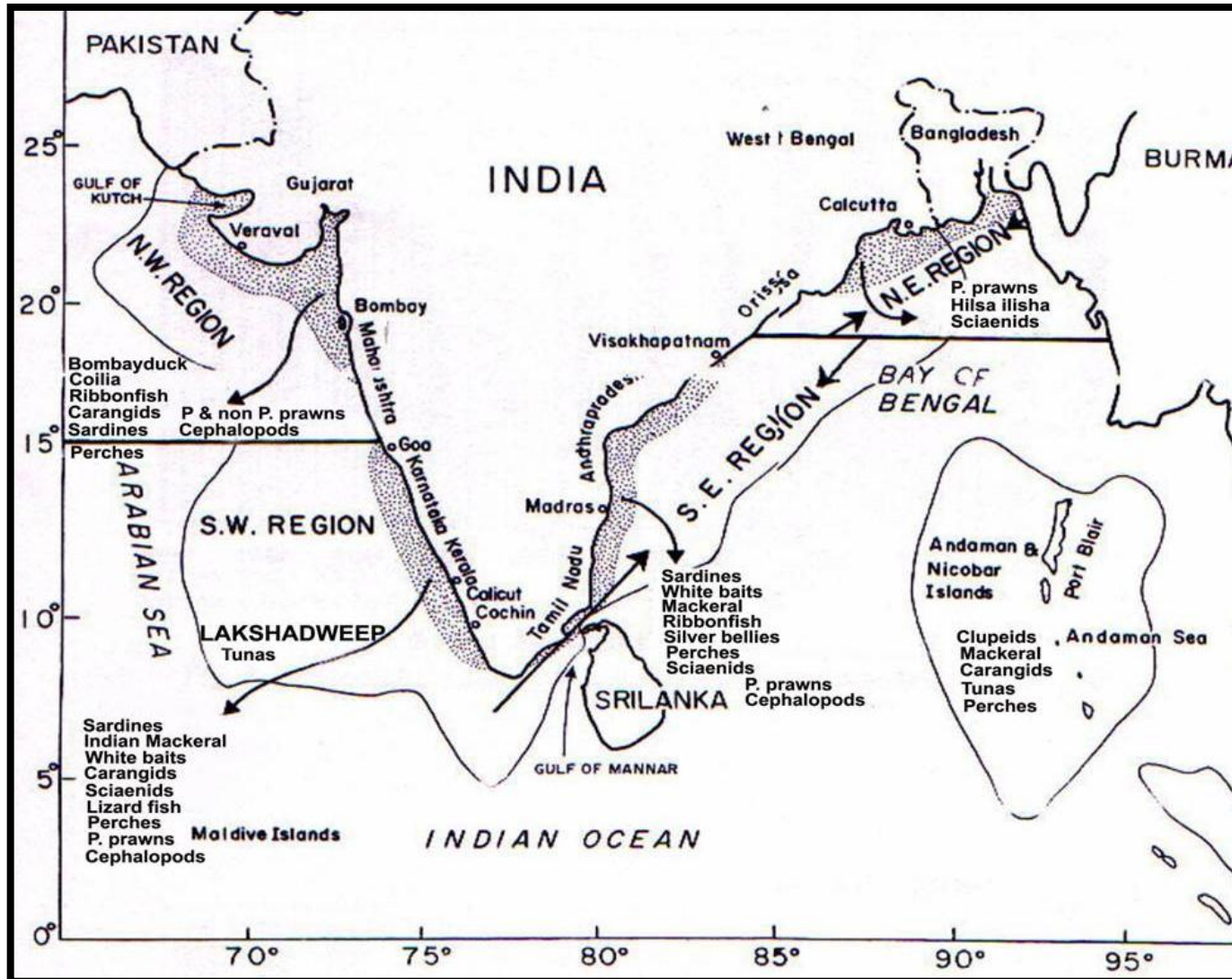
Component	Profile
<b>Physical Component</b>	
Length of coastline	8129 km
Exclusive economic zone	2.02 m km <sup>2</sup>
Continental shelf	0.50 million km <sup>2</sup>
Inshore area (< 50 m depth)	0.18 million km <sup>2</sup>
Fishing villages	3202
<b>Human Component</b>	
Marine fishers population	3.5 million
Active fishers population	0.9 million [20% in mech., 20% moto., 60% in arti.]; 30% posses ownership of fishing vessels
<b>Infrastructure Component</b>	
Landing centers	1332
Major fishing harbours	6
Minor fishing harbours	27
Mechanised vessels	58,911
Motorised vessels	75,591
Non-motorised vessels	104,270



# Indian Marine Fisheries - statistics

Gross value at land centre	19,753 crores
At retail point	28,511 crores
Export earnings	US\$ 2.84 billion
% in total exports	3%
Domestic markets	81% fresh; 5% frozen 6% dry; 5% fish meal
Per capita fish consumption	2.58 kg (range 39 – 0.3)
Share in GDP	1.1%
Share in agricultural GDP	5.4%

# India – Coastal Eco-regions/ EEZ



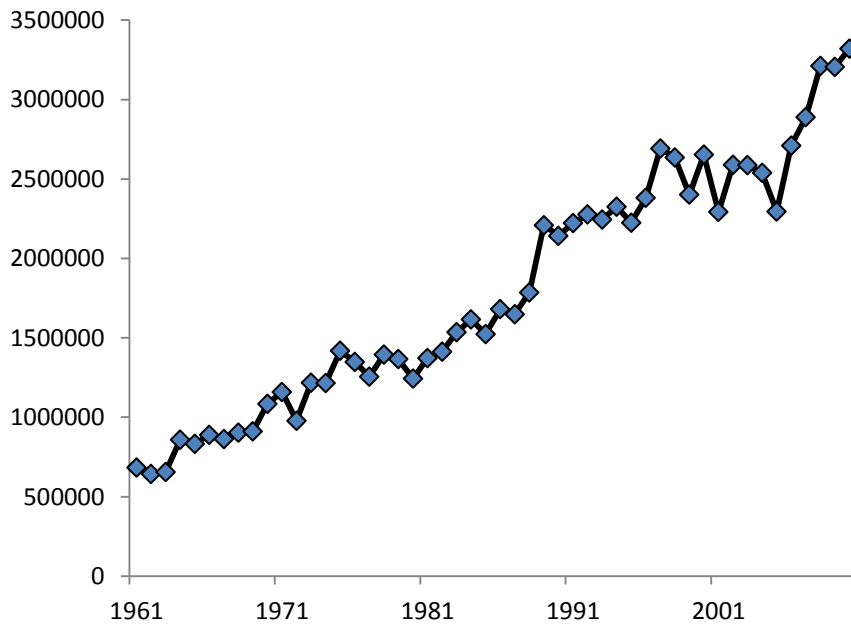
9 maritime states

2 island territories

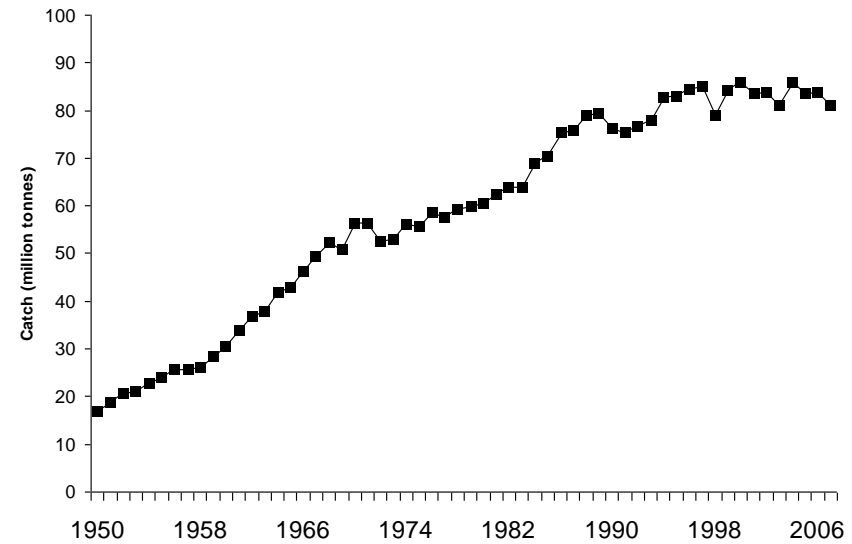
4 regions

West coast :  
2/3, more productive

# India Vs World – Catch Trends



India



Global

**India** : 0.53 mt to 3.3 mt, stagnated at 2.7 during 2000-07

High fecundity, continuous spawning, fast growth, short life span

**Global** : stagnates at 82 m t for 15 years

# Classification of Fisheries

Realm-wise	Broad resource group-wise	Major species-wise (exceeding 100,000 tonnes)	Vessel-wise	Gear-wise
Pelagic fisheries [55]	Finfish [80.5]	Oil sardine [15.0]	Non-mechanized [4.8]	Trawl [44.0]
	Demersal fisheries [45]	Crustacean [14.9]	Motorized [24.9]	Seining [19.2]
	Molluscan [4.6]	Bombay duck [4.1]	Mechanized [70.3]	Gillnets [18.4]
		Threadfin breams [3.9]		Hooks and lines [2.0]
		Carangids [7.5]		Bag nets [11.0]
		Ribbonfish [5.6]		Artisanal [4.8]
		Mackerel [5.5]		
		Penaeid shrimp [6.8]		
		Non-penaeid shrimp [5.4]		
		Cephalopods [4.4]		

## What do we exploit - MULTISPECIES

Country	Number of species		
	Finfishes	Penaeids	Cephalopods
India	1400 (263)	36 (15)	34 (8)

**Commercial species in brackets**



# How the Exploitation is Carried Out

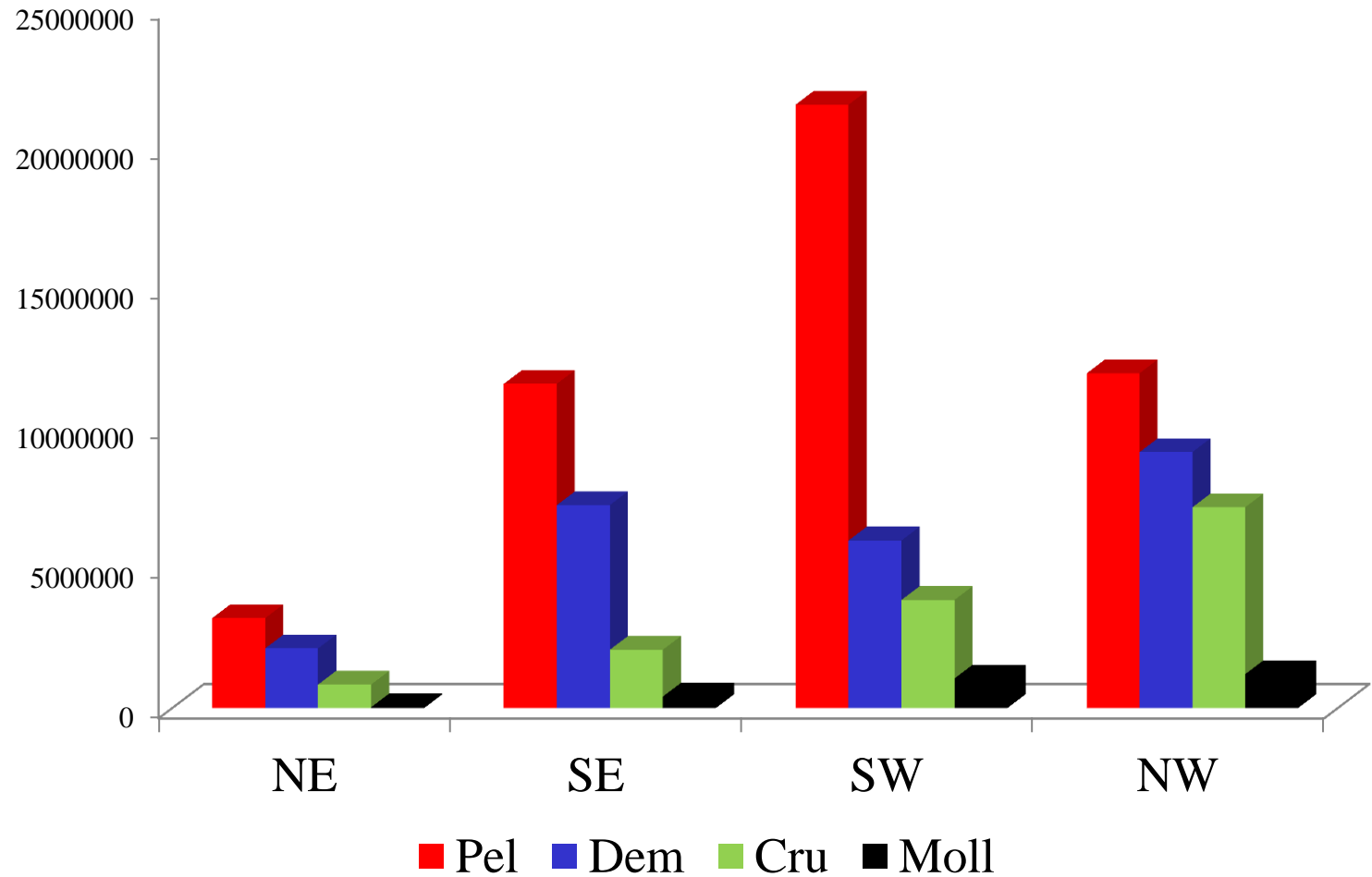
- 5 major Gears
  - Trawl -
  - Bagnets
  - Gillnets
  - Seines
  - Hook & Line
- Major Crafts
  - Mechanized - 58,911
  - Motorized - 75,591
  - Non-motorised -104,270
- More than 25 craft gear combinations



# Scale of Marine Fisheries in India

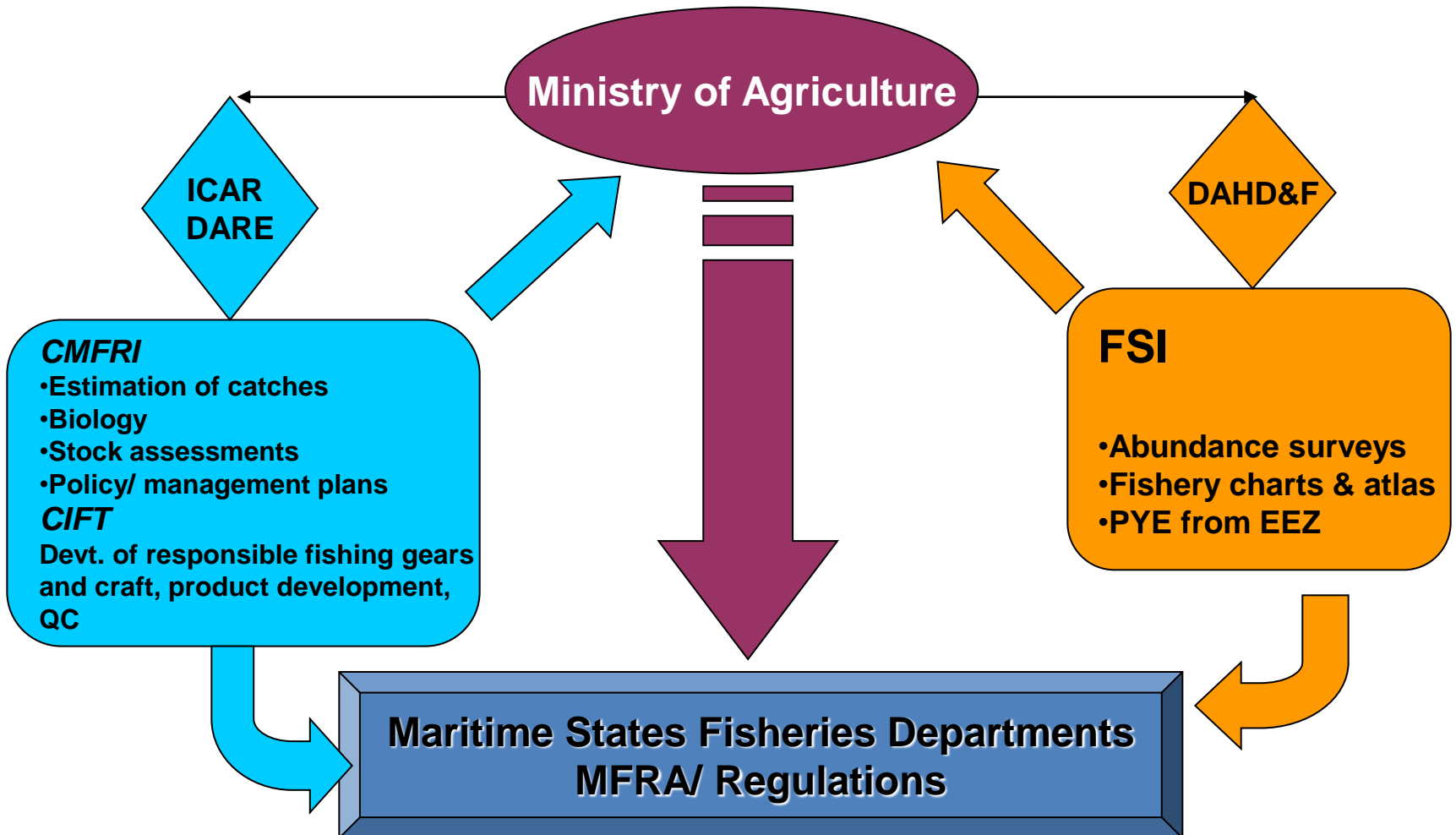
Craft	Length (m)	Engine power (hp)
<b>Mechanised</b>		
Trawlers	9-20	150 - 400
Gillnetters	7-14	80-100
Purseseiners	11-15	100-120
Dolnetters	10-15	80-100
Ringseiners	10-20	85-120
Pole & liners	10-12	100
<b>Motorised (with &gt; one outboard motors)</b>		
Plank-built canoes	8-22	35-120
Plywood boats	10-17	40-65
<b>Motorised (with one outboard motor)</b>		
Catamaran	5-7	2-5
Dugout canoes	5-7	2-10
Plank-built canoes	5-12	2-25
Plank-built boats	7-9	8-15
Plank transom canoes	7-9	8-15
Plywood boats	9-12	8-15
<b>Non-motorised</b>		
Catamaran	5-7	-
Dugout canoes	5-7	-
Plank-bulit canoes	5-12	-

# Regionwise – groupwise landing for the period 1961 - 2010



# **Marine Fisheries Management in India**

# Management Structure



# Open Access Fishing is Governed by

Primary aim is to prevent and minimize disputes among different sectors

- Indian Fisheries Act, 1897
- The Wild Life (Protection) Act, 1972
- MFR (regulation) Bill, 1978 formulated after the EEZ declaration
- MFRA of maritime states enacted from 1980 in all maritime states
- Maritime Zones of India Act, 1981
- Environment (Protection) Act, 1986

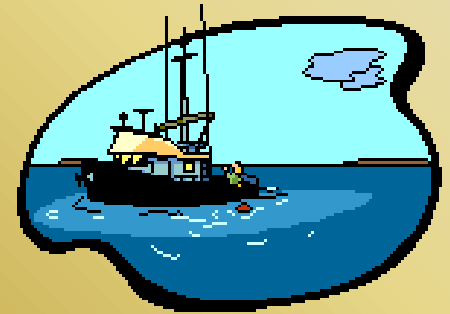
## Drawback

no entry restrictions,  
retire old fishing fleets,  
no legal action against  
violators

# MAJOR FISHERIES



# *Trawl fisheries*



- **Major gear-44% of landings**

- Number of trawlers increased twice, the estimated efficiency (engine horsepower) increased by nearly 4 times, from 951,200 hp (1980) to 3,448, 570 hp (1998).
- From 1999, employed for deep sea fishing upto 400 m depth
- The medium trawlers undertaking multi-day voyages carry nearly a dozen different trawl nets each rigged differently and having different cod-end mesh sizes (15 to 35 mm) to target commercially highly valued resources.



- Penaeid shrimps are the main stay of the trawl fishery.
- High opening trawls reduce the dependance on shrimp; instead squid, cuttle fish and fishes became important.
- Finfishes exploited by trawls belong to 21 major fish groups.
  - Each region is characterized by dominance of specific finfish groups.
  - NE coast - sciaenids, catfish and pomfrets (together contributing 74.0% to the demersal landings).
  - SE coast - silverbellies and pigface breams
  - SW coast - threadfin breams and other perches
  - NW coast - sciaenids, catfish and threadfin breams



# Seine Fisheries



- Ring Seine (mini purse seine) - most popular seining method for the pelagics along Kerala coast
- 1000 purse seiners - Karnataka (>50%), Goa and Maharashtra ; Ring seines - Kerala (>70%) and Tamil Nadu.
- Main species - small pelagics such as oil sardine, lesser sardines, anchovies and mackerel



# Gillnet Fisheries

- The gillnet catches which ranged from 1.0 lakh to 1.35 lakh t during the 1980s and 1990s, increased by more than 4 times in recent years (5.8 lakh t in 2008).
- Share of mechanized gillnetters (MGN) is increasing as compared to outboard gillnetters (OBGN) (last 5 years).
- Exploits only few species; upto 60 species recorded.
- Small meshed gillnets (Clupeids and croakers)
- Large meshed gill nets (Sharks, seerfish, mackerels, catfishes, pomfrets, tunas and carangids)
- Average productivity of this gear - estimated at 13.7 kg/h maximum in SW coast followed by NE.



# Bag net Fisheries

- ✓ Major gear used by artisanal fishers along NW and NE coasts.
- ✓ Gujarat and Maharashtra, the fixed variety of bag nets – Dolnets. Operate upto 40 m (8862 no.s)
- ✓ 80% of the bag net fisheries come from the mechanized dolnetters
- ✓ Catches - non-penaeid shrimps (Kiddi shrimp *Acetes indicus*), the mid-water carnivore Bombay duck (*Harpadon nehereus*), golden anchovy (*Coilia dussumeiri*) as well as penaeid shrimps and ribbonfishes.

## Issues

- ✓ exploits the resources indiscriminately
- ✓ small mesh sizes - results in growth over-fishing of one of the main species, Bombay duck;
- ✓ juveniles form 45 – 65 % of catch.
- ✓ *A. indicus* -constitute the principal by-catch



# *Hooks and Line Fisheries*



- Contributes - 2% of the all India marine fish catch
- Targets the large pelagic fishes such as sharks, tunas and barracudas.
- Regional modification and craft mechanisation
- Development schemes of the government has targeted promotion of H&L fisheries particularly the modern version of long line fishing for tunas.
- Many large shrimp trawlers in NE converted to longliners.

# Artisanal Fisheries



- Sector has dwindled with the advent of mechanization from 88 % in 1960 to 2 % recently
- Innovative - with fishing gears, and to withstand competition from the mechanized sector, motorized their crafts, initially with outboard engines and lately with inboard engines as well.
- Catamaran and plank built boats have been motorised



# *Bivalve fishery*



- Clams and mussels mainly in inland waters and bays; hand picking and by dredge.
- Meat is also sold both in internal markets as well as to export processing plants
- Kerala leads India in the production of clams with estimated annual landings of about 66,000 tons (t) in 2008-09
- Estimated fishery from bivalves is approximately 1 lakh t.

# *Sea weed production*

**Production - approximately 100,000 tons (wet weight) in 2004, manly from east coast**

**India produces 110-132 tons of dry agar annually utilizing about 880-1100 tons of dry agarophytes.**

**On the west Coast – Gujarat - seaweed resources present on the intertidal and subtidal regions.**

**These resources have great potential for the development of seaweed-based industries in India.**





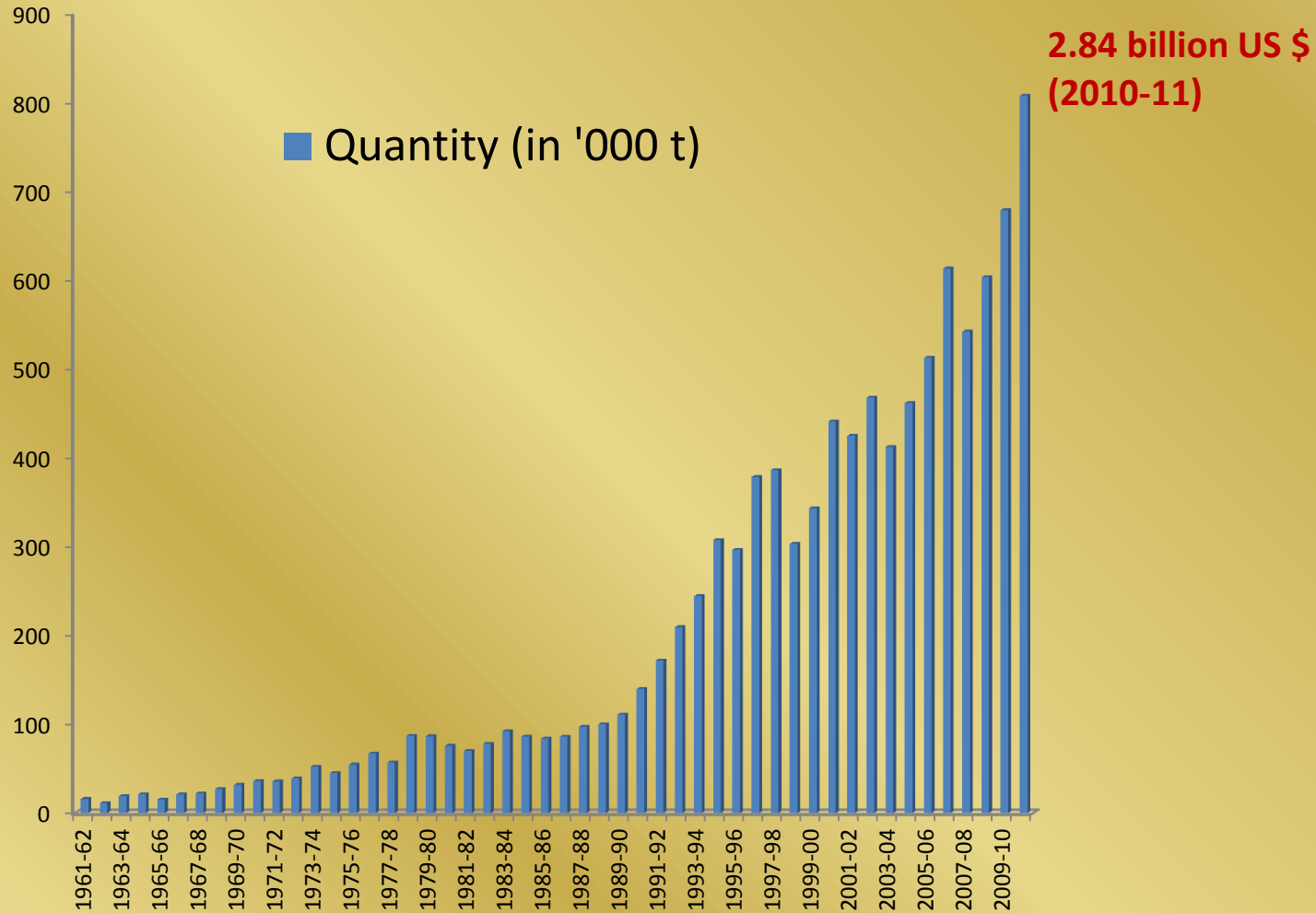
# Top-ten Resources by Value

(Landing centre prices)



Rank	Resource/ Stock	Rs. Billion	US\$ Million
1	Penaeid shrimps	43.4	964.4
2	Sardines	10.7	237.8
3	Cephalopods	9.0	200.0
4	Seerfishes	6.0	133.4
5	Pomfrets	5.8	128.9
6	Croakers	4.6	102.2
7	Carangids	4.6	102.2
8	Mackerel	3.9	86.7
9	Perches	3.9	86.7
10	Bombay duck	2.5	55.6
	Others	15.6	346.7
	TOTAL	110.1	2446.7

# Marine products export growth



# Regulatory Measures Include

- Closed season
- Closed fishing areas
- Marine Protected Areas (MPAs)
- Protected Species
- Ban on certain destructive fishing gears and methods
- Minimum mesh size regulation
- Minimum legal size at capture
- Use of Turtle Excluder Device (TED) in trawls in Orissa

# Closed Season for Mechanized Sector

<b>State</b>	<b>Months</b>	<b>Days</b>
Gujarat	June - August	45
Maharashtra	June - August	45
Goa	June - August	45
Karnataka	June - August	45
Kerala	June - August	45
Tamil Nadu	April - May	45
Andhra Pradesh	April - May	45
Orissa	April - May	45
West Bengal	April - May	45

# Spatial Closures

State	Reserved for traditional vessels	Available to mechanized vessels
Goa	Up to 5 km	Beyond 5 km
Kerala	Up to 10 km	<25 GRT: 10-22 km; >25 GRT: beyond 23 km
Karnataka	Up to 6 km	<15m LOA: 6-20 km; >15m LOA: beyond 20 km
Maharashtra	Up to 5-10 fathom	Beyond 10 fathom depth
Tamil Nadu	Up to 3.4 nautical miles	Beyond to 3.4 nautical miles
Andhra Pradesh	Up to 10 km	<20m LOA: 10-23 km; >20m LOA: beyond 23 km
Orissa	Up to 5 km	<15m LOA: 5-10km; >15m LOA: beyond 20 km

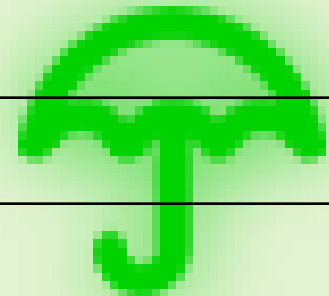
# MARINE PROTECTED AREAS (MPAs)

- Currently, there are 31 MPAs (majority in A&N)
- The current area under MPAs is 6.16 per cent of the area in the coastal biogeographic, which is proposed to be expanded to 7.12 per cent
- Oil wells in Bombay High and Godavari Basin also function as MPAs

# Protected Species

(under Indian Wildlife (Protection) Act, 1972)

Species/ Group	Number
Molluscs	24 species
Elasmobranchs	10 species
Grouper fish	1 species
Sea horses	All species
Sea Cucumber	All species
Sponges and seafans	All species
Corals	All species
Turtles	All 5 species
Whales, dolphins, sea cow	All species



# Minimum Legal Sizes



Species	Weight (g)/ Length (mm)
<i>Panulirus polyphagus</i>	300 g
<i>P. homarus</i>	200 g
<i>P. ornatus</i>	500 g
<i>Thenus orientalis</i>	150 g
<i>Pampus argenteus</i>	200 g
<i>Loligo duvauceli</i>	80 mm
<i>Sepia pharaonis</i>	115 mm
<i>Octopus membranaceous</i>	45 mm





# Ban on Destructive Fishing Methods

- Dynamite fishing
- Cyanide poisoning
- Pair trawling in GoM and Palk Bay
- Thalluvalai (minitrawl) in GoM and Palk Bay





## Mariculture in India



# Bivalve mariculture

Mussel farming



Rack and bottom culture -  
20 t (1971) - 18432 t  
(2010)

Edible Oyster farming



Rack  
and  
ren,  
rack  
and  
tray

Pearl culture



Technology  
developed in  
1970s , yet to  
take off

# Sea-weed farming

- PepsiCo Food has introduced farming of *Eucheuma cottoni* and *Hypnea musciformis* in 100 ha through contract farming system.
- ❖ *Kappaphycus alvarezii* farming was initiated at Palk Bay in 2003.
- ❖ Production reached 865 t dry weight in 2009.



# Cage farming



CMFRI has been successful in demonstrating open sea cage farming of lobster and Asian Sea bass at different parts of Indian coast with the support of NFDB and fishermen societies and is targeting to harvest one lakh tonne of fish through open sea cage farming



**Lobsters harvested from cage**

# Hatchery production of finfish seed

CMFRI has been able to successfully breed Cobia – *Rachycentron canadum* in captivity

Hatchery production technology of Asian sea bass (*Lates calcarifer*) has been standardised by CIBA



# Hatchery production of marine ornamentals

Broodstock development,  
breeding and larval rearing of  
marine ornamental fishes –

*Clown fishes* – *Amphiprion*  
*chrysogaster*, *A. percula*, *A.*  
*frenatus*,  
*A. ocellaris*;

*Damsels* -  
*Chrysiptera unimaculata*,  
*Dascyllus aruanus* and  
*D. trimaculatus* successful





# Issues



- **Declining catches and overfishing in coastal waters** (open access, c/e of demersals reduced, FDMFW SE coast etc)
- **Post-harvest losses** (discard, spoilage, reduced quality)
- **Habitat degradation** (industrial waste, domestic sewage, pesticides etc)
- **Climate change**
- **Illegal, unreported and unregulated landings**
- **Poor implementation of regulations** (eg; mesh size)

# Complexity of Tropical Fisheries - An Example



- Fish stocks in each ecosystem are in different stages of exploitation
- Of the 60 species of finfishes, crustaceans & cephalopods landed in one coastal trawl haul at the Chennai Fisheries Harbour
  - 6 were in overexploited category
  - 40 were in optimally exploited category
  - and 4 were in underexploited category
- One fishing village for every 2 km of coastline
- Active fisher population in India 0.9 million
- Active fisher population at Iceland + New Zealand is 12,000
- These 2 countries together produce 2.6 million tonnes annually (216 t/fisher)
- So with more fishers we produce less (2.9 t/fisher)
- Because more people are dependant on fisheries as a livelihood



# Future Plans



## Fisheries sustainability

Unlike other resources  
invisible, diverse, migratory,  
seasonal, its own dynamics  
as well as anthropogenic and  
climatic impacts

# ***Management and conservation of the resources***

- ✓ ***Ecosystem-based fisheries management (EBFM)***  
*better than single species mgmt, ecosystem evaluation and modeling, can predict changes*
- ✓ ***Bycatch reduction-*** *BRDs and sem pelagic trawling*
- ✓ ***Capacity reduction-*** *limit entry, buyback*
- ✓ ***Understanding climate variability and fisheries-***  
*improved information on climate and effects made available*
- ✓ ***Implementation of CCRF*** -overexploitaton of stocks, damage to ecosystems, trade issues: ecolabeling
- ✓ ***Natural hazards – disaster management***
- ✓ ***Mariculture-*** *potential mariculture site identification*





- ✓ **Development of Infrastructure-** *post harvest loss - 15%, public investment, VMS, better domestic marketing*
- ✓ **Diversification of vessels and deep sea fishing-** *1.3 lakh t of deep sea resources- tuna longliners and squid jiggers*
- ✓ **Diversification of products** *-value added products*
- ✓ **Utilisation of fish waste to useful products**
- ✓ **Marine Protected Areas (MPAs)-***area to expand to 7.12%*

Also to look into -

## Habitat degradation

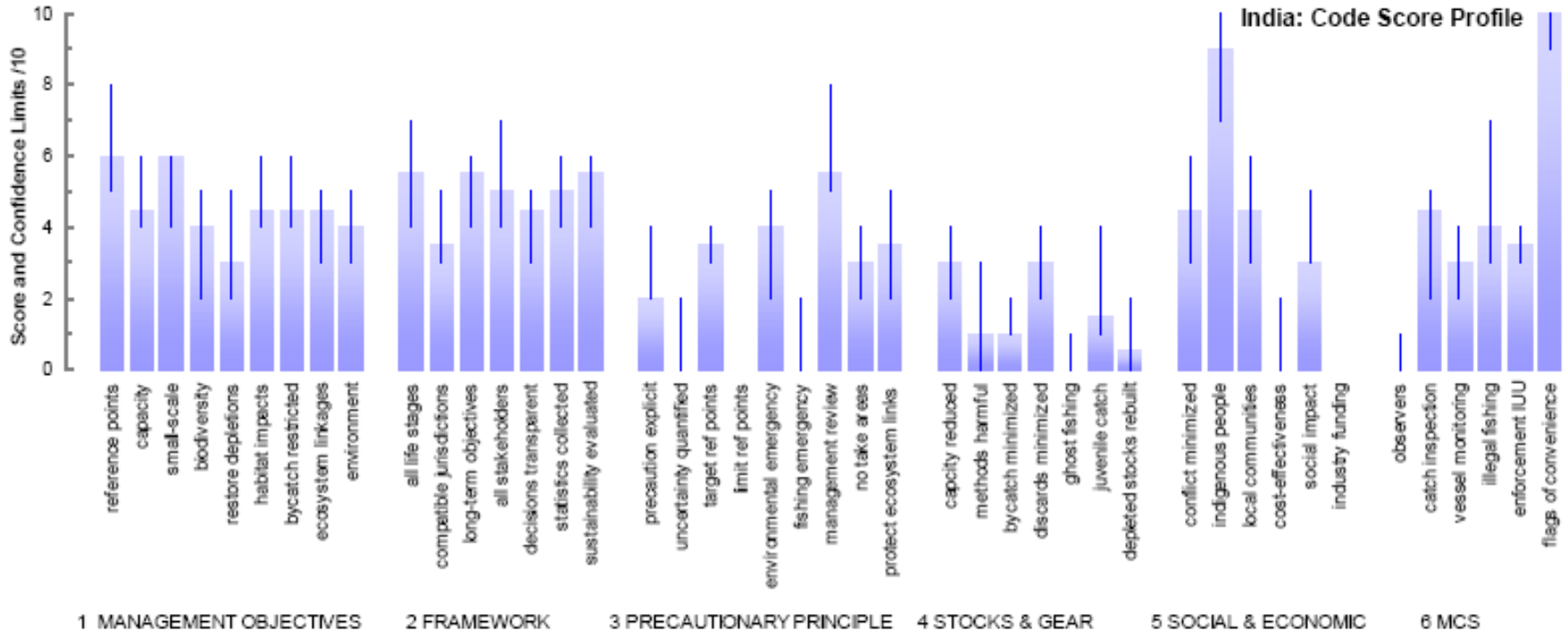
- water contamination
- enforcement of standards for water discharge
- maintaining the quality of river runoff
- reducing greenhouse gas emissions
- ? -----





**Compliance to FAO CCRF**

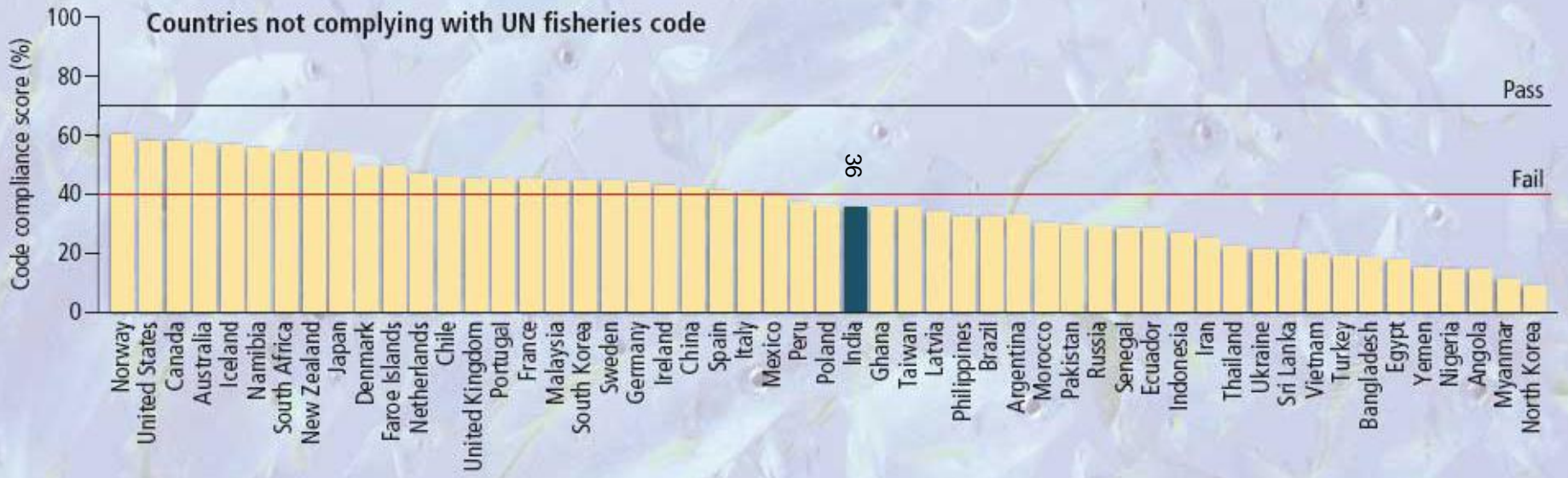
# India's Score



**High scores** for reference points, conflict minimization, protection of indigenous fishers etc,  
**Poor scores** for quantifying uncertainties in estimates, lack of limit reference points, lack of initiatives for rebuilding stocks and prevent juvenile fishing



### Countries not complying with UN fisheries code



Reference: The evaluation was done by a group of experts from the Fisheries Centre, University of British Columbia, the Federal University of Rio Grande, Brazil and WWF International

# **The Sunken Billions: The Economic Justification for fisheries Reform- World Bank report, 2008**

- This study concludes that marine capture fisheries are an underperforming global asset.
- The difference between the potential and actual net economic benefits from marine fisheries is in the order of \$50 billion per year.
- India can very well capture \$2 billion per year from marine fisheries by way of fisheries reforms and improved governance

Thank You

A decorative graphic featuring the text "Thank You" in a red, cursive font. The text is framed by a green vine with a pink flower bud on the left, a pink daisy with a yellow center on the right, and several green leaves.