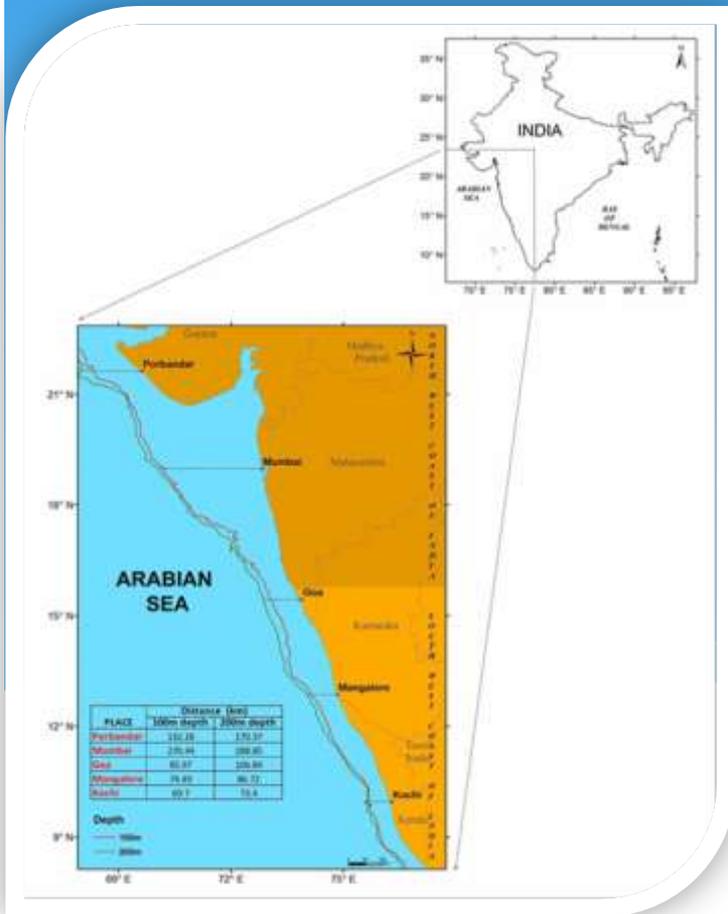


# Trawl fishery management of Eastern Arabian Sea



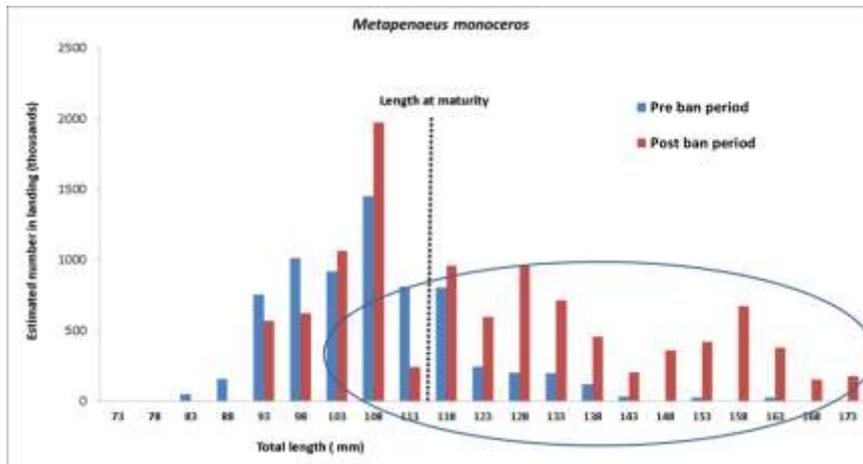
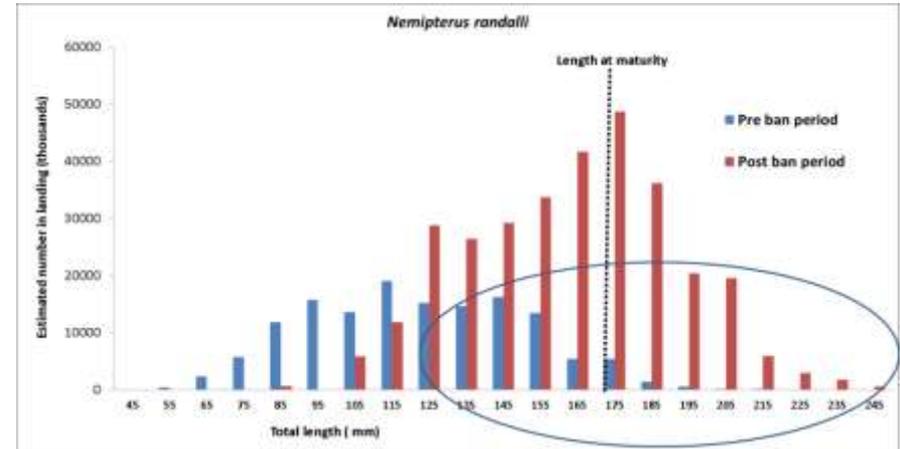
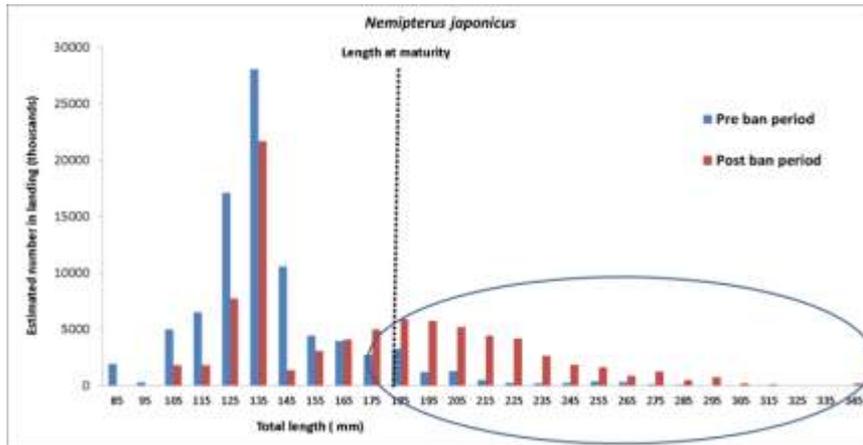
Dr. A.P.Dineshbabu,  
Central Marine Fisheries Research Institute,  
India

## Existing management practices

- \* ***Seasonal closure of fishery:*** The regulations for “closed season were notified for the Eastern Arabian Sea from 1988 onwards.
- \* ***Mesh size regulation and minimum legal size:*** Minimum mesh size for different species were recommended for avoiding juvenile bycatch. Diamond mesh size of 35 mm showed that it provides better opportunity for the juveniles to escape and it is recommended for cod end of trawls
- \* ***Restriction of fishing areas:*** In the context of persistent conflicts between artisanal and mechanized vessels in the inshore waters. Under this act, the mechanized boats have been banned from fishing in inshore areas, which have been assigned exclusively to the artisanal craft. Community participation in the formulation of the management actions are yielding good results in some parts of the country.
- \* ***Protected species and Marine Protected Areas (MPAs):*** Several species are protected under Wildlife Protection (1971) Act. Capture or trade on these species is prohibited under the act. Releasing sharks after finning is prohibited under a notification. Under this act, fishing for whale shark is prohibited.
- \* There are 31 MPAs along India’s coastline that have been officially declared for conserving and protecting coastal and marine biodiversity (SCBD, 2006)

# Impact studies of seasonal closure

## Spawning stock renewal of important fishery resources

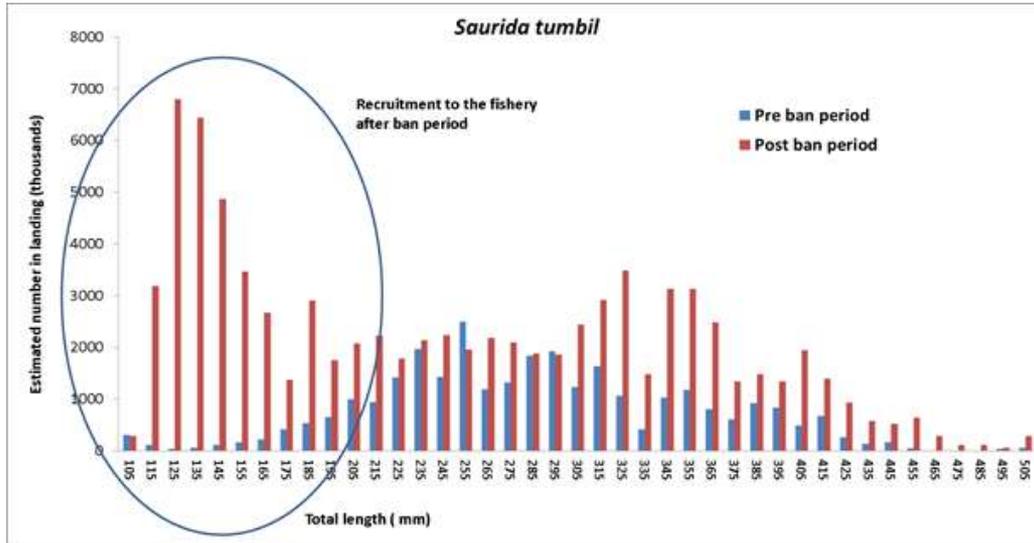


There was significant improvement in spawning population in many of the targeted resources as a result of closure of fishing.

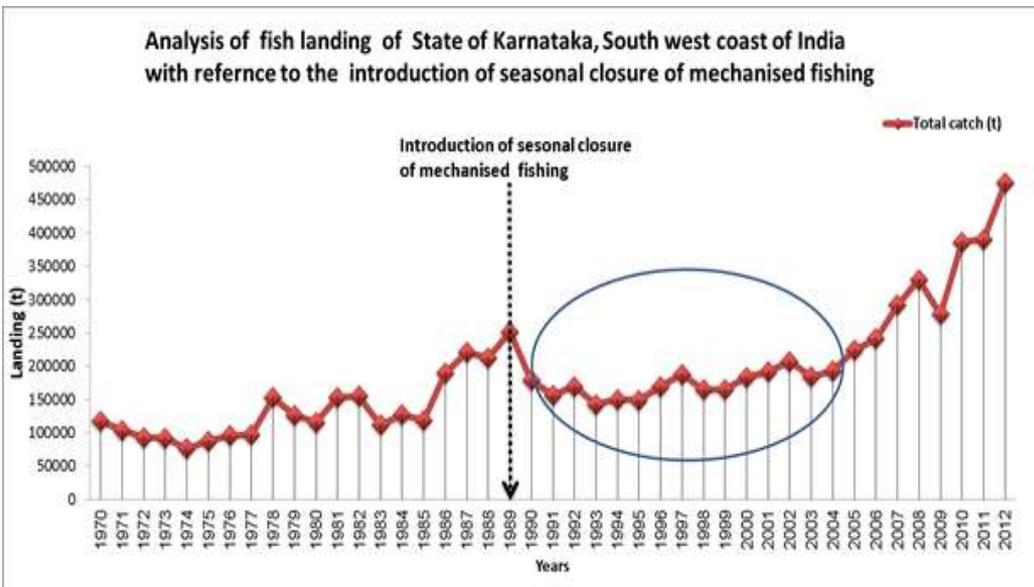
Which is found to lead to successful recruitment in these species.

# Impact studies of seasonal closure

## Successful recruitment and stability in fish production



Apart from improving the spawning stock there is clear indication of increase in recruitment numbers of many demersal species, immediately after the lifting of seasonal closure of the fishery



The consistency in fishery in the southern State (province) of Karnataka during 1990 to 2005 was attributed to the maintenance of sufficient spawners in the population and also to the successful recruitment resulted by these spawners.

## Selectivity based bycatch restriction: Practical difficulties and solutions experimented

- The use of selection technology in reducing the incidental catch of non-target species from the fishing ground in tropical waters is helpful in reducing the bycatch and discard only in a limited way.
- As suggested by FAO design based BRDs in association with area closures and temporal closures of trawling will be the best option for the bycatch reduction in tropical waters.
- GIS based resource studies were initiated in India, for temporal and spatial mapping of commercial and non-commercial resources in their different stages of life (juveniles and adults) in different fishing grounds.
- Such maps found to serve serve a handy tool for suggesting operational interventions to avoid over-exploitation of juveniles and spawners.
- GIS maps are found to be useful as an efficient tool for decision making in declaration of marine protected area (MPA) and essential fish habitats (EFH).

# Importance of participatory GIS in spatial data collection and its application in Indian trawl fisheries

- In-situ monitoring of trawl fisheries with its spatial characteristics from a depth beyond 250 m on regular basis is practically impossible for a Institutional/ Government mechanism due to its exorbitant expenditure involvend in the process
- More recently, **public participatory GIS (PPGIS)** and **participatory GIS (PGIS)** is viewed as a more efficient tool in solving social and resource conservation issues, which empowers communities those who are often ignored in traditional GIS practices
- The underlying assumption in PGIS concept is that by participation of stakeholders significantly for success of resource management efforts (Craig et al, 2002;Keyem, 2002).
- An experiment of participatory GIS was attempted in marine fisheries sector of EAS in which indigenous knowledge base of fishermen about fishing ground and their GPS based spatial data on the fishing ground, fishing method, fish catch and discards were integrated with research expertise of fishery scientists.
- The data sharing between fishermen and researchers were successfully continued for last eight years resulted in the resource maps which provided immense information of spatio-temporal resource distribution of juveniles, spawners and resource abundance.

# Participatory research programs in spatial data collection

## On board data collected

- Cruise No
- Token No
- Date
- Depth of shooting
- Time of shooting
- Shooting latitude
- Shooting longitude
- Hauling depth
- Hauling time
- Hauling latitude
- Hauling longitude
- Net type
- Mesh size
- Total catch and LVB (kg)
- Total discard (kg)
- Number of hauls/day
- List of commercial species with its percentage by weight.

Commercial trawler ( 52” wooden with 160 hp engine capacity) which was engaged in multi-day trawling for a cruise period of 8 to 13 days in a trip was engaged for the participatory research program.

Along with fishing information, an unsorted portion of discarded catch was collected as sample with token number representing the haul.

## Sample collection and analysis

A sample of catch/bycatch was immediately preserved in fish hold with ice collected with token number representing fishing details of the day and location and operation. It is being brought to shore as fresh as other commercial catch. The samples were qualitatively and quantitatively analysed in the laboratory upto species level

## *Fisheries resource information and management (FRIM) software was developed for interface data query for GIS mapping.*

- \* From the database of fishing and fishery information, to derive GIS maps and to carry out GIS analysis, there is need for interface software, which can make queries on the data required to give the output for GIS software.
- \* **FRIM** software facilitates the analysis of the database by sending simple or complex queries.
- \* The determination of CPH, monthly averages, comparison of fish composition between fishing grounds, analyses of bycatch, juvenile species, species to species correlation, repetition of species in space and time etc., can be performed at great ease using *FRIM*.
- \* The output can be easily represented on a map using Arc GIS or any other GIS software.
- \* FRIM-GIS outputs is being used for fishery resource mapping there by will be helpful in planning, policy making and sustainable exploitation of fishery resources.

• Click Cruise Fishwt\_pct

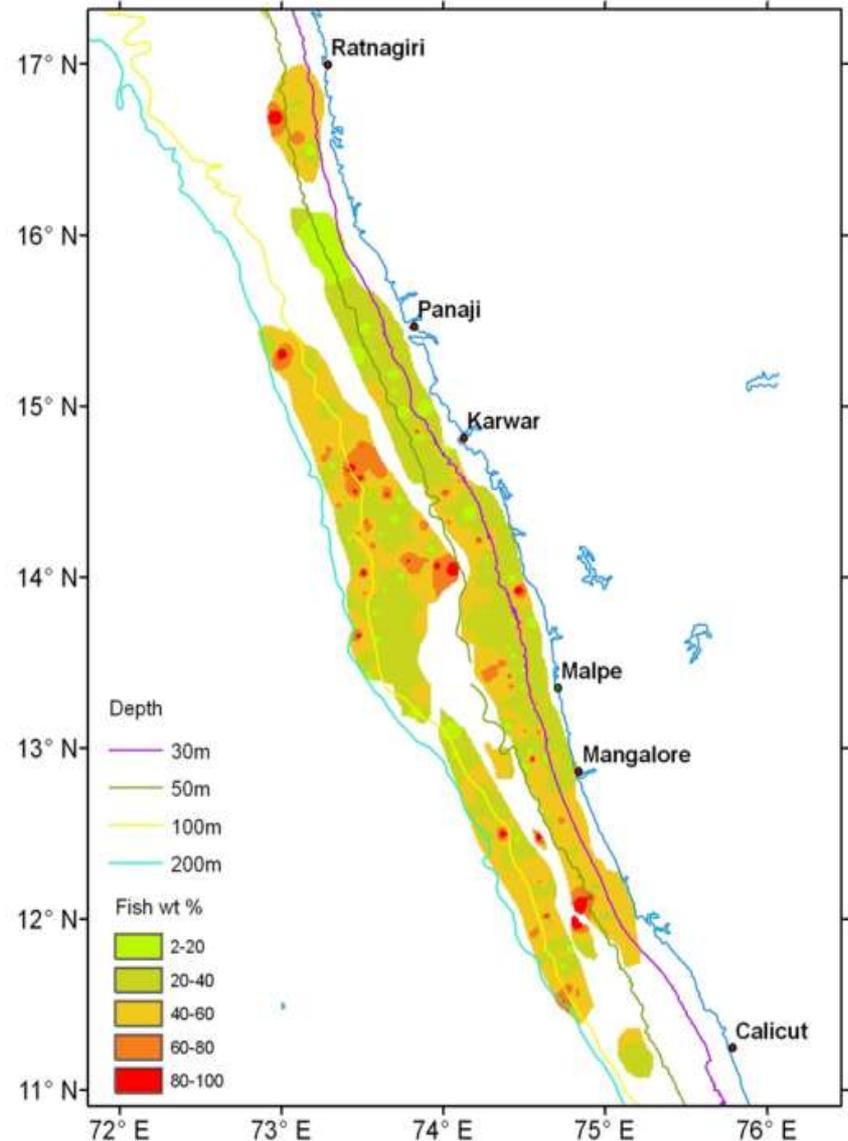
**Save Fish**

Species	Species	Variable	CruiseDate	Latitude	Longitude
0.004203	388	188	4/8/2009	14.0201	73.941
0.00441	382	174	3/19/2009	13.1248	74.4846
0.326776	386	186	4/8/2009	14.3751	74.1522
0.018783	402	186	5/16/2009	14.721	73.9815
0.000207	402	186	5/16/2009	13.431	74.8815
0.014445	384	186	3/1/2009	13.388	74.8825
0.137886	384	176	3/1/2009	13.917	73.381
0	182	88	8/23/2008	14.1850	73.9248
0.003333	219	146	3/1/2009	13.2288	74.57248

Summary Statistics:  
 Avg. Size: 388  
 Species Count: 1  
 Avg. Size Depth: 176  
 Avg. Size Date: Total  
 Per Year: Per Month

Buttons: Select all, Clear, **Cruise Fish**, Show Result

## Raster map showing Nemipterus FishwtPet

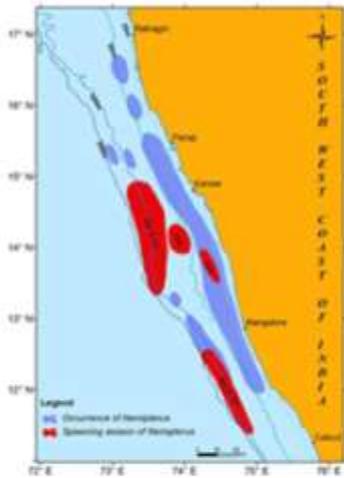


• Click Cruise Fishwt\_pct

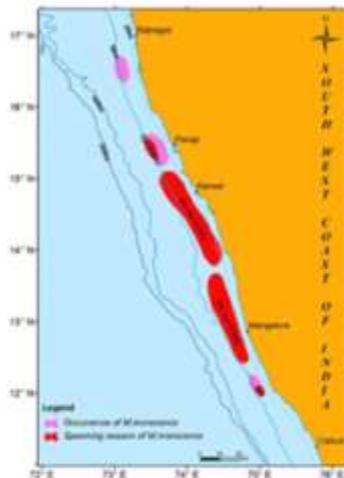
# Results of participatory research programs in spatial data collection

## Seasonal peak spawning grounds identified for commercial fishes

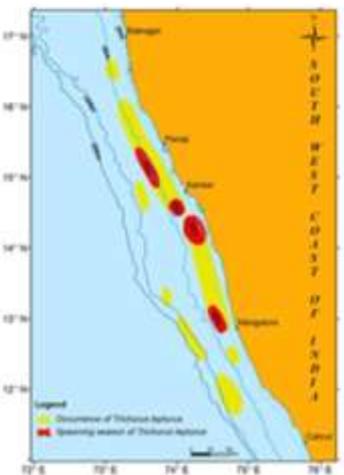
*Nemipterus randalli*



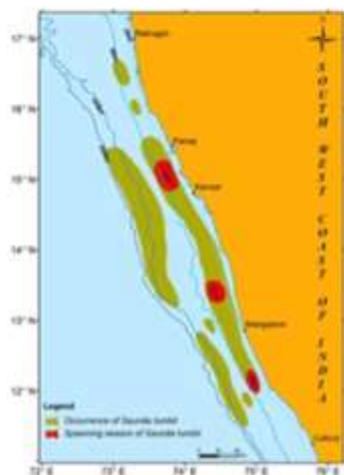
*Metapenaeus monoceros*



*Saurida tumbil*

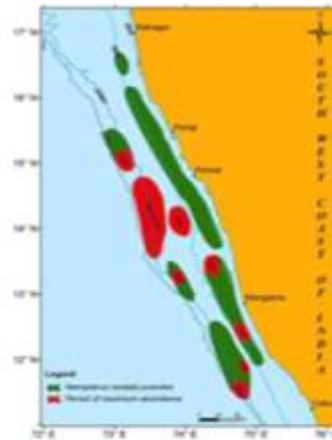


*Trichurus lepturus*

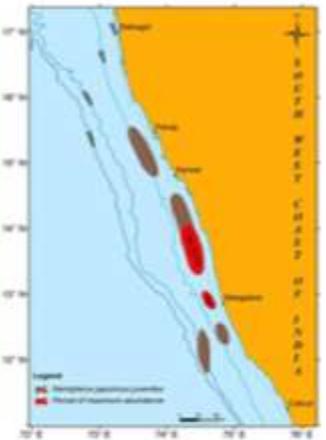


## Areas of seasonal juvenile abundance identified for commercial fishes

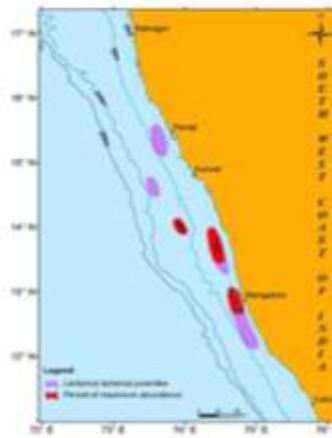
*Nemipterus randalli*



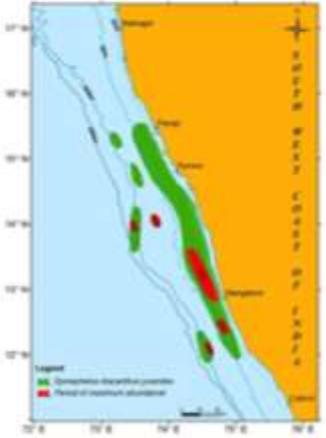
*Nemipterus japonicus*



*Lactarius lactarius*



*Epinephelus diacanthus*



## Encouraging aspects from the fisheries sector

- Ever since the GPS aided technologies are affordable to the fishing industry in variably all the mechanised vessels are using the technology and they are in a position to collect fishing and fishery information.
- Since the economic return from the marine fishery is dwindling more and more fishermen are realising that there is a need for fishery management for improving the fishery in coming years or else they feel their existence is in danger.
- The workshops and Interactive illustrative demonstration of the research results using GIS with participatory research, found to generate interest in stake holders, which they feel near to the reality. This feeling will help in wide adoption of policy interventions which can be made in participatory mode.
- The attempt of participatory GIS program was started as pilot program with one sampling boat in South west coast of India is being carried out all along the coast with involvement of more than 12 mechanised fishing vessel operators joining in data sharing.

Thank you