Climate change impacts on coastal resources and dependent livelihood in Tamil Nadu, Southeastern India

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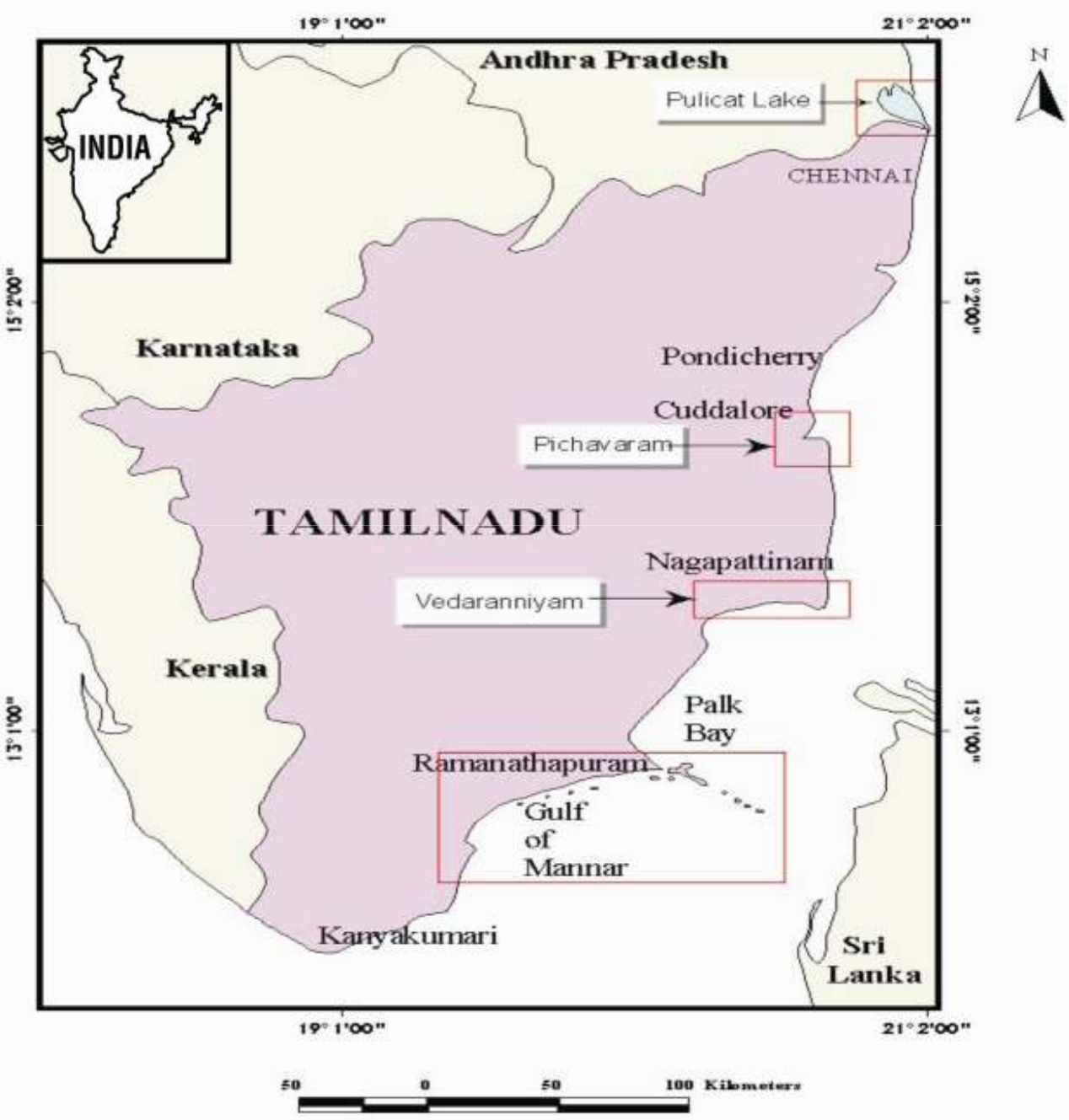
Tamil Nadu



- Coast - 1076 km
- 13 coastal districts
- > 800,000 active fishermen
- Key coastal habitats like coral reefs, seagrass beds, mangroves, estuaries etc.

Map source: Ramesh *et al.*, 2008 (modified)

Rivers

- There are 7 rivers
- Mostly seasonal now
- Several check dams
- Flow reduced
- Encroachment for aquaculture, construction etc.
- Sand mining
- Monsoon failure
- Loss of nutrient input in coastal systems

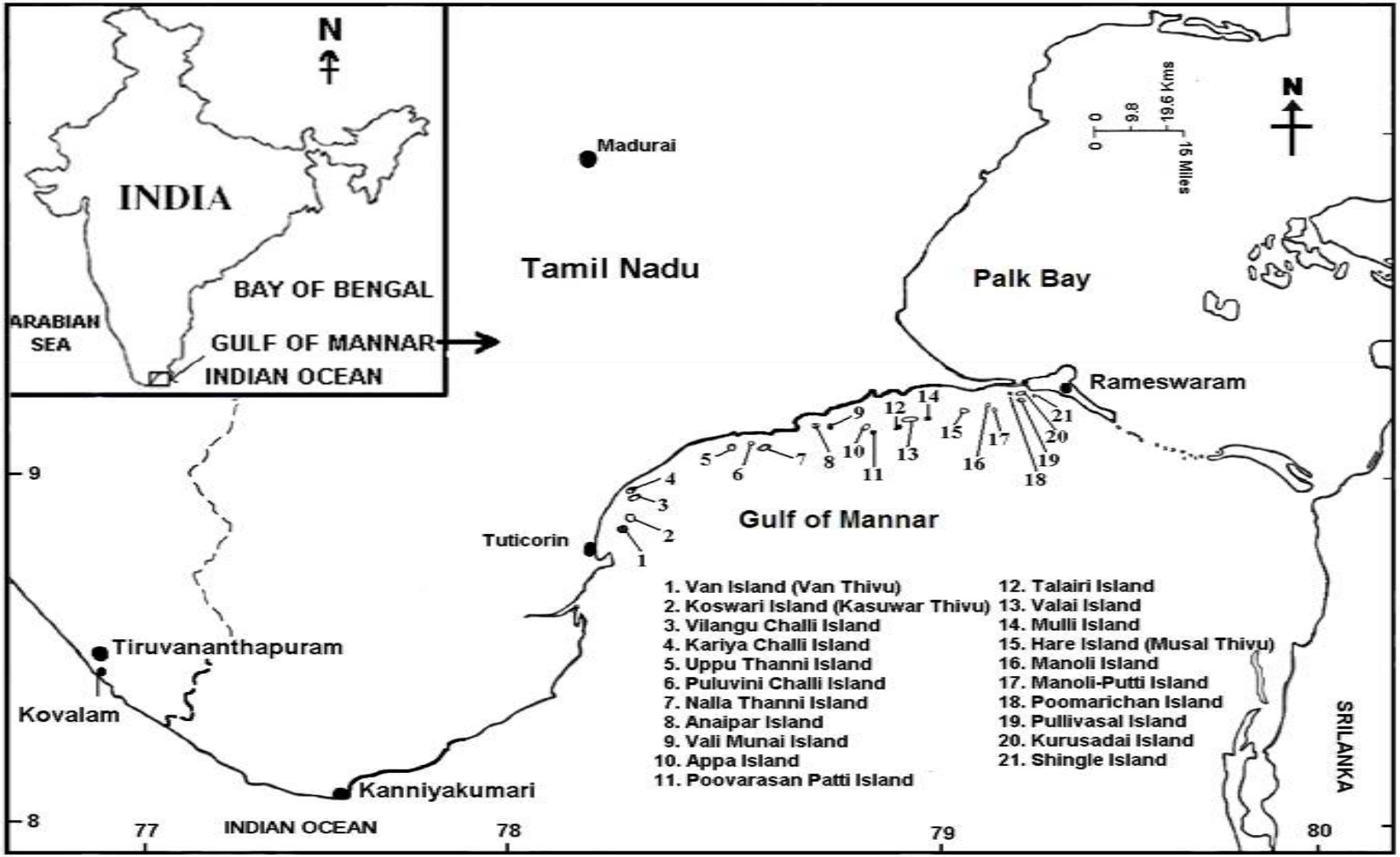
Human induced threats

- Population
- High dependency on fishery resources
- Destructive and over fishing (Trawling, Shore seine, push net, traps etc.)
- Pollution - Domestic and Industrial
- Coral mining
- Mangrove deforestation

Others (incl. natural threats)

- Climate change
- Monsoon failure
- Increase of disease prevalence
- Cyclone, tsunami

Gulf of Mannar - Case study 1 (Corals reefs)



Reef status

- Reef areas in Gulf of Mannar are formed around 21 islands at a depth between 0.5 and 6 m.
- Total reef cover - 110 Sq.km; Present cover - 75-80 Sq.km
- Coral bleaching during 1998 – about 60%, over 90% recovery.
- Present live coral status - 40%
- Coral species – 117
- Associated flora and fauna - over 3900

Threats to coral reefs of Gulf of Mannar

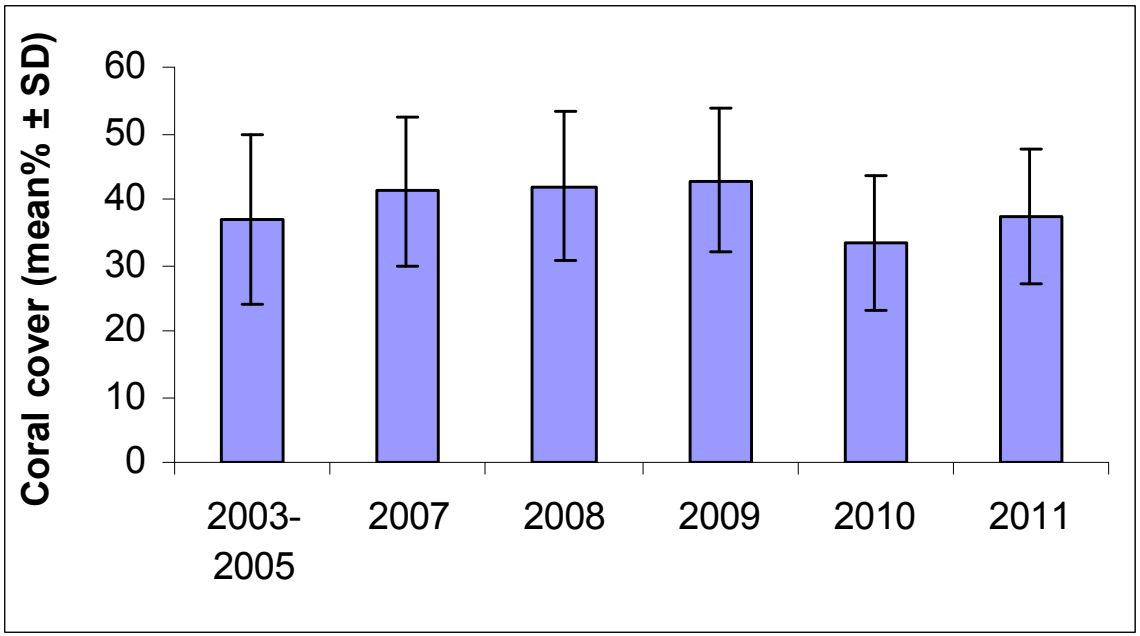
- **Coral mining**

  In 1970's it was estimated that the exploitation of corals was about 60,000 cubic meters (about 25,000 metric tones) per annum.

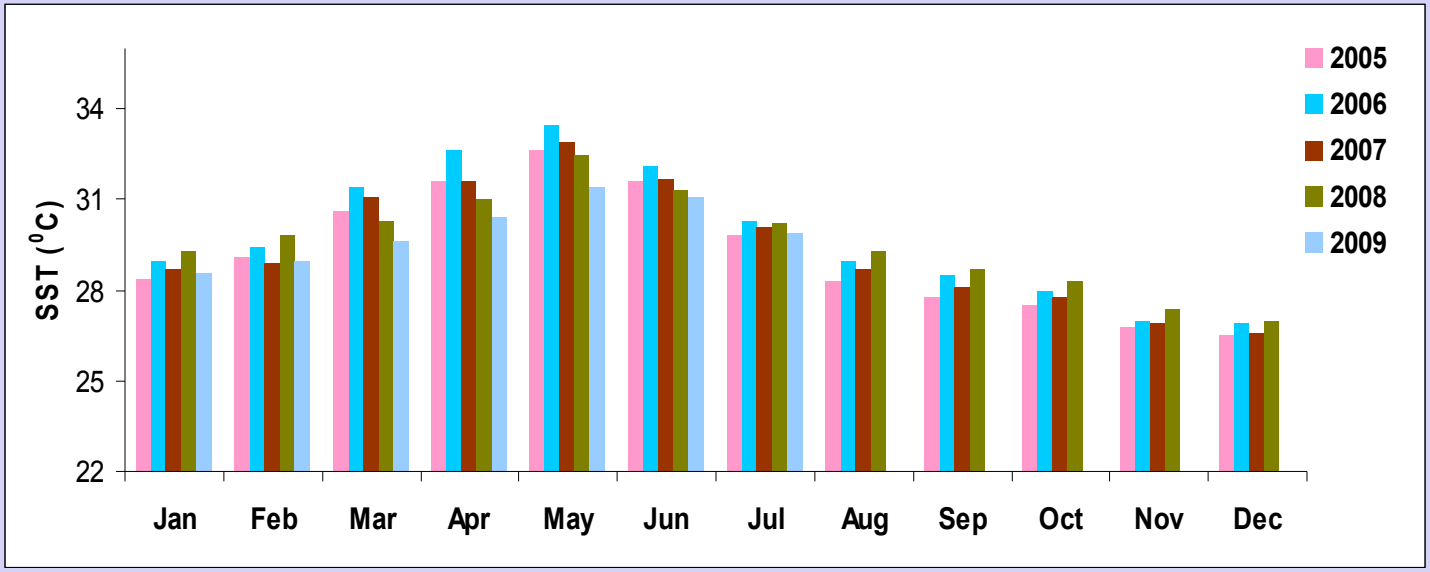
  In July 2001, the federal government included all corals under schedule - I of Wildlife (Protection) Act, 1972.
- **Fishing in reef areas** **(Inshore trawling, shore seine, traps)**
- **Seaweed collection in reef areas**
- **Pollution - domestic**
- **Invasion of exotic seaweed**
- **Cyclone, tsunami**
- **Climate change**

Coral status

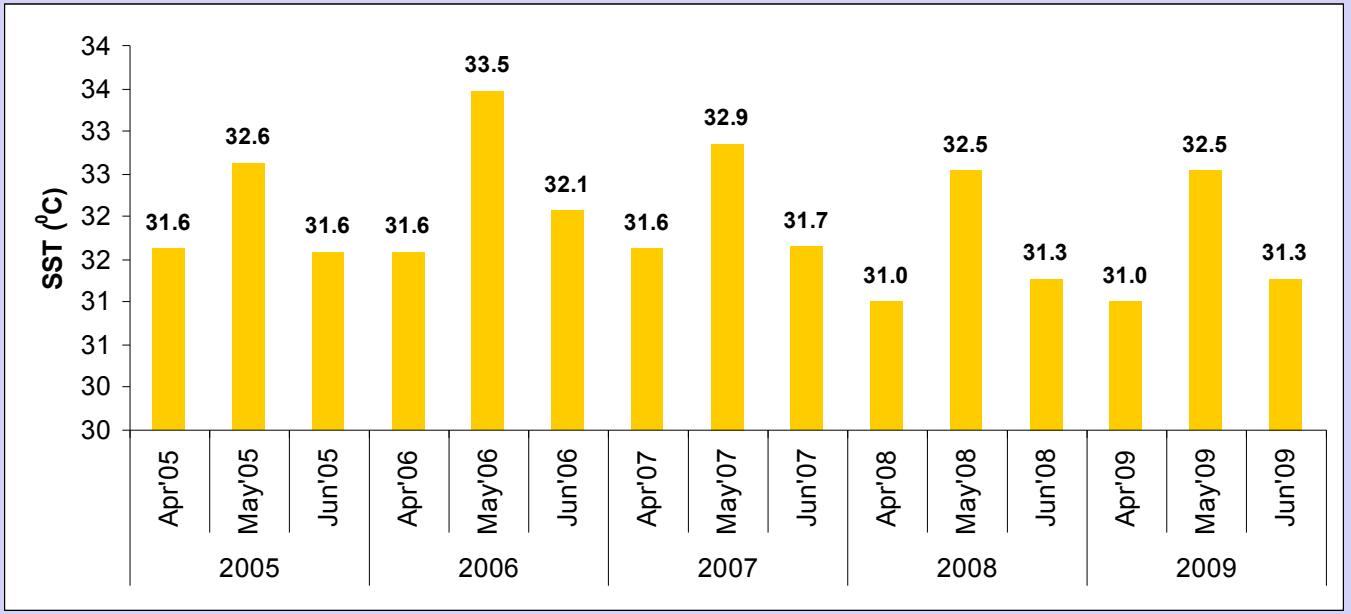
- Regular Monitoring since 2005
- Shows resilience
- Mortality (9.77%) in 2010 due to prolonged elevated SST



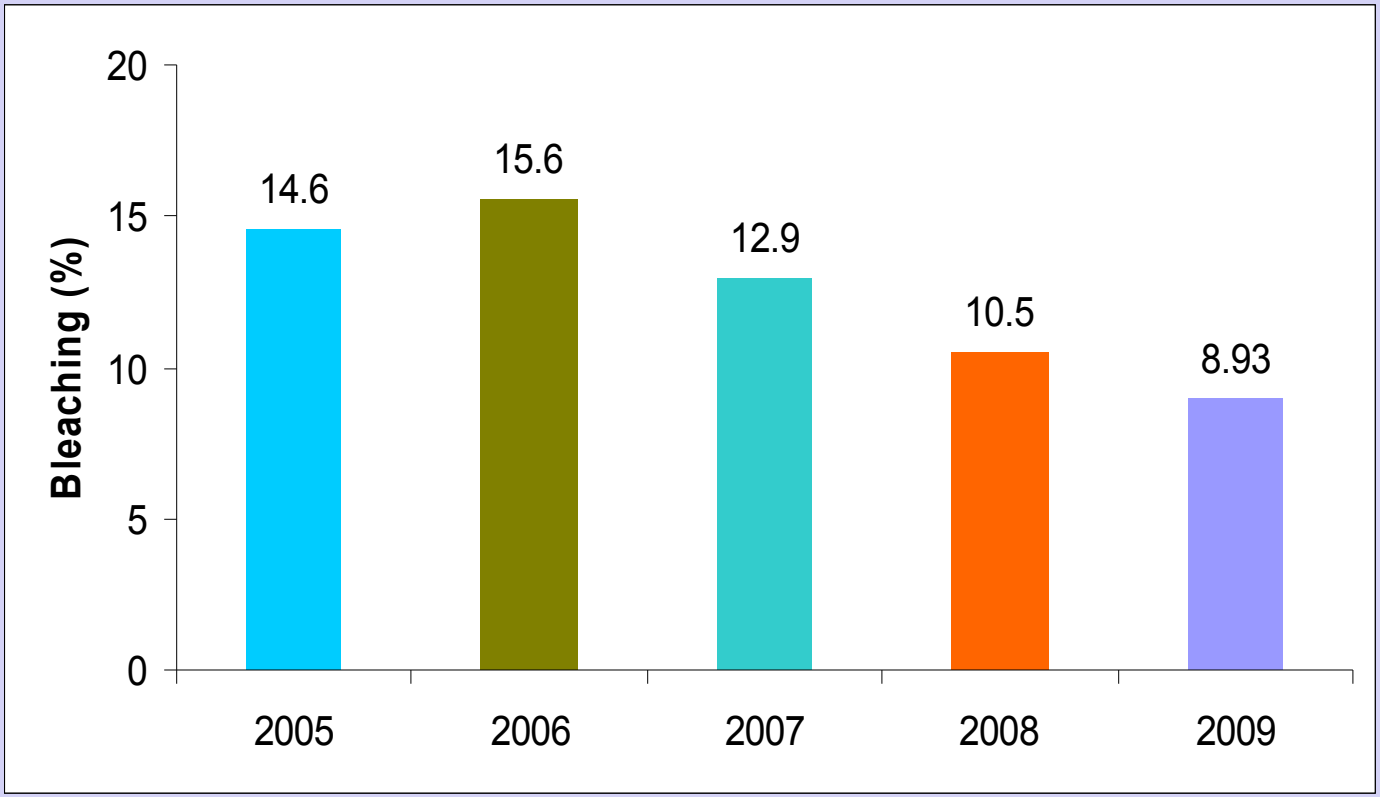
Average monthly SST values in the Gulf of Mannar during 2005 to 2009



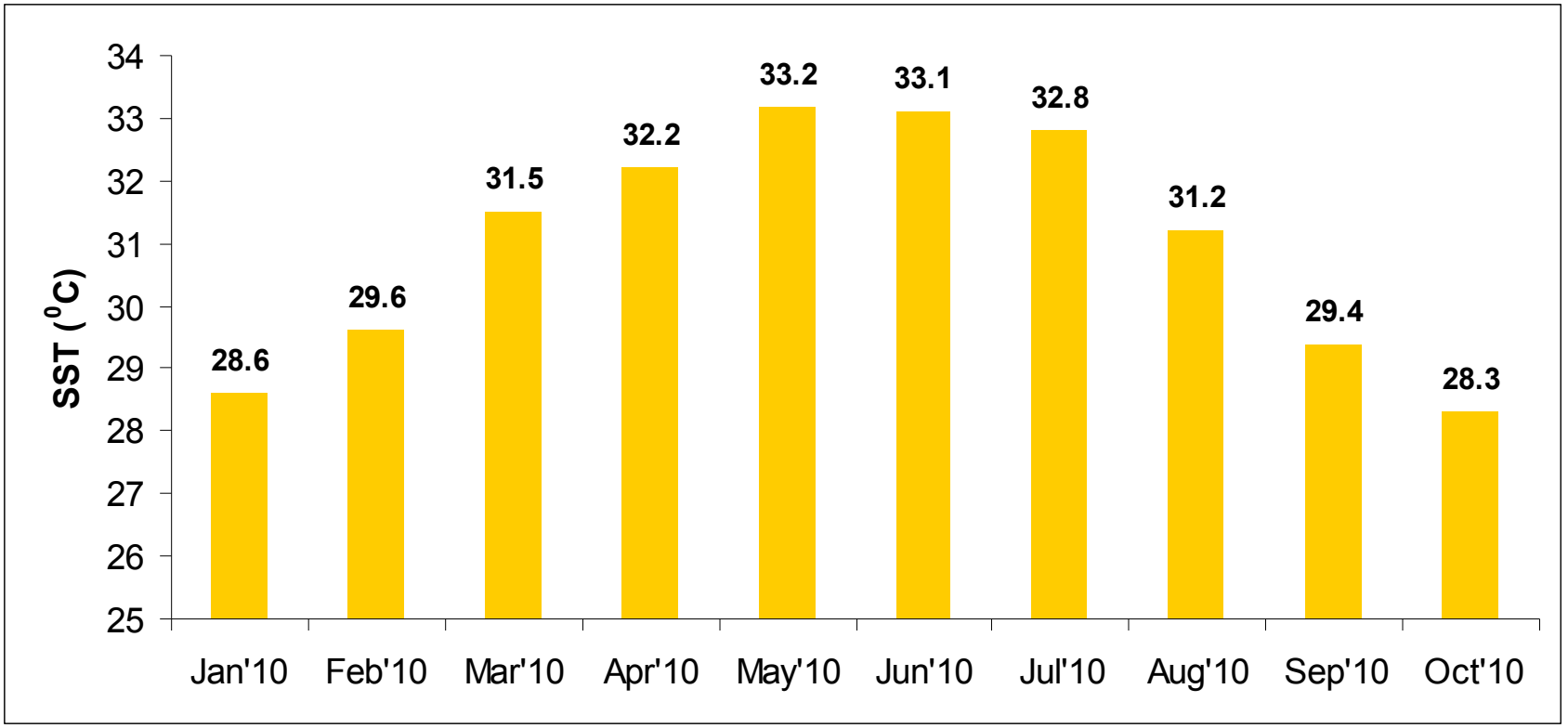
Sea surface temperature (0 C) in summer (April, May and June) during 2005 to 2009



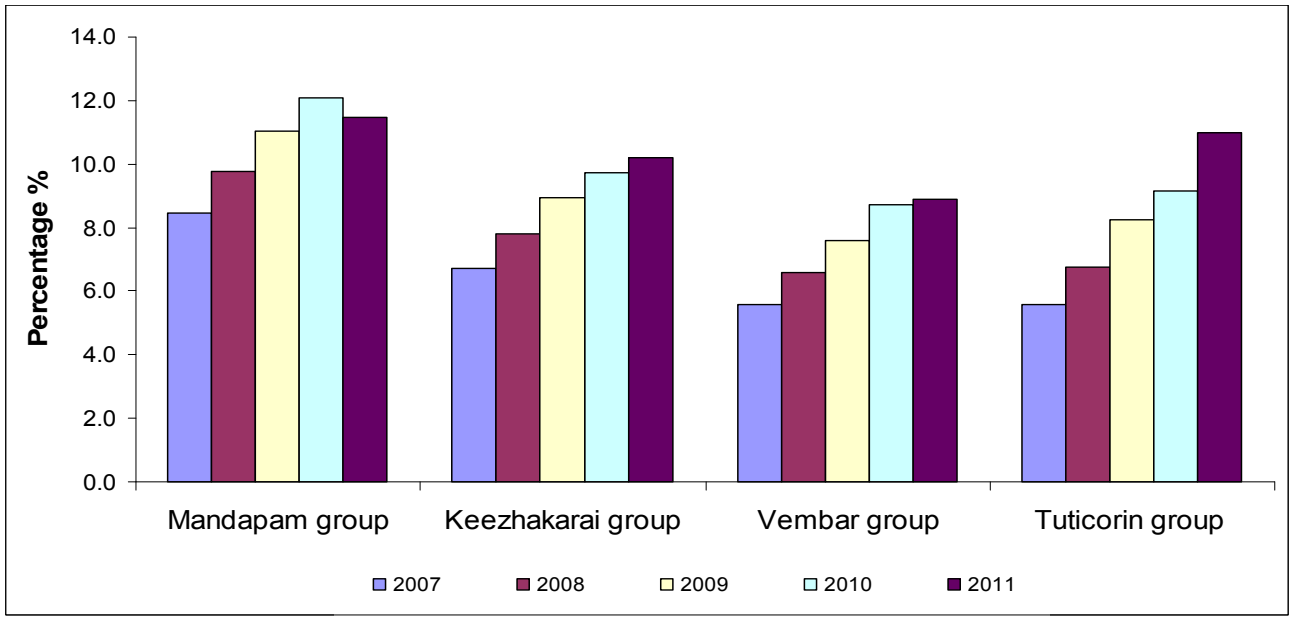
Coral bleaching



Temperature (0C) in Gulf of Mannar in 2010



Coral disease prevalence



- 6.7% in 2007 & 10.6% in 2011
- Nine distinct types of diseases
- disease susceptibility increases when elevated temp.

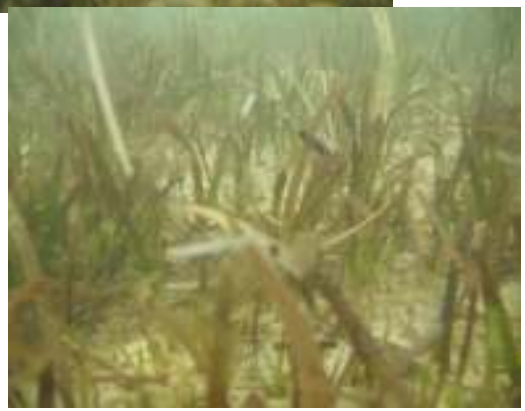
Reef Associated Ornamental Fishes

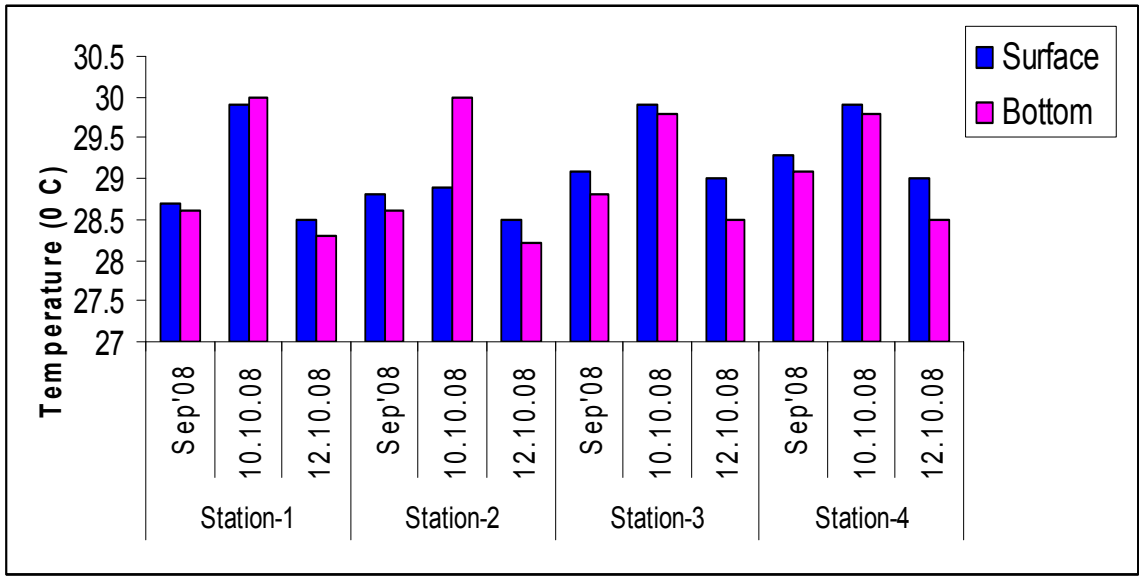
- Over 70 reef associated fish species identified.
- Over 50% of the identified fishes are now become rare, threatened or highly threatened – due to over exploitation and climate change effects
- Recent studies reveal that these fishes are seen in abundance in deeper areas, where hard substrates (pars) with patch corals are available - 15 km away from reefs with depth over 20m.



Algal Bloom in Reef Area

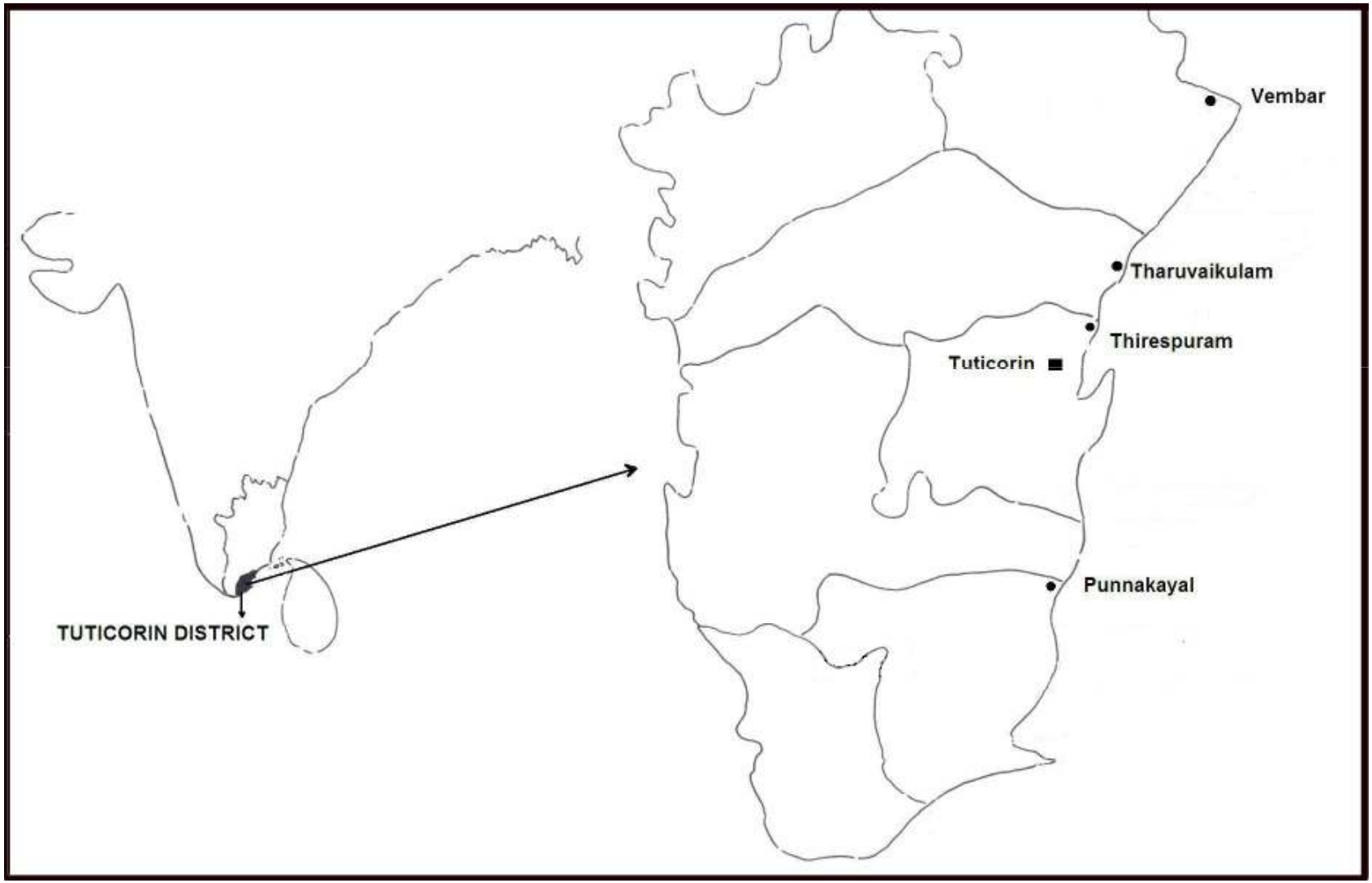
- October 2008 - algal bloom in reef area - *Noctiluca scintillans.*
- The oxygen level - 0.7 - 1.2 mg/l
- Over 5000 dead fishes and bivalves observed
- Several coral colonies were bleached.
- Seagrass beds was also affected.





Gulf of Mannar - Case study 2

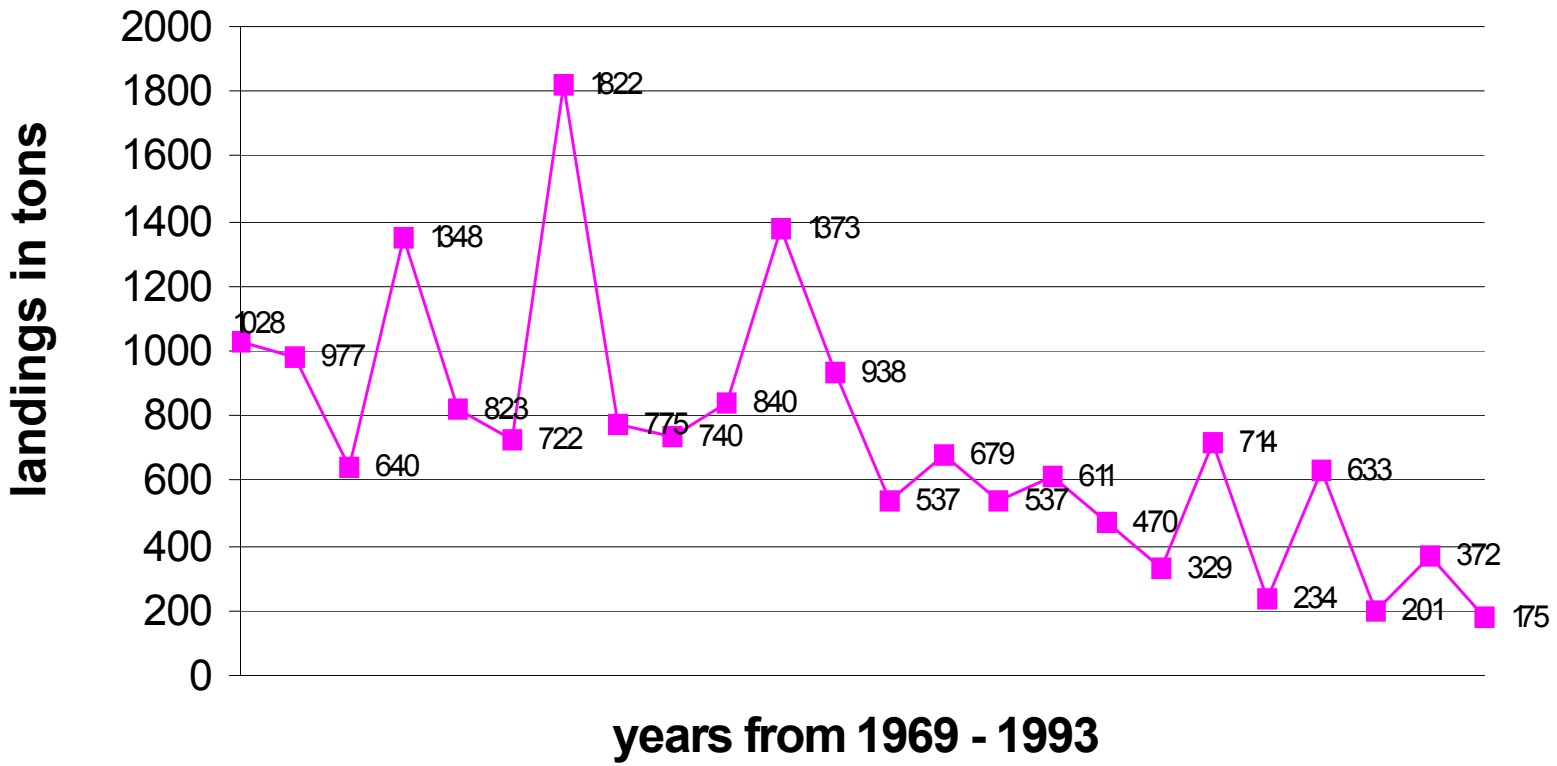
(Loss of *Lactarius lactarius* fishery)



Fishery Status

Fishing area / village	1980-1990	Now
Tuticorin	Over 10 tons per day during peak season	• Dissipating status • 150 kg per day during peak season. • Few catches are recorded from Yeruvadi and Kanyakumari coast • Fishermen pointed out that the fishery has now changed towards the Thalaimannar area of Sri Lanka
	Abundance of False Trevally in depths of 2 -5 fathoms	Fishermen need to travel 40-45 miles. Fishing at depths over 20 fathoms.
	Country crafts had good catches (300 – 500 kg)	Country crafts do not get *Lactarius*
	Exclusive fishery for False Trevally	No exclusive fishery - only by catch

Landing data of *Lactarius* in Tamil Nadu



Reason for the loss of fishery

- **Both nature and man are responsible.**

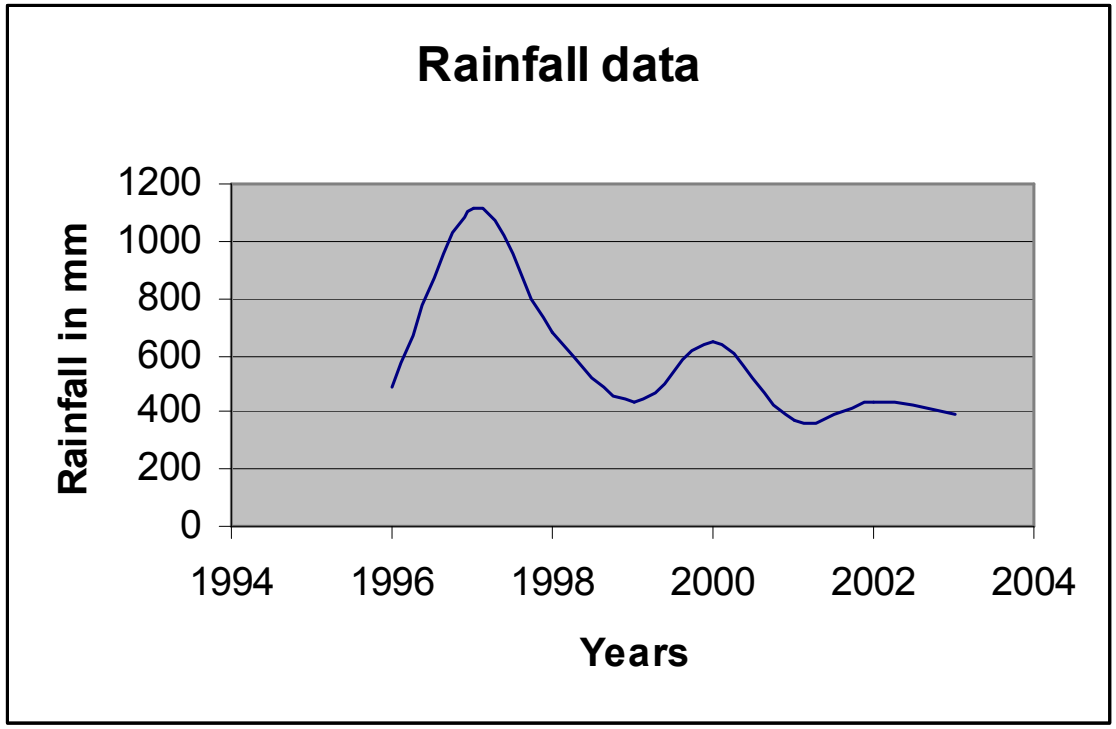
- **Lack of rain fall.**

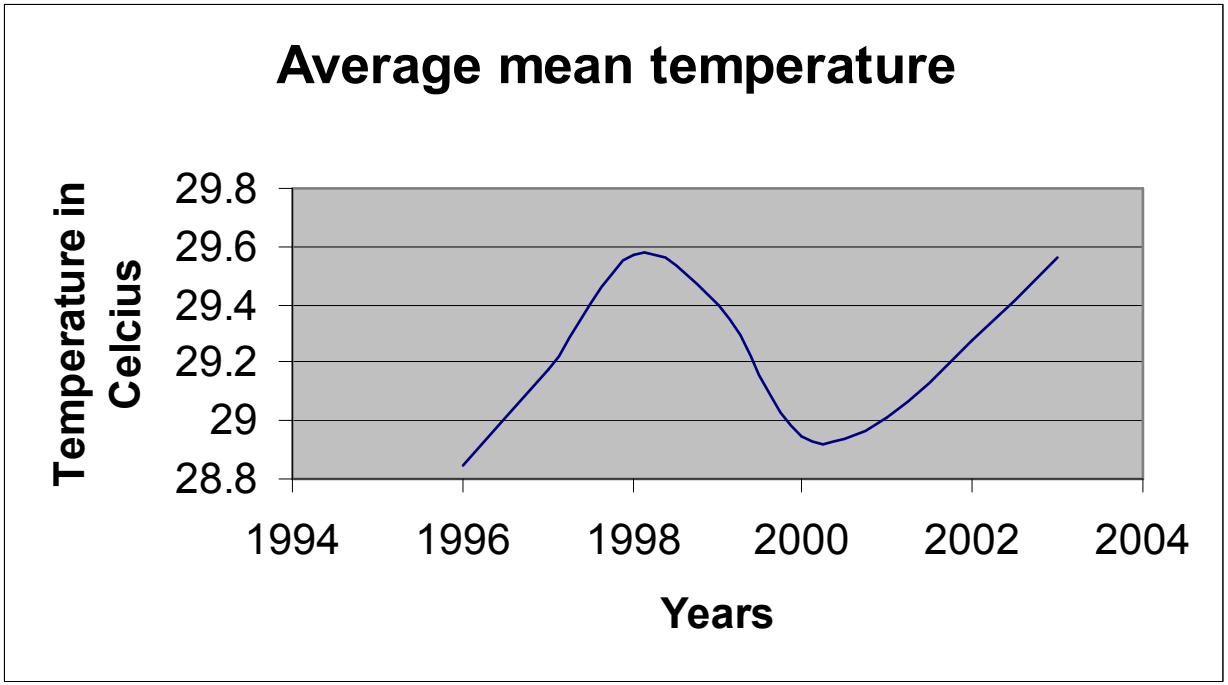
  Out of 2 major rivers, Thamirparani flows throughout year, but Vaipar has totally dried. Other two small rivers, Kallar and Vembar also totally dried.

- **Lack of supply of food in the coastal waters, which is supported by continuous, unsustainable and repeated fishing in the same area..**

- **The effect of El-Nino during 1998 has caused a change in the climatic pattern - by an increase in temperature and decrease in rain fall.**

- **The climatic factor also supported by the destructive fishing practices.**


Rainfall data
Rainfall in mm
1200
1000
800
600
400
200
0
1994
1996
1998
2000
2002
2004
Years


Average mean temperature
Temperature in Celcius
29.8
29.6
29.4
29.2
29
28.8
1994
1996
1998
2000
2002
2004
Years

Effect on the socio-economics of dependent fishermen

- **A decade ago**
  Fisherman with country craft able to earn Rs.600-700/day (peak season)
  Fisherman with trawl boat – Rs.1000-1500/day

- **Now**
  There is no exclusive fishery
  Traditional fishermen are most

Summary

- Tamil Nadu coast has productive key habitats which support good fishery.
- Traditional fishermen fully depend on fishery resources for livelihood.
- Human induced threats along with climate change impacts affect key habitats, associated fishery and livelihood of fishermen.
- The total cover and health of coral reefs, seagrass beds, mangroves and estuaries are reduced.
- Loss of fishery is noticed on various fish species - including Lactarius, Mackeral, Snapper, Barracuda, Pomfret, Grouper, Jacks, Lobster and Mud crab
- Migration, change of fishing practice, change of profession are seen among fishermen.
- The key habitats are managed under varied conservation status.
- Though the human influence is reduced within the Protected Areas, the climate change impacts cause series damage.
- Within the Protected Areas there are signs of resilience because of various management measures, including Coastal Ecosystem Rehabilitation activities to support the resilience.
- However, the combined effects of human influence and climate change hold the key.
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Thank you