

## Introduction

- Flatfishes contributed about 1.2 percent of the total marine fish landings during 2013.
- Flatfishes are mainly exploited by trawlers
- Major contribution of the fishery is from the west coast of India
- Even though flatfishes make only minor economic contributions to tropical fishery landings, subsistence and artisanal fishers by their sheer numbers and intensity, harvest large numbers of flatfishes.
- Average fluctuation of price of the fish varied from 20 INR for fresh catch to 80 INR for processed fish.
- The fish is consumed both fresh and in dry salted form.

## Methods

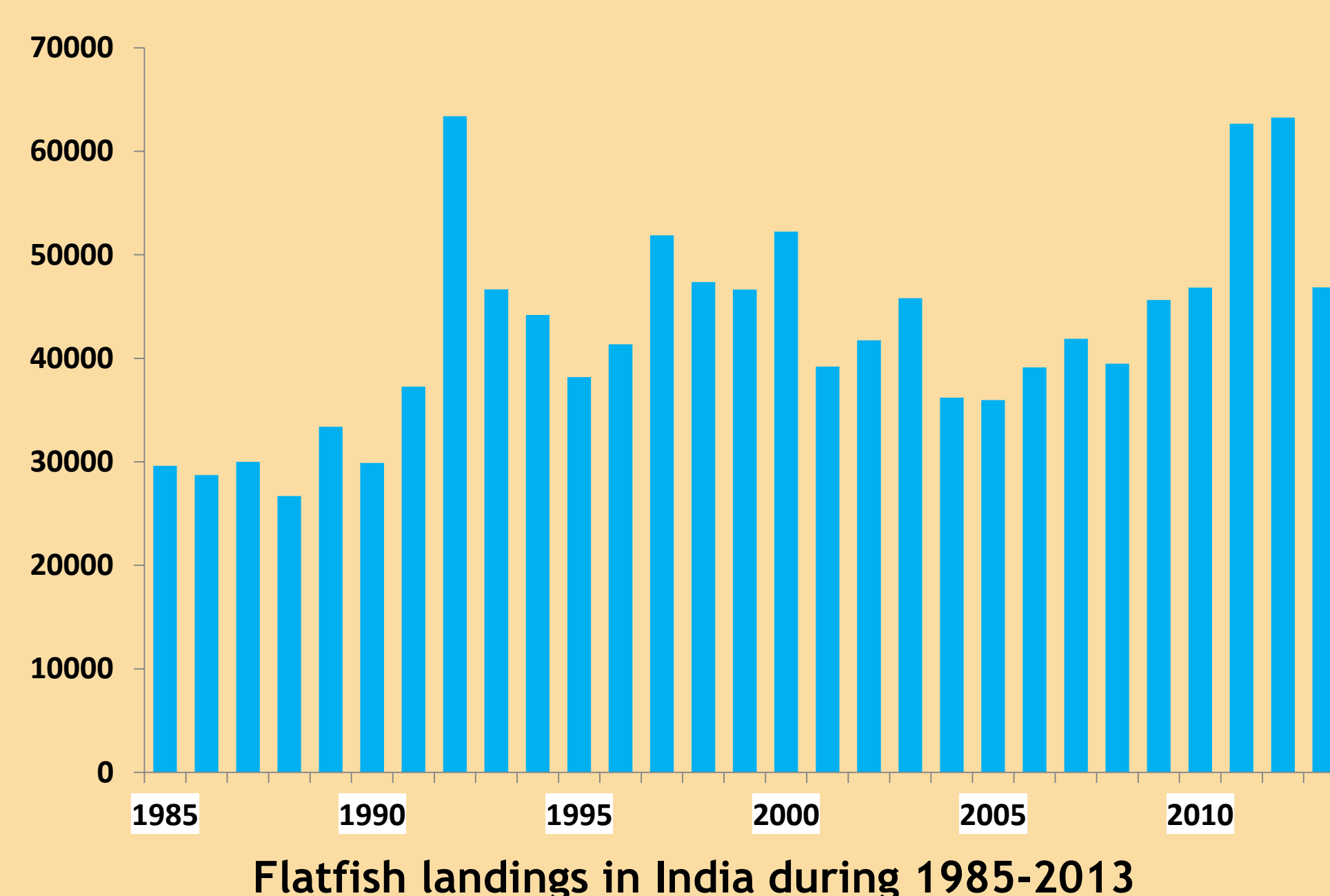
- Regular sampling of trawler landings was conducted to obtain samples for biology work.
- Length and weight of individual fish was measured in the lab. Fishes are also individually examined for their state of maturity based on stage of gonads.
- Catch statistics is obtained from the FRA Division of CMFRI.
- Sampling data is raised to the FRAD data to get the species composition of the fish for the month.
- The length-weight relationship was studied following Le Cren (1951).
- The growth and mortality parameters were estimated using FiSAT programme (Gayanilo *et al.*, 1996) after pooling the annual data for the period 2001-13.
- For estimating natural mortality rate (M), the  $t_0$  was considered as '0' (Sparre *et al.*, 1989) and the surface seawater temperature was taken as 28°C.
- The fishing mortality rate (F) was estimated by subtracting the value of M from Z.
- The exploitation ratio (E) was estimated from length -converted catch curve

## Analysis

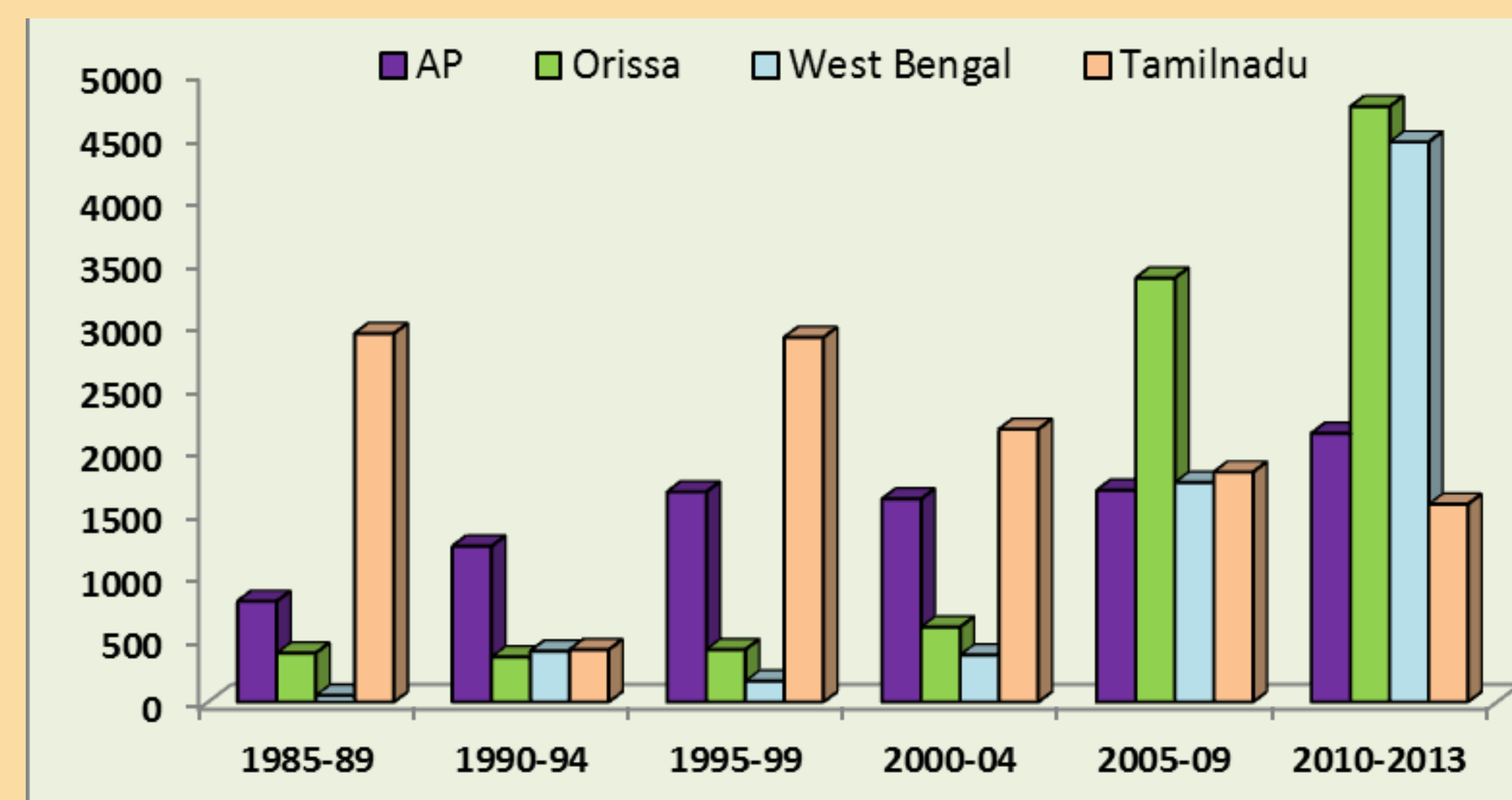
- The data collected on catch and effort of flatfishes landed by trawlers during 1985-2013 were utilised in this study.
- The data on length was grouped into 5 mm class intervals and the raised monthly frequency distribution was used for the growth studies (Sekharan, 1962).
- The length frequency data collected from the landing centres at weekly intervals from April 2011 to March, 2013 were used for estimation of population parameters.

## Results & Discussion

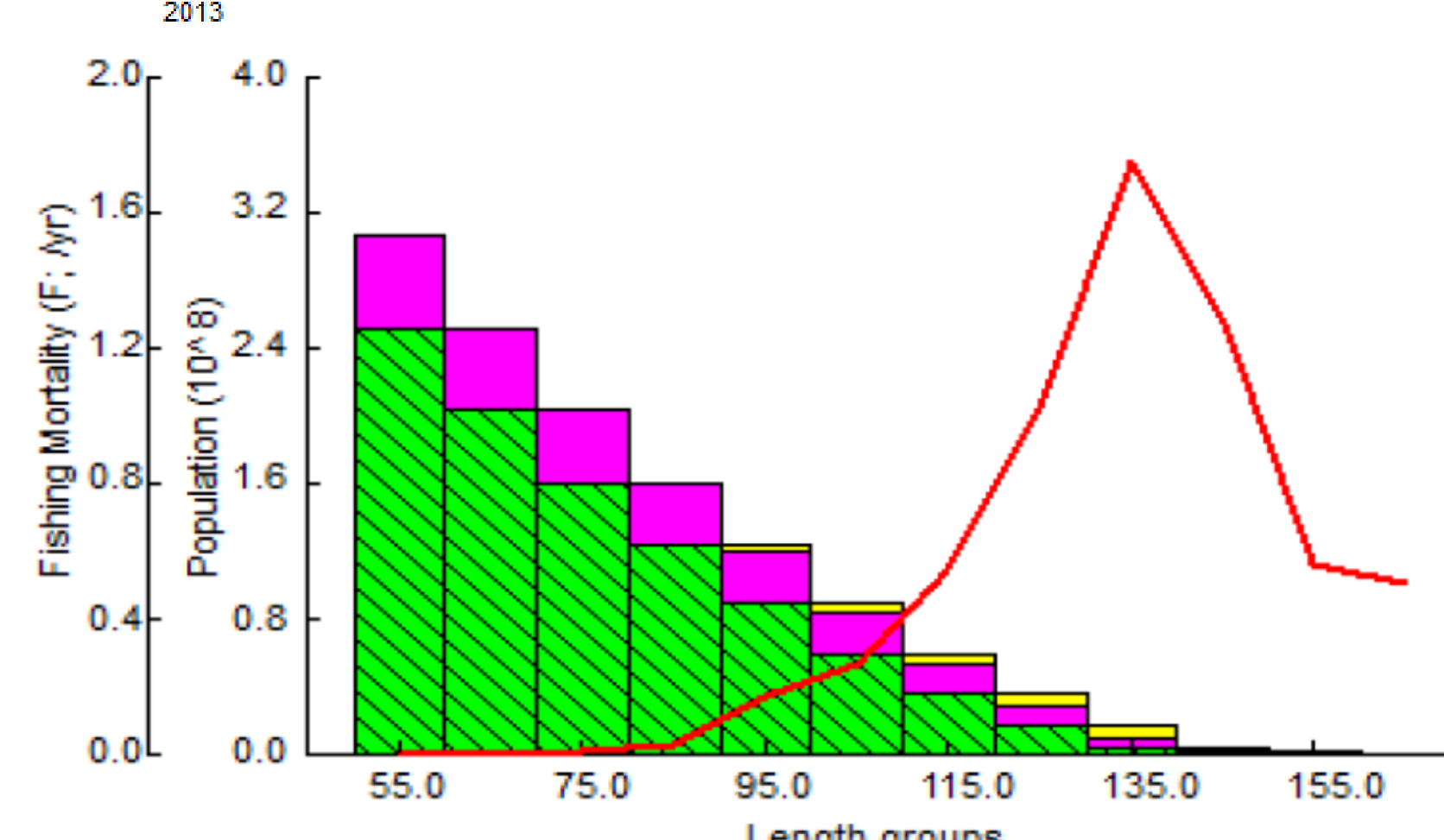
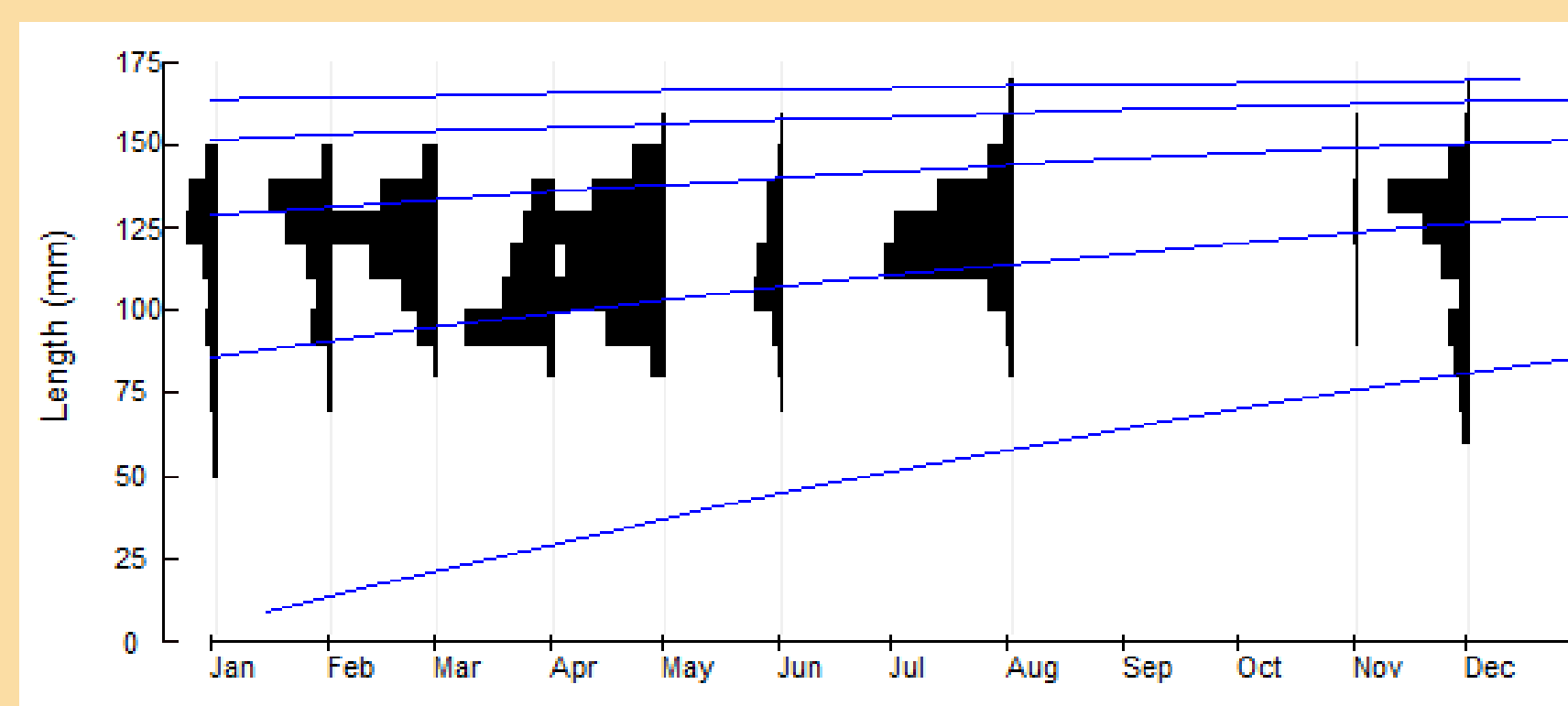
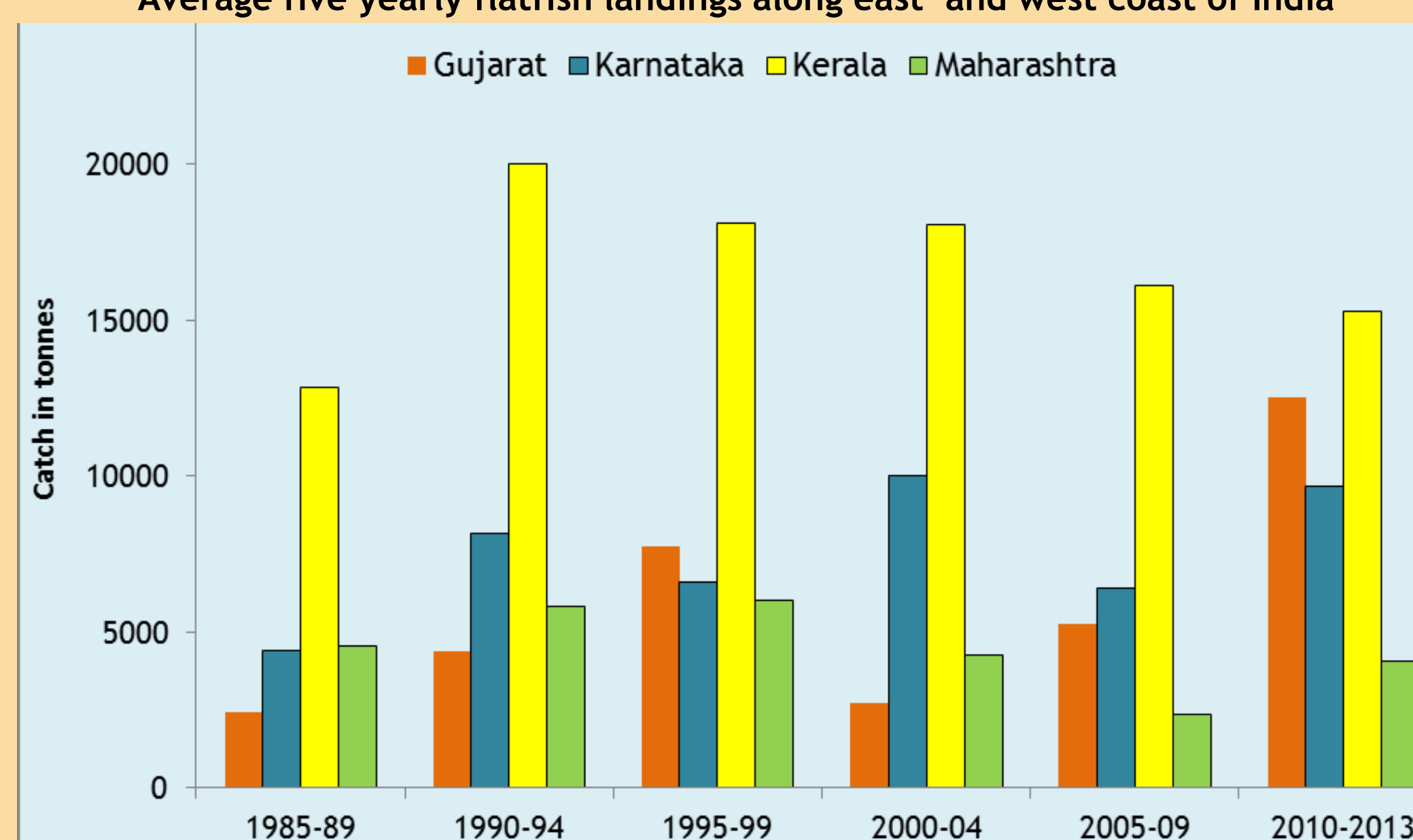
- All India landings of flatfishes increased from 29611 t in 1985 to 46845 t in 2013, ie an increase of over 58 percent during a 24 year period.
- Taking a statewise breakup, it was seen that Andhra Pradesh showed a gradual increase in flatfish landings from 1985 to 2013.
- An upward trend in the fishery was also noticed in the neighbouring state of Orissa, however a decline was noted after 2009.
- Flatfish landings in Tamilnadu have shown a gradual decline during the years 1990 to 2013.
- Taking a five yearly breakup of Tamilnadu which contributed to over 70 percent of the flatfish fishery in 1985-89 on the east coast showed a decrease in its contribution to 12 percent.



Flatfish landings in India during 1985-2013

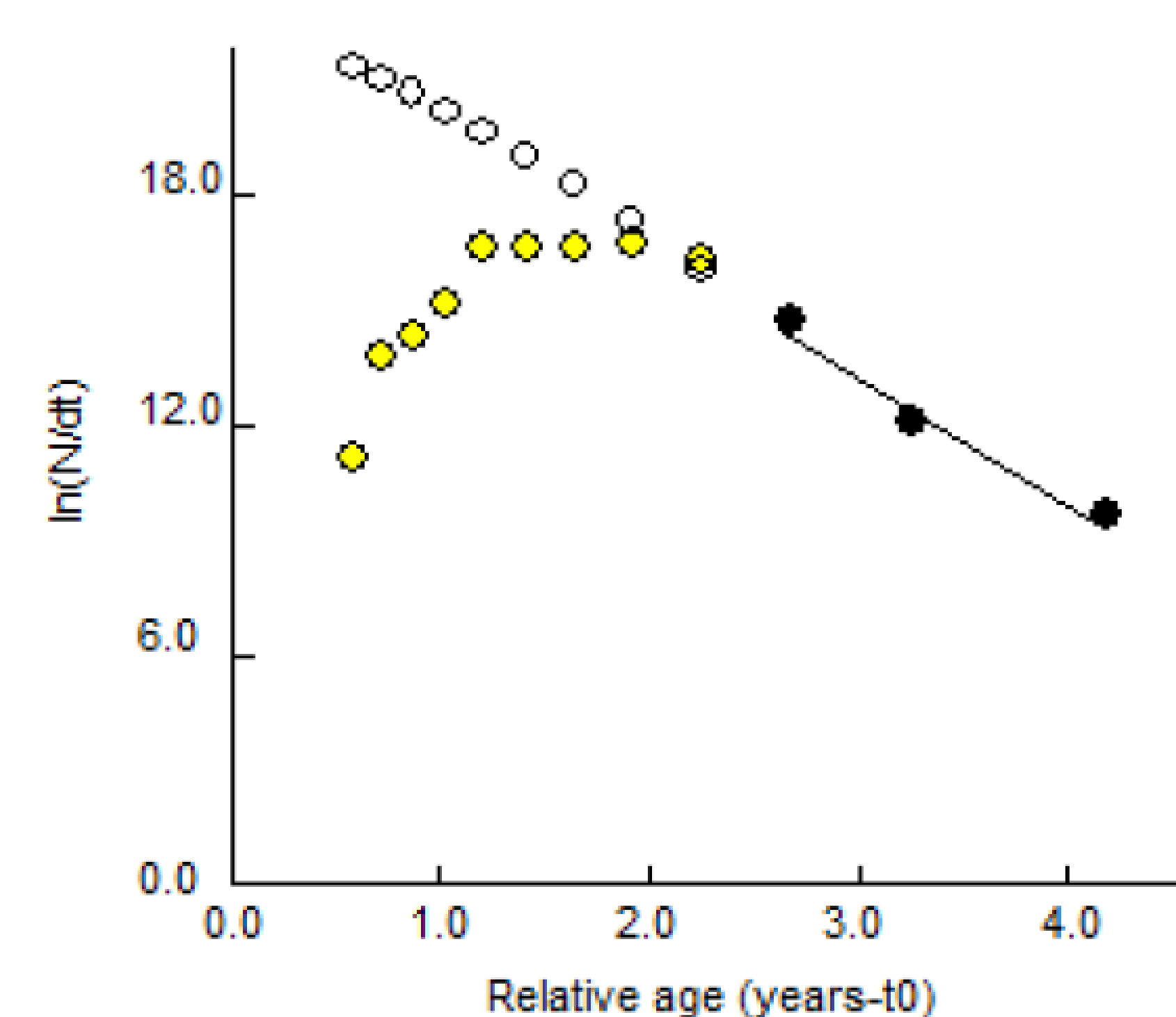


Average five yearly flatfish landings along east and west coast of India



- However, the average five yearly contribution of Orissa and West Bengal to the flatfish fishery increased during the years 1985-2013 by around 27-34 percent respectively.
- A slight decrease was also noted in the average five yearly contribution of Andhra Pradesh to the flatfish fishery.
- On the west coast of India, the major flatfish contributors are Kerala, Gujarat, Karnataka and Maharashtra.
- Flatfish fishery of Kerala is dominated by the sole fishery especially the Malabar sole *Cynoglossus macrostomus* which extends its distribution from Mulki in Karnataka to Central Kerala.
- This species contributes to over 95 % of the flatfish fishery here. Flatfish landings have decreased by 16 percent during the period 1986 -2013.
- Contribution of flatfish to the fishery of Gujarat and Karnataka has increased by 10 and 6 percent respectively during the years 1986-2013.
- $L_{inf}$  was estimated at 177.2 mm with a growth coefficient of 0.64. Using the growth parameters the natural mortality M was estimated at 1.54.
- Z was estimated at 3.29 using length converted catch curve method and F was estimated at 1.75.
- Exploitation rate E was estimated at 0.53, which is a good exploitation rate. The fishery is therefore sustainable.

Length-Converted Catch Curve  
(for  $Z=3.29$ ;  $M$  (at 28.0°C)=1.54;  $F=1.75$ ;  $E=0.53$ )



## References

- Gayanilo, F. C. Jr., P. Sparre and D. Pauly. 1996. The FAO- ICLARM stock assessment Tools. User's manual. FAO, Rome. 8: 126pp.
- Le Cren, E. D. 1951. Length-weight relationship and seasonal cycle in gonad weight and condition of the perch (*Perca fluviatilis*). *J. Anim. Ecol.*, 20: 201-219.
- Sekharan, K.V. 1962. On the oil sardine fishery of Calicut area during the years 1955-56 to 1958-59. *Indian J. Fish.*, 9 A (2) : 679-700.
- Sparre, P., Eric Ursin and Siebren C. Venema. 1989. Introduction to tropical fish stock assessment. Part I - Manual. *FAO Fish. Tech. Pap.*, 306/1 :337pp.