

# **The Fourth Indian Fisheries Forum, Proceedings**

**24-28 November, 1996**

*held at*

**School of Marine Sciences  
Cochin University of Science and Technology  
Kochi 682 014  
Kerala, India**

**Asian Fisheries Society, Indian Branch**

**1999**

# Presence of Upwelled Water in the Shelf Region along the Central East Coast of India towards the end of Summer Monsoon and its Possible Effect on the Migration of Bullseye (*Priacanthus* spp.) in to the Shallower Areas of the Shelf

V. NARAYANA PILLAI, V.V. SINGH, P.KRISHNA KUMAR and A.NANDA KUMAR

Central Marine Fisheries Research Institute (ICAR), Post Box No. 1603, Tatapuram P.O., Cochin 14.

## Abstract

Characteristics of shelf waters along the central east coast towards the end of summer monsoon season has been studied. Occurrence/ abundance of Bulls eye in the shallower areas of the shelf is found related to the movement of upwelled water into the shallower areas of the shelf towards the end of summer monsoon season. Bulls eye was found avoiding the areas of low salinity caused by river runoff in the area between 15° and 17°N Latitude.

## Introduction

Priacanthids are known to undertake both shoreward as well as alongshore (southerly and northerly) migrations during premonsoon/summer monsoon/post monsoon seasons. Vijayakumaran and Naik (1988) reported a southerly shallow water migration of Bulls eye in the premonsoon period and a northerly migration in the post monsoon period in the eastern Arabian sea region. Zacharia *et al.*, (1991) observed that Priacanthids undertake onshore migration from deep water (200-500 m) to shallow waters (20-60 m) during south west monsoon season and once again return to deeper areas (100-200 m) during post-monsoon season along the west coast of India.

Priacanthids, being a deep water resource, occur at depth ranges of 200-500 m during most part of the year, their habitat characterized by comparatively low sea water temperature, high salinity and low dissolved oxygen concentrations. Their occurrence/abundance in the shallower areas of the continental shelf along the east coast towards the end of south west monsoon season (July-August-September) could be due to favourable environmental conditions. The occurrence/abundance of Priacanthids in the shallow areas of the shelf along the central and north east coast and the influence of hydrographic conditions resulting out of coastal upwelling is reported in this communication.

## Materials and Methods

The catch and effort data were collected on board FORV *Sagar Sampada* during 1985, 1986, 1987 and 1988 along the South east and North east coast using bottom and pelagic trawls. Seawater temperature, salinity and dissolved oxygen data at surface and subsurface levels with special reference to fishing depth were collected from fixed stations. Fishing stations were selected based on echotraces and suitability of the ground for

bottom trawling. Random samples were collected from each haul for biological investigations on length-frequency, sex, maturity, feeding habits etc.

Bottom trawls employed were High Speed Demersal Trawl I, II and III designed and fabricated by CIFT and chalut trawl. While arriving at averages, special care was taken to see that results obtained from operating the same gear alone were considered for calculations of averages.

## Results and Discussion

Studies of Lafond (1954), Varadachari (1958 and 1961), CMFRI (1988) and Murthy and Varadachari (1967) deal with the variations in hydrography caused by upwelling. Regular monitoring of hydrographic features of the inner shelf waters by CMFRI during the period 1985-1995 revealed that the process of upwelling was active in this area during July-August-September in varying intensities and presence of deep water fishes like *Priacanthus* spp. and *Psenes* spp.

Observations made at fishing depths between 60 m and 100 m revealed variations in sea water temperature between 20.5°C and 23.0°C, salinity between 33.67‰ and 34.37‰ and dissolved oxygen concentration between 0.6 ml and 1.36 ml. During September-October two water masses were identified in the central and northern region between Lat 15N and Lat 21N with temperature ranging between 27-30°C and 12 to 27°C respectively. Respective salinities were between 39‰ - 36‰ and 35‰ - 36‰. During August-September the characteristic feature was the presence of salinity inversions in deeper water at depths of 200-400m. The water masses appeared to be bifurcated at subsurface levels with comparatively low salinities in the south (south of Kakinada) and higher salinities in the north (off Visakhapatnam). Possibly the fresh water discharge from the rivers Godavari and Krishna would have resulted in

the lowering of salinity at surface levels in the southern region. The northerly drift along the coast would have also favoured the distribution of the fresh water slightly northwards upto Kakinada.

James and Pillai (1990) observed comparatively rich grounds for Priacanthids off Andhra Pradesh during August-September. CPUE of 1-5 t per hour were obtained for the fishing square 14/80 during August-September. According to Sivakami (1990), along the east coast in the central zone, generally with lesser catches, Priacanthids with a CPUE of 102 kg./hr. was the dominant group caught mainly in the depth range of 51-100 m. Bande *et al.*, (1990) observed very poor catch rate of 3 kg./hr. for Priacanthids on the south east coast. The CPUE up to 100m depth along the north east coast was 165 kg./hr. According to them Priacanthids migrate across the shelf and parallel to the shelf probably depending on cold water current.

Observations made during July, 1988 along the central east coast revealed CPUE of 180 kg./hr. mainly at a depth range of 60-180m. Most of the Priacanthids caught from grounds located above 17°N Lat (North of Kakinada) were found to be in advanced stages of maturity indicating their likely spawning during the south west monsoon season. Those collected from grounds located below 17°N Lat. (South of Kakinada) were in comparatively immature condition which may spawn only during the north east monsoon season (CMFRI Annual Report 1990-91).

Present study revealed the comparative abundance of Priacanthids during August-September in the shallower region of the shelf between 60m and 100m especially in the fishing square 14/80 (between 14°N and 15°N Lat.) with a CPUE of 1000-5000 kg./hr. Between Lat 15°N and 17°N, the area where the river Godavari and Krishna flow out into the sea, where the effect of fresh water is comparatively high, the representation of Priacanthids in the fish catches were very poor (3 kg./hr.) or nil. North of 17°N, upto 20°N Lat., comparatively good catches of Priacanthids were observed between depth range of 60-100m (800-1200 kg).

#### Acknowledgements

The authors wish to express their sincere gratitude to Dr.M.Devaraj, Director, CMFRI, Cochin for his encouragement and keen interest in the present study.

#### References

- Bande, V.N., Gopinatha Menon, N. and Balachandran, K., 1990. Studies on the distribution and abundance of Bulls eye (*Priacanthus* spp.) in the EEZ of India. *Proc. First Workshop Scient. Resul. FORV Sagar Sampada, 5-7 June, 1989*: 233-238.
- CMFRI, 1988 to 1995. Annual Reports, Published by the Director, Central Marine Fisheries Research Institute, Cochin. : pg.var.
- James, P.S.B.R. and Pillai, V.N., 1990. Fishable concentrations of fishes and crustaceans in the offshore and deep sea areas of the Indian Exclusive Economic Zone based on observations made onboard FORV *Sagar Sampada*. *Proc. First Workshop Scient. Resul. FORV Sagar Sampada, 5-7 June, 1989*: 201-213.
- Lafond, E.C., 1954. On upwelling and sinking off the east coast of India. *Andhra Univ. Memm. in Oceanography, 1*: 117-121.
- Murthy, C.S. and Varadachari, V.V.R., 1967. Upwelling along the east coast of India. *Bull.Nat.Inst.Sci. India.*, 38 (1):80-86.
- Sivakami, S., 1990. Observations on the demersal fishery resources of the coastal and deep sea areas of the Exclusive Economic Zone of India. *Proc. First Workshop Scient. Resul. FORV Sagar Sampada, 5-7 June, 1989* :215-231.
- Varadachari, V.V.R., 1958. On some meteorological and oceanographic studies of the coastal waters off Waltair in relation to upwelling and sinking. *Andhra University D.Sc. Thesis*.
- Varadachari, V.V.R., 1961. On the process of upwelling and sinking in the east coast of India., *Prof. Mahadevan Shastyaabdapurthy commemoration volume* : 156-162.
- Vijayakumaran, K. and Naik, S.K., 1988. A study of the stock of *P.hamrur* (Forsk.) during March and September between Lat.11° and 16°N along the west coast of India. *FSI Spl.Publ.*, 2: 106-119.
- Zacharia, P.U., Sunilkumar Mohamed, K., Pillai, P.P. and Purandhara, C., 1991. Bulls Eye - An emerging trawl fishery resource along Dakshina Kakinada coast, *Mar. Fish.Infor.Serv., T and E Ser*, 114 : 29-31.