

Fig.2. Length frequency distribution of *E. diacanthus* in the by-catch of trawls operating off Quilon



Fig.1. Juveniles of *Epinephelus diacanthus* landed in shrimp trawlers at Neendakara Fisheries Harbour, Quilon, Kerala.

weight varying from 15-43g were used. The length weight relationship was estimated as  $\text{Log } W = -5.421865 + 3.26 \text{ Log } L$  ( $r = 0.9193$ ).

From the length-weight relationship estimated in the present study, the calculated weight of the juvenile *E. diacanthus* of mean size of 110mm was estimated as 17.2g. Manoj Kumar (2005) using VBG Formula, had estimated a growth of 244mm during the first year of its life span off Calicut along Malabar coast while Chakraborty (1994) had estimated a growth of 229mm for the same period from Bombay. Tessa (1994) had observed that *E. diacanthus* in the size group of 231-250mm had 43% of the individuals in the transitional stage. Therefore, applying the pooled fit of length-weight relationship for males and females of  $\text{Log } W = -4.03 + 2.82 \text{ Log } L$  (Manoj Kumar, 2005) for the species off Malabar coast, the calculated weight of the fish at 244mm (TL) is 504g. Thus it may be concluded that an estimated biomass of

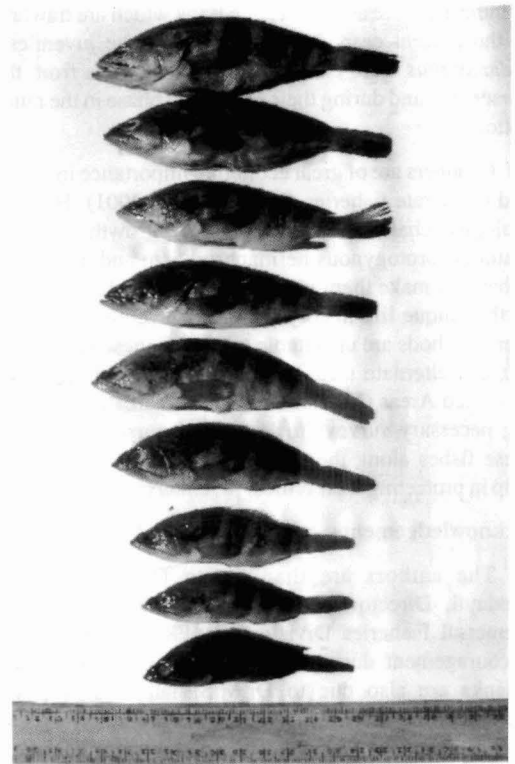


Fig. 3. Different size groups of *E. diacanthus* juveniles landed at Neendakara fisheries harbour, Quilon.

76t of fish could have been obtained at the end of the 1<sup>st</sup> year if all the 151744 individuals (2610Kg/17.2g) were allowed to grow which would fetch a price of Rs.25-30/kg.

Silas (1969) while reporting the capture of juveniles of *E. diacanthus* to the tune of 10kg (average length of 21.8cm) in experimental trawling conducted off 9°33' N – 75°41' E had emphasized the need to study the behavior of *Kalava*. According to Zacharia *et al.* (1996), since the juveniles of *E. diacanthus* are caught from 30-60 m depth, the young ones abound in the muddy bottom for feeding purpose and stay in fishing ground for 8 months after which they migrate to deeper waters for further growth and breeding. Castro and Huber (2000) opined that groupers being reef fishes have a complex life history consisting of a planktonic larval and benthic juvenile and adult stage. While the planktonic larvae drift with the current, the juveniles settle in shallow areas where they find hiding places and as they increase in size they move to deeper waters (Tucker, 1999). According to Silas (1969), the grounds seen around 8° N off southwest coast

of India are more akin to Wadge Bank which are trawlable. In the present case, it is possible that the juveniles of *E. diacanthus* were caught in shrimp trawlers from their nursery ground during their settlement phase in the muddy bottom.

Groupers are of great economic importance in tropical and temperate fisheries (Marino *et al.*, 2001). However, biological characteristics such as slow growth, late age of maturity, protogynous hermaphroditism and aggregating behaviour make them vulnerable to overfishing. Because of the unique life history pattern, conventional management methods are unsuitable to protect these species. It is felt that alternate measures such as establishing Marine Protected Areas (MPAs) are to be demarcated after making necessary surveys to locate the nursery grounds of these fishes along the west coast of India. This would help in protecting their critical juvenile/spawning habitats.

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