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Status of Exploited Fishery Resources of Azhikode Estuary, Kerala, India

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The exploited fishery resources in Azhikode estuary have been quantified as 360.02 t and 424.80 t during 2005-06 and 2006-2007, respectively, with a mean annual catch of 392.2 t. Finfishes accounted for 47% of total landings, followed by molluscs (32%) and crustaceans (21%). Thirty finfish species belonging to 18 families, 6 species of penaeid shrimps, 2 species of palaemonid prawns, 2 species of crabs and 4 species of bivalves contributed to the exploited fishery. Catfishes, mullets, *Gerres* spp., pearlspots and snappers were the major groups of finfish species while *Metapenaeus dobsoni* and *Fenneropenaeus indicus* formed the bulk of shrimp landings. *Scylla serrata* represented the bulk of crab landings of 8-12 t. The catch of *Villorita cyprinoides* from the estuary has been estimated to be between 120 and 135 t. Highest landings were observed during pre-monsoon period in both years (55.32-63.78%), followed by post-monsoon (27.63-25.76%) and the lowest was during monsoon (17.06-10.46%). More than 50% of fish catch in the estuary was contributed by fixed engines such as Chinese dip nets and stake nets. Finfishes accounted for the highest production per ha during both the years (0.68-0.83 t $ha^{-1}yr^{-1}$) followed by clams (0.45-0.56 t $ha^{-1}yr^{-1}$) and shrimps and prawns (0.27- 0.34 t $ha^{-1}yr^{-1}$). Fish production in the estuary showed a steady increase from monsoon to pre monsoon and majority of species supporting lucrative fishery in the estuary showed maximum occurrence during high saline months.

Keywords : Azhikode estuary, fish production, fishing gears, fishing seasons

Cochin backwaters (9°40' and 10° 12'N; 76°10' and 76°30' E), is a tropical positive estuarine system connected permanently to Arabian sea at Cochin and Azhikode. Azhikode estuary is situated at the northern end of Cochin backwaters, where one of the main branches of river Periyar drains out into the sea through a 500 m wide channel. The depth of the estuary varies considerably from 1.5 to 8 m. It supports diverse flora and fauna which tolerate oligohaline, mesohaline and marine conditions prevailing in the estuary during most of the months except during southwest monsoon when the estuary is virtually converted into a freshwater basin. Different aspects of fish and fishery resources of Cochin backwaters have been studied by Pillay (1960), Shetty (1965), Kurup (1982), Kurup & Samuel (1985a, b, 1987). The exploited fishery resources of Ashtamudi estuary in Kerala was studied by Kurup & Thomas (2001). Nasser & Noble (1995) have studied the crab fishery of Azhikode estuary.

In this paper, an attempt is made to quantify the exploited fishery resources of Azhikode estuary, based on gear wise landings, during 2005-07 and also to correlate the influence of hydrographic parameters on fishery resources.

Materials and Methods

Quantification of exploited fishery resources in Azhikode estuary has been made based on the monthly fishery surveys conducted up to six kilometres from barmouth covering approximately 240 ha of water body using a 7.6 m L_{OA} fiberglass boat,

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M.B. Kingfisher, during August, 2005 to July 2007. The catches were observed for a period of 24 h continuously in each station. Gear details such as length, mesh size and twine size were also recorded. Total number of each category of fishing gears were enumerated and the fish catches were examined in detail from not less than 30% of each type of gear. Daily landings from each category of gears and methods were computed following Kurup *et al.* (1993). Monthly catch was then estimated by multiplying the daily catch with the total number of fishing days. Season wise fish production was computed by adding production figures from February to May, June to September and October to January for pre-monsoon, monsoon and post monsoon respectively.

Surface and bottom water samples were collected from 8 stations in the Azhikode estuary on a monthly basis for studying various hydrographic parameters (Fig.1). Temperature was recorded with a sensitive mercury thermometer, pH using a pH meter with a resolution of 0.1 (pH Scan, Eutech Instruments), salinity using a Refractometer (Atago, Japan) and dissolved oxygen (DO) by the azide modification of Winkler method (Greenberg *et al*., 1992).

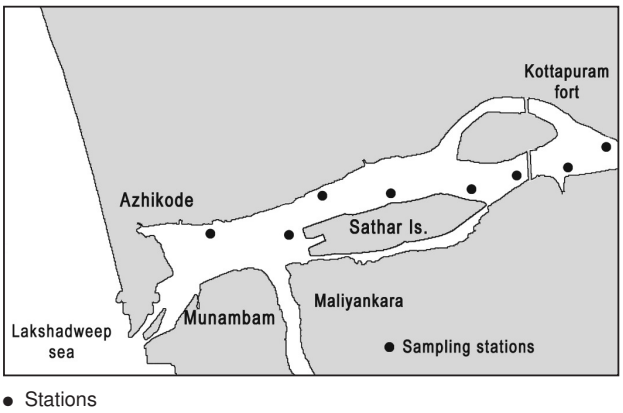

Fig. 1. Sampling stations in Azhikode estuary

Results and Discussion

During the study period, surface temperature varied between 26 and 35°C and bottom water temperature from 25 to 31°C in the Azhikode estuary. Salinity ranged from 3 to 35 ppt in the surface waters and from 4 to 36 ppt in the bottom water. The range of pH was 6.5-10.3 in the surface and 6.4-11.0 in the bottom waters. Dissolved oxygen ranged between 3.31 and 8.73 ml l^{-1} in the surface and 2.59 and 8.97 ml l^{-1} in the bottom waters.

The annual exploited fishery of the estuary was estimated at 360.02 t and 424.80 t during 2005-06 and 2006-2007, respectively with a mean annual catch of 392.2 t. Finfishes accounted for 47% of annual landings followed by molluscs (32%) and crustaceans (21%). Fishery resources of Azhikode estuary comprised of 30 finfish species belonging to 18 families, 6 species of penaeid shrimps, 2 species of palaemonid prawns, 2 species of crabs and 4 species of bivalves. The estimated landings of various species groups during 2005-06 and 2006-07 are given in Table 1.

Catfishes, mullets, *Gerres* spp., pearlspot and snappers constituted the major groups in the exploited finfishes during the two years. Catfishes contributed 25 and 30 t respectively in the first and second year. *Tachysurus maculatus* and *Tachysurus subrostratus* formed the principal species among catfishes. Mullets were represented mainly by *Mugil cephalus*, *Liza parsia* and *Liza macrolepis* and contributed 25 t during the first year and 22 t during the second year. *Gerres filamentosus* and *Gerres setifer* contributed 22 and 30 t, during first and second year respectively. Snappers accounted for 12 and 18 t in the first and second year, respectively, and were constituted by *Lutjanus johni* and *Lutjanus argentimaculatus*. *Etroplus suratensis*, *Scatophagus argus*, *Megalops cyprinoids*, *Lates calcarifer*, *Ambassis dayi*, *Platycephalus crocodilus*, *Sillago sihama*, *Hyporhamphus xanthopterus*, *Hyporhamphus limbatus*, *Chanos chanos*, *Leiognathus dussumieri* and *Stolephores commersonii* were the other fish species of commercial importance in the estuary.

Table 1. Estimated finfish and shellfish production (tonnes) from Azhikode estuary during 2005-07

Species groups	2005-06	2006-07	Mean
Finfishes			
Mullets	25.0	22.0	23.5
Gerres spp.	22.0	30.0	26.0
Platycephalus spp.	4.0	7.0	5.5
Lutjanus spp.	12.0	18.0	15.0
Etroplus suratensis	14.0	16.0	15.0
Sillago sihama	4.0	7.0	5.5
Ambassis spp.	6.0	9.0	7.5
Catfishes	25.0	30.0	27.5
Scatophagus argus	8.0	12.0	10.0
Lates calcarifer	4.0	6.0	5.0
Half beaks	6.0	4.0	5.0
Anchovies	6.0	4.0	5.0
Megalops cyprinoides	4.0	5.5	4.8
Chanos chanos	4.0	5.0	4.5
Leiognathus spp.	3.0	4.0	3.5
Flat fishes	2.0	3.0	2.5
Clupeids	3.0	2.5	2.8
Others	12.0	16.0	14.0
Shellfishes			
Fenneropenaeus indicus	16.0	19.0	17.5
Penaeus monodon	2.0	3.0	2.5
Metapenaeus monoceros	6.0	4.0	5.0
Metapenaeus dobsoni	38.7	53.0	45.8
Macrobrachium rosenbergii	1.0	1.8	1.4
Scylla serrata	12.0	8.0	10.0
Villorita cyprinoides	120.0	135.0	127.5
Total	359.7	424.8	392.2

Metapenaeus dobsoni dominated the landings of shrimps during the two years with an average catch of 45.8 t, followed by *Fenneropenaeus indicus* (17.5 t). *Metapenaeus monoceros, Penaeus monodon* and *Macrobrachium rosenbergii* also contributed to the landings. *Scylla serrata* on an average contributed 10 t to the annual landings. The contribution of *Villorita cyprinoids* was estimated as 120 and 135 tonnes during the first and second year, respectively.

The month wise estimated fishery production from the estuary during 2005-06 and 2006-07 is given in Fig. 2. In 2005-06

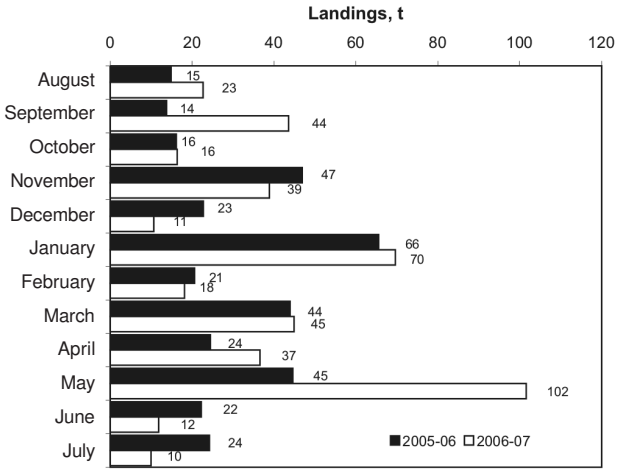

Fig. 2. Month-wise fishery production from Azhikode estuary during 2005-07

period, highest fishery production was recorded during January (65.56 t) whereas in 2006-07, highest production was in May (101.62 t). The least production was recorded in September (13.77 t) and July (9.93 t) of the first and second year, respectively. In both years, highest landings were during pre-monsoon (55.32 and 63.78%, respectively), followed by post-monsoon (27.63 and 25.76%, respectively) and the lowest production was observed during monsoon (17.06 and 10.46%, respectively).

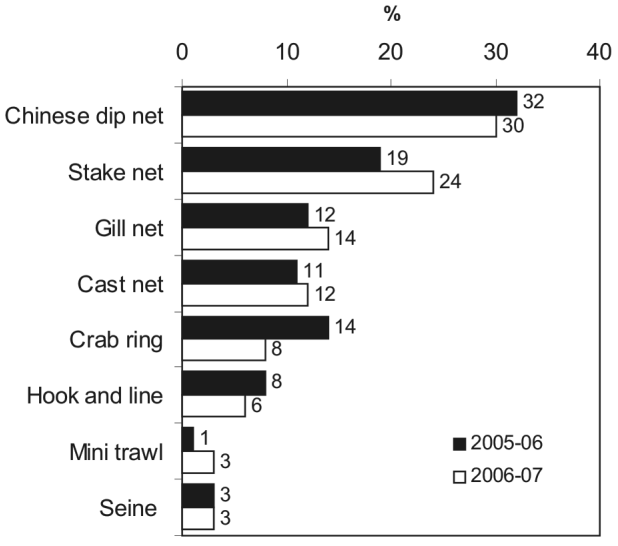

Fig. 3. Percentage contribution of fishing gears in fishery production of Azhikode estuary during 2005-06 and 2006-07

A total of 106 Chinese dip nets, 103 gillnets, 59 stake nets, 35 cast nets, 18 crab rings, 16 seines, 6 hook and lines and 3 mini trawls were enumerated as operating in the Azhikode estuary during the study period. Percentage contribution of different gears in exploited fishery production from the estuary during the study period is given in Fig. 3. Chinese dip nets contributed 30-32% of the annual landings, followed by stake nets (19-24%), gillnets (12-14%), cast nets (11-12%), crab rings (8-14%), hook and lines (6-8%), min-trawl (1-3%) and seines (3%). More than 50% of fish production in the estuary was contributed by fixed gears such as Chinese dip nets and stake nets in both the years.

The estimated annual fishery production per ha from the estuary during 2005-06 and 2006-07 were recorded as 1.50 and 1.77 t, respectively. Year-wise production per ha of fishery resource groups is given in Fig. 4. Finfishes recorded the highest production per ha during the two years (0.68-0.83 t ha^{-1}), followed by clams (0.45-0.56 t ha^{-1}) and shrimps and prawns (0.27-0.34 t ha^{-1}) and crabs (0.03-0.05 t ha^{-1}).

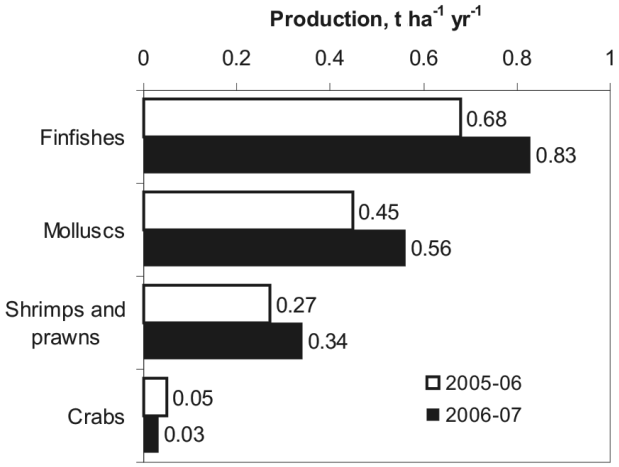

Fig. 4. Annual production per ha of exploited fishery resources from Azhikode estuary during 2005-07

Species groups contributing to the fishery in Azhikode estuary showed similarity to that reported from Vembanad lake (Kurup & Samuel, 1985a). However, the exploited fishery in Azhikode estuary was represented only by 30 finfish species which is on a lower side as 42 species were reported in Vembanad lake (Kurup & Samuel, 1985a). Kurup & Thomas (2001) reported 28 finfish species supporting commercial fishery exploitation in Ashtamudi estuary. A higher representation of marine migrants could also be observed in Azhikode estuary (47%) compared to Vembanad lake (32.27%). It appears that the estuary remains more or less brackish or marine except during heavy monsoon discharges. Salinity values recorded in the present study revealed that bottom water salinity remained high in all stations during post-monsoon and pre-monsoon months. Similar high salinity profile during post-monsoon and pre-monsoon in Ashtamudi estuary has been attributed to the preponderance of marine fishes and their juveniles in that water body (Nair *et al*., 2001; Harikrishnan & Kurup, 2002). The cumulative flushing time in Azhikode estuary was highest during pre-monsoon periods (4.8 tide cycles in April) in contrast to monsoon periods (1.22 tide cycles in August) (Ravichandran & Pylee, 1998). Higher percentage occurrence of marine migrants in this estuary may be attributed to its prolonged high salinity profile. According to Kinne (1966), salinity is the ecological master factor controlling the life of estuarine animals. Conforming to the observations of Kurup & Samuel (1985a), it was found in the present study that majority of fish species showed maximum occurrence during high saline periods and fish production increased steadily from monsoon to pre-monsoon.

Kurup *et al.* (1990a) have quantified the fish production from Vembanad lake, the southern part of Cochin estuary extending from Cochin barmouth in north to Alleppey in south, as 7202.12 tonnes. The present account encompasses an estimate of fish production in the northern part of Cochin backwaters. The percentage contribution of finfishes in total fish production is comparable to the same reported by Kurup *et al.* (1990a). However, shrimps constituted only 18.35% in the total fish production in

Azhikode estuary in contrast to 48.58% in Vembanad lake (Kurup *et al*., 1990a). Furthermore, the production of clams in Azhikode estuary is also much lower when compared to the same from Vembanad lake.

Results of the present study also reveal that most finfish species in Azhikode estuary registered a higher production per ha when compared to the report by Kurup *et al*. (1990a) in Vembanad lake, while shrimps and crabs showed a much lower production per ha. Among shrimps, the percentage contribution of *Fenneropeanaeus indicus* in Azhikode estuary was relatively high (24.23%) in contrast to its availability in Vembanad lake (14.4%) (Kurup *et al.,*1990b). On the contrary, the contribution of *Metapenaeus monoceros* is on the lower side when compared to previous estimates.

Fishing season of edible crabs extended from November to May with a definite peak in December, which is in contrast to the findings of Nasser & Noble (1995) who reported a fishing season starting from March to August with a peak in May. The peak occurrence of *Scylla serrata* was reported during April and November, in the downstream part of Vembanad lake (Kurup *et al*., 1990a). However, the present findings on the fishing season of crabs are similar to those of Devasia & Balakrishnan (1985) and Kurup *et al*. (1990a). The mean annual production of crabs from Azhikode estuary was estimated as 10 t in the present study which is on the lower side when compared to the production in the estuary reported earlier (Nasser & Noble, 1995) and to the downstream part of Vembanad lake (Kurup *et al*., 1990a).

Seasonal trend of fishery production in Azhikode estuary showed agreement with the previous reports. Kurup *et al.* (1990a) reported the highest production during the pre-monsoon period (44.17%) followed by post-monsoon period (34.13%) whereas in the present study, landings from the former and latter seasons were 55.32 and 27.63%, respectively. Gearwise landings also showed comparable results. Stationary gears, *viz*. stake nets and Chinese dip nets together constituted 51% of total landings in Azhikode estuary while Kurup *et al.* (1990 a) reported the share of stationary gears as 72.5% in total fish production from Vembanad lake.

The study showed a steady increase in the fish production of the estuary from monsoon to pre monsoon and majority of species supporting lucrative fishery in the estuary showed maximum occurrence during high saline months.

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