Exploited fishery resources of the Vembanad lake

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ABSTRACT

The fishery of the Vembanad lake is constituted by 115 species of fin fishes, 6 species of penaeids, 4 species of palamsonids and 3 species of crabs. The annual yield of fishes and crustaceans from the lake was estimated as 7 202.1 tonnes and the average yield per ha as 342.14 kg. The total value of the yield was Rs 96.188 million. The percentage contribution of various groups to the total yield was as follows: penaeid prawns, 60.86; fishes, 34.8; crabs, 2.51; and palamsonids, 1.33%. The major species or groups other than penaeids represented in the fishery were the croaker (599.76 tonnes), glassy perchlets (533.53 tonnes), cat fishes (528.68 tonnes), pearl spot (324.02 tonnes), estuarine crab (255.54 tonnes), gerrids (112.37 tonnes) and half beaks (84.25 tonnes). Of the 10 zones demarcated in the lake, zone 1, located in the northern sector near the bar mouth, was the most lucrative fishing ground followed by zone 2.

The Vembanad lake of Kerala (lat.9°28 and 10°10’ and long. 76°13’ and 76°31’) is 60 km long from north to south (Cochin to Alleppey) and has an area of 21 050 ha. Thanneermukkom salinity barrier has separated this lake into 2 entirely different ecosystems, estuarine northern sector or the downstream region (Cochin to Thanneermukkom; Cochin backwaters area, 12 440 ha) and freshwater southern sector or the upstream region (Thanneermukkom to Alleppey; area, 8 610 ha). So far no concerted attempt has been made to quantify the exploited fin fish and crustacean resources of this lake.

MATERIALS AND METHODS

Monthly survey cruises extending from Kochi to Alapuzha were conducted for 13 months from June 1988 to June 1989 using 2 boats, Flying Fish and Dutchman I made available by the Indo-Dutch Co-operation Programme on Kuttanad Water Balance Study Project. Based on the information available on the physico-chemical conditions and fish fauna of the lake (Kurup and Samuel 1987), the lake was apportioned into 10 zones (Fig. 1). Each zone was further divided into subzones and their fishing activity was continuously monitored for 24 hr, to include day and night catches. The total number of units of similar gears operated in each subzone was enumerated and the catches from not less than 30% units were examined, giving due importance to species-wise total weight, length frequency, sex, maturity stage, etc. The period of fishing in respect of the observed catch and the total hours of fishing/day were also recorded. The daily landings of individual species from each category of gear was computed by ap-
plying the formula \( w = \frac{W}{n} \times N \), where \( W \) is total weight of species; \( w \) is total weight of the species recorded from the sampled gears; \( n \) is number of gears sampled; and \( N \) is total units of similar gears operated in the sub zone. The daily species-wise landings from all the zones were thus estimated. The monthly production was calculated by multiplying daily landings with the total number of fishing days. The value (in rupees) of the exploited fishes and the crustaceans were calculated with the help of market prices.

RESULTS

Species composition

From the lake 115 species of fishes belonging to 84 genera, 6 species of penaeids prawns, 4 species of palaemonid prawns and 3 species of crabs were identified.

Estimation of production

The annual yield of the whole lake during July 1988 to June 1989 was 7.202.1 tonnes, consisting of penaeid prawns (4,383.4 tonnes; 60.86%), fishes (2,506.1 tonnes; 34.8%), crabs (181.0 tonnes; 2.51%) and palaemonids (113.6 tonnes; 1.83%). Their total cost was Rs 96.188 million. The average annual production/ha was 342.14 kg. Of the total annual estimated landings for the whole lake (7,202.1 tonnes), the northern portion accounted for 6,698.1 tonnes (93%) and the region south of Thanneermukkom barrier for 504.0 tonnes (7%). The value of the above resources worked out to be Rs 87,474 million (91%) and 8,714 million (9%) respectively. The annual yield in the northern region was 538 kg as against 59 kg in the southern, fetching Rs 7,032.0 and 1,012.0 respectively. Price of the fish always registered a higher value (32% higher) in the southern region. The yield level in the southern section was 10.96% of the northern region.

Group-wise landings

Fishes: During July to December, except September, the fishes dominated the catches (Table 1). In zones 5 - 10 fishes dominated other resources. The important fin-fish group constituting the fisheries and their percentage contributions are as follows: Croakers, 8.32%; glassy perchlets, 4.69%; cat fishes, 4.34%; pearl spot, 4.5%; mullets, 2.77%; estuarine sprat, 2.28%; gerreids, 1.56%; and half beaks, 1.16%. Each of the following 8 species contributed to more than 100 tonnes to the fishery of the lake: *Dayeclaena albida*, *Ambassis gymncephalus*, *Etrousus suratensis*, *Tachysurus maculatus*, *Tachysurus subrostratus*, *Ehirava fluviatilis*, *Ehirava fluviatilis*. 

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Gerres filamentous and Liza Parsia.

Penaeids: Penaeid prawns were the other main resource of the lake. They dominated over the resources in zones 1 and 2. Highest landings of penaeids was recorded from zone 2, followed by zone 1. The lowest was from zone 8. Practically no penaeaid fishery was prevalent in zone 10. A month-wise comparison of the landings of various groups of the whole lake revealed the preponderance of penaeids during January to June. The highest production of penaeids was in February, followed by January, the lowest was in July. Among the 6 species, Metapenaeus dobsoni, M. monoceros and Penaeus indicus were available throughout the year, contributing to 48% of the total production from the lake. While M. dobsoni formed 74.2% of the total penaeid yield, the contributions from P. indicus and M. monoceros were 14.88 and 10.31% respectively.

Palaemonids: Four species of Macrobrachium contributed to 1.83% of the fishery of the lake, of which Macrobrachium rosenbergii and M. idella contributed to 0.55 and 0.99% respectively. Zone 7 accounted for highest yield, followed by zone 5. The lowest was from zone 10. Highest figures for landings as well as percentage contribution to the total fishery of the lake were in July and lowest in January. July to October formed the peak fishing season.

Crabs: The highest contribution of edible crabs was from zone 1, followed by zones 3 and 2. The lowest landing was from zone 7. Practically no crab fishery was noticed in zones 8 - 10. In general, crab fishing intensity showed 2 peaks, the major season during February to June and minor during October to December.

Season-wise/quarter-wise landings: Month-wise total catch from the lake showed the highest landings in February (1 021.23
tonnes) and the lowest in July (224.38 tonnes). The pre-monsoon period recorded the highest landings (44.17%), followed by the post-monsoon period (34.13%). The lowest landing was during monsoon (21.74%).

The fishes showed their dominance in the catches during monsoon, followed by post-monsoon. On the contrary, the penaeids were very predominant during the pre-monsoon, but scarce during the monsoon season. The maximum landings of palaeomonsids were obtained during monsoon, followed by the post-monsoon periods. Crab catches were highest in pre-monsoon, moderate during post-monsoon and least during monsoon. Quarter-wise 38.87% of the total landings from the lake was obtained during the first quarter (January - March), 25.45% during the second (April-June), 20.83% in the fourth (October-December) and 14.84% during the third quarter (July-September).

Zone-wise landings

The highest yield was recorded from zone 2 followed by zone 1. However, in terms of value, the sequence was reversed. A gradual, but sizeable decline in yield as well as value can be noticed in the remaining zones except in zone 8 where the landing was slightly higher when compared to its preceding as well as succeeding zones (Table 2). The monthly variations in yield pattern and values obtained in the different zones is depicted in Fig. 2.

Gear-wise landings

Landings from the two stationary gears, viz. stake nets and dip nets, accounted for 72.48% of the total catches from the lake. Of this, the stake net contributed 53.14% (3 827.48 tonnes) and dip nets 19.4% (1 393.34 tonnes). Among the wading gear, gill nets contributed 10.15% (730 tonnes), seines 9.68% (697.05 tonnes), cast

<table>
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<tr>
<th>Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>8</th>
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<td>144.3</td>
<td>226.0</td>
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<td>157.6</td>
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<td>234.4</td>
<td>77.0</td>
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<td>1.2</td>
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<tr>
<td>Palaeomonsidae</td>
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<td>61.0</td>
<td>27.4</td>
<td>5.2</td>
<td>5.0</td>
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<td>0.9</td>
<td>0.9</td>
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<td>181.0</td>
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<tr>
<td>Crabs</td>
<td>80.2</td>
<td>61.0</td>
<td>27.4</td>
<td>5.2</td>
<td>5.0</td>
<td>1.3</td>
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<td>0.9</td>
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<tr>
<td>Total</td>
<td>2 944.3</td>
<td>2 659.8</td>
<td>542.0</td>
<td>674.0</td>
<td>345.8</td>
<td>233.1</td>
<td>152.0</td>
<td>247.4</td>
<td>89.1</td>
<td>15.6</td>
<td>7 202.1</td>
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Fig. 2. Monthly variation in the total yield and total value in different fishing zones.
nets 3.49% (252.18 tonnes), and line fishing 2.54% (182.98 tonnes). Other indigenous fishing methods accounted for 1.66% (119.36 tonnes). The maximum landings from stake nets were obtained in January (63.56%) and lowest in July (27.1%). Dip net catches varied from 3.33% in August to 31.59% in February. Gill net contributed between 5.76% and 31.26% of the lake's total landings. The gill net recorded highest landings in July, followed by that in May. It was lowest in September. Cast nets contributed to 0.63 to 12.87% of the total catches, showing high values in August and July, and lowest in January. The share from the line fishing varied from 0.37 to 10.54%, highest values being recorded in July and November and lowest in September. Fishing with other indigenous gears and practices were common throughout the year with a high intensity during July, moderate in December and low in September.

**DISCUSSION**

Among the 115 species of fishes listed 106 confirmed with the faunistic list of Kurup (1982). Though Menon and Raman (1961) reported 7 species of penaeid prawns from the lake, only 6 species were noticed. Conforming with the earlier observation (Kathirvel *et al.* 1978) *Portunus (P.) pelagicus* was reported during high saline periods. Its close relative *P. (P) sanguinoioides* is recorded now as a migrant species into this water body.

A critical evaluation of the annual landing trends of the 10 zones of the study area revealed that the zones of the downstream sector were the most lucrative sectors. Highest values were encountered from zone 1 and the rate of diminishment towards zone 2 was gradual. Surprisingly, the difference between the two adjacent zones 2 and 4 was glaring. Such a contrasting difference could also be seen between zones 5 and 6. The fishery of zone 6 showed more resemblance to that of zone 8 than to that of zone 5. The drastic ecological changes (Kurup *et al.* 1989) encountered in zone 6 and its adjoining downstream areas due to man-made changes in the ecosystem, can possibly be taken as the reason for the observed depletion in resources.

The post-larval recruitment into brackishwater environment is considered as a causative factor in bringing about the fluctuation in the prawn yield (Baxter 1962). Natural immigration of penaeid larvae into Vembanad lake during high saline periods has been reported and this would suggest that the environment of the lake offers them better refuge as a nursery than the marine habitat. However, in recent years more than 16 000 ha were reclaimed from the lake (Anonymous 1988). The salinity of the estuary has also decreased now. Prior to the construction of the barrier, salinity incursion was noticed up to Pulinkuzh, about 90 km away from Cochin and salinity in the upstream region reached up to 23‰ in Kumarakom - Muhamma region (Josanto 1971). However, in the present conditions, the salinity of this region did not go beyond 6‰. Similarly, in the downstream region from the salinity barrier, in zone 6, salinity did not go beyond 10‰ (Kurup *et al.* 1989) against 22-26‰ (Josanto 1971). This may be either due to Periyar diversion into Muvattupuzha or commissioning of the Edamalayar Hydroelectric Project. Therefore, a reduction in the nursery area has been effected due to the above reasons.

The post-larvae which arrive in the lake can tolerate a wide range of salinity (Kuttyamma 1975), and hence invade the best feeding grounds, even those with mod-
erate salinity values, for rapid growth. As they grow bigger in size, they become more sensitive to low salinities and hence are forced to descend into more favourable downstream areas. The maximum growth rate in penaeid prawns are also associated with optimum saline conditions (Kutiyamma 1975). The shrinkage of the nursery grounds may have also resulted in the overcrowding of juveniles in the lower reaches, viz. zones 1 and 2. These areas where shrimp juveniles become concentrated are subjected to heavy fishing pressure due to the indiscriminate operation of stake nets. The incidence of size over fishing is clearly discernible from the size group of *Metapenaeus dobsoni* constituting the fishery of this lake in recent years (Kurup et al. 1989). Zones 1 and 2 have dual advantages, when compared to other zones of the lake. The availability of marine migrants are always high due to either the direct ingress from the sea or massive outward migration from the upper reaches, due partly to sudden changes in the prevailing salinity.

It is, therefore, obvious that the saltwater exclusion project is responsible for the remarkable difference in the yield pattern in the upstream and downstream regions of the lake. Further, the depletion of the resources in the upstream is not adequately compensated by natural propagation of freshwater species or by ranching using fast growing freshwater fishes like the carps. Prior to the construction of the barrage, the fishery of this region was also sustained by *Peneaus indicus, P. monodon, Metapenaeus dobsoni, M. monoceros, Mugil cephalus, Liza macrolepis, Chanos* etc. and reports indicated that prawns worth Rs 50 000 were caught every day (KSSP 1978). But after the commissioning of the barrage, practically very little catch is obtained from the southern part. Some of the freshwater fishes, such as *Horabagrus brachysoma, Clarias betrochasus and Ompok bimaculatus* are on the wane, and need protection and artificial propagation. Nevertheless, the production of *Etropus suratensis* has increased, especially in zone 8, during December to May when the barrier remains closed. Highest yield of the pearsrot has been recorded from zones 8 (21.9 tonnes) and 9 (6.7 tonnes) during April. The stagnant oligohaline conditions prevalent in the upstream regions of the lake may be very congenial for the survival of this species.

ACKNOWLEDGEMENTS

We thank Shri Viond, Project Director, Kuttanad Water Balance Study Project, for providing the financial support; to Shri K C Cherian, Computer Operator, KWBS, for processing the data; and to the Kerala Agricultural University, for making available all the required facilities at the College of Fisheries, Panagad, Cochin.

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