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EXPLOITED FISHERY RESOURCES OF THE VEMBANAD LAKE

4. ESTIMATES OF MARKETABLE SURPLUS OF PRODUCTION

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ABSTRACT

The exploited fish and shellfish are disposed off through 51 markets located in and around the lake. 32 landing centres are also identified through which the majority of the landings are disposed into these markets. The highest quantity is sold at Kolothumkadavu market of Vaikom, followed by Shertallai, Udayamperoor and Chandiroor. The Marketable surplus production is computed at 4298.97 tonnes comprising of 2647.10 t of fishes, 910.70 t of penaeids, 272.88 t of palaemonids, 120.89 t of crabs and 348.09 t of clam meat. 110 species of fishes, 6 species of penaeids, 3 species each of palaemonids and crabs and the meat of *Villorita cyprinoides* are sold through these 51 markets. Among the marketed quantities, the first five positions are occupied by *Metapenaeus dobsoni*, *Etroplus suratensis*, *Macrobrachium idella*, *Sarotherodon mossambicus* and *Etroplus maculatus*. Of the exploited fishery resources of the lake, 80% of fishes arrive in the markets in contrast to 26% of penaeids and 42.56% of crabs. A species level assessment reveals that while only 20.1 % of *Penaeus indicus* reaches the markets, 26% each of *Metapenaeus dobsoni* and *M. monoceros* are available in the markets. In the case of *Macrobrachium resenbergtii* and *Scylla serrata*, 34.67 and 38.69% respectively are the marketable surplus productions. The difference between the estimates of the exploited resources and the marketable surplus is accounted for by the quantity that are being bypassed either into processing plants or for consumption in houses and hotels.

INTRODUCTION

THE VEMBANAD LAKE in Kerala (09°28' and 10°10' N and 76°13' and 76°13' E) is the largest brackishwater body in South India, having a length of 60 km north to south from Cochin to Alleppey and area of 2105 ha. The completion of Thanneermukkom salinity barrier in the year 1976 has resulted in the separation of this lake into two entirely different ecosystems, retaining estuarine conditions in the northern sector or downstream region

(Cochin to Thanneermukkom) and transforming the southern sector or upstream region (Thanneermukkom to Alleppey) into a fresh water habitat. Available information on fishery resources of this lake mainly dealt with faunistic diversity (Shetty, 1965; Kurup, 1982; Kurup and Samuel, 1985 a), regional and spatial distribution of fishes (Kurup and Samuel, 1987), fishing methods (Kurup and Samuel, 1985 b) and estimates of production (Menon and Raman, 1961; Kurup *et al.*, 1989). Virtually no information is available on the number and

position of markets located around the Vembanad Lake through which the catches are marketed, the quantity arrived at different markets and the portion of the total production of the lake that reaches the market. The marketable surplus of production of some of the important inland water bodies of India were already estimated (Job *et al.*, 1955; Jhingran, 1985; Shetty *et al.*, 1965) and data on the similar line is very essential for assessing the impact of lacustrine fishery on the general economy of any fishing region. It further enables to assess the quantity which bypass the markets through other means. The seasonal fluctuations in the market price of commercially important fishes, prawns, crabs and clams can also be assessed through such surveys. This work was undertaken as part of an investigation envisaged under the Indo-Dutch Co-operation programme on the Kuttanad Water Balance Project (1987-'89).

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financial support and also to Mr. K. C. Cherian for the computer assistance.

MATERIALS AND METHODS

The data for the present study were collected from the regular fortnightly market surveys conducted during the period from May 1988 to June 1989. From a preliminary survey, it is seen that the exploited fishery resources of the lake are disposed of through 51 markets and 32 landing centres located in and around the lake (Fig. 1, 2, Table 1). Based on the geographical locations they were grouped under 9 market zones with 4 - 7 markets under each zone (Table 1). The species-wise landings and prevailing market prices were recorded from each market on a fortnightly basis, the morning and evening, wherever possible. The mean daily landings of each market during different months were estimated from the fortnightly figures thus gathered and the monthly landings were computed by multiplying this with the total number of calendar days of the respective months. The data were analysed with the help of a PC/XT.

TABLE 1. Markets surveyed and their annual landings in kg

Market Zones	No.	Name of Market	Annual landings	Nearest Town	District
I.	1	Thévara	154701.90	Ernakulam	Ernakulam
	2	Aroor	124442.70	Alleppey	Alleppey
	3	Kumbalangi	78269.30	Ernakulam	Ernakulam
	4	Palluruthy	152943.00	"	"
	5	Chullickal	72329.90	"	"
	6	Pazhangad	28812.05	"	"
	7	Eda Cochin	15560.95	"	"
II.	8	Ernakulam	125822.50	"	"
	9	Champakara	118851.60	"	"
	10	Fort Cochin	84640.00	"	"
	11	Kadavanthara	42715.50	"	"
	12	Kaloor	100176.30	"	"
	13	Nettoor	23382.15	"	"
	14	Panangad	26055.65	"	"

TABLE 1. *Contd.*

III.	15	Chandiroor	211291.40	Alleppey	Alleppey
	16	Kuthiathodu	101196.00	"	"
	17	Ponnamvely	147883.60	"	"
	18	Chavady	151691.90	"	"
	19	Valiathodu	53199.05	"	"
IV.	20	Udayamperoor	220361.40	Ernakulam	Ernakulam
	21	South Parur	151728.10	"	"
	22	Chempu	80313.50	Vaikom	Kottayam
	23	Perumbalam	27921.80	Ernakulam	Alleppey
	24	Poothotta	26103.00	Ernakulam	Ernakulam
	25	Murinjhapuzha	14424.35	"	"
V.	26	Shertallai	317805.00	Shertallai	Alleppey
	27	Poochakkal	96697.00	"	"
	28	Kadakkapalli	63444.00	"	"
	29	Pallipuram	13595.50	"	"
	30	Muttathiparambu	7580.00	"	"
	31	Ottapunna	9009.00	"	"
VI.	32	Kolothumkadavu	323105.30	Vaikom	Kottayam
	33	Nanadom	73547.46	"	"
	34	Kaduthuruthy	59451.05	"	"
	35	Vadayar	15389.05	"	"
	36	Chemmanathkara	42557.10	"	"
	37	Puthenthodu	29900.30	"	"
	38	Appanchira	12328.60	"	"
	VII.	39	T.V. Puram	72484.75	"
40		Ullala	131505.90	"	"
41		Thanneermukkom	98253.46	Shertallai	Alleppey
42		Ambika Market	12253.80	"	Kottayam
43		Achinakam	17008.00	Vaikom	Kottayam
44		Puthanangadi	10728.25	Shertallai	Alleppey
VIII.	45	Muhamma	36697.75	Alleppey	Alleppey
	46	Mannanchery	24430.95	"	"
	47	Komalapuram	32543.30	"	"
	48	Chandakavala	45953.41	Kottayam	Kottayam
	49	Kumarakom Jetty	103993.80	"	"
	50	Attipedika	2169.10	"	"
IX.	51	Alleppey	119166.80	Alleppey	Alleppey

RESULTS

Estimates of marketable surplus production

Unlike in the marine sector, the catches are not disposed entirely through the landing centres and hence the quantification based on landing centres survey was found unpracticable

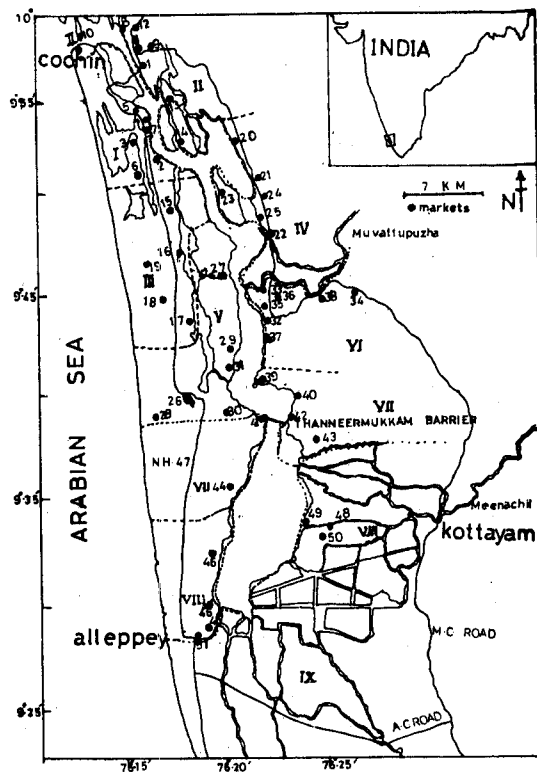


Fig. 1. Vembanad Lake showing location of markets.

for quantifying the exploited fishery resources of the lake. The marketable surplus production from the lake between June 1988 to May 1989 is estimated as 4298.97 tonnes consisting of 2647.10 t of fishes (61.58%), 910.07 t of penaeid prawns (21.17%), 272.88 t of palaemonid prawns (6.35%), 120.89 t of crabs (2.81%) and 348.09 t of clam meat (8.09%). The total value of these items is computed at Rs. 550 Lakhs.

Species-wise estimation

110 species of fishes, 6 species of penaeids, 3 species of palaemonids, 3 species

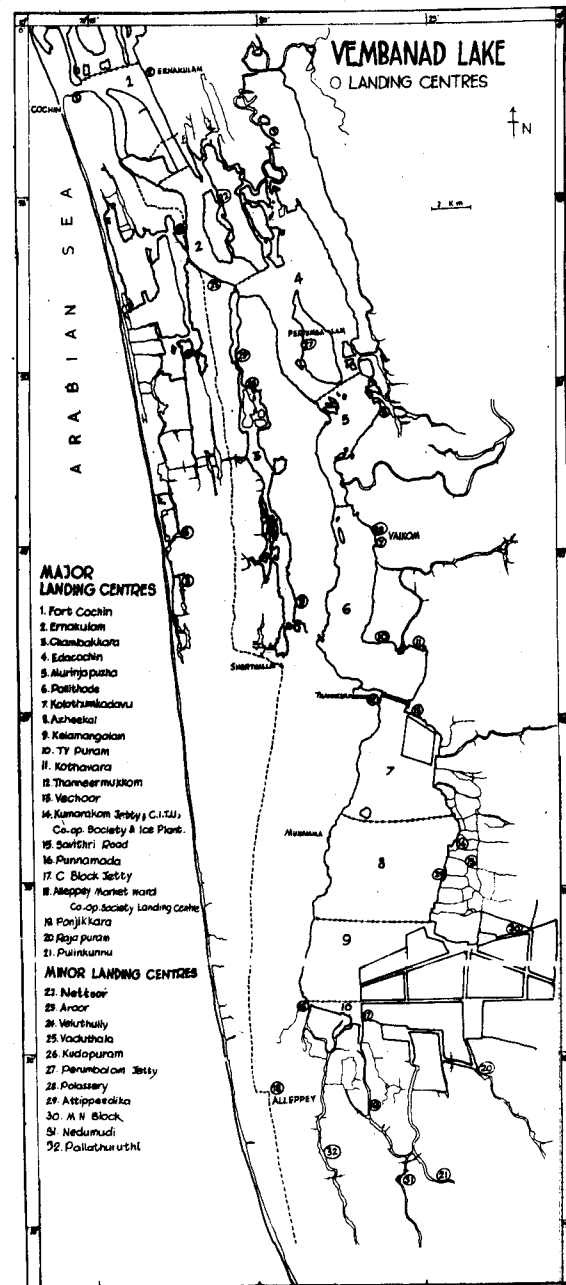


Fig. 2. Vembanad Lake showing location of landing centres.

of crabs and black clam meat were available in the markets of the study area (Table 1). The species-wise quantities during the period between June 1988 to May '89 is given in Table 2. Among the 110 species of fishes, *Etrophus suratensis* constituted the maximum of 459.00 t (10.68%), followed by *Sarotherodon mossambicus* 201.66 t (4.69%), *Etrophus maculatus* 199.74 (4.65%), *Ehirava fluviatilis* 198.27 t (4.61%), *Daysciaena albida* 162.67 t (3.79%), *Mystus guilo* 124.39 t (2.89%),

Tachysurus maculatus 106.59 t (2.47%) and *T. subrostratus* 94.83 t (2.20%). 16.12% of the marketable surplus production was contributed by *Metapenaeus dobsoni* (693.79 t), while *Penaeus indicus* formed 2.44% (104.69 t). The predominance of the freshwater prawn *Macrobrachium idella* in the markets is noteworthy. This species contributed to 258.5 t which formed 6% of the total resources sold through the markets. The edible crab *scylla serrata* formed only 2.30% (98.89 t).

TABLE 2. Marketed fishery resources (in kg) during June 1988 to May 1989

Species	Total landings	Species	Total landings
<i>Alectis indicus</i>	158.10	<i>Etrophus suratensis</i>	458997.60
<i>Ambassis commersoni</i>	15479.95	<i>Epinephelus tauvina</i>	2720.55
<i>Ambassis dayi</i>	33667.75	<i>Escualosa thoracata</i>	150.00
<i>Ambassis gymnocephalus</i>	91923.60	<i>Gerres filamentosus</i>	40850.95
<i>Amblypharyngodon mola</i>	21214.00	<i>Gerres setifer</i>	270.00
<i>Anabas testudineus</i>	27792.80	<i>Glossogobius giuris</i>	61609.05
<i>Anodontostoma chacunda</i>	1316.90	<i>Gobiopsis macrostomus</i>	6245.65
<i>Anguilla bicolor bicolor</i>	632.25	<i>Heteropneustes fossilis</i>	35103.00
<i>Austrobatrachus dussumieri</i>	284.50	<i>Horabagrus brachysoma</i>	2210.30
<i>Brachirus orientalis</i>	29758.30	<i>Hyporhamphus (H) limbatus</i>	18524.95
<i>Bunaka gyrinoides</i>	180.00	<i>Hyporhamphus (H) xanthopterus</i>	52360.21
<i>Clarias batrachus</i>	5380.25	<i>Johnius (J.) belangerii</i>	201.50
<i>Carangoides praeustus</i>	795.00	<i>Labeo dussumieri</i>	8098.60
<i>Caranx carangus</i>	46.50	<i>Lates calcarifer</i>	11958.95
<i>Caranx ignobilis</i>	13431.15	<i>Leiognathus brevisrostris</i>	9015.20
<i>Caranx sexfasciatus</i>	10582.50	<i>Leiognathus equulus</i>	8376.85
<i>Channa marulius</i>	21459.15	<i>Lethrinus microdon</i>	77.50
<i>Channa striata</i>	75333.35	<i>Liza macrolepis</i>	19131.27
<i>Chanos chanos</i>	4937.65	<i>Liza parsia</i>	78677.10
<i>Cynoglossus bilineatus</i>	4141.60	<i>Liza subveridis</i>	21.00
<i>Cynoglossus puncticeps</i>	6548.25	<i>Lutjanus argentimaculatus</i>	7329.10
<i>Dasyatis (H) uarnak</i>	1196.00	<i>Lutjanus johni</i>	372.00
<i>Dasyatis (P) sephen</i>	1137.50	<i>Lutjanus russelli</i>	186.00
<i>Dayella malabarica</i>	2397.00	<i>Mastacembelus armatus</i>	1046.15
<i>Daysciaena albida</i>	162669.50	<i>Mastacembelus quentheri</i>	237.00
<i>Dussumieria acuta</i>	18.60	<i>Megalapis cordyla</i>	263.50
<i>Ehirava fluviatilis</i>	198265.20	<i>Megalops cyprinoides</i>	52072.40
<i>Eleutheronema tetradactylum</i>	5185.60	<i>Mugil cephalus</i>	34372.05
<i>Elops machnata</i>	564.70	<i>Muraenesox bagio</i>	6604.95
<i>Etrophus maculatus</i>	199740.10	<i>Mylio berda</i>	713.00

TABLE 2. *Contd.*

<i>Mystus (M.) gulio</i>	124390.90	<i>Taenioides cirratus</i>	276.00
<i>Mystus (M.) malabaricus</i>	2182.00	<i>Tetradon fluviatilis</i>	22.75
<i>Mystus (M.) oculatus</i>	74.40	<i>Therapon jarbua</i>	4431.15
<i>Mandus marmoratus</i>	2118.00	<i>Thryssa kammalensis</i>	3458.00
<i>Nematulosa nasus</i>	1592.00	<i>Thryssa purava</i>	3601.50
<i>Ompok bimaculatus</i>	376.95	<i>Thryssa mystax</i>	5661.65
<i>Oxyurichthys micolepis</i>	2452.10	<i>Thyrsoidea macrurus</i>	150.00
<i>Oxyurichthys nijsseni</i>	398.75	<i>Triacanthus brevirostris</i>	302.50
<i>Platycephalus indicus</i>	16948.70	<i>Trypauchen vagina</i>	1516.00
<i>Platycephalus crocodilus</i>	97.95	<i>Upeneus (U.) sulphureus</i>	31.00
<i>Plectorhynchus nigrus</i>	25366.85	<i>Upeneus (U.) vittatus</i>	31.00
<i>Pomadasys hasta</i>	240.00	<i>Valamugil cunnesius</i>	3155.00
<i>Protonibea diacanthus</i>	93.00	<i>Valamugil seheli</i>	68.00
<i>Psettodes erumei</i>	77.50	<i>Wallago attu</i>	14212.15
<i>Pseudorhombus arsius</i>	210.00	<i>Xenentodon cancilia</i>	6829.60
<i>Puntius amphixhius</i>	10512.15	<i>Puntius stigma</i>	635.50
<i>Puntius filamentosus</i>	18801.60	<i>Eipnephelus diacanthus</i>	600.00
<i>Puntius sarana</i>	59612.40	<i>Rastrelliger kanagurtha</i>	4371.00
<i>Scatophagus argus</i>	7801.20	<i>Metapenaeus dobsoni</i>	693790.70
<i>Scomberoides tol</i>	18.00	<i>Metapenaeus monoceros</i>	99422.21
<i>Secutor insidiator</i>	409.20	<i>Penaeus canaliculatus</i>	62.00
<i>Siganus javus</i>	494.00	<i>Penaeus indicus</i>	104694.80
<i>Sillago sihama</i>	37985.25	<i>Penaeus monodon</i>	11726.10
<i>Sarotherodon mossambicus</i>	201656.30	<i>Penaeus semisulcatus</i>	1319.95
<i>Sphyraena jello</i>	680.40	<i>Macrobrachium idella</i>	258508.80
<i>Stolephorus commersonii</i>	9064.00	<i>Macrobrachium rosenbergii</i>	13622.25
<i>Stolephorus indicus</i>	2352.40	<i>Macrobrachium scabriculum</i>	147.25
<i>Stolephorus waitei</i>	12299.00	<i>Portunus (P.) sanguinolentus</i>	5964.00
<i>Strongylora strongylura</i>	45.00	<i>Portunus pelagicus</i>	16094.25
<i>Synaptura commersoniana</i>	2509.10	<i>Scylla serrata</i>	90475.54
<i>Tachysurus maculatus</i>	106594.20	<i>Villorita cyprinoides var. cochinchensis</i>	348094.90
<i>Tachysurus subrostratus</i>	94834.25	TOTAL	4298968.00

Monthwise estimation

Monthly fluctuations of the fishery resources in the markets indicated the highest quantity in June (523.13 t) and lowest in July (179.93 t) (Fig. 3). The period between September to March presented a near stable feature eventhough a slight drop was noticed in December. April and May recorded the lowest figures.

Zonewise estimation

The total disposal of catches through the nine zones during the 12 months are quantified

and the maximum quantities are disposed through Zone III followed by Zones I & VI (Fig. 4). The lowest estimate was from Zone IX. In general, the marketable surplus quantities are higher in the Zones of the northern region of the lake than in the southern zones. The marketable quantities showed a gradual decline from Zone IV southwards except in Zone VI with notable reductions in Zones VII to IX.

Relative importance of markets

While assessing the relative importance of the various markets, it is seen that the

TABLE 3. Market prices of important species of fishes, prawns, crab and molluscs from June '88 to May '89

Species	Price/kg in rupees		
	Mini- mum	Maxi- mum	Aver- age
FISHES			
<i>Mugil cephalus</i>	21	32	27
<i>Liza parsia</i>	18	28	22
<i>Liza macrolepis</i>	18	28	22
<i>Daysciaena albida</i>	21	25	23
<i>Etroplus suratensis</i>	24	29	26
<i>Tachysurus subrostratus</i>	7	14	10
<i>Tachysurus maculatus</i>	8	14	11
<i>Megalops cyprinoides</i>	16	22	17
<i>Hyporhamphus limbatus</i>	8	12	9
<i>Hyporhamphus xanthopterus</i>	11	15	13
<i>Lates calcarifer</i>	8	35	21
<i>Chanos chanos</i>	10	32	21
<i>Ehirava fluviatilis</i>	6	10	7
<i>Scatophagus argus</i>	8	27	15
<i>Gerres filamentosus</i>	9	16	13
<i>Caranx ignobilis</i>	18	12	16
<i>Leiognathus brevisrostris</i>	6	8	7
<i>Leiognathus equulus</i>	7	10	8
<i>Sillago sihama</i>	18	24	20
<i>Mystus gulio</i>	8	12	9
<i>Glossogobius giuris</i>	10	16	14
<i>Ambassis dayi</i>	5	13	8
<i>Ambassis gymnocephalus</i>	3	8	6
<i>Amblypharyngodon mola</i>	3	14	7
<i>Puntius filamentosus</i>	6	11	8
<i>Puntius sarana</i>	7	13	9
<i>Wallago attu</i>	13	22	18
PENAEID PRAWNS			
<i>Metapenaeus dobsoni</i>	6	11	8
<i>Metapenaeus monoceros</i>	10	22	18
<i>Penaeus monodon</i>	15	113	46
<i>Penaeus indicus</i>	20	34	28
PALAEEMONID PRAWNS			
<i>Macrobrachium rosenbergii</i>	16	90	70
<i>Macrobrachium idella</i>	8	25	12
CRAB			
<i>Scylla serrata</i>	8	13	10
MOLLUSC			
<i>Villorita cyprinoides</i> (Meat)	3	8	5

highest quantity is noticed at Kolothumkadav market of Vaikom (323.11 t). This was followed

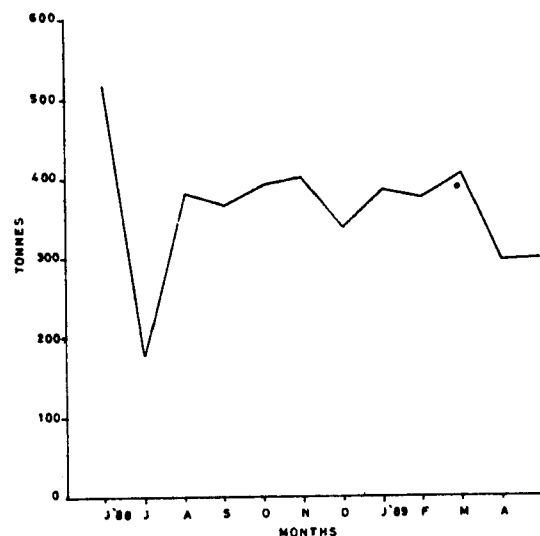


Fig. 3. Monthly variations in the marketable surplus of production.

by Shertallai (317.11 t), Udayamperoor (220.36 t) and Chandiroor (201.29 t). Thevara, Palluruthy, Chavadi and South Parur each contributed to more than 150 t annually, while Aroor, Ernakulam, Champakkara Kaloor, Kuthiathode, Ponnampveli, Ullala, Kumarakom Jetty and Alleppey contributed to between 100 - 150 t each. While the quantities marketed through 12 centres are found to be below 25 t each, those from 22 markets presented figures between 25 - 100 t. The weighted market price variation of important fishes and crustaceans are given in Table 3.

DISCUSSION

During the present survey conducted within a span of 12 months, the presence of 110 species of fishes, 6 species of penaeids, 3 species each of palaemonids and crabs were identified in the landings disposed off from the lake. 105 species of fishes recorded now conformed with the faunistic list of Kurup (1982). This includes those species either

rediscovered from this lake (Kurup and Samuel, 1980 a, b) or others which represent new distributional records from the Indian region (Kurup and Samuel, 1981 a, b). The presence of *Rastrelliger kanagurta* noticed in good quantity in the catches disposed off from the

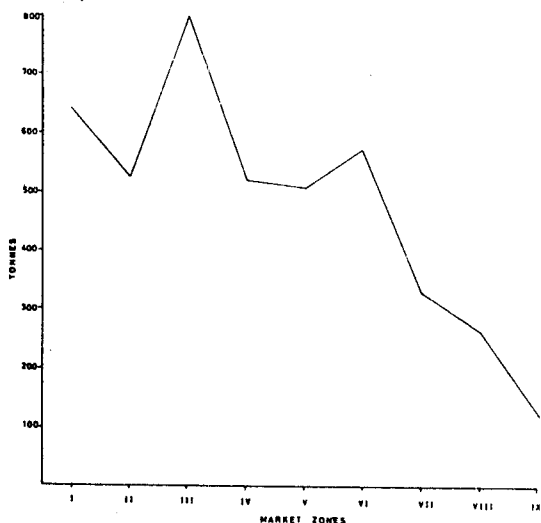


Fig. 4. Zone-wise variations in the marketable surplus of production.

lake conforms the findings of George (1966). According to Menon and Raman (1961), the penaeid prawn fishery of the Cochin Backwater is mainly constituted by *Penaeus indicus*, *Metapenaeus monoceros*, *M. dobsoni* and *M. affinis*, eventhough 7 species are available in the lake. However, the present study indicates that the commercial penaeid prawn fishery of the lake is contributed by the first three species, eventhough the presence of six species was registered from the markets. Other penaeids recorded now, such as *Penaeus semisulcatus* and *P. canaliculatus* have also been recorded from the Cochin Backwater by Rao and Kathirvel (1972) and Kathirvel *et al.* (1978). Among the three species of crabs, *Scylla serrata* is a permanent inhabitant of the lake (Devasia and Balakrishnan, 1985), the presence of *Portunus (P.) pelagicus* was reported from

the backwaters during high saline periods (Rao and Kathirvel, 1972) and its close relative *P. (P.) sanguinolentus* is also recorded anew in the landings, during the present investigation.

The annual production of fishes, prawns and crabs from the lake excluding the pokkali fields and polders was estimated as 7,202.12 t. In addition to this, 7025.66 t of live clams (shell-on) were also obtained annually from the lake (Kurup *et al.*, 1989). The annual marketable surplus is estimated as 3,950.96 t which included fishes, prawns and crabs. From these data it is obvious that only 56.23% of the exploited fishery resources reaches the markets. While the annual production figures of penaeids, fishes, crabs and Palaemonids were 3499.08 t, 3297.2 t, 284 t and 117.69 t respectively (Kurup *et al.*, 1989), the quantities that reached the markets were respectively 910.01 t, 2647.10 t, 120.89 t and 272.28 t only. From this it is evident that while 80% of fishes caught reach the markets, only 26% of penaeids and 42.56% of crabs are brought for sale at these centres. In the case of the palaemonid prawns, especially *Macrobrachium idella*, the marketable surplus was more than double that of the annual production figures. This may be due to their heavy landings in the adjoining rivers and paddy fields and their disposal through the markets of the study area. The 20% difference noticed between the exploited and marketed quantities of fishes may have either been used for domestic consumption or sold to hotels or shops directly.

It is of interest to note that some of the freshwater species of fishes such as *Channa striata*, *Etroplus maculatus*, *E. suratensis*, *Sarotherodon mossombicus*, etc. showed slight increase in their marketable quantities compared to their annual production figures (Kurup *et al.*, 1989) in the lake. This may also be due to the availability of additional quantities arriving from the adjoining parts of the lake (north of Cochin Bar-mouth) or rivers, pokkali fields or paddy fields.

The difference between the annual production of prawns (Kurup *et al.*, 1989) and their marketed quantities were analysed. The results show that while only 20.10% of *Penaeus indicus* reaches the markets, 26% each of *Metapenaeus dobsoni* and *M. monoceros* are available. The marketed quantity of *Macrobrachium rosenbergii* and *Scylla serrata* are 34.67% and 38.69% respectively. The larger size groups of the above species are processed for export and hence the direct procurement by processing plants might account for the existing difference in the quantity of production and marketable surplus. A fraction of the production in these cases also may have directly reached the hotels, households, etc.

Since the markets are situated within a radius of one kilometre from the lake proper, the catches reached the markets invariably during early morning hours (0500 - 0800 hrs).

Either middlemen or members of family of the fishermen performed the sale. The present survey indicates that the price of the important food fishes generally shows significant seasonal variations, especially in markets situated in the northern region. These variations appear to be correlated to the availability and abundance of marine food fishes. However, there is consistency in the market prices of important fish species, such as *Etroplus suratensis*, *Mugil cephalus*, *Liza parsia*, *Lates calcarifer*, *Wallago attu* and *Hyporhamphus xanthopterus* in the markets situated in the upstream regions of the lake. The market price of prawns and crabs unlike fishes seem to depend on their size; the larger ones which are taken by the processing plants for export maintaining a comparatively high and stable price, but the smaller size grades which are locally consumed exhibiting seasonal fluctuation in prices.

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