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Status of Bottom Trawl Fishery In Kerala (South India)

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The total number of bottom trawlers operated from 11 harbours in Kerala comprising 6 major and 5 minor harbours were enumerated during August 2000 to July 2001. A total of 4960 bottom trawlers were found to operate during the study period. On an average, 1542 trawlers were landed per day in Aug-2000 while it was only 738 in Nov-00 being the lowest. 40-50'LOA size class vessels (38%) dominated among the trawlers operated in Kerala followed by 31-40' (30%). Total bottom trawl landings were quantified as 2,46,116 tonnes that accounts for 46% of the total marine fish landings and 87% under total mechanised sector during 2000-01. The annual average CPUE was estimated to be 891kg with a catch/hr of 53 kg. Highest share of the trawl landings was reckoned from 21-40 m depth contributing to 24.5% while highest CPUE from bottom trawl net was also recorded from the same depth.

Key words : Bottom trawl, Status, Kerala

The introduction of mechanised trawlers to exploit the demersal resources beyond the traditional fishing grounds of Kerala was attempted in the early fifties have been received with great enthusiasm due to its high returns and therefore it became widespread all along the trawlable coastal grounds. As it was found to be the most efficient method with high returns for the exploitation of shrimps, the number of bottom trawlers showed an exponential increase along the coast of Kerala. Earlier studies on the trawl fishery of Kerala coast are well documented. (Kurian, 1965; Satyanarayana *et. al.* 1964; Panicker & Sivan,1965; Kuthalingam, 1965; Kuthalingam *et. al.*, 1978; Radhalakshmy & Nair, 1985; Kartha & Sadanandan, 1986) . However, information on their present status of such trawlers operated from different harbours of Kerala, their percentage contribution to the exploited stock from different harbours, L_{OA} composition, depth wise contribution of trawl landings, catch per unit effort, etc. are still lacking. The present attempt is to bridge these gaps and to up to date the information on bottom trawl fishery in Kerala.

Materials and methods

6 major (Sakthikulangara Neendakara, Cochin, Munambum, Beypore, Puthiyappa) and 5 minor harbours viz. Thottapally, Murikkumpadam, Ponnani, Chombala and Mopla Bay spread along 7 districts on Kerala were observed at weekly intervals during August 2000 to July 2001. The observations on trawl landings were recorded for a period of 12 h during day time while details regarding night

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landing were compiled on the basis of enquiry. Selection of trawl units for detailed observation was done following Alagaraja (1984). Details on L_{OA}, gear specifications, make and size of the craft, engine with model size, catch and species composition etc. were recorded from the selected units while data on cruise time, facilities on board, fishing endurance and actual fishing hours exerted along with the number of hauls, crew strength, duration and number of hauls performed, depth of fishing, fishing ground, etc. were collected from the fishing crews on the basis of personal interviews. The daily catch was computed by multiplying the average catch arrived at from the selected units multiplied by total units operated from the harbour on a daily basis. The monthly catch was estimated by multiplying the daily landings with actual number of fishing days recorded in every month. Details of number of trawlers operated from different fisheries harbours of Kerala were collected from the harbour offices and the data so obtained were cross verified with the help of auctioneers, Government officials, boat owners association members, boat crews, etc. On the other hand, the average number of trawlers operated on a daily basis from each harbour was enumerated on the basis of visual counts done during the four visits made in a month at each harbour. The catch per unit of individual trawl net and major species / groups of commercially importance were computed following Scariah *et. al.*, (1999). The effort in terms of fishing hours was worked out on the basis on actual time spent for fishing following Anon (1984).

Results and Discussion

Trawlers operated from different fishing harbours of Kerala was enumerated as 4960 Table 1. Highest number was recorded from Sakthikulangara while in Chombala was lowest. The average number of units landed at each harbour during August 2000 to July 2001 (Table1) showed that invariably, the number of trawlers landed were highest during August 2000 and a reduction in the number was observed in November 2000 and July 2001. More than 50% of the trawlers were found operated from Quilon district while the number of trawlers operated from the harbours situated along northern districts was very insignificant. A decline in the number of trawlers operated at Cochin harbour was mainly due to the diversion of a sizeable number to Murikkumpadam fisheries harbour.

While examining the L_{OA} composition of bottom trawlers operated from different harbours of Kerala , boats in the size class 40-50' formed 38%, thus emerging as the major type followed by 31-40', which accounted for 29.77%

Table 1. Average number bottom of trawlers landed daily in various fisheries harbours of Kerala during Aug-00 to July-01

Harbour	Actual numbers based at harbours	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01
Sakthikulangara	1800	550	410	370	270	320	365	390	497	523	474	345	350
Neendakara	700	360	325	186	174	225	82	150	200	270	88	150	300
Thottapally	40	-	-	16	7	9	9	13	13	6	-	-	-
Cochin	600	139	96	83	28	85	16	83	90	133	121	142	85
Munambam	750	140	105	93	80	29	150	95	130	141	160	74	16
Murikkumpadam	200	60	39	32	16	39	37	41	113	98	68	80	19
Ponnani	200	29	31	19	56	-	76	85	62	73	65	25	-
Puthiyappa	260	93	39	46	53	105	99	96	103	122	96	140	20
Beypore	300	97	69	57	22	82	96	131	122	81	135	83	-
Chombala	30	20	16	7	12	6	5	22	8	18	16	20	-
Mopla bay	80	54	39	26	20	9	25	20	21	28	40	18	-
Total	4960	1542	1169	935	738	909	960	1126	1359	1493	1263	1077	790

(Fig.1). The percentage representation of 21-30 and <20' were 12 and 6% respectively. Interestingly, the size class 51-60' accounted for 12%. The recently introduced trawlers with 65-70'OAL based at Munambum are constructed with steel and powered with 440-680 Hp model diesel engines and these are operated targeting cephalopods and deep sea prawns at depths beyond 300m. The large scale modernisation of these units with state of the art echo sounders / fish finders, GPS and sophisticated communication system were the major technological innovation observed in this sector recently. These units were also fitted with the V form steel otter board, which is having the advantage of not digging on the ground when compared to the conventional flat otter board. While analysing the cod end mesh size of the trawlers, it appeared

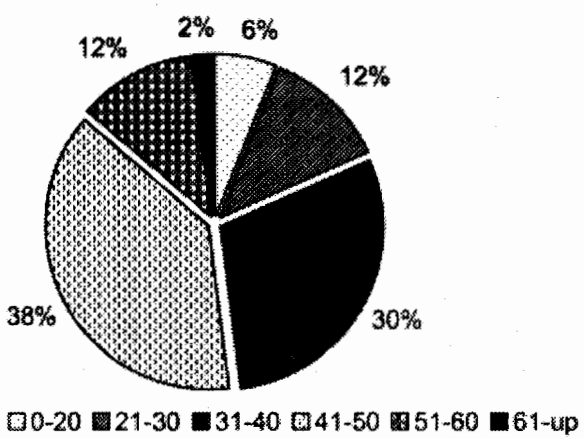

Fig.1. Percentage composition of trawlers of different size range (LoA), operated along Kerala coast

that 76% of the cod end was represented by 16-20 mm while representation of 20-24 mm was only 22%.

The annual landings from bottom trawls along Kerala coast during 2000-01 is computed at 246116 tonnes which accounts for 87% of the landings from the mechanised sector. The month wise variation in the landing from trawl nets is shown in Fig.2. Landings showed a gradual increase from June to September. After plummeting in November-00 the landings

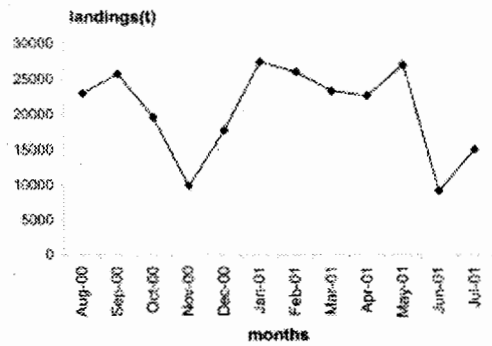

Fig. 2. Total estimated landings from trawlers in Kerala during Aug-00 to July-01

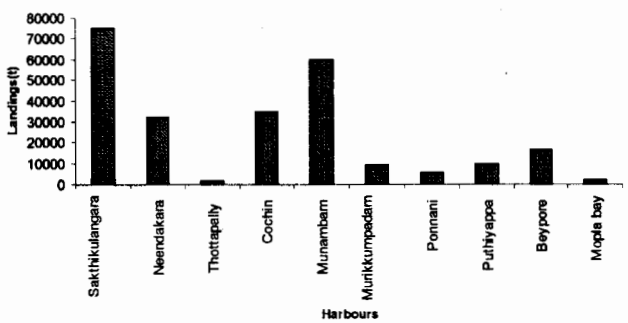

Fig.3. Harbour wise estimates of trawl landings during Aug-00 to Jul-01.

registered a gradual increase in December were more or less steady during January to May. The magnitude of landings from different fisheries harbours of Kerala is depicted in Fig 3. Major portion of the trawl landings were recorded from Sakthikulangara followed by Munambum and Cochin harbours, contributing to 31, 24.2 and 14% respectively of the total landing. The patterns of monthly landings from trawls from 11 harbours of Kerala are shown in Fig.4 (a-j). In Sakthikulangara, the landings were invariably high during December to May with another peak during September 00 and February 01(Fig.4a). The intensity of trawl fishing observed in this harbour had a direct bearing on the availability of *Parapenaeopsis stylifera* along Quilon - Kayamkulam coast. In Neendakara harbour also similar trends was noticed, however, peak

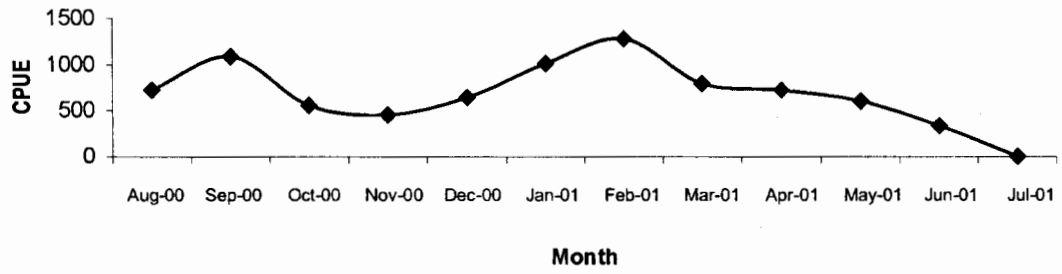

Fig.4.a Pattern of monthly landings from trawlers operarted from Sakthikulangara Harbour

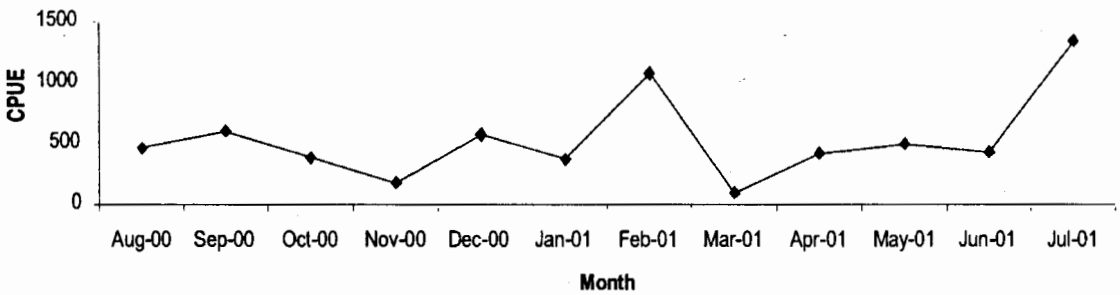

Fig.4.b Pattern of monthly landings from trawlers operarted from Neendakara Harbour

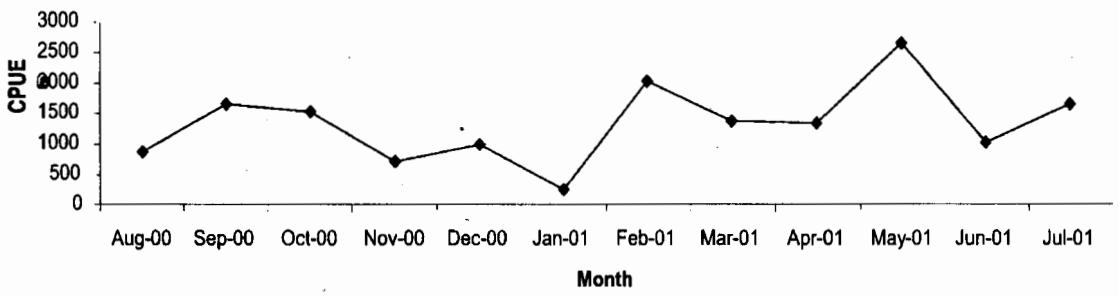

Fig.4.c Pattern of monthly landings from trawlers operarted from Cochin Harbour

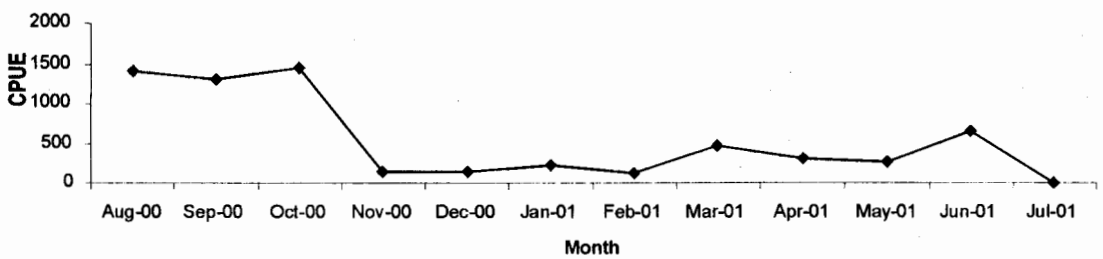

Fig.4.d Pattern of monthly landings from trawlers operarted from Murikkumpadam Harbour

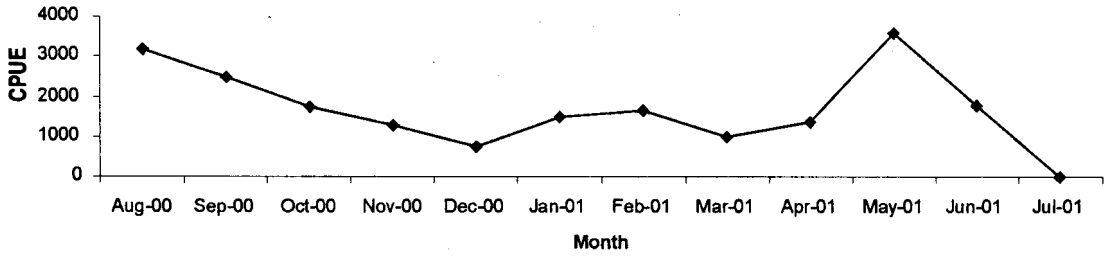

Fig.4.e Pattern of monthly landings from trawlers operarted from Munambam Harbour

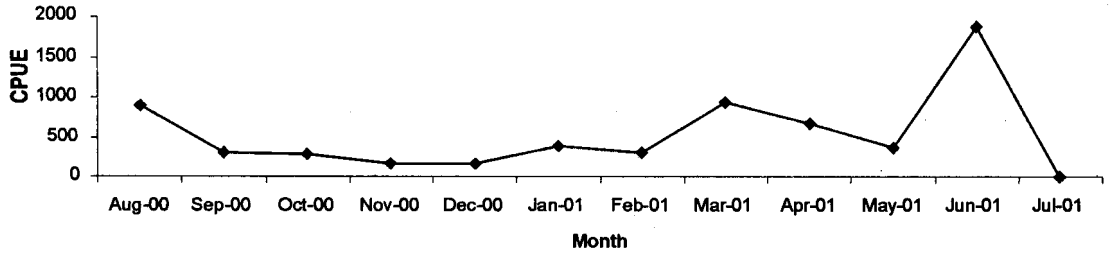

Fig.4.f Pattern of monthly landings from trawlers operarted from Ponnani Harbour

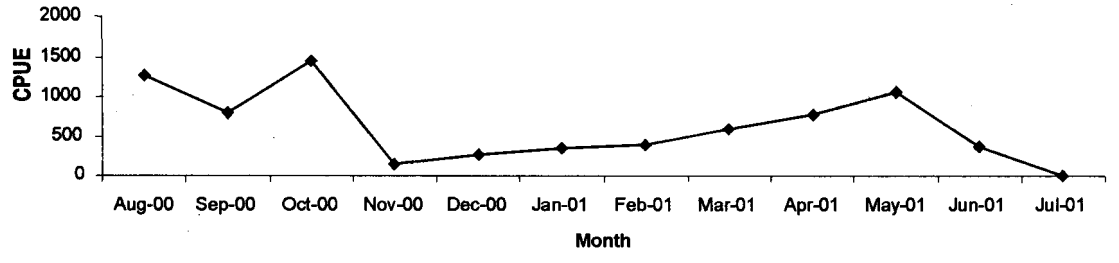

Fig.4.g Pattern of monthly landings from trawlers operarted from Beypore Harbour

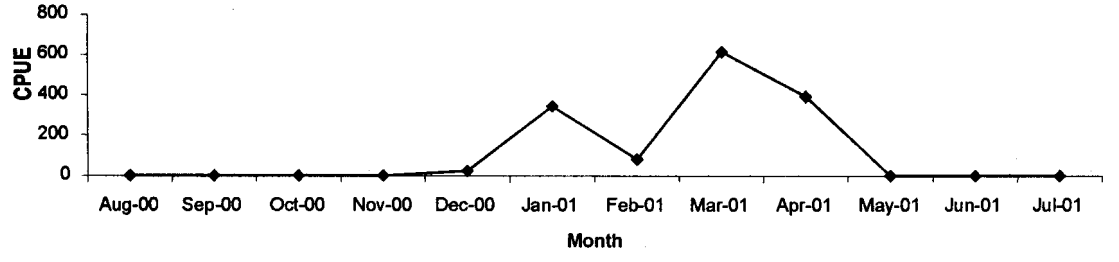

Fig.4.h Pattern of monthly landings from trawlers operarted from Mopla bay Harbour

landings were registered during June to July. In Cochin also two peaks were observed, the major peak during February to May and the second peak during August-September. The CPUE recorded from the bottom trawl nets during August 2000 to July 2001 is shown in Fig.5. It varied from 21 kg in February to 127 kg in July and the average was computed at 53 kg. The CPUE of trawl nets were comparatively high during monsoon and post monsoon months while it was lower towards the fag end of premonsoon months. The catch per boat varied

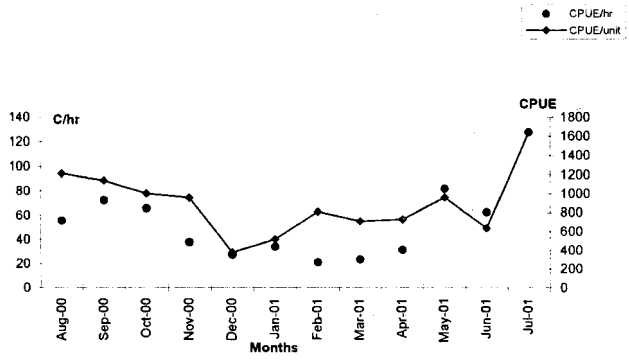

Fig.5. CPUE recorded for bottom trawl nets during August 2000 to July 2001

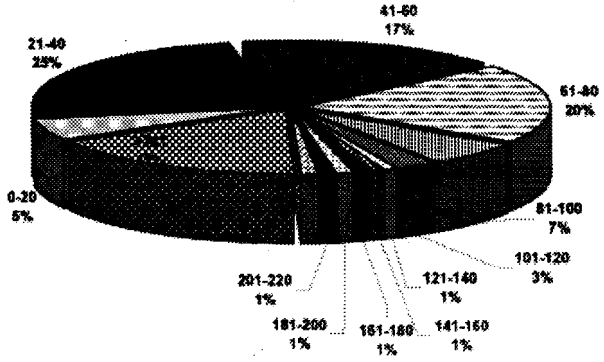

Fig.6.Trawl net landings from different depth zones along Kerala coast

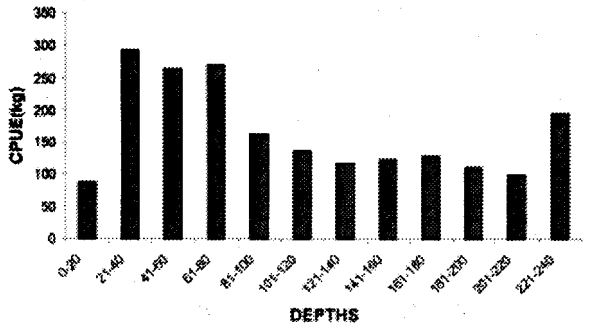

Fig.7. CPUE recorded in trawl nets operated at different depth zones along Kerala coast.

from 379 kg in December to 1639 kg in July and the average value was worked out as 891 kg. The CPUE was low during October-December periods, which may be due to the operational difficulties of bottom trawlers on account of incessant rain and rough weather. The trawl net landings from different depth zones along Kerala coast was computed and the result are shown in Fig 6.The bottom trawl fishing grounds encompass from 5 to 450m depths along Kerala coast. The depth wise analysis revealed that highest percentage of trawl net landings was encountered from 21-40m (24.5%) followed by 61-80m(20%)while it was 17% in the depth zone 41-60m. The contribution to the bottom trawl landing from 80-100 m was 7% while above 240m it accounted for 17.1%. The coastal shrimps accounted for major part of the landings from the inshore regions less than 40 m depth while hairtails, lizard fishes, nemipterids, carangids and squid contributed to the lion share of the landings from 61-80 m depth zone whereas cuttle fish was the major resource exploited from 81-100m depth. Deep sea prawn, lobsters, Chloropthalmus spp. and Blackruff contributed to the landings from depth zones beyond 240m.The trends in the CPUE recorded in trawl nets operated at different depth zones along Kerala coast is shown in Fig.7. The CPUE recorded from 21-80 m depth was less similar with slightly higher values at 21-40m. Beyond 80 m the CPUE showed an inverse relationship with the increase in depth, however, beyond 221m the CPUE showed an increasing trend.

Among the mechanised boats operated along Kerala coast, more than 90% belong to bottom trawl, specifically aimed for the exploitation of shrimp resources of the inshore waters (Ravindran & Baiju, 1998). During the early 60's there was about 150 mechanised boats (Scariah *et. al.*, 1999) and another hundreds introduced in the late sixties and seventies (Sehara & Kanakkan, 1993). Small sized trawlers of 30 and 32' L_{OA} that combined the good features of more than one design exerted high fishing pressures along coastal waters of Kerala, especially on shrimps. According to Jyothilal (1998) the number of mechanised boats in Kerala have gone up to 7300 units, among them 4000 are bottom trawlers operating mostly with in 50

m depth zone. In the present study, the number of bottom trawl net unit is enumerated as 4960 and this in comparison with previous estimates are on a higher side. The trawlers emigrated from the neighbouring states might have been covered in the present enumeration and this would explain for the very high number of bottom trawl units recorded in the present study. The maximum permissible number of trawl nets along Kerala coast is worked out as 1145 (Kalawar, 1985), and while comparing the present strength against this, the number operated is four time higher than the required. The ever-increasing demand for prawn for export is one of the reasons for the development of this sector as an organised industry. Realising the importance of instituting the measures for amelioration of the dwindling nature of the marine fisheries resources of Kerala, Govt. of Kerala enacted Kerala Marine Fisheries Regulation Act (KMFRA) in 1980. Govt. of Kerala have also implemented a seasonal closure of bottom trawling during the monsoon since 1988 with a duration varying from 21-70 days (Nair, 1989) as per the recommendation made by one of the committees appointed in this regard.

In the present study, trawl landings was computed at 246116 tonnes and this formed 87% of the landings from mechanised sector during 2000-01. Kurup (2002) estimated the total marine landings from Kerala during 2000-01 as 5.65lakh tonnes, and the respective contribution from the traditional, mechanised and motorized sectors were 54, 45 and 1% respectively. It appears that trawl net contribution formed 46% of the total exploited marine fisheries resources of the state in 2000-01. Scariah *et.al.*, (1999) reported that the landing from trawl net in Kerala during 1970 was 1 lakh tonnes while in 1997, it increased to 2.74 lakh tonnes. While comparing the trawl landing recorded in the present study with that of similar data available for prior to 1987, the pre trawl ban periods, the present estimate is the high landing from bottom trawls in Kerala. This can be attributed to the increase registered in the landings of demersal fishes as opined by Kurup (2002a). A perceptible increase in the landings of some of the demersal resources such as Penaeid prawns, cephalopods, perches and Carangids could also be seen since the imposition of the ban (Nair, 2000). Before the introduction of ban, the CPUE from trawl net was as low as 190 kg, however, with the imposition of ban on monsoon trawling, a steady increase of CPUE to 452 kg was registered (Scariah *et. al.*, 1999). From the results of the present study, it is obvious that the CPUE showed further increase touching as high as 891 kg. Kurup (2002 b) reported that there was an increase in the catch per effort values of cephalopods, perches, soles, threadfin breams, croakers and lizardfishes in the coastal waters of Kerala. It can, therefore reasonably be inferred that the high CPUE values recorded from bottom trawlers operated along Kerala coast might be due to the increased availability of the demersal resources. According to Yohannan *et.al.*, (1999), there is a spectacular increase in the marine fish landing after 1988 and this is mostly due to the increase in the landing registered from the trawl nets. The authors also expressed the view that the ban on trawling imposed during varying periods of monsoon since 1988 also might have had a beneficial effect on the fishery as this provided favourable conditions for spawning and recruitment of fish species during the peak period of these activities. The results of the present study also show very strong agreement with that of Yohannan *et. al.*, (1999).

Of the 4960 trawlers operated in Kerala during 2000-2001 more than 50% are based at Kollam followed by Ernakulam and Calicut with 31.25% and 11.29% respectively. About 4.03% of the trawlers are based at Malappuram district while the percentage representation in Kannur and Alappuzha district are very negligible. A

glance on the production statistics of the trawl nets registered during the last three decades showed wide fluctuations. In general there was steep decline in the total landings and CPUE during 1970 to 1988 in the total trawl landings (Scariah *et. al.*, 1999). From about 1 lakh tonnes caught during 1975-79, it lowered to 0.49 lakh tonnes during 1980-84 (Nair, 1989). However, the catches from bottom trawlers showed a steady increase since the implementation of trawl ban from 1988 to 2001 except in 1995 (Scariah *et. al.*, 1999). During this period, the highest landing of 3.17 lakh tonnes was registered in 1997 from bottom trawl nets. In the present study, the trawl nets contributed to 87% of the mechanised sector and this appeared to be the highest, which showed variation from 17.63% in 1983 to 47.65% in 1997 (Scariah *et. al.*, 1999). Monthly variation in landing and CPUE from trawl nets from 10 harbours also showed an increasing trend. This may be due to the cumulative effects of the introduction of larger trawlers for fishing, negotiation in to distant waters for operation of gears and the impact of imposition of ban on bottom trawling during monsoon since 1988. While examining the harbour wise bottom trawl landings of the state, Sakthikulangara harbour registered a two fold increase from 50000t in 1981 to 750863t in 2001 with a respective CPUE of 247kg to 746kg . Another noteworthy finding is the dominance of 40-50" OAL vessel class followed by 30-40" vessels in the bottom-trawling fishery of Kerala. Interestingly, vessels with more than 50" OAL were found equally represented along with smaller vessels thus making distant water fishing a reality. A depth wise apportioning of trawl landings also revealed that there is sharp increase in the landings from 40-60m and above 60 m and this would also unfold the magnitude of distant water fishing prevalent along the shelf waters of Kerala.

As per the Kerala Marine Fisheries Regulation Act (KMFRA, 1980). The fishing vessels fitted with mechanical propulsion were prohibited from fishing from the shore up to 30m line in the sea along the coast line of the state from Kollemkode to Paravoor-Pozhikkara having length of 78Km and the area up to 20 m line in the sea along the coastline from Paravoor-Pozhikkara to Manjeswaram having length of.512 km. On the contrary, the results of the present study revealed that 24.52% of the bottom trawl landing were accounted from 21-40m depth range while it was 5% from 0-20m depth. It was also observed that the trawlers along the coastal belt of Kerala were found to operate four seamed nets with varying mesh sizes for different species viz. 20-24 mm for fishes, 16-18 mm for prawns, 20mm for squids and cuttle fishes. In the case of anchovies an inner liner of 10mm mesh size is used to catch small specimens. 80% of the trawlers fished for *P.stylifera* and *M.dobsoni* employed 18mm diamond meshes for cod ends while in rest of the gears 20-24mm sized cod end meshes were observed. A mesh size of 35mm has been scientifically established as the optimum dimension for a prawn fishery dominated by the species *P.stylifera* and *M.dobsoni* (James, 1992). There appears to be the total violation of KMFRA (1980) which stipulates that bottom trawls having less than 35mm mesh size at the cod ends have been prohibited in the territorial waters. Incidence of night trawling were invariably reported from almost all regions in the coast in spite of the fact that trawl fishing is also prohibited during sunset to sunrise (KMFRA, 1980). Infringement of all these prohibitory orders is a common affair and . majority of the boats conduct night trawling during premonsoon and monsoon months ,in the inshore waters off 5-50m depth zone along the Quilon belt, from Kayamkulam to Alappuzha, where the shrimps are very abundant. This was evidenced by the highest CPUE recorded from these depth zones. The Government of Kerala

vide KMFRAct also banned the operation of fishing vessels of less than 43 feet beyond the territorial waters but most of the vessels having less than the above size were found operating at higher depths in order to exploit cephalopods and threadfin breams.

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