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BATHYMETRIC DISTRIBUTION OF THE MARINE PRAWN *METAPENAEUS DOBSONI* MIERS OFF COCHIN, KERALA

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ABSTRACT

Although *M. dobsoni* was recorded upto a maximum depth of 34 m, major part of the fishery occurred in the 6-15 m depth zone. An inverse relationship between abundance and depth was apparent, as revealed by the overall catch-rate of 2.20, 0.92 and 0.13 kg hr. at $\leq$10 m, 15m and $\geq$ 20m, respectively. The occurrence of higher proportion of larger specimens of both sexes was obvious from the overall mean-size of 69.2, 73.4 and 82.3 mm for males and 78.2, 87.3 and 94.6 mm for females recorded at the corresponding depths. The proportion of females in population also progressively increased with depth and about 90% of the overall individuals inhabiting $\geq$ 20m depths were females, of which about 80% were spawners. Immature females and relative proportion of males in population were more at 10m depths.

INTRODUCTION

MOST of the studies on resources and biology of penaeid prawns have been based on commercial catches of trawlers, which tend to operate at regions, where higher concentration of the more valuable species are available. Conclusions arrived therefrom are likely to be more biased, since each species has its intrinsic limits of distribution. The behaviour, movements and distribution of sexes, age-groups, etc. may also differ within the species. There is, therefore, need for a rational study on resources and biology of the species taking into account the area of their distribution. This paper illustrates the bathymetric aspects of population of the common Indian penaeid prawn *M. dobsoni*, based on a survey by the Research Vessel 'CADALMIN' off Cochin during 1978-80.

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MATERIAL AND METHODS

During the experimental cruises totalling 42 days one hour haul was made each at the predetermined depth zones, *viz.* 5-10 m, 15 m and 20-36m depths, off the new Light House situating near the barmouth of Cochin Backwater. After estimating the catch on deck, samples of this species were further analysed for sex, length and maturity stages of females. Mean and average values were appropriately calculated and pooled for each depth zone.

RESULTS

Specimens of this species were collected upto a maximum depth of 34 m, but major part of the fishery occurred between 6-15 m depths, the highest concentration being at 8-10 m and negligible quantities beyond 30 m

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depth. Although occasions of its absence in catches were recorded from all depths, the frequency of such days increased towards deeper grounds. A decreasing trend in catch against depth was further evident from the average monthly catch-rate (Table 1) which ranged between 0.25-5.00, 0.25-1.35 and 0.02-0.60 kg/hr, with an overall average of 2.20, 0.92 and 0.13 kg/hr at $\leqslant$ 10 m, 15 m and $>$ 20 m depths, respectively. However, shifting of fishery from the lower limits of distribution towards middle zone was noted for

TABLE 1. *Depthwise distribution of* M. dobsoni *off Cochin in different months (mean value of several observation days is given)*

Period	Depth ≤ 10 m Kg/hr	%	15 m Kg/hr	%	≥ 20 m Kg/hr	%
November '78 ..	1.03	79.2	0.25	19.2	0.02	1.5
December ..	4.40	72.7	1.05	17.4	0.60	9.9
January '79 ..	5.00	78.7	1.20	18.9	0.15	2.4
February ..	0.25	15.4	1.35	83.3	0.02	1.2
February '80 ..	1.05	44.9	1.25	53.4	0.04	1.7
March ..	0.65	42.8	0.85	55.9	0.02	1.3
May ..	3.05	84.7	0.50	13.9	0.05	1.4
Mean ..	2.20	67.7	0.92	28.3	0.13	4.0

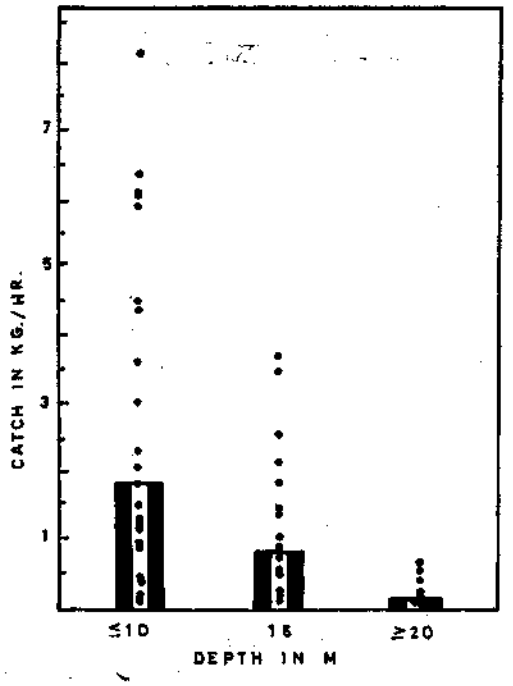

FIG. 1. Bathymetric distribution of catch-rate for *M. dobsoni* during observation days, with the mean given as bar.

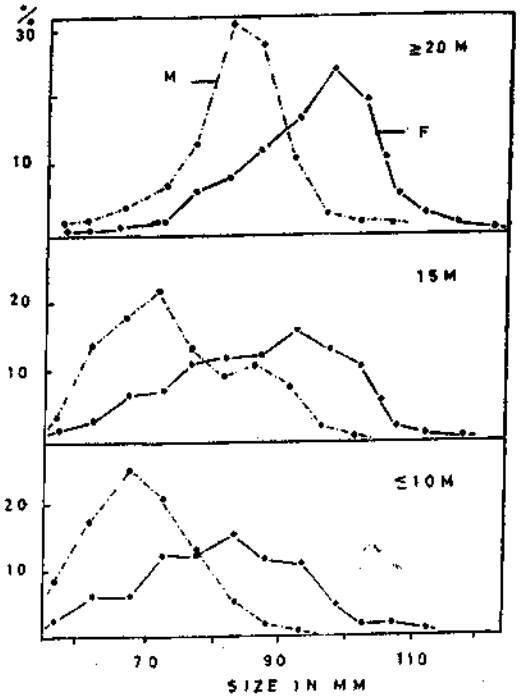

FIG. 2. Overall size distribution of *M. dobsoni* against depth.

a short period in February-March, when more than 50% of the population occurred at 15 m depth.

Though a wide range of size was present at all the depths, larger individuals were in increasing proportion concurrently for both sexes towards the deeper grounds. Thus, the modal-length (Fig. 2) increased gradually from 66-70 to 66-75 and 81-85 mm for males and 76-85 to 86-95 and 91-105 mm for females respectively at $\leqslant$ 10 m, 15 m and $\geqslant$ 20 m depths. Similar trend of increasing size with depth was also evident from mean-length for different days (Fig. 3) which ranged between 63.4-79.5, 66.5-82.5 and 68.5-91.0 mm, with the overall mean of 69.2, 73.4 and 82.3 mm for males and 63.6-89.7, 74.0-92.2 and 85.1-99.7 mm, with the mean at 78.2, 87.3 and 94.6 mm for females at the corresponding depth zones.

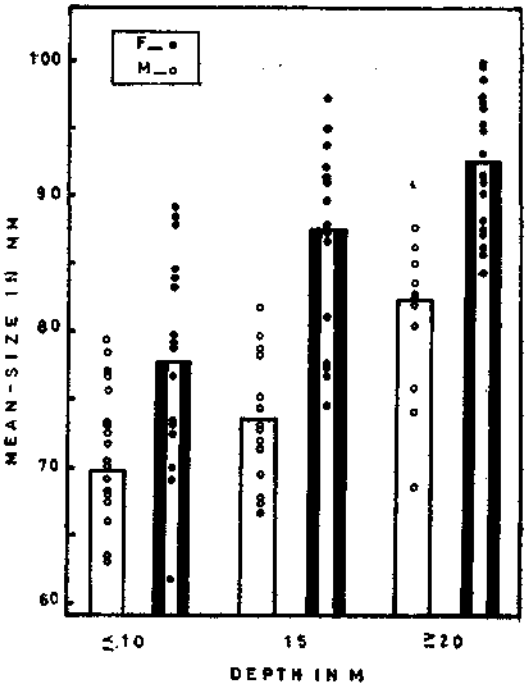

FIG. 3. The mean size of *M. dobsoni* against depth on observation days, with the overall mean given as bar.

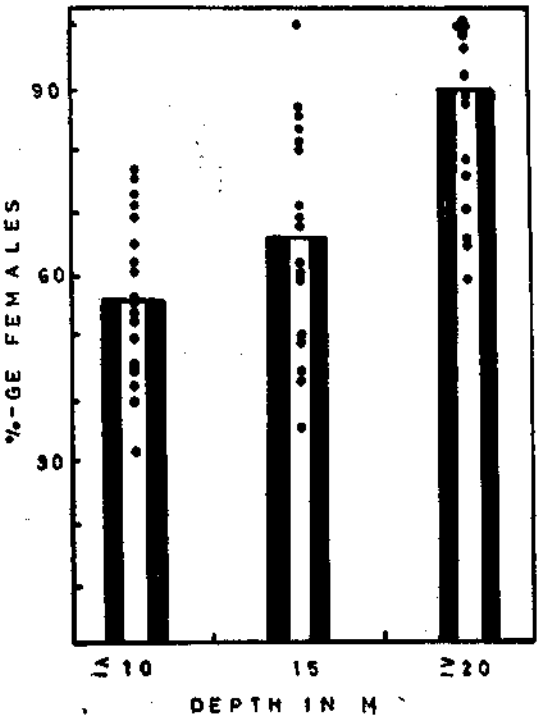

FIG. 4. Percentage female ratio of *M. dobsoni* against depth during the observation days, with the mean given as bar.

Females (Fig. 4) which accounted for 63.8% of the samples analysed from all depths, dominated the population in increasing proportion towards the deeper grounds. The ratio of females on individual days varied between 40.0-78 8, 42.3-100 and 53.8-100%, with the collective average of 51.2, 67.2 and 92.2% at $\leqslant$ 10 m, 15 m and $\geqslant$ 20 m depths, respectively. Males were represented in better proportions, in particular at shallow zones, during intensive recruitments of fresh stocks. Very often females only were noted in samples from $\geqslant$ 20 m depths coinciding with poor fishery.

Immature individuals, which formed 30.9% among females, decreased in strength towards deeper waters. The proportion of them for the individual days varied widely between (Fig. 5) 7.7-83.4, 7.0-41.7 and 0.0-30.1%, with

an overall average of 47.4, 17.7 and 4.5% at $\leqslant$ 10 m, 15 m and $\geqslant$ 20 m depths respectively. Immature females were relatively in better ratio than on other occasions during higher concentrations of fishery at the shallow grounds.

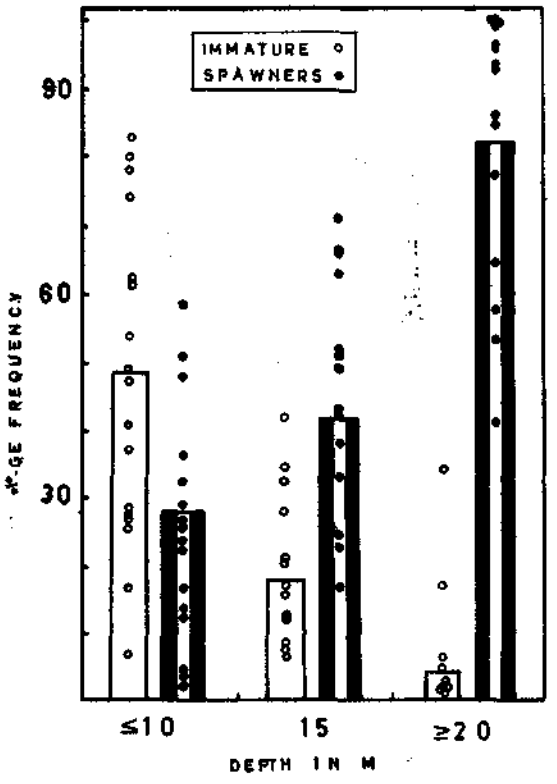

FIG. 5. Percentage ratio of immature and spawners among females of *M. dobsoni* against depth during the observation days, with the mean given as bar.

The proportion of spawners (Fig. 5), which included 'mature' and 'spent' females, contributing 39.0% among females from all depths, showed a positive relationship with depth. They accounted for 11.1-57.6, 16.1-71.4 and 42.4-100% with the collective average of 27.4, 49.9 and 81.9% at $\leqslant$ 10 m, 15 m and $\geqslant$ 20 m depths respectively. On several occasions spawners only were collected from the deeper zones, particularly at the time of lean fishery.

DISCUSSION

The observation, that bulk of the population of *M. dobsoni* remained at $\leqslant$ 10 m depths, while part of them, discriminatively the aged and spawners, dispersing gradually towards deeper grounds upto a maximum depth of 34 m, suggets an intrinsic limit of bathymetric distribution and also the selective movements of different categories of individuals within the range of depths. Higher concentration of this species had been earlier reported by George *et al.*, (1967) at 12-15 m depths, which agrees with the present observation during the short period in February-March. Such a seasonal bathymetric shifting of fishery of this species was also indicated by George *et al.*, (1968) that bulk of the population dwelled closer to the shore during monsoon and moved deeper after the rainy seasons along the southwest coast. It is further stated by Grant and Griffin (1979) that core of the penaeid population remained in 1-19 m, while about 1.0% of them moved daily to the deeper 20-90 m depths. Since salinity is more stable and similar in between the depth zones except during monsoon periods, temperature may be assumed the main barrier for farther movements of this species deep into the sea. This is upheld by Laevastu and Hyes (1981), who state, 'Cold-blooded animals have the ability to perceive and select a limited thermal range, in which they tend to congregate, and this is usually the opportunity for maximum expression of activity and is ultimately manifested in their abundance and distribution'.

Selective movements of larger individuals, particularly the famales in advanced maturity and spent conditions, suggest spawning migrations towards deeper grounds. Tuma (1976) had indirectly corroborated this view stating that about 17% of the inseminated females of *Penaeus merguiensis* remained at 1-7 fm, as against 73% of them in 8-10 fm. In addition to spawning habits, sensitivity to temperature and availability of food were also attributed

for offshore movements of prawns by Anderson (1956). Boddeke (1976) and Laevastu and Hyes (1981) were of the opinion that larger and sexually mature female prawns were more sensitive to higher temperature near the shore and hence moved towards the colder boundaries in deeper waters. However, selective movements of the spawners away from the core population, which is intensively fished, support better survival of the stock.

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