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Influence of Lunar Periodicity on the Size Composition and Abundance of Penaeid Prawns in Stake Net

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Data on length frequency of penaeid prawns landed by stake nets during lunar periods were analysed to assess variations in size composition and seasonal abundance. The full moon phase had lower size range compared to new moon phase and except in the case of *P. indicus*, the variation in catch between the two periods was not significant. In the case of *M. dobsoni* and *M. monoceros*, significant variation at 1% level was noticed between months.

Key words: Stake net, penaeid prawns, size composition, lunar influence.

Stake net is one of the major gear in use along the back waters of Kerala. Ghosh (1991) reported the existence of 17724 stake nets in this region. Total landings by these nets during the reported period was 17135 t of penaeid prawns (Suseelan & Rajan, 1991). Many investigators have indicated that lunar periodicity has got some influence on the availability of penaeid prawns. Recek (1959) reported better catch of penaeid prawns before full moon. According to Menon & Raman (1961) higher catch of penaeid prawns was obtained during new and full moon days. Ingle *et al.* (1959) and Balasubramanyam (1965) observed that catch was poor during full moon days. According to Kurian & Sebastian (1976) filtering of large volume of water during new moon and full moon days due to strong tidal current resulted in better catch. Endorsing this observation, Garcia & Le Reste (1981) stated that the catch depended on the volume of water filtered per unit of fishing time. It also appears that pattern of rain fall influences availability of prawns (Menon & Raman, 1961).

In this investigation an attempt is made to correlate the size composition and abundance of penaeid prawn landed by stake nets around the Cochin region with the lunar phases and intensity of rainfall.

Materials and Methods

The samples were collected from stake nets operated at Perumpadapu, Cochin, having 10 mm mesh in the cod end. Random samples were taken during the days following full moon and new moon. Length frequency measurement of *Penaeus indicus, Metapenaeus monoceros* and *Metapenaeus dobsoni* were recorded and analysed statistically by calculating the mean (*x*), standard deviation (*~*) the quartiles at Q1, Q2 and Q3, the coefficient of variation (cv%) and Bowley's coefficient of skewness (sk) for length frequency distribution. Analysis of variance technique was employed to compare day to day variation in the catch. The rain fall data for the period from July 1992 to June 1993 were used to find out the correlation with the landings.

Results and Discussion

The results of analysis of the data on length frequency are presented in Table 1 and 2. The size range was low during full moon phase and progressive increase or decrease in size was not evident following full/new moon days. While *M. dobsoni* showed heterogenous character, *M. monoceros* maintained homogenous nature. *P. indicus* was heterogenous during full moon period and homogenous during the other phase.

The value of coefficient of skewness indicated that the population of *M. dobsoni* was larger than median length but in the case of *M. monoceros*, the individuals were found to be smaller than the median length. The difference in mean size during the two phases of moon may be due to the fact that prawns of different species and size groups

Table 1. Length frequency of penaeid prawns from stake nets during the fortnight after new moon

M. dobsoni								*M. monoceros*								*P. indicus*							
SK	Days	*-*	*-*	Q1	Q2	Q3	CV%	SK	Days	*-*	*-*	Q1	Q2	Q3	CV%	SK	Days	*-*	*-*	Q1	Q2	Q3	CV%
0.08	NM	5.50	0.62	5.08	5.47	5.93	11.27	-0.04	NM	8.63	0.72	8.09	8.61	9.04	8.34	-0.08	NM	11.04	0.95	10.28	11.03	11.67	8.61
-0.02	I	5.53	0.58	5.03	5.48	5.91	10.49	-0.80	I	8.63	0.70	8.08	8.62	9.01	8.11	-0.12	I	10.07	1.98	8.75	10.53	11.48	10.66
+0.12	II	5.46	0.70	5.08	5.46	5.94	12.82	-0.06	II	8.62	0.83	8.01	8.62	9.16	9.63	-0.12	II	10.15	1.48	8.85	10.27	11.38	14.58
0.78	III	5.47	0.61	5.07	5.16	5.90	11.15	-0.09	III	8.42	0.79	7.88	8.45	8092	9.38	-0.24	III	10.39	1.59	9.35	10.12	11.38	15.30
0.60	IV	5.51	0.64	5.10	5.27	5.94	11.62	-0.07	IV	8.49	0.70	7.98	8.51	8.97	8.24	-0.95	IV	10.29	1.33	9.52	9.57	11.09	7.74
0.32	V	5.55	0.65	5.28	5.52	5.99	11.71	-0.04	V	8.46	0.99	7.88	8.52	9.11	11.70	0.18	V	10.60	1.14	9.76	10.43	11.40	10.75
-0.16	VI	5.73	0.69	5.28	5.78	6.14	12.04	-0.12	VI	8.59	0.65	8.12	8.60	8.98	7.57	-0.86	VI	10.24	0.88	9.58	10.26	10.31	8.59
0.63	VII	5.51	0.78	5.04	5.48	6.00	14.16	-0.15	VII	8.56	0.7	8.10	8.63	9.02	8.18	-0.12	VII	10.46	1.02	9.75	10.49	11.07	9.78
-0.13	VIII	5.23	0.65	4.79	5.22	5.57	12.43	-0.09	VIII	8.65	0.53	8.29	8.67	8.99	6.13	-0.10	VIII	9.43	1.01	8.75	9.48	10.08	10.71
-0.14	IX	5.17	0.61	4.74	5.18	5.51	11.80	0.06	IX	8.25	0.62	7.88	8.28	8.73	7.52		IX to XIV Stray catch						
	X to XII No catch								X to XII No catch														
0.56	XIII	5.73	0.42	5.06	5.31	6.20	7.33	-0.05	XIII	8.00	0.49	7.16	8.00	8.35	6.13								
-0.10	XIV	5.67	0.57	5.24	5.68	6.04	10.05		XIV Stray catch														

Table 2. Length frequency of penaeid prawns from stake nets during the fortnight after full moon

M. dobsoni								*M. monoceros*								*P. indicus*							
SK	Days	*-*	*-*	Q1	Q2	Q3	CV%	SK	Days	*-*	*-*	Q1	Q2	Q3	CV%	SK	Days	*-*	*-*	Q1	Q2	Q3	CV%
-2.85	FM	5.74	0.78	4.97	5.76	5.38	14.26	-0.23	FM	8.55	0.77	8.05	8.64	9.01	9.01	0.02	FM	10.49	1.12	9.68	11.50	11.36	10.08
0.01	I	5.36	0.56	5.04	5.41	5.75	10.45	0.01	I	8.37	0.70	7.83	8.37	8.92	8.36	0.32	I	11.40	0.89	10.63	11.63	12.10	7.81
0.15	II	5.42	0.59	5.10	5.39	5.78	10.89	0.14	II	8.39	0.77	7.85	8.29	8.87	9.18		II	Scanty					
0.09	III	5.45	0.57	5.15	5.51	5.94	10.46	-0.06	III	8.58	0.90	7.95	8.61	9.20	10.49		II	No catch					
0.00	IV	5.55	0.55	5.18	5.56	5.94	9.91	-0.02	IV	8.61	0.84	7.97	8.61	9.23	10.92	-0.33	IV	11.00	1.29	10.20	11.40	12.00	11.73
0.06	V	5.33	0.78	4.90	5.35	5.86	14.63	-0.02	V	8.89	0.84	8.20	8.89	9.55	9.45	-0.26	V	1.00	0.79	10.33	11.13	11.60	7.83
0.10	VI	5.51	0.57	5.16	5.49	5.92	10.34	-0.10	VI	9.11	0.81	8.23	8.92	9.49	8.89	0.10	VI	11.72	0.91	11.12	11.72	12.45	7.76
0.14	VII	5.47	0.67	5.19	5.50	5.91	12.25	-0.05	VII	8.74	0.94	8.05	8.75	9.38	10.75		VII	Scanty					
-0.11	VIII	5.70	0.80	5.16	5.76	6.24	14.04	0.17	VIII	8.54	0.78	7.96	8.46	9.07	9.13		VIII to XI No catch						
	IX to X No catch								IX to X No catch							0.16	XII	10.70	1.05	9.88	10.52	11.40	9.81
-0.09	XI	5.78	0.39	5.50	5.79	6.03	6.75	-0.04	XI	8.42	0.49	8.03	8.44	8.82	5.82		XIII	Scanty					
-0.28	XII	5.46	0.71	4.86	5.60	6.02	13.00	0.21	XII	8.36	0.58	7.93	8.24	8.71	11.96	0.12	XIV	10.16	0.8	9.60	10.05	10.62	7.87
-0.06	XIII	5.67	0.62	5.22	5.69	6.07	10.93	0.00	XIII	8.72	0.51	8.45	8.75	9.05	5.85								
-0.11	XIV	5.51	0.64	5.04	5.39	5.83	11.62	-0.14	XIV	8.56	0.59	8.13	8.56	8.94	6.89								

Table 3. ANOVA of stake net catch during full moon and new moon periods

Full moon to 14 days

M. Monoceros					*P. indicus*					*M. dobsoni*				
Source	SS	df	ms	F	Source	SS	df	ms	F	Source	SS	df	ms	F
Total	3.3465	52			Total	2.2406	25			Total	14.0711	52		
Days	0.7047	12	0.0587	0.89	Days	1.5951	7	0.2279	63.5*	Days	5.0375	12	0.4198	1.86 (NS)
Error	2.6418	40	0.0660		Error	0.6455	18	0.0359		Error	9.0359	40	0.2258	

New moon to 14 days

Source	SS	df	ms	F	Source	SS	df	ms	F	Source	SS	df	ms	F
Total	8.2478	73			Total	3.2123	44			Total	20.4770	74		
Days	2.0583	11	0.1871	1.87 (NS)	Days	0.9300	11	0.0845	1.22 (NS)	Days	4.0848	10	0.4085	1.50 (NS)
Error	6.1895	62	0.0998		Error	2.2823	33	0.0692		Error	16.3922	64	0.2561	

behave differently and that the catch in stake nets is dependent on favourable environmental conditions. George (1969) observed that the mode and time of operation influenced the catch. The observations of Garcia & Le Reste (1981) on lunar influence were inconsistent. Roessler *et al.* (1969) noted an increase of larval abundance in moonless nights.

The ANOVA of catches from full moon to 14 days (Table 3) showed significance ($P<0.05$) in the case of *P. indicus* only, but from new moon to 14 days did not show significance at 5% level. Earlier studies by Menon & Raman (1961) could not establish any variation in catch between two phases but positive correlation between catch and darker night was observed by Balasubramanyam (1965).

The length frequency data for different months (Table 4) showed that the minimum mean length for *M. dobsoni* and *M. monoceros* was observed in March and for *P. indicus*, in May. The maximum length for *P. indicus* and *M. monoceros* was

Table 4. Length frequency of penaeid prawns from stake nets in different months

		M. dobsoni						*M. monoceros*						*P. indicus*						
SK	Month	*-*	*~*	Q1	Q2	Q3	CV%	SK	*-*	*~*	Q1	Q2	Q3	CV%	SK	*-*	*~*	Q1	Q2	Q3	CV%
0.07	Jul	5.54	0.50	5.16	5.56	6.02	13.54	-0.02	8.48	0.71	8.02	8.61	9.00	8.37	0.12	10.73	1.09	9.80	10.39	11.26	10.16
0.08	Aug	5.43	1.03	4.84	5.45	6.16	18.97	-0.21	8.46	0.69	8.01	8.64	9.05	8.16	0.09	10.11	0.63	9.64	10.07	10.59	6.23
0.07	Sep	5.64	0.62	5.22	5.68	6.08	10.99	-0.22	9.10	0.80	8.60	9.12	9.62	8.79	0.11	11.63	0.85	11.10	11.58	12.18	7.31
0.08	Oct	5.67	0.52	5.27	5.62	6.03	9.17	0.06	8.78	0.68	8.35	8.76	9.22	7.74							
0.11	Nov	5.68	0.59	5.25	5.62	6.08	10.39	-0.64	8.35	0.73	7.81	8.68	8.87	8.74							
0.09	Dec	5.49	0.58	5.09	5.44	5.86	10.56	-0.94	8.85	0.70	8.37	8.84	9.24	7.91							
0.03	Jan	5.54	0.47	5.20	5.54	5.90	8.48	0.07	8.26	0.95	7.74	8.30	8.94	11.50							
0.16	Feb	5.31	0.42	5.13	5.31	5.56	7.91	-0.06	8.02	0.60	7.61	8.03	8.40	7.48	-0.13	11.54	0.74	10.83	11.58	12.16	6.41
0.09	Mar	4.97	0.42	4.34	4.97	5.72	8.45	-0.01	8.01	0.75	7.45	8.00	8.54	9.36	-0.22	11.25	0.95	10.40	11.35	11.96	8.44
0.06	Apr	5.40	0.43	5.11	5.41	5.75	7.96	-0.04	8.16	0.82	7.78	8.24	8.74	6.42	-0.10	11.32	0.81	10.79	11.44	11.97	7.16
-0.08	May	5.14	0.49	4.76	5.16	5.50	9.53	-0.18	8.57	0.55	8.31	8.62	8.96	10.05	-0.10	10.05	1.15	9.15	9.89	10.62	11.44
-0.10	Jun	5.73	0.60	5.30	5.75	6.12	10.47	0.02	8.50	0.62	8.02	8.44	8.88	7.29	-0.12	9.80	1.15	9.04	9.90	10.57	11.75

Table 5. Monthly variation in the catch of 3 species of penaeid prawns

Month	*M. dobsoni*	*M. monoceros*	*P. indicus*
July	0.8552	0.5664	0.3428
August	1.0750	1.8044	0.1465
September	5.0525	2.4796	0.0890
October	1.6069	3.3047	0.0969
November	5.8683	1.9857	-
December	0.7143	0.3705	-
January	1.1908	0.5456	0.0414
February	1.1763	1.0633	0.0092
March	0.9868	1.0936	0.0569
April	0.5590	0.1389	0.1817
May	1.7074	0.3404	0.2040
June	1.2996	0.4014	0.3486

Source	SS	df	ms	F
Total	30.8168	123		
Months	14.4703	11	1.3155	9.01**
Error	16.3465	112	0.1460	

Source	SS	df	ms	F
Total	9.5196	121		
Months	2.7290	11	0.2481	4.01**
Error	6.7906	110	0.0617	

Source	SS	df	ms	F
Total	6.2595	80		
Months	1.3409	11	0.1219	1.71*
Error	4.9186	69	0.0713	

recorded in September and for *M. dobsoni*, in November. The population of *M. dobsoni* was heterogenous whereas the other two were homogenous in nature. Length of *M. dobsoni* during most of the time was greater than median length, while a negative trend was observed in the case of the other two species.

The heterogenity of *M. dobsoni* can be attributed to the continuous recruitment of the stock resulting in significant variation in the size structure. Mohammed and Rao (1971) observed that progression in the length curve was difficult due to continuous emigration and immigration of under sized individuals. In the case of *P. indicus*, variation in size structure was not pronounced, as this species appear after attaining certain size and hence were homogenous.

The predominant size groups of *M. dobsoni*, *M. monoceros* and *P. indicus* ranged between 5.0 to 6.2 cm. 7.7 to 9.6 cm and 9.6 to 11.7 cm respectively, contributing 70.1%, 81.5% and 59.6% of the total annual landings. Regarding the quantity of catch landed in different months (Table 5), significant difference (1% level) was noticed in respect of *M. dobsoni* and *M. monoceros*. *M. dobsoni*, the major contributor to the total landings,

Table 6. Species wise average catch per day in different months with reference to rain fall

Month	Rain fall in mm	Catch in kg		
		M. dobsoni	*M. monoceros*	*P. indicus*
July	899.0	0.8552	0.5664	0.3428
August	406.0	1.0750	1.8044	0.1465
September	455.0	5.0525	2.4796	0.0890
October	309.0	1.6058	3.3034	0.0969
November	174.0	5.8683	1.9857	-
December	110.0	0.7143	0.3705	-
January	-	1.1908	0.5456	0.0414
February	60.0	1.1763	1.0633	0.0092
March	9.0	0.9868	1.0936	0.0569
April	114.0	0.5590	0.3404	0.1817
May	198.0	1.7074	0.3404	0.2040
June	843.0	1.2996	0.4014	0.3486

was abundant during September, November and May, whereas the landings of *M. monoceros* was high during August to November.

The modal length of all the species studied was less than the size attained at first maturity. George (1969) reported the size at the first maturity as 6.4 cm for *M. dobsoni*. Mohammed (1969) observed that the length of more than 80% of the prawn was below 10.0 cm and the modal size group was between 8.1 to 9.0 cm in the case of *P. indicus*. The present observation is more or less in agreement with the above.

The percentage of young ones landed by the stake net was worked out as 88.3, 94.7 and 82.7 respectively for *M. dobsoni*, *M. monoceros* and *P. indicus* (Fig. 1). The large scale capture of under sized prawns could be prevented by using large mesh cod ends. George *et al.* (1974) stated that enhancement of mesh size had no adverse effect on fishery economics.

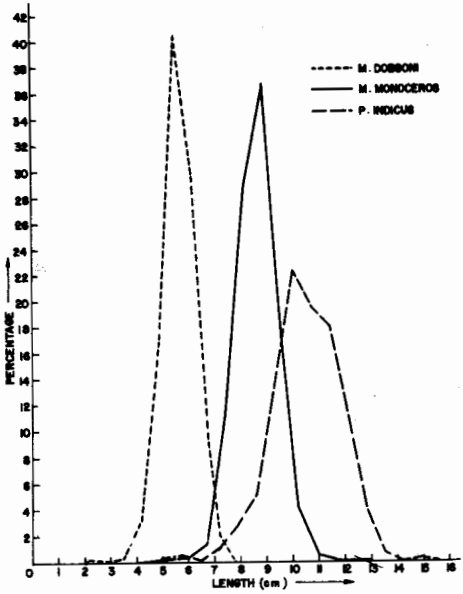

Fig 1. Size Frequency Distribution

Table 6 provides the monthly rain fall data and the catch for the corresponding months. Any correlation between rain fall and landing could not be established, especially in the case of *M. dobsoni*, the major constituent in the stake net catch. A direct correlation between rain fall and catch was observed in the case of *P. indicus* only. Mohammed (1969) stated that the seaward migration of *P. indicus* was a slow process and individuals were carried by large influx of rain water.

The results of the present study indicate that the influence of lunar phases on the catch by stake nets was observed only in the case of *P. indicus* and that too, during the new moon period. Significant difference between months on catch was observed in the case of *M. dobsoni* and *M. monoceros*.

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