

## Effect of lunar periodicity on the abundance of crabs from the Goa coast

Anil Chatterji, Z A. Ansari, B S Ingole, R A Sreepada, A Kanti & A H Parulekar  
National Institute of Oceanography, Dona Paula, Goa 403 004, India

Received 21 September 1993; revised 4 July 1994

Lunar periodicity showed a significant influence on the occurrence of edible crabs (*Portunus pelagicus*, *Charybdis cruciata* and *Portunus sanguinolentus*). High density of these crabs was recorded in the trawl catches during full moon and new moon. There was a strong seasonality in the occurrence of individual species. Total body weight revealed significant differences and higher values were recorded during new moon and full moon whereas, low values during intermediate phase. Similarly percentage of moisture and protein was higher during new moon and full moon and lower during intermediate phase, with the exception of *Portunus sanguinolentus*.

Lunar periodicity plays an important role in the occurrence of crustaceans. Several attempts have been made to study the fluctuations in the catches of prawns and other demersal fishes in relation to lunar periodicity but very little information is available on the influence of lunar cycle in controlling the physiological and biological aspects of the economically important crabs. It has been observed that the rain fall and tidal currents are the most important factors which influence prawn catches in Cochin backwaters<sup>2</sup>. The fluctuation in the prawn landings in relation to lunar cycle in the Godavery estuary system and Chilka Lake are reported<sup>3-6</sup>.

*Portunus pelagicus*, *Charybdis cruciata* and *Portunus sanguinolentus* are commercially important crabs and constitute a minor but regular fishery along the Goa coast<sup>7</sup>. The present communication deals with the effect of lunar periodicity on the abundance, body weight, meat content, moisture and protein of swimming crabs along the Goa coast.

The samples were collected during November 1988 to October 1989 off Goa coast (lat. 15°28'N; long. 73°47'N). A trawl net (mouth area 12.5 × 2.5 m and cod end mesh size of 30 mm) was towed just above the seafloor in the depth range 15-35 m for 1 h at uniform speed of 1 knot for collecting samples. The length, width and weight of each specimen were recorded. A total of 299 specimens of *P. pelagicus* (ranging 9.9-12.1 cm in length and 4.6-5.5 cm in width) 208 specimens of *Charybdis cruciata* (3.9-5.1 cm in length; 2.4-4 cm in width) and 189 specimens of *P. sanguinolentus* (7.2-7.4 cm in length; 3.2-4.3 cm in width) were collected during new moon, full moon and periods between the two moon phases (intermediate). Dry weight of each crab was calculated after

drying the crab for 48 h at 80°C. Moisture and protein contents were estimated following the method of Parsons *et al.*<sup>8</sup>.

Abundance of crab (Fig. 1) was maximum during full moon phase ( $\bar{X} = 25 \pm 14$ ) and minimum in intermediate phase ( $\bar{X} = 15 \pm 18$ ). Mean density in crab population during new moon phase was  $23 \pm 14$ . Mean abundance showed seasonal fluctuation with highly significant variations (ANOVA;  $P < 0.001$ ). There was a spatial variation in the overall catches and the maximum abundance of berried females of the three species was during the premonsoon (February-May).

The wet weight of the crab was relatively high in new moon phase and low in intermediate phase (Table 1). Correlation between the season and wet weight in all species was highly significant ( $P < 0.001$ ). Similarly, moisture content was high during new moon phase ( $P < 0.001$ ) in all species. The protein content in the meat (Table 1) was comparatively low in intermediate phase ( $P < 0.05$ ) and high during full moon

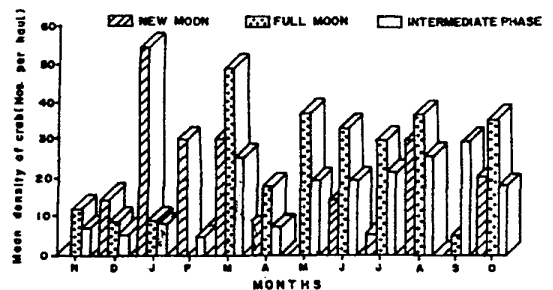


Fig. 1—Seasonality in the occurrence of three species of the crab

Table 1—Variations in mean length, mean width, wet weight, percentage of moisture and protein in relation to lunar periodicity

Phase	Mean length (cm)	Mean width (cm)	Wet wt (g)	Moisture (%)	Protein (%)
<i>P. pelagicus</i>					
New Moon	12.1±2.2	5.0±0.3	73.9±46.7	73.5±8.4	10.0±4.8
Full Moon	9.7±2.4	4.6±1.4	49.0±28.2	53.5±16.0	15.7±3.5
*Inter	11.8±2.3	5.5±0.9	40.4±0.5	63.8±29.0	10.1±4.0
<i>C. cruciata</i>					
New Moon	3.9±1.9	2.4±0.2	34.3±1.9	94.5±0	8.5±3.0
Full Moon	5.1±1.4	4.0±0.5	25.9±0	66.5±15.4	10.2±0
*Inter	5.1±0.3	3.3±0.2	12.9±1.3	43.7±14.4	7.2±5.9
<i>P. sanguinolentus</i>					
New Moon	7.2±1.1	3.2±0.3	41.2±0	79.5±1.0	10.9±0
Full Moon	9.2±1.0	4.3±0.4	40.3±0.3	60.5±0	10.6±0.2
*Inter	7.4±2.3	4.2±1.1	29.6±15.0	56.2±16.8	3.4±1.1

\*Intermediate phase

phase ( $P < 0.001$ ) with the exception of *P. sanguinolentus* (Table 1).

The effect of lunar and tidal rhythms on the intertidal and subtidal organisms was reported<sup>9</sup>. Crustaceans showed a definite pattern in occurrence, locomotion, feeding and reproductive behaviour in relation to tide<sup>10-13</sup>. *Carcinus* spp exhibited lunar and tidal periodicities under semi-diurnal tides and often reverted to circadian activity patterns in areas with little or no tidal influence<sup>14</sup>. The abundance of crustaceans was high during new moon phase<sup>5,6,15</sup>. Similarly, in the present study, highest population density was recorded during new moon phase for all species. Subramanyam<sup>5,6</sup> reported high landings of prawn during new moon phase. Similarly, higher catches were reported during new moon tide in the Palk Bay and Gulf of Mannar, on the southeast coast of India<sup>1</sup>.

It is difficult to identify and quantify the true causes of fluctuation in different lunar phases without long term fishery independent data. There is no information available to show the correlation between lunar cycles and condition of the crab. It is generally believed that the weight of the crab increases during new moon phase and decreases considerably during

full moon and intermediate phases. This study also shows the same pattern wherein the wet weight is higher in new moon phase in the three species.

The authors are grateful to the Department of Science, Technology and Environment, Govt of Goa for financial assistance.

## References

- 1 Hamsa Ameer K M S, *Indian J Fish*, 25 (1978) 165.
- 2 Menon M K & Raman K, *Indian J Fish*, 8 (1961) 1.
- 3 Subramanyam M, *Proc Indo-Pacific Fish Coun*, 11(II), Kuala Lumpur (FAO), 1964, 44.
- 4 Subramanyam M, *Fish Techn*, 2 (1965) 26.
- 5 Subramanyam M, *Proc Indo-Pacific Fish Coun*, 19(II), Honolulu (FAO), 1966, 1.
- 6 Subramanyam M, *J Mar Biol Ass India*, 9 (1967) 111.
- 7 Ansari Z A & Harkantra S N, *Seafood Export J*, 7 (1975) 1.
- 8 Parson T R, Maita T & Lalli C W, *A manual of chemical and biological methods for seawater analysis* (Pergamon Press, New York), 1984, 107.
- 9 Rudloe A, *Bull Mar Sci*, 36 (1985) 395.
- 10 Enright J T, *Z Verlg Physiol*, 46 (1963) 276.
- 11 Barnwell F H, *Am Zool*, 8 (1968) 569.
- 12 Saigusa M & Hidaka T, *Oecologia*, 37 (1978) 103.
- 13 Greensapn B N, *Anim Beh*, 30 (1982) 1084.
- 14 Naylor E, *J Exp Biol*, 37 (1960) 481.
- 15 Lipcius R N & Engel W A V, *Bull Mar Sci*, 46 (1990) 180.