Length-weight relationship of the Indian horseshoe crab
*Tachypleus gigas* (Muller)

ANI W CHATTERJI, J K MISHRA, R VIJAYAKUMAR and A H PARULEKAR

National Institute of Oceanography, Dona Paula, Goa 403 004

The length-weight relationship, besides providing a mathematical relationship, also yields information on the general well-being, variation in growth with sex, size at first maturity, gonad development and breeding season.

*Tachypleus gigas* (Muller) is one of the four species of the horseshoe crab found along the north-east coast of India with a high concentration off Balramgari (21°27'N; 87°04'E). The study was undertaken to know the length-weight relationship of breeding pairs of *T. gigas*.

The samples for this study comprised only the specimens which migrated towards shore for breeding during full and new moon phases. Total 43.5 specimens of the horseshoe crab (*T. gigas*) of both the sexes (215 males of 102-130 mm and 220 females of 98-246 mm size) were collected during November 1988 to December 1989 from the breeding beach of Balramgari (21°27'N; 87°04'E). The carapace length of each individual was recorded to the nearest mm and the body weight was measured up to 0.1 g. The specimens were grouped sexwise and then divided into eight different size groups of 10 mm each between the length 90 and 180 mm. The relationship between carapace length and body weight was estimated by the least square method of LeCren (1958). The regression equation Log *W* = *a* + *b* log *L* was calculated separately for both the sexes.

The average size of females was always higher than that of males. An exponential relationship was observed in both the sexes when the value of body weight was plotted against the value of carapace length (Fig. 1a). On logarithmic transformation, a linear relationship was observed (Fig. 1b). The regression equation estimated for this relationship is expressed as:

- **Males**: Log *W* = -3.291 + 2.545 Log *L* (r = 0.853)
- **Females**: Log *W* = -4.050 + 2.904 Log *L* (r = 0.978)

The W and L are the body weight and carapace length of the crab, respectively.

The value of *b* was higher in female (2.904) than in males (2.545) and ranged from 1.819 to 3.276 in males and 2.602 to 3.205 in females at 95% confidence interval. The analysis of covariance showed no significant difference in the elevation of regression between the two sexes and the values of 5 were significant at 5% level in both the sexes (Table 1).

The size of female (98-246 mm) in *T. gigas* is always bigger than males (Sekiguchi *et al.* 1976). In this study the size range of females was 101-130 mm with maximum percentage of size group 111 to 120 mm. Surprisingly, the males above 130 mm were not found in the samples. The possibility of sex reversal in males above 130 mm size, if any, could not be ascertained. However, information on this particular aspect on any other species of the horseshoe crab is not available and deserves a detailed investigation.

The weight of the crab increased more than the square of the length in both the sexes.
CeHerji et al. (1988) found that in Carcinoscoptus, the weight of the crab was more than the square of the carapace length (b = 3.893) whereas, in males (b = 2.206) it was more than the square of the carapace length. The present study also showed that male specimens were heavier than females at smaller sizes whereas females were heavier than males at larger sizes. As such, the length-weight curve of male was above the length-weight curve of female up to the length of 130 mm and thereafter beneath it. In some other aquatic organisms, the point of intersection has been considered as the range of size between which organisms attain sexual maturity (Chatterji et al. 1977, Chatterjee and Ansari 1985). In C. rotundicauda, both male and female curves intersected between the carapace length of 130 and 135 mm which indicated the length at which the crab attained sexual maturity (Chatterji et al. 1988). In this study, however, due to non-availability of the immature specimens in considerable number, it could not be confirmed whether the point of intersection of the two curves represented the size of attainment of sexual maturity in T. gigas.

![Graph](Fig 1. Carapace length and body weight relationship of T. gigas: (a) Parabolic relationship, (b) linear relationship.)

Table I. Statistics of regression of log weight on log length of T. gigas

<table>
<thead>
<tr>
<th>Source</th>
<th>Regression coefficient b</th>
<th>Residual df</th>
<th>Correlation coefficient r</th>
<th>Observed T</th>
<th>5%t Significance</th>
<th>95% Confidence limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2.545</td>
<td>0.834</td>
<td>170</td>
<td>0.853</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>2.904</td>
<td>0.059</td>
<td>165</td>
<td>0.978</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

df = Degrees of Freedom. S = Significant

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REFERENCES


