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# Length-weight relationship in two marine portunid crabs, *Portunus (Portunus) sanguinolentus* (Herbst) and *Portunus (Portunus) pelagicus* (Linnaeus) from the Karnataka coast

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The carapace width/carapace length-body weight relationship in two marine Portunid crabs, *Portunus (portunus) sanguinolentus* and *Portunus (Portunus) pelagicus* from Karnataka waters was studied. In *P.(P.) sanguinolentus*, the relationships between carapace width/ carapace length and body weight were $W=0.0000511\ L^{3.02612}$ and $W=0.0005552\ L^{3.07468}$ for juveniles, $W=0.0000362\ L^{3.09969}$ and $W= 0.0003974\ L^{3.17157}$ for adult males and $W= 0.0000658\ L^{2.96044}$ and $W=0.0008287\ L^{2.95317}$ for adult females. In *P. (P.) pelagicus*, the relationships were $W=0.00009\ L^{2.87333}$ and $W=0.0004709\ L^{3.10602}$ for juveniles, $W=0.0000032\ L^{3.61676}$ and $W =0.0003521\ L^{3.178655}$ for adult males and $W= 0.0000163\ L^{3.25274}$ and $W =0.0008874\ L^{2.93117}$ for adult females. Analysis of covariance of carapace width-weight data in these crabs suggested that between the regression equations in males and females no significant difference ($P$ <0.05) was observed in the former species, whereas, significant difference ($P$ <0.05) was observed between the slopes in the latter species. The present results indicated that males are heavier than females at any given length in these crabs.

*Portunus (Portunus) sanguinolentus* and *P.(P.) pelagicus* support fishery of considerable value all along the Indian coast and together contribute up to 90 % of the crab landings. In the context of increased importance of crab resources and interest evinced in culture, there is an urgent need to study the biology and related aspects. In the present account, the width-weight and length-weight relationships in *Portunus (Portunus) sanguinolentus* and *P.(P.) pelagicus* from the Karnataka coast is reported since similar studies in brachyurans are limited[1-10].

## Materials and Methods

About 579 crabs, comprising 267 numbers of *P. (P.) sanguinolentus* and 312 numbers of *P. (P.) pelagicus*, collected from the commercial trawl landings at Mangalore and Malpe during 1992-94 were analysed for studying the length-weight relationship. Crabs in the intermoult stage with all appendages intact were only considered for the study since crabs in premoult and postmoult stages showed marked variation in weight. All material was analysed in the fresh condition.

The crabs were washed thoroughly to remove all mud, sand and epizoic forms. Individual width [carapace width (CW) between tips of the largest lateral spines across the body] and length [carapace length along the middle line between the frontal notch and posterior margin)] were measured using a vernier caliper and the individual weight was recorded (accuracy of 0.001 g) after removing all adhering water from the body using a blotting paper. Males and females measuring 80 mm CW and above were classified as adults since crabs below this size were juveniles.

The length-weight and width-weight relationships were determined separately for juveniles, adult males and adult females in *P. (P.) sanguinolentus* and *P. (P.) pelagicus* by the method of least squares using the logarithmic form of the exponential equation, $W=aL^b$, where W=weight, L=length and `a' and `b' are constants. For this purpose, the observed values of width /length and weight of individual crabs were transformed into logarithmic values and regression analysis was carried out using a computer software (Lotus 1-2-3) to calculate the `a' and `b' values of the regression equations. The

correlation coefficient[11] ($r$) was determined to know the degree of association of the two variables involved. Analysis of covariance[11] technique was conducted to test the significance of variation between the regression coefficients (b) in males and females.

## Results and Discussion

A scatter diagram each for juveniles, adult males and adult females in respect of *P. (P.) sanguinolentus* and *P. (P.) pelagicus* was obtained by plotting the weight against width and weight against length of individual crabs (Figs 1 and 2). From the closeness of the scatter and from the parabolic nature of the plot, it is clear that there exist a good relationship between width and weight, and between length and weight, as also the suitability of fitting the exponential formula, $W=aL^b$ to the data.

The study has indicated that males are heavier than females at a given width in both the species. The difference in weights at a given carapace width between males and females was predominant above 120 mm CW in *P. (P.) sanguinolentus* and above 115 mm CW in *P. (P.) pelagicus*. The non-linear curves plotted based on the calculated values along with the observed values in Figs 1 and 2 suggested that there was direct relationship between the observed and calculated weights at different widths/lengths in juveniles, adult males and adult females in these portunids.

The coefficient of correlation ($r$) obtained for juveniles, adult males and adult females were nearly equal to 1, [0.98708, 0.98845 and 0.98201 in *P.(P.) sanguinolentus* and 0.96554, 0.98501 and 0.98821 in *P .(P.) pelagicus* respectively] indicating that the values were significant and hence, a high degree of

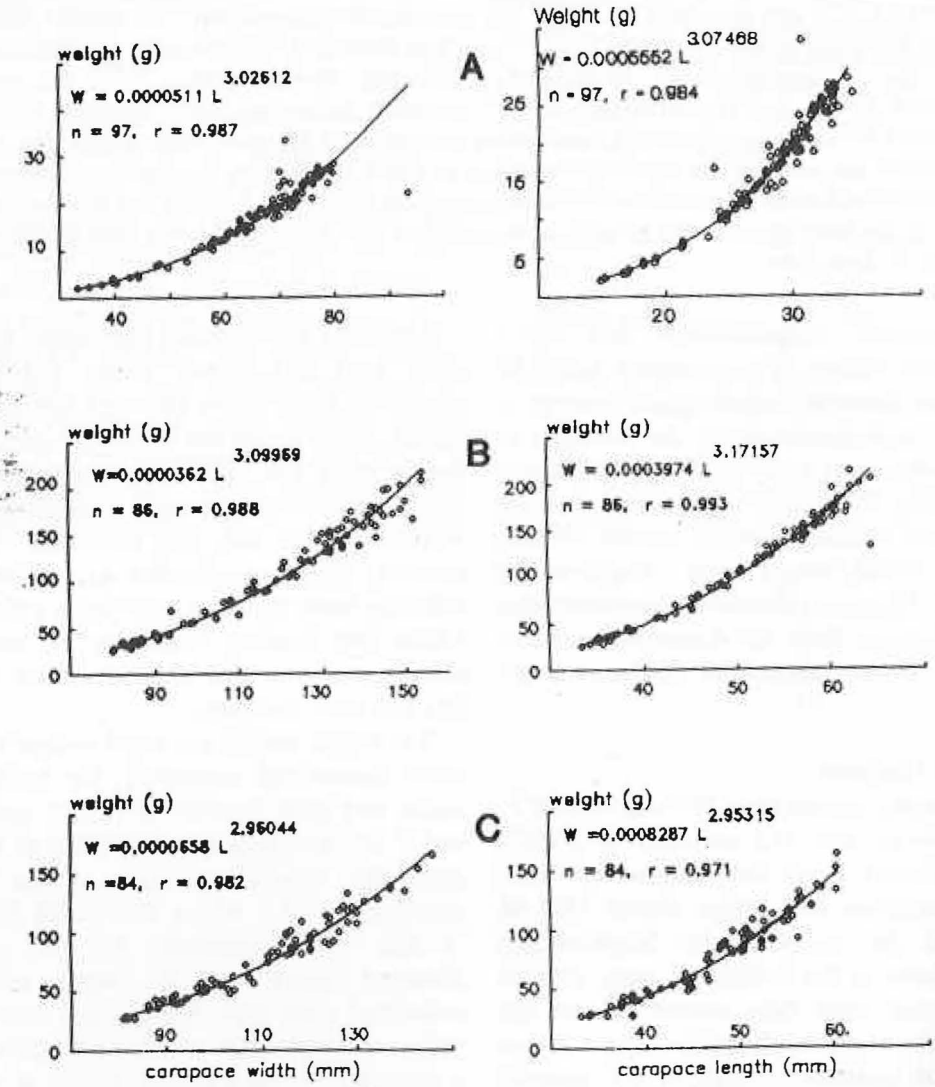


Fig. 1—Carapace width/length-weight relationship in *P. (P.) sanguinolentus*-A) juveniles; B) adult males; C) adult females.

Table 1—Anova table for testing the identicality of regression lines in the carapace width- weight relationship among males and females of *P.(P.) sanguinolentus* and *P. (P.) pelagicus*

| Source of variation | Degrees of freedom | Sum of squares | Mean square | Observed F | 5 % F |
|---|---|---|---|---|---|
| | | *P.(P.) sanguinolentus* | | | |
| Deviation from individual regression with in sexes | 166 | 0.2714 | 0.001635 | | |
| Difference between regression | 1 | 0.0046 | 0.0046 | 2.8135* | 3.90 |
| Deviation from average regression | 165 | 0.276 | | | |
| | | *P. (P.) pelagicus* | | | |
| Deviation from individual regression with in sexes | 213 | 0.4967 | 0.002332 | 19.5540** | 3.87 |
| Differences between regression | 1 | 0.0456 | 0.00456 | | |
| Deviation from average regression | 214 | 0.5423 | | | |

*Not significant at 5 % level, ** Significant at 5% level

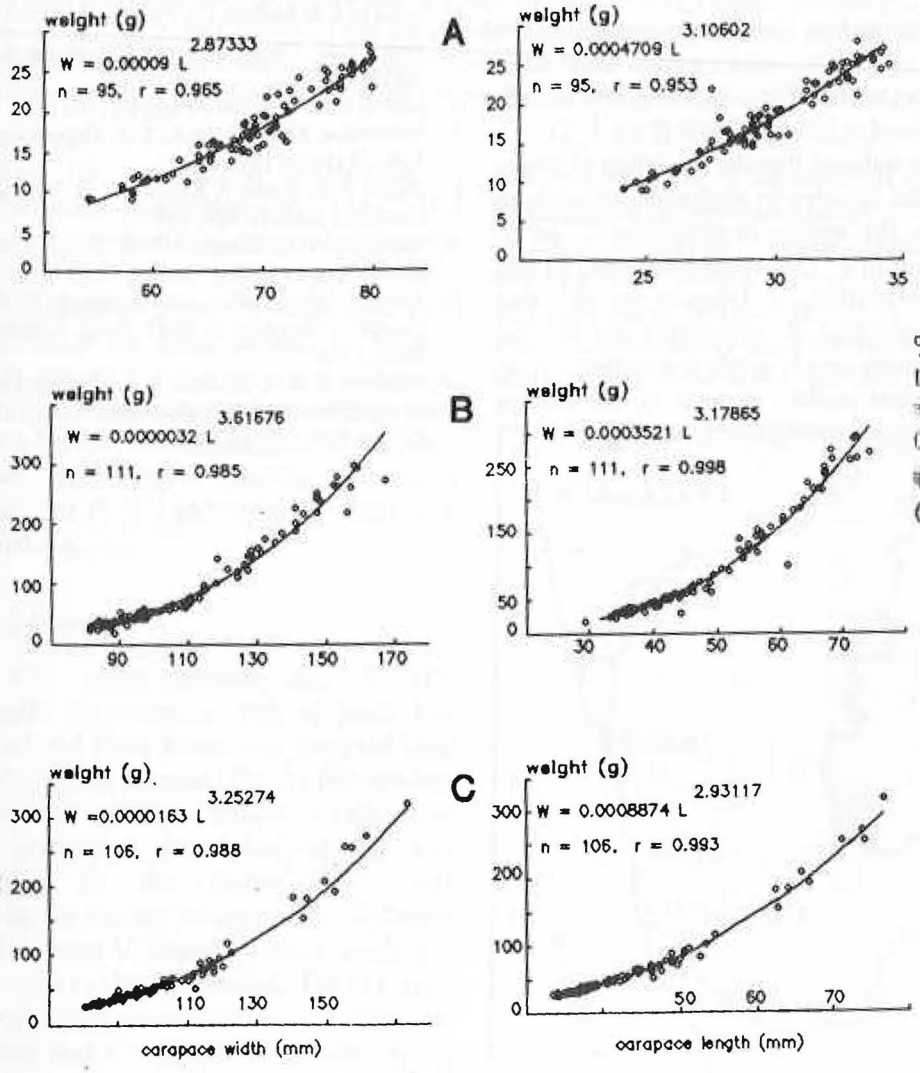




Fig. 2—Carapace width/length-weight relationship in *P. (P.) pelagicus*-A) juveniles; B) adult males; C) adult females.

positive correlation existed between width and weight in these crabs.

The exponential values (b) of the width-weight relationship in juveniles, adult males and adult females (Figs 1 and 2) followed the cube law (b=3.02612, 3.09969 and 2.96044) in *P. (P.) sanguinolentus* indicating thereby nearly an isometric pattern of growth, whereas, in *P. (P.) pelagicus*, the corresponding values (b=2.87333, 3.61676 and 3.25274 respectively) particularly in males and females suggested marked departure from isometric pattern growth.

Analysis of covariance of carapace width-weight data revealed that between the regression coefficients in males and females no significant difference ($P < 0.05$) was observed in *P. (P.) sanguinolentus*, whereas, significant ($P < 0.05$) difference was observed in the *P. (P.) pelagicus* (Table 1).

Similarly, relationships between carapace length and weight of juveniles, adult males and adult females in respect of *P. (P.) sanguinolentus* and *P. (P.) pelagicus* found to be significant (Figs 1, 2).

Present results indicate that the tendency of males being heavier than females in portunids which is in conformity with the earlier observations[2-10] in *P. (P.) pelagicus* and in *P. (P.) sanguinolentus*. In this context, the observation of Dhawan *et al.*[1] that females of *P. pelagicus* (Goa waters) are heavier than males at a given length needs re-examination in view of the present studies as well as the studies made on this species from different regions[5,8,10].

The differences in exponential values in juveniles, adult males and adult females may possibly be due to the differential diet presumably resulting from size difference, change in cheliped strength, foraging behaviour and metabolic rate of the animal.

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