# Morphometric Measurements as an Index for Estimating Yield of Meat in Shell Fishes 1. Crab *(Scylla serrata)* Forskal*

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Sixty one observations on length-breadth and whole weight-meat weight relations of India crab *(Scylla serrata)* were made. From the length of crab (cm) the whole weight (gm) can be computed by the equation:

$$\log W = -0.1708 + 2.3341 \log L$$

Similarly for any given length (cm) the meat weight (gm) can be found by the relation,

$$\log w = -1.5745 + 3.0148 \log L$$

Very little work on the morphometric and yield measurements have been done on crabs of Indian waters. The study of length-weight relationship is an important tool in fishery biology and according to Le Creen (1951) it is pursued with two objectives, namely (1) to establish a mathematical relationship between two variables namely, the length and the weight; so that if one is known the other could be computed and (2) to know whether variations from the expected weight for the known length groups are indications of fatness, general well being, gonad development and suitability of environment. Dawan *et al.* (1976) studied the length-weight relationship in *Portunus pelagicus* (crab) from Zuary estuary and obtained exponent values above 3 for both the sexes. It is known that the animal grows by successive moults and time lag between moulting is less in the earlier stages of growth. According to Marlin (1965) the length-width ratio decreased as the animals grew. George (1963) reported that the number of times that a crab moults during its life time, and the length of time between moults, varies among species and is affected by such factors as temperature and amount of food available. Hamai (1934) found that the growth of Meretrix meretrix at different localities and also under different substrata in influenced by temperature, salinity and other parameters of the environment. Nair (1984) observed that the plot of height against depth in backwater oysters *(Crassostrea madrasensis)* of Cochin harbour showed an exponential trend and a relationship of the form $H = AD^B$. Where H is the height and D is the depth.

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## Materials and Methods

Live crabs caught from the fishing grounds off Cochin were brought to the laboratory. They were washed thoroughly in chlorinated water to be free of adhering slime and dirt. The carapace length and breadth were measured using a scale. Whole weight is the total weight of the animal. After removing the carapace, gills, intestine and eggs, the meat was picked up and weighed. Sixty one observation were made on length-breadth, whole weight-and meat weight.

## Results and Discussion

The crabs selected for the study ranged between 8.8 and 16.5 cm in length. The ratio of length vs breadth is between 1.27 and 1.45 and meat weight vs whole weight is between 0.104 and 0.314. The length measurements were found to have positive and highly significant ($P < 0.001$) correlation with respect to other measured variables. The values of r, the correlation coefficient between pair of variables are given below:

| | |
|---|---|
| Length and breadth | 0.97** |
| Log length and log whole weight | 0.90** |
| Log length and log meat weight | 0.92** |
| Whole weight and meat weight | 0.87** |

**highly significant, $p < 0.001$

Treating the length of crab as independent variable (x), linear regression equations for dependent variable (y) were formed. These equations are:

$y = 0.6843\,x + 0.5625$, y is the breadth (cm)
For whole weight x (in g) we have

$y = 0.2599\,x - 9.8338$, y is the meat weight (g)
These regression lines are presented in Figs. 1 & 2 respectively. From the figures it is clear that the regression line fit very well with the plotted points in respect of length, breadth and whole weight - meat weight relations.

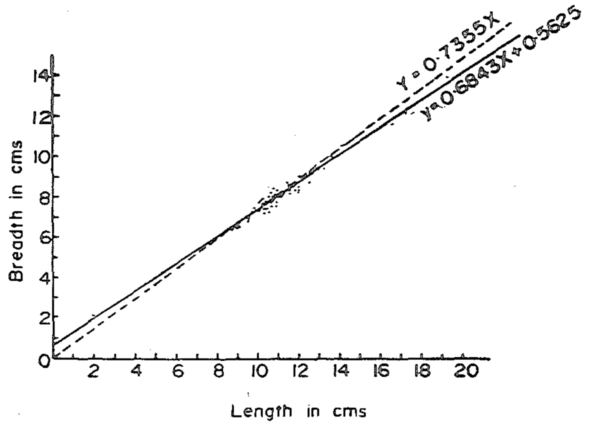


Fig. 1. Regression of breadth of crab on length

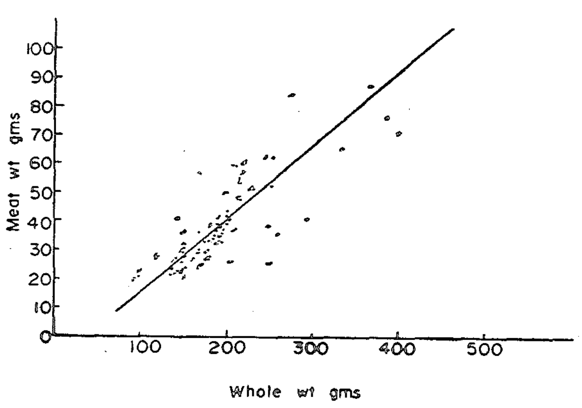


Fig. 2. Regression of meat weight of crabs on whole weight.

The length-breadth relationship (Fig. 1) suggests that they are approximately directly proportional. Allowing some sampling fluctuations, we can safely modify the regression equation as:

$y = Bx;$

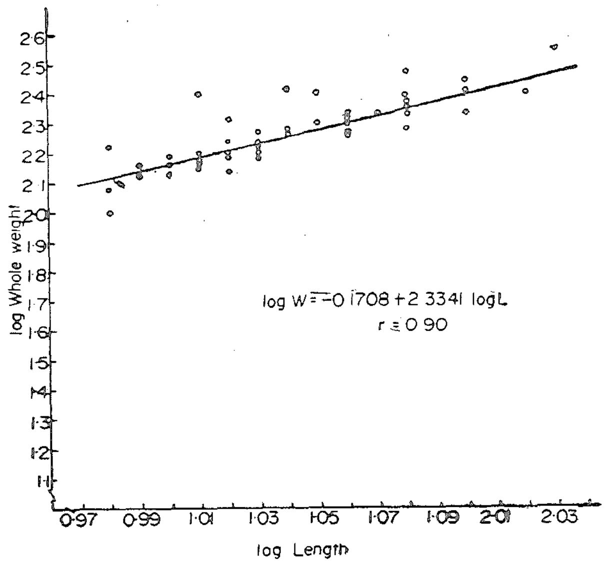


Fig. 3. Regression of whole weight on length

Thus the regression equation becomes

$y = 0.7355\,x$ which means that the breadth is about 73.6% of that of the length of the crab. From the above fitted regression equations, for any given value of x, the corresponding y value can be obtained.

As regards to the length-weight relationship, they are connected by the hypothetical law

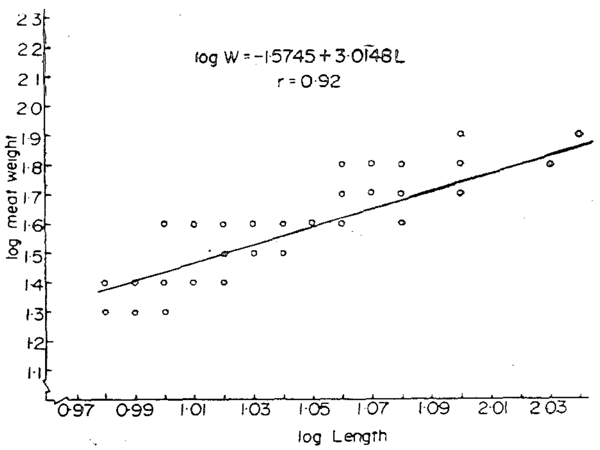


Fig. 4. Regression of meat weight on length

$w = aL^n$ or

$\log w = \log a + n \log L$, where w is the weight and L is the length.

This is a linear relationship of the form

$y = a + bx$

If the length (cm) is known, the whole weight (gm) can be computed by the equation,

$\log W = -0.1708 + 2.3341 \log L$, W is the whole weight L is the length

Test of significance of the regression coeft. was carried out using t-test. The regression coeft. was found to be highly significant which establishes the linear relationship ($t = 15.581$, $df = 59$, $p < 0.001$

Similarly for any given length (cm), the meat weight (g) can be found by the relation.

$\log w = -1.5745 + 3.0148 \log L$, w is the meat-weight.

The regression coeft. was tested to be highly significant with $t = 18.216$, $df = 59$, $p < 0.001$.

The goodness of fit of the regressions is shown in figures 3 & 4 respectively.

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## References

Dawan, R. M., Dwivedi, S. N. & Victor Ramamanickam, G. (1976) *Indian J. Fish.* 23, 57

George, H. (1963) *Edible Crabs of the United States. Fishery Leaflet*, 550

Hamai, I. (1934) *Sci. Reports. Tohoku Univ. Ser.* 4, 209

Le Creen, C. P. (1951) *J. Anim. Ecol.* **16**, 189

Marlin, E. (1965) *U.S. Department of Interior, Fish and Wildlife Service, Special Scientific Report, Fisheries,* **110**, 501

Nair, N. Unnikrishnan (1984) *Studies on Backwater Oyster Crassostrea madrasensis* (Preston) *of Cochin Harbour*. Ph.D. Thesis, University of Cochin