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Note

Length - weight relationship of a mesopelagic shrimp, *Oplophorus typus* from the west coast of India

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ABSTRACT

The length-weight relationship of *Oplophorus typus* (Oplophoridae) was studied from samples by Isaac Kid -Mid water Trawl (IKMT) operated onboard FORV *Sagar Sampada* off west coast of India during October 1998 to May 2001. The relationship between total length and total weight and other dimensional relationships were also worked out. The relationships are not significantly different between male and female.

Studies on length-weight relationship of pelagic shrimps of forage/economic value are scanty from Indian waters. Information on length-weight relation of shrimps is needed in studies on growth and sexual maturity and for obtaining yield estimates by analytical models. Growth is manifested as an increase in size and as such is best measured in terms of its volume or weight. But it is usually and easily gauged from observation of its total length. It has been mathematically proved that there is a fairly constant relationship between total length and weight of the individuals of the species. Therefore, when knowledge of the growth in volume or weight is required, it is usually calculated from length-weight relationship.

For comparison of data from different source, the relationship existing between total length and carapace length

is required. In view of the importance of size composition in population studies, the relation between tail length and total length and total length and carapace length of *Oplophorus typus* was calculated. The study assumes relevance in the context of the emerging potential of *O.typus* from the DSL as a future candidate for commercial exploitation. The present account furnishes a detailed study of the length - weight relationship as well as the other dimensional relationships of *O.typus*, an attempt made for the first time in the Indian region.

Samples of *O. typus* collected from 75-750m depth by the IKMT operated during day and night in the west coast of India during October 1998 - May 2000 were utilized for the study. The details on total length, carapace length, total weight, tail weight, were collected. Sex-wise measurements of total length

(postorbital margin of carapace to tip of telson), tail length (margin of first abdominal segment to tip of the telson), and carapace length (dorsal portion of the postorbital margin to mid posterodorsal margin of the carapace) were taken to the nearest millimetre using vernier calipers.

Data collected for two years period (October 1998- May 2000) were pooled to represent all available size groups in the collections. The relationship between length and weight was calculated by least square method using the formula:

$$W = aL^b$$

where W= Weight, L= Length

‘a’ and ‘b’ are constants and expressed logarithmically as $\log W = a + b \log L$

To learn whether the regression of different parameters are significantly different between males and females, analysis of covariance (Snedecor and Cochran, 1968) was employed.

The estimates of regression coefficient (both males and females) were tested for finding the significance of variation from the expected value of 3 by employing the ‘t’ test using the formula

$$t = \frac{|b - \beta|}{S_b}$$

b = regression coefficient

$\beta = 3$

S_b = standard error of b

Total length-total weight relationship

Males: A total of 200 males ranging in total length from 20 to 48mm and total weight from 0.1 to 1.93 g were used to study the total length – total weight

relationship

The total length and total weight scatter diagram gave the exponential form of the equation as: $W = 0.000119522 L^{2.90109}$

The Log-log transformation gave the equation as: $\log W = -3.92255 + 2.90109 \log L$

The correlation coefficient value estimate was: $r = 0.925715$

Females: A total of 213 females ranging in total length from 20 to 46mm and ranging in total weight from 0.12 to 1.77 g were employed to study the total length and total weight relationship.

The total length and total weight scatter diagram gave the exponential form of the equation as: $W = 0.00013863L^{2.83368}$

The Log-log transformation gave the equation as: $\log W = -3.85812 + 2.83368 \log L$

The correlation coefficient value estimate was: $r = 0.945958$

The length - weight relationship of male and female was tested for significance by ANACOVA (Snedecor and Cochran, 1968) and as there was no significant difference in the slopes and elevations of the two sexes, the data were pooled to arrive at a common formula for the species (Fig.1).

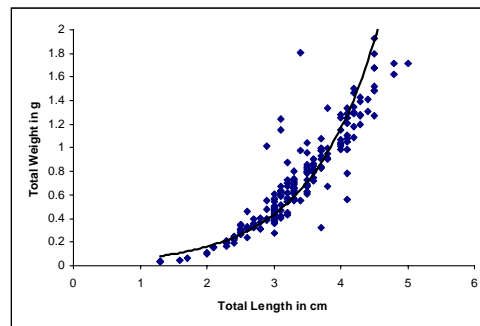


Fig. 1. Total length - total weight relationship

The pooled equation gives as: $W = 0.000131416L^{2.85937}$

The Log-log transformation gave the equation as: $\text{Log } W = -3.88135 + 2.85937 \text{ Log } L$

The correlation coefficient value estimate was: $r = 0.936757$

The significance of the variation in the estimate of 'b' value from the cubic relation was tested by the 't' test

$$t = \frac{2.85937 - 3.0000}{0.02497} = -5.6319$$

The 't' value was found to be non-significant hence, the cubical relationship (3) holds good for length-weight relationship.

Total length -tail weight relationship

Males: A total of 200 males ranging in total length from 20 to 48mm and tail weight from 0.07 to 0.62 g were measured to study the total length -tail weight relationship.

The total length and total weight scatter diagram gave the exponential form of the equation as: $W = 0.0000151L^{2.85249}$

The Log-log transformation gave the equation as:

$$\text{Log } W = -4.81889 + 2.85249 \text{ Log } L$$

The correlation coefficient value estimate was: $r = 0.961114$

Females: A total of 213 females ranging in total length from 20 to 46mm and ranging in tail weight from 0.12 to 1.77 g were measured to study the total length and tail weight relationship.

The total length and tail weight scatter diagram gave the exponential form of the equation as: $W = 0.0000098L^{2.99487}$

The Log-log transformation gave the

equation as: $\text{Log } W = -5.00388 + 2.99487 \text{ Log } L$

The correlation coefficient value estimate was: $r = 0.939157$

The total length and tail weight relationship of male and female was tested for significance by ANACOVA (Snedecor and Cochran, 1968) and as there was no significant difference in the slopes and elevations of the two sexes, the data were pooled to arrive at a common formula for the species (Fig.2).

The exponential form of the equation was: $W = 0.00001221L^{2.93137}$

The Log-log transformation gave the equation as :

$$\text{Log } W = -4.92005 + 2.93137 \text{ Log } L$$

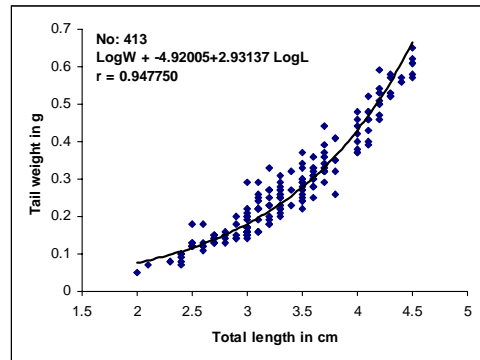


Fig. 2. Total length -tail weight relationship

The correlation coefficient value estimate was: $r = 0.947750$

The significance of the variation in the estimate of 'b' value from the cubic relation was tested by the 't' test.

$$t = \frac{2.93137 - 3.0000}{0.0314} = -2.1856$$

The 't' value was found to be non-significant hence, the cubical relationship (3) holds good for total length- tail weight relationship.

Total length – carapace length relationship

Males: A total of 200 males ranging in total length from 20 to 48mm and carapace length 0.7 to 1.5 cm were measured to study the total length and carapace length relationship.

Females: A total of 213 females ranging in total length 20 to 46mm and carapace length 0.7 to 1.5 cm were measured to study the total length and carapace length relationship.

The analysis of covariance showed that there was no significant difference between the regression coefficient of male and female. Hence, the single equation calculated for the total length (TL) and carapace length (CL) of both sexes is of :

$$CL = 0.11689 + 0.28415 TL \quad (r = 0.880071).$$

Since information on the length-weight relationship of other pelagic shrimps of deepwater regions of India is lacking, some of the works done on penaeid prawns in the shallow waters are discussed here. Murthy and Ramaseshaiah (1996) studied the total length – total weight relationship of *Metapenaeus dobsoni* from the Vishakapatnam coast and gave a common formula for both sexes as there was no significant difference between both sexes. The observations on length-weight relationship of some penaeid prawns (Rao 1988 and Nandakumar and Damodaran, 1998 in *M.monoceros* and Ramaseshaiah and Murthy, 1997 in *M.barbata*). showed significant difference between males and females and separate equation was calculated for each sex. In their study on total length-tail weight relationship in *M.dobsoni* from Vishakapatnam coastal waters Murthy and Ramaseshaiah (1996) did

not observe any significant difference between sexes and gave one common formula for both sexes.

In the present study, the relationship between the total length and carapace length was not significantly different between sexes. Ramamurthy and Manickaraja (1978) did not observe any difference between juveniles and adults in the carapace length and total length relationship in *Parapenaeopsis stylifera*, *M.dobsoni* and *M.affinis*. Murthy and Ramaseshaiah (1996) studying the total length - carapace length relationship of *M. dobsoni*, gave separate equation for each sex, as there were significant differences between sexes.

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References

- Longhurst, A.R. 1970. Crustacea resources: In: J.A. Gulland (Ed). *The Fish Resource of the Ocean*. FAO Fish. Tech. Paper, No. 97: 252 - 306.
- Murthy, V.S.R. and M. Ramaseshaiah 1996. Length-weight relationship and other conversion factors in *Metapenaeus dobsoni* (Miers) from the Vishapatnam coast. *Indian J. Fish.*, 43(2): 179-185.
- Nandakumar, G. and R. Damodaran 1998. Length-weight relationship of the speckled shrimp, *Metapenaeus monoceros* (Fabricius). *J. mar. biol. Ass. India*, 40 (1&2): 30 - 43.
- Ramamurthy, S. and M. Manickaraja 1978.

- Relation between tail and total lengths and total and carapace lengths for three commercial species of penaeid prawns of India. *Indian J. Fish.*, **25**: 233-236.
- Ramaseshaiah, M. and V.S.R. Murthy 1997. Length weight and total length - carapace length relationships of *Metapenaeus barbata* (De Haan) from the Vishakapatnam coast. *Indian J. Fish.*, **44** (1): 91-95.
- Rao, G. Sudhakara. 1988. Length-weight relationship and other dimensional relationships of *Metapenaeus monoceros* (Fabricius) from the Kakinada coast. *Indian J. Fish.*, **35**: 211-215.
- Snedecor and Cochran 1968. *Statistical Methods*. Oxford and IBM Publishing Co. Calcutta, 593 pp.