

Length-weight Relationship of two Palaemonid Prawns, *Macrobrachium idella* and *M. scabriculum* — A Comparative Study

K. V. JAYACHANDRAN* and N. I. JOSEPH

Department of Aquatic Biology & Fisheries, University of Kerala, Trivandrum - 695 007

Length-weight relationships of two commercially important freshwater prawns, *Macrobrachium idella* and *M. scabriculum*, have been worked out separately for the two sexes of the two species. 't' test showed that growth departs significantly from the isometric growth in the case of both sexes of *M. idella* and in the female of *M. scabriculum*. Therefore, the cubic formula $W = CL^3$ may be applied only in the case of males of *M. scabriculum*. In all the other cases $W = CL^n$ may be followed.

Length-weight relationship provides a mathematical relationship between the two measurements as a means of interconversions (Le Cren, 1951). It is also an index to measure the variations from the expected weight to length of an individual prawn or group of prawns. The weight has generally been found to vary with the cube of the length (Kunju, 1978). The above relationship can be expressed as $W = CL^3$, where W is the weight, L the length and C a constant. Since prawns are prone to change its body proportions during its life, a more satisfactory formula for expressing the relationship may be taken as $W = CL^n$, where W is the weight, L the length and C and n are constants to be estimated empirically.

Macrobrachium idella and *M. scabriculum* are the two commercially important palaemonid prawns of the south-west coast of India. An attempt has, therefore, been made here to study the length-weight relationships of these two prawns.

Materials and Methods

336 specimens of *M. idella* (218 males, ranging in total length from 22 to 110 mm and 116 females, ranging in total length from 34 to 92 mm) and 194 specimens of *M. scabriculum* (116 males, ranging in total length from 24 to 63 mm and 80 females, ranging in total length from 25 to 45 mm) were

collected from the Vellayani Lake, about 16 km south-east of Trivandrum city using cast nets. Total length and weight of each prawn were recorded to the nearest mm and mg respectively. The method of analysis of covariance (for comparison of regression lines) (Snedecor & Cochran, 1975) was used for comparing the length-weight relationship in the sexes of the two species.

Results and Discussion

The results of the analysis of covariance for *M. idella* and *M. scabriculum* are presented in Table 1. It may be observed from the Table that the slopes did not vary significantly whereas elevations (average size) differed significantly between the two sexes of the two species. From Table 2, it may be seen that the females of *M. idella* showed greater average size than males whereas the males of *M. scabriculum* showed greater average size than females. Since significant differences were noticed in the elevations, the regression equations establishing length-weight relationships have been calculated separately for the two sexes of the two species and are presented in Figs. 1 & 2.

The increase in weight of both sexes of the two species of prawns is found to be numerically slightly higher than the cube of its length, as in the case of *Macrobrachium malcolmsonii* (3.38788 for males and 3.82041 for females) (Ibrahim, 1962); in *Macrobrachium rosenbergii* (3.1935 for the species as

* Present Address: College of Fisheries, Panangad, Cochin-682 506

Table 1. Analysis of covariance (comparison of regression lines) to compare growth rates (slopes) and elevations of weight between sexes with respect to total length of *M. idella* and *M. scabriculum*

	<i>M. idella</i>			<i>M. scabriculum</i>		
	df	SS	MSS (Deviation from regression)	df	SS	MSS
Males	218	0.9314	0.0043	114	0.6862	0.0060
Females	116	0.4668	0.0040	78	0.3159	0.0041
	334	1.3981	0.0042	192	1.0021	0.0052
Pooled within	335	1.3990	0.0042	193	1.0048	0.0052
Difference between slopes	1	0.0009	0.0009	1	0.0027	0.0027
Between and within	336	1.9778	0.0059	194	2.1573	0.0111
Between adjusted means	1	0.5778	0.5778	1	1.1525	1.1525
For comparison of slopes - F values		0.2143			0.5192	
		Not significant			Not significant	
For comparison of elevations - Fe values		137.571			221.63	
		Highly significant			Highly significant	

a whole) (Rao, 1967); in *Penaeus monodon* (3.1032 for males) and in *Penaeus indicus* (3.4554 for males and 3.0776 for females) (Rao, 1971).

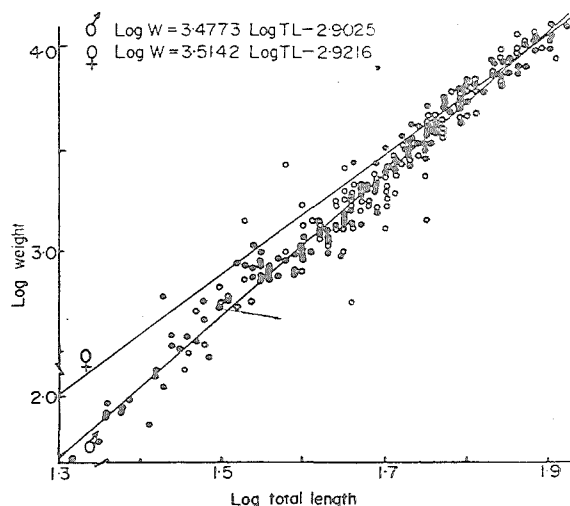


Fig. 1. Length-weight relationship of *M. idella*

However instances where it is less than 3 have also been recorded in the following cases - *Leander styliferus* (2.8754) (Kunju, 1955); *Metapenaeus monoceros* (2.7603) (George, 1959); *Parapenaeopsis sculptilis* (2.944) (Hall, 1962) *Metapenaeus affinis* (2.7867) (Subrahmanyam, 1967); females of *Penaeus monodon* (2.9022) (Rao, 1971).

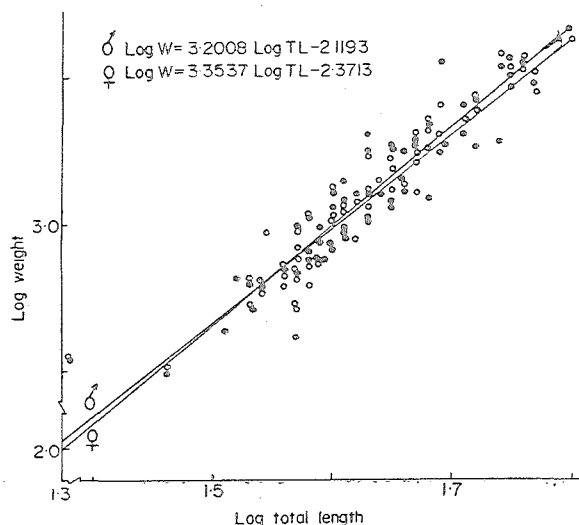


Fig. 2. Length-weight relationship of *M. scabriculum*

The fact that the weight will be proportional to the cube of any linear dimension has been studied in fishes (Kumari & Nair, 1979). According to Allen (1938) for an ideal fish which maintains a constant shape, the value of 'n' will be 3. The same appears to be true in the case of the prawns studied here where the isometric growth value varies from 3.20 to 3.47. Though the above formulae hold good for the length-weight relationships of the two sexes of both the species, it appears advisable to test the regression

coefficients against the isometric growth value 3 to find whether there is any significant departures from the above value of 3. This was done using the 't' test.

Table 2. Regression coefficients (growth rates) and average size (weight) for the two sexes (growth rate and average size compared to total length)

Name of species	Regression coefficient		Mean value	
	Male	Female	Male	Female
<i>M. idella</i>	3.4773	3.5142	3.3149	3.4855
<i>M. scabriculum</i>	3.2008	3.3537	3.1847	2.9400

The test showed that the growth departs significantly from the isometric growth in the case of both sexes of *M. idella* ($t=34.8$ with 218 df for males and $t=2.0$ with 116 df for females) and in the females of *M. scabriculum* ($t=1.4$ with 114 df for males and $t=193.5$ with 87 df for females). Hence the cubic formula $W = CL^3$ may be taken for representing the length-weight relationship only in the case of the males of *M. scabriculum*. In the other cases the growth rates are found to be significantly different from the isometric growth and hence the cubic law may not be used for representing the relationship.

The authors are thankful to Shri N. K. Balasubramanian, Lecturer in Biostatistics, Department of Aquatic Biology & Fisheries, University of Kerala for the help rendered in the statistical interpretation

of the present work. The first author is grateful to the UGC for awarding a senior research fellowship during the tenure of which this work was undertaken.

References

- Allen, K. R. (1938) *J. Anim. Ecol.* 7, 333
- George, M. J. (1959) *Indian J. Fish.* 6, 268
- Hall, D. N. F. (1962) *Fish. Publ. Colonial Office, London* 17, 1-229
- Ibrahim, K. B. (1962) *Indian J. Fish.* 9A, 433
- Kumari, S. D. R. & Nair, N. B. (1979) *Matsya* 4, 52
- Kunju, M. M. (1955) *Proc. Indo-Pacific Fish. Counc.* 6 (3), 404
- Kunju, M. M. (1978) *CMFRI Spl. Publ.* No. 3, 48
- Le Cren, E. D. (1951) *J. Anim. Ecol.* 20, 201
- Rao, R. V. P. (1971) *Indian J. Fish.* 14, 251
- Rao, R. M. (1967) *Proc. natn. Inst. Sci. India* 33, 252
- Snedecor, G. W. & Cochran, W. G. (1975) *Statistical Methods*, Oxford & IBH Publishing Co., New Delh
- Subrahmanyam, C. B. (1967) *Indian J. Fish.* 10, 11