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LENGTH-WEIGHT RELATIONSHIP IN THE GOLDSPOT MULLET *LIZA PARSIA* OF COCHIN ESTUARY*

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ABSTRACT

The length-weight relationship of *Liza parsia* of Cochin Estuary was calculated separately for indeterminates, males and females. The logarithmic regression equations obtained are — males : log w = —1.2117 + 2.5619 log l ; female : log w = —1.0628 + 2.4465 log l and indeterminates : log w = —1.2468 + 2.6788 log l. The 'r' values revealed very good correlation between length and weight. Analysis of covariance showed the 'b' values of male, female and indeterminate significantly differ at 5% level. Paired comparison using students 't' clearly showed that except between female and indeterminates, the 'b' values are not significantly different at 5% level. By testing the regression coefficients against the isometric growth value it is found out that the former values showed statistically significant difference from the expected value of '3', hence concluded that $w = al^3$ will not be a proper representation of the length-weight relationship of this species and the growth pattern in this case is different from isometric growth of fishes.

INTRODUCTION

THE GOLD SPOT MULLET *Liza Parsia* (Ham. Buch) is one of the common mullets in Cochin Estuary and constitutes a thriving fishery in the estuaries and brackishwater lakes of Kerala (Kurup and Samuel, 1985). A perusal of the literature shows that only a few works are available on the mullets of this estuary (Sunny, 1975 ; Kurup and Samuel, 1983). Studies on the length-weight relationships of mullets are those of Kesteven (1942), Thomson (1966), Sarojini (1957), Luther (1963), Rangaswamy (1976) and Babu and Neelakantan (1983).

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MATERIAL AND METHODS

A total of 572 specimen were collected during 1979-80 from the barmouth and adjacent areas of Cochin Estuary using chinese dipnets, castnets and dragnets. Fishes were measured and weighed in fresh condition, standard length was measured from tip of snout to hypural plate and the weight was recorded in grams to the nearest 0.1 milligram. The length-weight relationship of each fish

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can be expressed by the formula $w = alb$ were w = weight, l = standard length and 'a' and 'b' are constants. Or it can be linearly represented as $\log w = \log a + b \log l$. The constants $\log a$ and 'b' in the above equation were estimated using the method of least squares. The linear equation was fitted separately for male, female and indeterminates. The correlation co-efficient and standard error of 'b' were calculated following standard statistical procedures. Analysis of covariance is employed to test whether the 'b' values significantly differ at 5% level. The 't' test is used to test whether the regression co-efficient significantly deviates from the expected cubic value (Snedecor and Cochran, 1967).

Results and Discussion

The estimated co-efficients of the length-weight relationship and other details of statistical analysis are summarised in Table 1. The logarithmic relationship between length-weight of males, females and indeterminates are represented in Figs. 1 to 3. The respective equation obtained are as follows:

Males = $\log w = -1.2117 + 2.5619 \log' l'$
Females = $\log w = -1.0628 + 2.4465 \log l$
Indeterminates $\log w = -1.2648 + 2.26788 \log l$,

of male, female and indeterminate are significantly different at 5% level ($F = 4.2308$, $df = 2,566$). Hence pairwise comparison was carried out using student 't' the results (Table 3) revealed that except between female and indeterminate ($P<0.01$) the b values are statistically not different in all other combinations.

The regression coefficient of female is found to be the lowest when compared to male and indeterminate and highest was in indeterminate group. From this trend it may be presumed that indeterminate gained more weight with increase in length compared to male and female. Similar conditions were also reported in *Daysciaena albida* of Cochin Estuary (Kurup and Samuel, 1987). Babu and Neelakantan (1983) reported the b values of male, female and indeterminate of *L. parsia* collected from Kali Estuary are 2.79632.2.98863 and 2.93477 respectively. However, the above values were not subjected to any statistical testing and hence comparison with the present investigation is not possible. Sarojini (1957) reported that there is no significant variation in the 'b' values among the male, female and indeterminant of *Mugil parsia*. Luther (1963) is of opinion that the length-weight relationship of *Liza macrolepis* does not differ significantly from the sea and lagoon environments near Mandapam. Sunny (1975) observed

Table 1. *Co-efficients of length-weight relationship and statistical analysis of* L. parsia

	Number	'b'	log 'a'	r	Sb	t	Probability
Male ..	141	2.5619	—1.2117	0.9602	0.0640	40.0297	P<0.01
Female ..	153	2.4465	—1.0628	0.9039	0.0943	25.9438	P<0.01
Indeterminate ..	278	2.6788	—1.2468	0.9697	0.0250	107.1520	P<0.01

Scrutiny of 'r' values showed very good correlation between length and weight. Comparison of the regression co-efficients using F-test (Table 2) showed that the 'b' values in *L. macrolepis* of Cochin Estuary that the b value of indeterminants was very low and the female gained more weight with increase in length compared to males.

Generally the weight of the fish will be proportional to the cube of length, based on its diamensional equality. Beverton and Holt (1957) while discussing the merits of allometric formula with Cube formula stated that instance of important deviations from isometric growth in adult fishes are rare. Hence it appears advisable to test the regression co-efficients against the isometric growth value of '3' to find whether there is any significant deviation. For this purpose '*t*' test was employed by dividing the difference between '*b*' and '3' by standard error of '*b*'. The results of the analysis show that (Table 4) in all the three cases $P<0.01$ and hence the '*b*' values are significantly different statistically from 3 at 1% level. Deviation from the isometric value of 3 have been obtained in sardines (Antony Raja, 1967) and milkfishes (Grover and Juliana, 1976). Rangaswamy (1976) reported that the '*b*' value in *Mugil cephalus* of Ennore and Adyar Estuaries deviate from '3' at 5% level, suggesting that the length-weight relationship do not follows

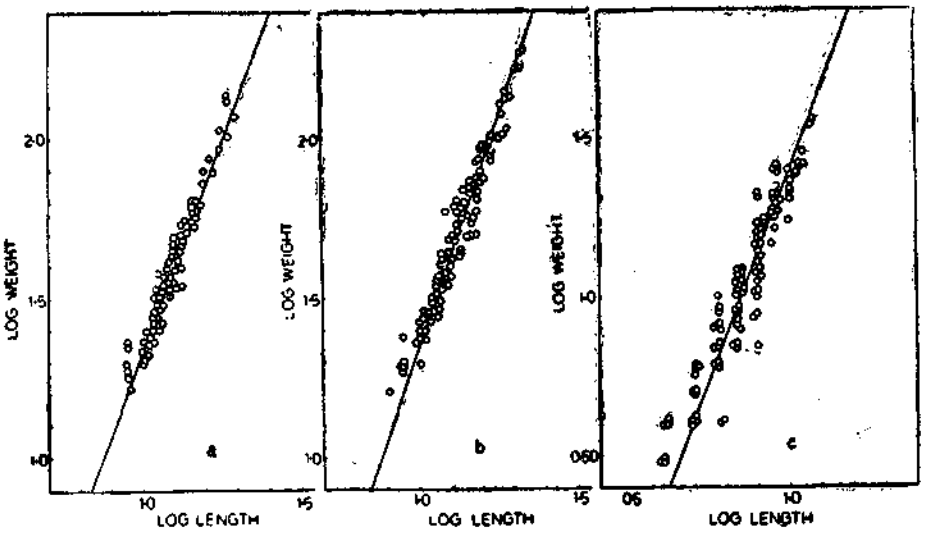

FIG. 1. Length-weight relationship of *Liza parsia*: a. Male, b. Female and c. Indeterminate.

TABLE 2. *Analysis of covariance test for comparison of slopes*

Sources	S_x^2	S_{xy}	S_y^2	Residual SS	Residual DF	F
Regression 1 (Male) ..	0.5412	1.3865	3.8530	0.3009	139	
Regression 2 (Female) ..	1.0657	2.6072	7.8073	1.4289	151	
Regression 3 (Indeterminate)	2.6269	7.0362	20.0443	1.1957	276	
Pooled Regression ..				2.9255	566	4.2308*
Common Regression ..	4.2338	11.0299	31.7046	2.9695		

* Significant at 5% level.

TABLE 3. *Pairwise comparison of slopes using student's 't'*

Comparison	't'	DF	Probability
Male *vs.* Female ..	0.8932	290	N.S.*
Male *vs.* Indeterminate	1.2989	415	N.S.
Female *vs.* Indeterminate ..	2.9859	427	P<0.01

* N.S. = Not significant at 5% level.

cube law. Luther (1963) and Sunny (1975) have not attempted to elucidate the deviation of '*b*' from Cube law in *Liza macrolepsis* collected from Mandapam and Cochin areas respectively. However in *M. cephalus* of Australian waters the relationship was found to fellow Cube law cubic (Kesteven, 1942). Babu and Neelakantan (1983) observed that in *Liza parsia* of Kali Estuary the '*b*' values of male, female and juveniles are less than '3', but the values were not tested to find the deviation.

Depending upon the deviation of '*b*' values from '3' fishes can be classified into three groups (a) $b=3$ where the body form of fish remains constant at different lengths isometric (Allen, 1938), $b<3$ when fish becomes more slender as the length increases and $b>3$ when fish grows more stouter with increase of length (allometric) (Grower and Juliano, 1976). But the value of '*b*' usually remains between 2.5 and 4 (Hile, 1936 ; Martin, 1949). The present observation is also in agreement with the above view and it can be concluded that the Cube formula $w = al^3$ will not be a proper representation of the length-weight relationship of *Liza parsia* inhabiting Cochin Estuary.

TABLE 4. *Statistical analysis to test deviation from Cube law*

	b	DF	Sb	t = b-3/Sb	P
Male ..	2.5619	139	0.0640	6.8453	P<0.01
Female ..	2.4465	151	0.0943	5.8696	P<0.01
Indeterminate ..	2.6788	276	0.0250	12.8480	P<0.01

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