

Length-Weight Relationships and Relative Condition Factor in *Priacanthus hamrur* (Forsskal)

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The length-weight relationship of *Priacanthus hamrur* was estimated and given by the equations, Males $W = 0.00000638 L^{3.1133}$ and Female $W = 0.00000811 L^{3.685}$. The b value showed significant difference between males and females. The b value computed for female did not show significant variation for the isometric value of 3 whereas in male the departure was found significant. In male and female the K_n value steadily increased up to about 100 mm and remained almost static up to about 150 mm and thereafter showed fluctuation. The seasonal change taking place in K_n value mainly indicate that in *P. hamrur* it is greatly influenced by feeding intensity rather than the cyclic change taking place in the gonads.

Key words : Length-weight relationship, relative condition factor, *Priacanthus hamrur*.

Length-weight relationship studies in fishes are being done with a view to establish the mathematical relationship between length and weight for enabling the interconversions of these variables as required in setting up of yield equations for estimating population strength (Beverton & Holt, 1957) and also to measure the variation from the expected weight due to changes in the well being, which takes place in the life cycle of all fishes (Le Cren, 1951). A scrutiny of the relative condition factor at different body lengths can give valuable information regarding the maturation and spawning in the life span of the fish whereas a close look at the conditions at different months may give definite clues regarding the breeding seasons. No attempt has so far been made to study the length-weight relationship and relative condition factor of *Priacanthus hamrur* from Indian waters or from elsewhere. However, similar

studies were conducted in *P. taylori* (Chomjurai, 1970; Watchagarun, 1971; Chantawong *et al*, 1984) and *P. macracanthus* (Rao, 1984).

Materials and Methods

Samples of *Priacanthus hamrur* were taken from cruises of Fishery Survey of India and Central Institute of Fisheries Nautical Engineering and Training during January 1992 to April 1993. This was also supplemented by samples collected from commercial trawlers operating from Visakhapatnam fishing harbour during May 1993. A total 1339 females and 693 males ranging in size from 68 to 288 mm and 65 to 245 mm, respectively were used. Total length was taken from the tip of lower jaw to end of caudal fin. Length was measured up to 0.1 mm using a dial reading caliper while weight was recorded up to 0.5 g with the help of a top loader scale.

The length-weight relationship can be expressed as:

$$W = aL^b \dots\dots\dots (1)$$

Logarithmic transformation of the above formula gives a linear equation:

$$\ln W = \ln a + b \times \ln L \dots\dots\dots (2)$$

Where W = weight in g, L = total length in mm, 'a' and 'b' are constants

The relationship was established for both male and female by linear regression of the natural logarithms of the length and weight data. The regression analysis, ANACOVA on the regression equations, 't' test on 'b' and 'r' values were carried out as per standard statistical procedures (Snedecor, 1961). Relative condition factor 'Kn' (Le Cren, 1951) was estimated for male and female using the formula:

$$Kn = \frac{W}{\hat{W}} \dots\dots\dots (3)$$

Where 'W' is the observed weight and $\hat{W}$ is the expected weight derived from the length-weight relationship. 'Kn' values for the various length groups and for different months were calculated after obtaining the mean lengths and mean weights for the corresponding length groups and months.

Results and Discussion

The logarithmic regression equations in respect of length-weight relationship for male and female *P. hamrur* (Fig. 1) are as follows:

Male :
 $\ln W = -11.9629 + 3.1132 \times \ln L$ ($r = 0.9956$)

Female :
 $\ln W = -11.7279 + 3.0684 \times \ln L$ ($r = 0.9977$)

The corresponding exponential formula can be expressed as follows:

Male : $W = 0.00000638 \times L^{3.1133}$

Female : $W = 0.00000811 \times L^{3.0685}$

The confidence limits (at 5%) for the b values of male and female were estimated as:

Male : 3.0937 - 3.1327

Female : 2.9321 - 3.2047

The results of the ANACOVA on the length-weight regression equation are given in Table 1 which shows that the F values were greater than the table values at 5% level. This indicates that both the slope as well as elevation were significantly different for males and females. Their 'r' values subjected to 't' test showed significant differences 0.1% level. Thus the length-weight relationships for male and female *P. hamrur* were considered as different and therefore a combined relationship could not be derived to represent both male and female.

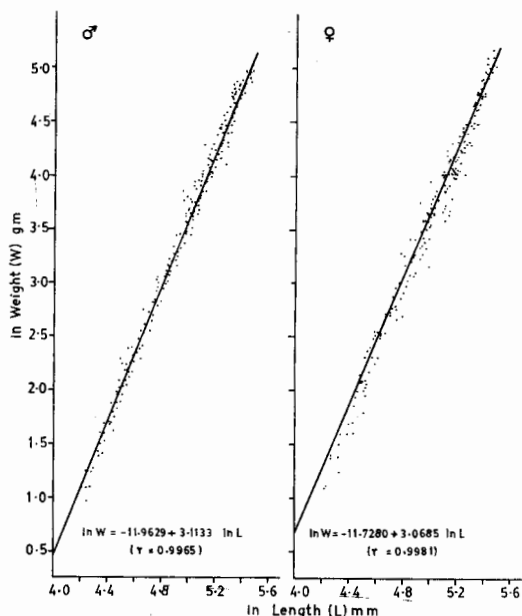


Fig. 1. Length-weight relationship of male and female *Priacanthus hamrur*

Table 1. Comparison of regression of length-weight relationship of males and females in *P. hamrur*

	Within	df	X ²	XY	Y ²	r	df	Deviation from regression	
								SS	MSS
1.	Male	692	51.0035	158.7888	497.8521	3.1133	691	3.4963	0.0051
2.	Female	1338	84.634	259.6975	799.9860	3.0685	1337	3.1062	0.0023
3.							2028	6.6025	0.0033
4.	Pooled	2030	135.6370	418.4855	1297.8381		2029	6.6713	0.0033
5.	Difference due to regression						1	0.0688	0.0688
6.	Between		13.8230	43.6325	137.7219				
7.	Total	2031	149.4600	462.1180	1435.5600		2030	6.7296	0.0033
8.	Between adjacent means						1	0.0583	0.0583

Comparison of slope $F = 0.0688$ (df. 1,2028) = 21.143428*; Comparison of elevation $F = 0.0583$ (df. 1,2029) = 17.721715*

* Significant at 0.5% level

The fluctuation of Kn values of males and females for different months showed similar trends (Fig. 2). The highest Kn values were observed in both females (1.5534) and males (1.383) during May while the values were lowest ($M = 0.9779$, $F = 0.9009$) during August. While the

males showed Kn values less than 1 in February, July, August and October, the females showed Kn values below 1 only in August. Except for the inflection noticed in February, both the sexes recorded high relative condition values during January-Junes.

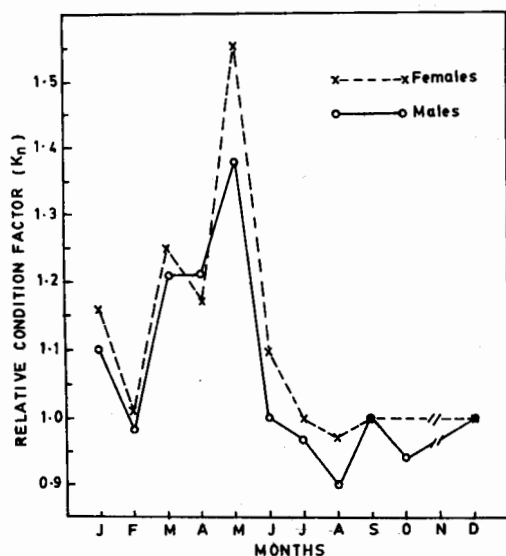


Fig. 2. Monthly variation of relative condition factor (Kn) of male and female of *Priacanthus hamrur*

Kn values for different length groups of 10 mm interval in respect of males and females are depicted in Fig. 3. Length groups above 210 mm in males and 230 mm in females were not included as the specimens belonging to these groups were sparse. It can be seen from Fig. 3 that in both the sexes, the Kn values steadily increased up to about 100 mm, remained almost static up to about 150 mm and thereafter showed fluctuations.

Joung and Chen (1992) observed that in *P. macracanthus* the length-weight relationship of male and female was significantly different at 5% level and the present findings agree with this. The b value obtained for females did not show significant variation from the isometric value of

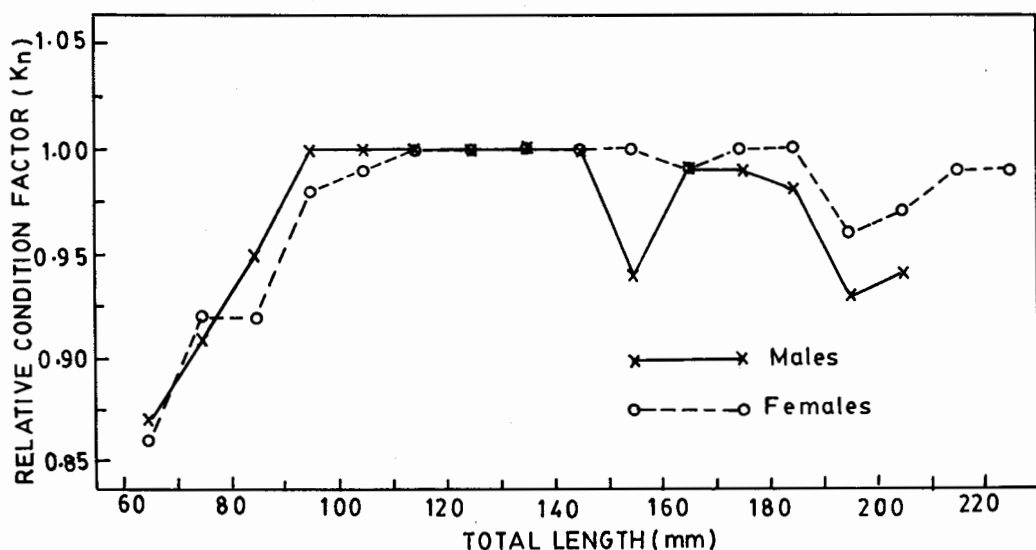


Fig. 3. Relative condition factor (K_n) for males and females of *Priacanthus hamrur* in different length groups

three whereas in males the departure from 3 was found significant. For an ideal fish which maintains dimension equality, isometric b value of 3 has occasionally been observed (Allen, 1938). Slope value less than 3.0 indicates that fish becomes more slender as it increases in length while slope greater than 3.0 denotes the stoutness, which would indicate that growth is allometric (Grover and Juliano, 1976). However, deviation from the cube law is often observed in most of the fishes as they change their body shape during growth. The value of b usually varies between 2.5 and 4.0 (Martin, 1949).

In the present study, the exponential value for females was 3.0684 ± 0.1363 (5% confidence limit) which indicates that the growth is isometric, whereas in males the b value was 3.1132 ± 0.0195 (5% confidence limit) which denotes that in males the growth does not exactly follow the cube law. It would thus appear that in *P. hamrur* the weight increases by a power of more than 3 with unit increase in body length as reported in female *P. macracanthus*

(Joung and Chen, 1992). However, these findings are at variance with the findings of Lester and Watson (1985) who reported b value of 2.7 and 2.9 respectively for *P. tayanus* and *P. macracanthus* which did not show significant deviation ($P = 0.05$) from isometric. Joung and Chen (1992) reported a b value of 2.65 for male *P. macracanthus* while Nugroho *et al.* (1983) estimated it as 2.7 for both the sexes of *P. macracanthus*. Chantawong *et al.* (1984) calculated a combined value of 2.5 for *P. tayanus*. It may, therefore, be inferred that *P. hamrur* shows a stout pattern of growth in contrast to its related species inhabiting south east Asian waters. The value of b is greatly influenced by the year classes of the specimens used for arriving at the length-weight relationship. Representation of younger fish in sample may yield a little higher b value while the predominance of older age group in the sample will reduce the b value. In the present study, older age males were represented less when compared to females and the higher value of b in males arrived may be attributed to the above reason.

Variations in condition of fishes have been attributed to a variety of reasons. The low and high conditions are invariably related to two major factors viz. spawning and feeding intensity. James (1967) suggested that the changes in the condition of ribbon fish *Eupleurogrammus intermedius* were related to factors other than reproductive cycle and the feeding habits. An inflection in the Kn value prior to the onset of maturity indicating the physiological changes the fish undergoes was observed in some species of the north east coast (Reuben *et al.* 1993). However, in *P. hamrur* no such inflection was observed prior to or during the size at first maturity, indicating that the sexual cycle of this fish does not have any profound influence on the condition of the fish. The gastro-somatic index of *P. hamrur* was reported by Philip (1994) and a comparison of monthly value of relative condition factor and gastro-somatic values showed a very strong correlation. It may therefore, be inferred that the condition of *P. hamrur* is greatly influenced by feeding intensity rather than the cyclic changes taking place in the gonads.

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