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Length-weight relationship of Indian mackerel, rastrelliger Kanagurta (Cuvier, 1817) off Southern coast of Maharashtra, India

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ABSTRACT

The parameters of the length-weight relationship of the form $W = aL^b$ are presented for 215 males, 277 females and 119 indeterminists with size range 6.4 to 29.9 cm TL. Samples from commercial (purse seines, Rampani, trawl, gill nets) and artisanal gears were taken during March 2011 to February 2012. From the F - ratio, it is evident that there is no significant difference among the regression coefficients between male, female and indeterminate. The estimated " b" values indicated positive allometric growth in males females, indeterminate and total ($P < 0.05$).

Key words : *Length weight, Indian mackerel,* Rastrelliger*, Maharashtra.*

Introduction

The Indian mackerel, *Rastrelliger kanagurta* (Cuvier, 1817) is one of the important pelagic, shoaling marine fish that is widely distributed in the Indo West Pacific region. India contributes 90% of the world mackerel production, out of which 77% is from west coast and 23% is from east coast of India. As far as Indian coast is concerned, this fishery is second in importance after Oil sardine, *Sardinella longiceps*. It is one of the major marine fishery resources of India which contributes about 7.9% to the total marine fish production of country (CMFRI, 2011).

The Maharashtra state with a coastline of 720 km and continental shelf of 89096 Sq.km has rich potential for marine fisheries. The state contributes to about 2.25 lakh tonnes of total marine fish landings of India (CMFRI, 2011). From this, Indian mackerel contributes 21761 tonnes (18.2%) to the total fish landings of the state, placing the resource on second position after prawns in terms of abundance (Shiledar, 2011).

The length-weight relationship (LWR) is an important factor in the biological study of fishes and their stock assessments. The LWR is particularly important in parameterizing yield equations and in estimations of stock size. This relationship is helpful for estimating the weight of a fish of a given length and can be used in studies of gonad development, rate of feeding, metamorphosis, maturity and condition (Le Cren, 1951). Methods to estimate the length-weight relationship of fishes are described by Pauly (1983).

From the point of fisheries management, it is revealed that there is localized variation in fishing intensity along the Indian coast and therefore for appropriate exploitation, proper management strategies are needed on regional scales. For this a holistic

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knowledge based on biology of Indian mackerel fisheries should be provided and LWR is one of them.

Material and Methods

This study is based on a total of comprising of 215 males, 277 females and 119 indeterminists with size range 6.4 to 29.9 cm TL. The parabolic equation $W = aL^b$ (Le Cren, 1951) was linearized to the form $Y = A + BX$ where, $Y = \log W$, $A = \log a$, $B = b$ and $X = \log L$. Based on this equation, constants A and B were estimated for each month using least squares method. The data for the sexes were treated separately in order to examine differences between sexes. Analysis of co-variance (Snedecor and Cochran, 1967) was used to test the significant difference in the estimates of "b" between sexes. The pattern of growth, whether isometric or allometric, was tested with t - test using the formula $t = b\text{-}3/S_b$ where "b" is the regression coefficient and S_b is the standard error of the regression coefficient.

Results

The main objectives of studying the length - weight relationship of fishes are to determine mathematical relationship between the two variables, so that if one is known the other could be estimated. Data for all the four groups such as males, females, indeterminants and total have been analysed separately. The regression equations obtained are shown in Table 1, with "X" variable as length and "Y" variable as weight. It was found that out of the total 611 specimens examined for the length-weight relationship 215 were males (LT = 12.5 to 29.3 cm, W = 25 to 289 g) 277 were females (LT = 14.6 to 29.9 cm, W = 34 to 304 g) and 119 were the indeterminants (LT = 6.4 to 22.4 cm, W = 5 to 145 g). Independent statistical analysis of their length and weight relationship gave the following regression equations.

Male : $W = 0.0029\ L^{3.2580}$

Female : $W = 0.0067\ L^{3.3804}$

Indeterminate : $W = 0.0068\ L^{3.2478}$

Total : $W = 0.0048\ L^{3.2986}$ (Fig. 1)

The observed values of length and weight of fishes were plotted and the parabolic curve was drawn Fig. 2. The t-test was employed to ensure allometric, isometric growth within the groups. The estimated "b" values indicated positive allometric growth in males females, indeterminate and total ($P < 0.05$). Table 2 shows the results of analysis of co - variance of length - weight relationship of male, female and indeterminate of *Rastrelliger kanagurta*. From the F - ratio, it is evident that there is no sig-

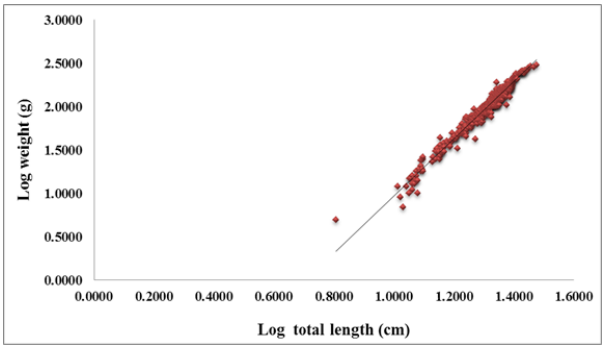

Fig. 1. Logarithmic relationship between total length and weight in the of *R. kanagurta*

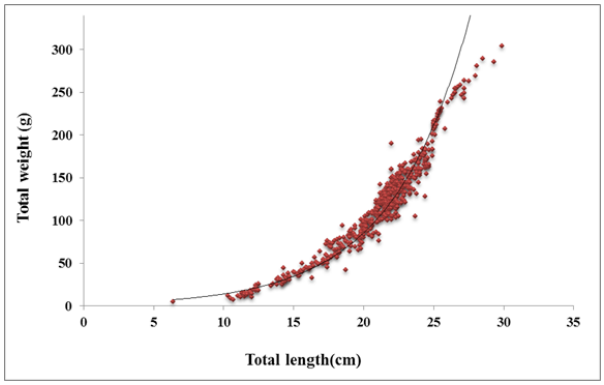

Fig. 2. Parabolic relationship between total length and weight in the of *R. kanagurta*

Table 1. Regression equations of length-weight relationships of males, females, indeterminants and total of *R. kanagurta*

Parameters	Equation	a	b	r	n
Males	Log W = -2.2763 + 3.2580 Log L	0.0029	3.2580	0.9584	215
Females	Log W = -2.4349 + 3.3804 Log L	0.0067	3.3804	0.9526	277
Indeterminants	Log W = -2.2693+ 3.2478 Log L	0.0068	3.2478	0.9750	119
Total	Log W = -2.3278 + 3.2986 Log L	0.0048	3.2986	0.9835	611

Table 2. Analysis of co-variance for comparison of length - weight relationship of male, female and indeterminate of *R. kanagurta*

Slopes	Σx2	Σxy	Σy2	n	b	Deviation from regression			
						Residual SS	Residual DF	Residual MS	F-ratio
Males	0.5163	1.6822	5.9668	215	3.2580	0.4862	213	0.0023	1.0953
Females	0.4318	1.4595	5.4370	277	3.3804	0.5032	275	0.0018	
Indeterminants	1.0733	3.4860	11.9091	119	3.2478	0.5873	117	0.0050	
Pooled regression		1.5767	605	0.0026					
Common regression	2.0214	6.6277	23.3128	611	3.2787	1.5824	609		

Significant at 5% level
Not Significant at 5% level
Table Value 0.05 (1), 2, 609: 3.0

nificant difference among the regression coefficients between male, female and indeterminate. Hence, the pooled regression equation for male, female and indeterminate could be written as follows,

Log W = -2.3268 + 3.2787 Log L

The corresponding non-linear equation is represented by

$W = 0.0047\ L^{3.2787}$

Discussion

In the present study, the length – weight relationship of *R. kanagurta* showed that the weight of fish increased at a rate lower than the cube law of length. There is no significant difference in regression coefficient between male and female at 50% level. The value of 'b" was found to be more than 3.0 in both male and female.

Abdurahiman *et al.* (2004) reported the length-weight relationship of Indian mackerel as $W = 0.005\ L^{3.261}$. Pratibha and Gupta (2004) observed linear growth of Indian mackerel having length-weight relationship was $W = 0.004457\ L^{3.29}$. Abdussamad *et al.* (2006) reported length-weight relationship for male and female as Log W = -5.54817+3.23919 Log L and Log W = -5.4674+3.18733 Log L respectively. Sivadas *et al.* (2006) calculated length-weight relationship for the pooled male and female as $W = 0.0000014\ L^{3.3}$ and that of indeterminate category as $W = 0.0000044\ L^{2.67}$.

There is no such difference found in earlier works on length-weight of the species carried out by different investigators from different regions have been compared with results obtained in present investigation.

References

Abdurahiman, K.P., Harishnayak, T., Zacharia, P.U. and Mohamed, K.S. 2004. Length-weight relationship of commercially important marine fishes and shellfishes of the southern coast of Karnataka, India. *NAGA, Worldfish Center Quarterly.* 27 : 9-14.

Abdussamad, E. M., Kasim, H. M. and Achayya, P. 2006. Fishery and population characteristics of Indian mackerel, *Rastrelliger kanagurta* (Cuvier) at Kakinada. *Indian. J. Fish*. 53(1): 77 – 83.

CMFRI 2011. Annual Report 2010-11. Central Marine Fisheries Research Institute, Cochin, 163 pp.

Le Cren, C.P. 1951. Length-weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). *Journal of Animal Ecology.* 20(2): 201-219.

Prathibha, Rohit and Gupta, A.C. 2004. Fishery, biology and stock of the Indian mackerel *Rastrelliger kanagurta* off Mangalore-Malpe in Karnataka, India. *J. Mar. Biol. Ass. India*. 46 (2) : 185-191.

Shiledar, A.A., Khandagle, P.A. and Chllappan, A. 2011. Unprecedented landings of Indian Mackerel in Maharashtra. *CMFRI Newsletter*.No.128.20 pp.

Sivadas, M., Nair, P. N. R., Balasubramanian, K. K. and Bhaskaran, M. M. 2006. Length weight relationship, relative condition, size at first maturity and sex ratio of Indian mackerel *Rastrelliger kanagurta* from Calicut. *J. Mar. Biol. Ass. India*. 48 (2) : 274-277.

Snedecor, G.W. and Cochran, W.G. 1967. *Statistical Methods,* Sixth edition, Oxford and IBM publishing Co., New Delhi: 593 p.