LENGTH WEIGHT RELATIONSHIP IN *RASTRELLIGER KANAGURTA* (CUVIER, 1817) FROM KARACHI COAST, PAKISTAN

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ABSTRACT

The length-weight relationships of 1650 *Rastrelliger kanagurta* (Cuvier, 1817) including 860 female and 790 male collected from July 2009 to June 2012 from the commercial landings at Karachi Fish Harbour West Wharf are presented in this study. The mean value of TL for male was 228 mm and female was 231 mm and mean weight range for male was 147g and female was 156 g it means that females are heavier than males. The regression showed highly significant ($P < 0.01$) values coefficient of correlation (r^2) ranges from 0.876 (female) and 0.795 (male). The mean regression value of b was 2.711, 2.922 and 2.838 for male, female and combined sexes respectively. The t-test ($P < 0.05$) shows that the difference amongst mean values was statistically significant as well.

Key-words: Length weight relationship, Karachi coast, *Rastrelliger kanagurta*

INTRODUCTION

Rastrelliger kanagurta (Cuvier, 1817) belonging to the family Scombridae order Perciformes, is a small indigenous fish species (SIS) of high commercial importance. The fish is important because of its rich taste and high nutritional value. Khan and Hoda, (1999) and Khan, *et al*., (2015) suggested that LWR can play role as an indication for some important life processes like growth and maturity of the fish. The Length-weight relationship is commonly used for two different purposes. First one, to illustrate mathematical model between length and weight in which one can be derive from the other and secondly, to estimate condition factor which is one of the important parameter which provides observations on the physiological state or fatness of the fish (Le Cren, (1951).

Some researchers like June (1972); Sobhana and Nair (1974); Papageorgious (1979); Ali (1979); Hussian and Ahmed (1992); Salam and Mahmood (1993); Khan and Hoda (1999) and Abbas (2000) reported the length weight relationship as an important information for fisheries management,

Length and weight data are essential for estimating growth rates, age structure (Kohler *et al*., 1995), the standing stocks biomass (Martin-Smith, 1996). Length-weight relationships are very important in fisheries management for comparison of growth studies, (Garcia-Arteaga, *et al*., 1997; Haimovici and Velasco, 2000), several other aspects of fish population dynamics (Morato, *et al*., 2001, Moutopoulos and Stergiou, 2002; Hossain, *et al*., 2006). This study provides the basic information on the length weight relationship of *R. kanagurta* from the Karachi coast that will be useful for fishery management.

MATERIALS AND METHODS

In the present study 1650 *Rastrelliger kanagurta* including 860 female and 790 male were collected from July 2009 to June 2012 from the commercial landings at Karachi Fish Harbour West Wharf 24º48′50ºN 67º13′45ºE near coastal area of Karachi, Pakistan. The sampling was done twice in a month for a period of three years.

The Length Weight relationship of Indian mackerel was carried out by the following relationship described by Meek (1903):

$$W=aL^3$$

The modified equation presented by (LeCren, 1951) was used:

$$W=a\ L^b$$

Where W is weight, L is length, a is constant or intercept and b is an exponent or slope.

The exponential form of relationship can be expressed in the logarithmic form (Wooton, 1990; Salam and Mahmood, 1993).

$$\text{Log } W=\text{Log } a + b \log (L)$$

RESULT AND DISCUSSION

Sample size, length and weight ranges, mean, standard deviation, regression and regression coefficient (r) are presented for total of 1650 individuals of *Rastrelliger kanagurta* including 860 female and 790 male are presented in (Table 1 and 2).

The mean value of total length for male was recorded 228 mm and female was 231 mm likewise mean weight of male was 147g and female was 156 g which shows that female heavier and slightly larger than male (Table 1). The regressions are highly significant ($P < 0.01$) and there r^2 values range from 0.876 (female) and 0.795 (male). The mean regression value of b for male and female was 2.711 and 2.922. The values of the exponent b for males, females and combined sexes were statistically significant ($P < 0.05$) (Table 2 and 3) and negative allometric growth pattern was observed in *R. kanagurta* (Table 2) by using the regression co-efficient b. The scatter plot for male, female and combined sexes is also presented (Fig. 1, 2 and 3).

The length-weight relationships were calculated as:

$$\text{Log } W = -4.732 \pm 2.922 \log L, \quad r = 0.946, r^2 = 0.876 \text{ (female)}$$
$$\text{Log } W = -4.720 \pm 2.711 \log L, \quad r = 0.882, r^2 = 0.795 \text{ (male)}$$
$$\text{Log } W = -4.532 \pm 2.838 \log L, \quad r = 0.936, r^2 = 0.841 \text{ (combined)}$$

Independent samples t-test was conducted to see the difference between the mean length of male and female *R. kanagurta*. The t-test is highly significant ($P < 0.05$) which indicates that the difference between mean value was statistically significant.

Table 1. Range, mean values of total length (TL) and body weight (B.Wt.) with standard deviation (S.D) of *Rastrelliger kanagurta.*

Sex	N	T.L (mm)			B.Wt. (g)		
		Range	Mean	S.D	Range	Mean	S.D
Female	860	175-310	231.19	24.386	66-340	156.47	52.513
Male	790	175-280	228.5	21.698	64-260	147	42.417
Combine	1650	175-310	229.9	23.17	64-340	151.94	48.164

Table 2. Regression equation and t-value of total length and body weight of female, male and combine sexes of *Rastrelliger kanagurta.*

			Regression Equation					t-value		
Relationship Examined	Sex	N	a	b	r^2	S.E "a"	S.E "b"	a	b	p
x: T.L	Female	860	-4.732	2.922	0.876	1.791	0.0376	-53.246	77.706	0.000
Y: B.Wt	Male	790	-4.720	2.711	0.795	1.509	0.0126	-36.727	53.349	0.000
	Combine	1650	-4.532	2.838	0.841	1.186	0.0304	-63.14	93.271	0.000

The length weight relationship in *R. kanagurta* provided in present study does not follow typical cube law suggested by LeCren (1951) because of negative allometry observed in this study. Negative allometric growth pattern in *R. kanagurta* was also reported by Rahman and Hafzath (2012) from Malaysia i.e. value of 'b' was 2.905 which is quite close to presented results in this study i.e. 2.838 but they observed variations in b value which could be because of environmental or geographical difference.

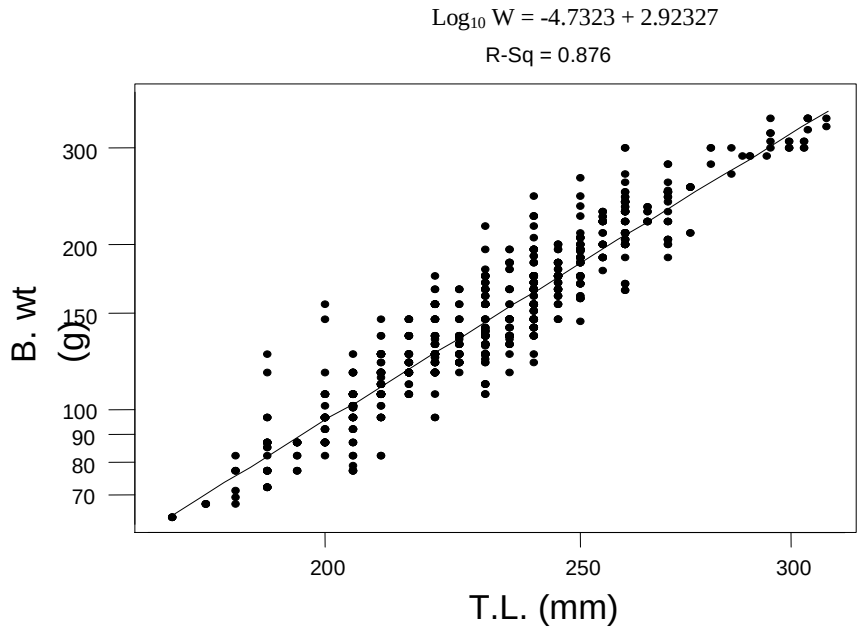

Fig. 1. Length weight relationship of female *Rastrelliger kanagurta*

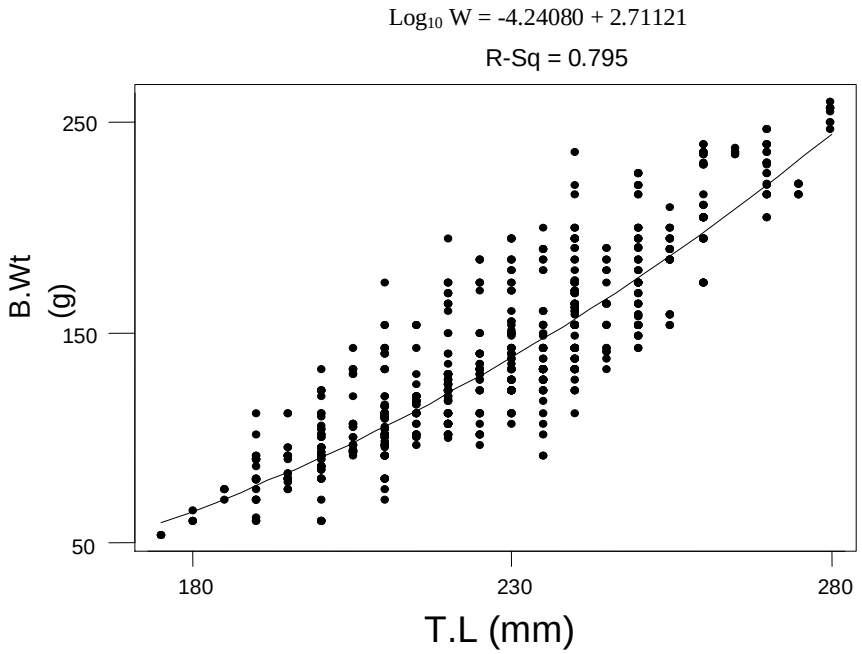

Fig. 2. Length weight relationship of male *Rastrelliger kanagurta*.

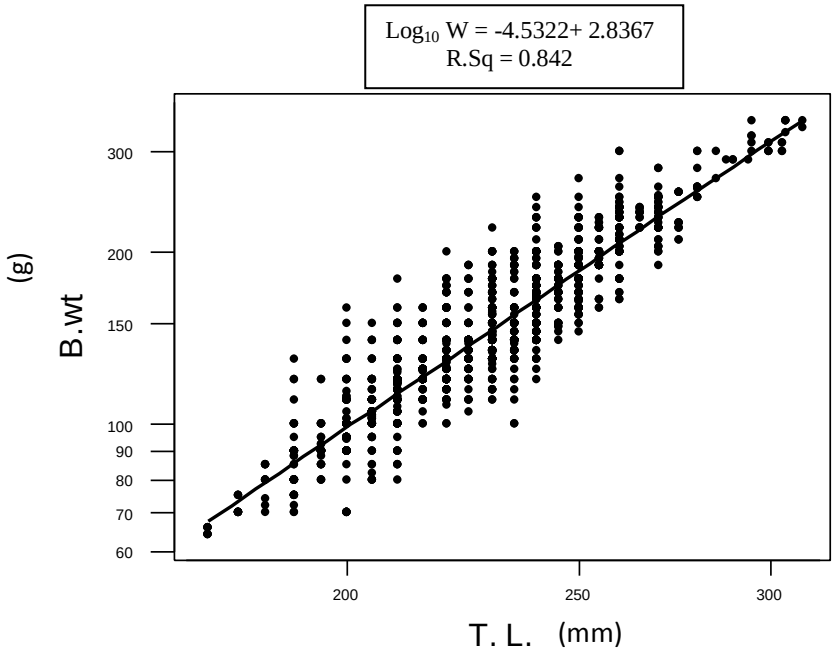

Fig.3. Length weight relationship combined sexes of *Rastrelliger kanagurta.*

The value of coefficient of correlation (r^2) for male, female and combined sexes presented here (r^2 = 0.795, 0.876 and 0.841) are close to observations by Sivadas *et al*. (2006) from India with a difference that coefficient of correlation (r^2) for immature and mature specimens were also provided. Hulkoti *et al*. (2013) observed no significant difference in 'b' value amongst male and female *R. kanagurta*.

However, positive allometric growth in *R. kanagurta* was observed by Amin *et al*. (2015) from Egypt and Bhendarkar *et al*. (2014) from India. Hence it can be suggested that growth pattern in *R. kanagurta* varies in different habitats and seasons.

Similar approach adopted by several workers from this region to provide length-weight relationship in different species such as, Hussain *et al*. (2010) presented length-weight relationship in different species collected from Korangi-Phitti Creek area (Arabian Sea). Khatoon *et al*. (2014) provided length-weight relationship for five different species from Arabian Sea, Riaz *et al*. (2017b) presented length-weight relationship in Sea bream from Karachi Coast, Riaz *et al*. (2017a) discussed seasonal variation in length-weight relationship and condition factor in Arabian yellow-finned sea bream and Safi *et al*. (2014) stripped piggy fish from Karachi Coast.

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