

Length Weight Relationship and Condition Factor of *Trichiurus lepturus* (Pisces: Trichiuridae) from Karachi Coast, Pakistan

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Abstract: In this study, length -weight relationship, Condition (K) factor of 580 *Trichiurus lepturus* were determined from Dec. 2008- Dec. 2009. Specimens were collected from Karachi fish harbor. Results showed highest mean length of fish of 76.33+ 17.043cm in Autumn season. The highest and mean weights of fish of 382.09+ 119.250gm were recorded in Autumn. Length and weight of fish were taken in fresh condition separately for male and female. The Correlation Coefficient of samples showed very high degree of Correlations varying from 0.91, 0.929, 0.927, 0.924 for Spring, Autumn, Winter and Summer respectively. The comparison of the sample of Spring, Autumn, Winter and Summer did not show any significant difference. The length – weight relationship of *T. lepturus* were detected $W=0.0043L^{0.36471}$. The mean of values of condition (K) of *T. lepturus* were determined as 0.099. In males, low relative condition values were observed in Autumn, where as high relative condition values were observed during winter.

Key words: Length- weight relationship, Condition factor, *Trichiurus lepturus*, Karachi Coast, Pakistan.

INTRODUCTION

Ribbon fishes of the family Trichiuridae is one of the important fishes in India with an average production of 1.07×10^5 tonnes for the period 1990-98 [1]. It contributes 4.57% of total marine catch. Among pelagic group of fish, it ranked fifth and among total fish catch, it ranked seventh in terms of production in 1998-99 period [1]. *T. lepturus*, found in tropical and temperate water to a depth of 350m [2]. Although not considered a popular food fish in the United States, *T. lepturus* is an important commercial fish in other countries. In 1990, 752,711 tons of *T. lepturus* landed worldwide, with over 85% of this catch occurred in the northwest pacific along the coast of China and Japan [2]. *T. lepturus* migrates seasonally and that it may enter into bays, cuts, and harbors in great numbers to spawn [3,4,5,6]. *T. lepturus* harvested in U.S water with a majority of the landings in the gulf of Mexico. The body length and weight are of great importance in fishery biology [7].

Fish plays an important role in the development of a nation. A part from being a cheap source of highly nutritive protein, it also contains other essential nutrients required by the body [8]. The length weight relationship of fish is an important fisheries management tool. Its importance is pronounced estimating the average weight at a given length group [9] and in assessing the relative well being of a fish population [10]. The relationship between weight and length for fish in a given population can be analyzed by measuring weight and length of the same fish throughout their life or of a sample of fish taken at a particular time [11].

In fisheries managements, the condition factor (K) reflects, variation and of fish information of physiological state in relation to its welfare [12]. Condition factor compares the wellbeing of fish and is based on the hypothesis that heavier fish of a given length are in better condition [13]. Condition factor has been used as an index of growth and feeding intensity [14]. Condition factor decrease with increase in length [15], and also influences the reproduction cycle in fish [16]. Condition factor is also a useful index for the monitoring of feeding intensity, age and growth rates in fish [17]. It is strongly influenced by both biotic and abiotic environmental conditions and can be used as an index to assess status of aquatic ecosystem in which fish live.

The aim of the present study is to keep seasonal record of length, weight and condition factor of *T. lepturus* through the year.

MATERIAL AND METHODS

A total of 580 *T. lepturus* specimens were randomly sampled from commercial landing at Karachi fish harbour during Dec 2008-Dec 2009. The fish were caught by using a wide range of fishing gear such as long line, trawl net and boat seines. The total length and weight of every fish were measured. Specimens were stored in coolers containing ice and transported to laboratory for further analysis. The data on total length, weight, sex of each fish were recorded immediately after collection of the sample.

The total length (TL) of the fish was measured from the tip of the anterior part of mouth to caudal fin using meter ruler calibrated in centimeter. Fish weight was taken after blot drying with a piece of clean hand towel. Weighing was done with a tabletop weighing balance to the nearest gram. The length measurement were converted into length

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frequencies with constant class intervals of 10cm differences. The mean lengths and weights of the classes were used for data analysis according to FISAT [18].

The relationship between the length (L) and weight (W) of fish was expressed by equation [19].

$$W=aL^b$$

where,

W= weight of fish in (gm)

L= Total length (TL) of fish in (cm)

a= Constant (Intercept)

b= The length Exponent (slope)

The 'a' and 'b' values were obtained from a linear regression of the length and weight of fish.

The Condition factor (K) was determined using the expression by [20].

$$K=100 W/L^3$$

Where,

K= Condition factor

W= Weight of fish (gm)

L= Length of fish (cm)

RESULT

A Total of 580 specimens (336 males and 244 females) of *T. lepturus* were analysed.

Length Composition

The length of 580 specimens of *T. lepturus* were observed between 47- 106 cm that were landed between 2008 of Dec to 2009 of Dec. Out of these, the total length of 224 female individuals were measured between 47- 106 cm, although the total length of 336 male individuals were measured between 47-106 cm. The most abundant samples were between 67 -76cm (24.13%) length groups (Fig. 1).

Weight Composition

The weights of 580 specimens of *T. lepturus* were taken. 26.72 % of individuals weighed between 240-304 gm, and 2.24 % of individuals weighed were between 175-239 gm.

Condition Factor

The Condition factor values which were calculated according to the total length groups in the seasonal samples were given in Tables (2-5). As it was seen here, the Condition factor of each gender showed variations with respect to season and length groups. The difference between combine groups of female male, female- male individuals in the same season and in the same length group was found statistically non significant (p>0.05) (Table 2-5)). It was noted that as the length of the fish increases the Condition factor decrease. The highest mean Condition factor was in Winter and Summer (0.1065, 0.1058) whereas the lowest Condition factor was in Spring and Autumn (0.0997, 0.0955).

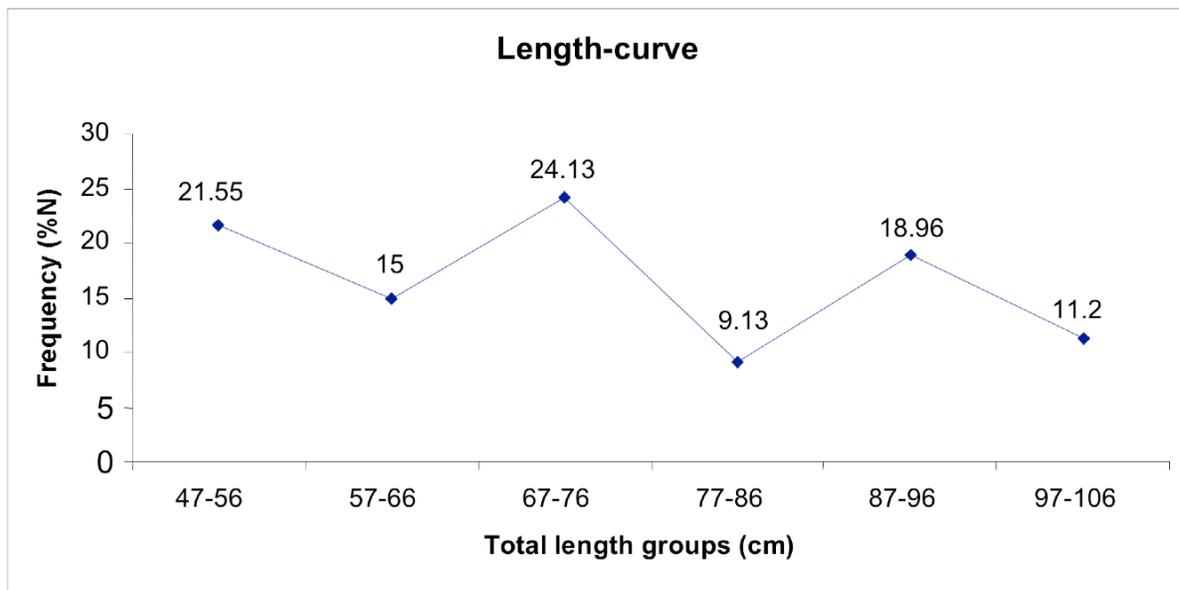


Fig. (1). Total length of distribution of *Trichiurus lepturus*.

Table 2. According to length groups 10 cm, seasonally, mean length (TL), mean weight (W), mean condition (K) values of *Trichiurus lepturus* and standard deviation and significance test of differences between means (Student's t-test, $p=0.05$). * $p<0.05$

Total Length Group	Sex	Spring			
		n	TL	W	K
47-56	Female	18	51.28±2.866	281.85±119.289	0.139±0.040
	Male	10	49.90±3.143	385±145.727	0.136±0.036
	F+M	28	50.79±2.986	338.57±141.519	0.125±0.057
57-66	Female	7	60.86±2.673	275±63.808	0.147±0.052
	Male	13	60.31 ±2.594	317.5±154.162	0.104±0.040
	F+M	20	60.50 ±2.565	300.50±125.362	0.121±0.049
67-76	Female	19	69.95±3.488	301.13±139.677	0.103±0.040
	Male	15	72.33 ±2.895	360.39±130.697	0.091±0.036
	F+M	34	71.00±3.411	336.62±136.730	0.097±0.038
77-86	Female	5	84±0.00	261.25±144.648	0.088±0.055
	Male	5	84±0.00	472.50±100.586	0.080±0.023
	F+M	10	84±0.00	388.00±156.511	0.083±0.036
87-96	Female	9	92.22±2.635	386.50±121.084	0.080±0.016
	Male	18	92.22±2.557	439.33±111.961	0.074±0.017
	F+M	27	92.22±2.532	416.30±116.797	0.077±0.016
79-106	Female	2	98±0.00	443.29±80.079	0.078±0.027
	Male	13	98±0.00	413.13±82.156	0.081±0.016
	F+M	15	98±0.00	430.00±81.306	0.079±0.021
Total	Female	60	68.73 ±15.540	326.33±128.696	0.108±0.045
	Male	74	77.32 ±17.294	390.88±132.281	0.092±0.042
	F+M	134	73.48± 17.020	361.98±134.125	0.099±0.040

Table 3. Seasonal relationship of *Trichiurus lepturus* in winter

Total Length Group	Sex	Winter			
		n	TL	W	K
47-56	Female	20	51.10±2.882	291.00±146.896	0.141±0.063
	Male	22	50.77±3.294	353.71±150.104	0.116±0.064
	F+M	42	50.93±3.071	330.95±149.02	0.121±0.062
57-66	Female	12	60.50±2.611	312.00±140.262	0.127±0.026
	Male	15	61±2.535	364.71±147.293	0.094±0.045
	F+M	27	60.78±2.532	345.56±144.251	0.106±0.053
67-76	Female	13	72.23±3.419	348.13±95.688	0.121±0.044
	Male	32	71.75±31.121	352.76±96.015	0.104±0.044
	F+M	45	71.89±3.178	351.11±94.832	0.118±0.041
77-86	Female	7	84±0.000	323.89±83.471	0.110±0.020
	Male	10	84±0.000	391.88±105.287	0.084±0.027
	F+M	17	84±0.000	355.88±97.760	0.097±0.027

Table (3) Contd....

Total Length Group	Sex	Winter			
		n	TL	W	K
87-96	Female	10	92±2.582	454.00±78.309	0.080±0.011
	Male	25	92.80±2.533	408.60±90.387	0.088±0.016
	F+M	35	92.57±2.535	421.57±88.449	0.086±0.015
79-106	Female	4	98±0.000	440.83±76.186	0.087±0.019
	Male	11	98±0.000	435.67±48.990	0.085±0.024
	F+M	15	98±0.000	438.33±58.727	0.086±0.021
Total	Female	66	68.50±16.667	350.76±123.030	0.115±0.049
	Male	115	74.49±16.619	376.17±117.321	0.101±0.042
	F+M	181	72.67±16.764	366.91±119.723	0.106±0.045

Table 4. Seasonal relationship of *Trichiurus lepturus* in Summer

Total Length Group	Sex	Summer			
		n	TL	W	K
47-56	Female	25	51.280 ±3.102	272.35±130.855	0.124±0.042
	Male	9	50.000 ±2.915	281.41±126.317	0.108±0.055
	F+M	34	50.941 ±3.064	328.38±138.285	0.116±0.049
57-66	Female	13	60.000 ±2.594	255.00±77.828	0.138±0.049
	Male	14	71.000 ±2.717	370.42±126.769	0.089±0.041
	F+M	27	60.7782±2.531	306.30±116.087	0.116±0.051
67-76	Female	20	71.050 ±3.501	375.75±128.394	0.128±0.044
	Male	14	50.000 ±2.916	328.57±65.675	0.097±0.034
	F+M	34	71.029±3.157	356.32±108.379	0.110±0.041
77-86	Female	6	84.000 ±0.000	375.00±95.394	0.120±0.041
	Male	6	84.000 ±0.000	417.14±81.948	0.074±0.028
	F+M	12	84.000 ±0.000	399.58±86.273	0.936±0.040
87-96	Female	5	93.000 ±2.738	398.64±91.490	0.090±0.022
	Male	23	92.174 ±2.534	431.18±109.695	0.089±0.036
	F+M	28	92.321±2.539	418.39±102.434	0.089±0.312
79-106	Female	2	98.000 ±0.000	367.78±77.947	0.109±0.016
	Male	13	98.000 ±0.001	477.50±118.142	0.068±0.017
	F+M	15	98.000 ±0.002	411.67±107.482	0.093±0.026
Total	Female	71	65.592± 14.3891	318.66±106.241	0.120±0.041
	Male	79	78.405±16.8975	400.13±120.304	0.092±0.040
	F+M	150	72.340± 16.9689	361.57±120.601	0.105±0.043

Table 5. Seasonal relationship of *Trichiurus lepturus* in Autumn

Total Length Group	Sex	Autumn			
		n	TL	W	K
47-56	Female	13	51.08±2.957	213.85±60.661	0.157±0.026
	Male	8	51.88±2.167	221.25±56.490	0.157±0.034
	F+M	21	51.38±2.655	216.67±57.778	0.157±0.029
57-66	Female	7	60.86±2.673	289.2857±36.220	0.129±0.018
	Male	6	59.67±2.582	282.500±26.598	0.133±0.011
	F+M	13	60.31±2.594	286.1538±31.034	0.131±0.015
67-76	Female	10	70.20 ±3.155	348.00±48.143	0.100±0.013
	Male	17	72.18±3.087	362.3529±35.930	0.097±0.012
	F+M	27	71.44±3.203	357.037±40.578	0.098±0.013
77-86	Female	5	84±0.000	402.00±57.619	0.067±0.009
	Male	9	84±0.000	408.33±57.554	0.068±0.009
	F+M	14	84±0.000	406.0714±55.406	0.068±0.009
87-96	Female	5	93 ±2.739	455.00±79.686	0.056±0.006
	Male	15	92.33 ±2.582	511.00±41.022	0.065±0.005
	F+M	20	92.50±2.565	497.00±56.531	0.062±0.006
79-106	Female	7	98±0.000	517.1429±43.670	0.054±0.004
	Male	13	98±0.000	521.923±43.471	0.055±0.004
	F+M	20	98±0.000	520.2500±42.44	0.055±0.004
Total	Female	47	71.55±17.759	344.47±119.110	0.105±0.043
	Male	68	79.63±15.830	408.09±113.035	0.088±0.036
	F+M	115	76.33±17.043	382.09±119.250	0.095±0.040

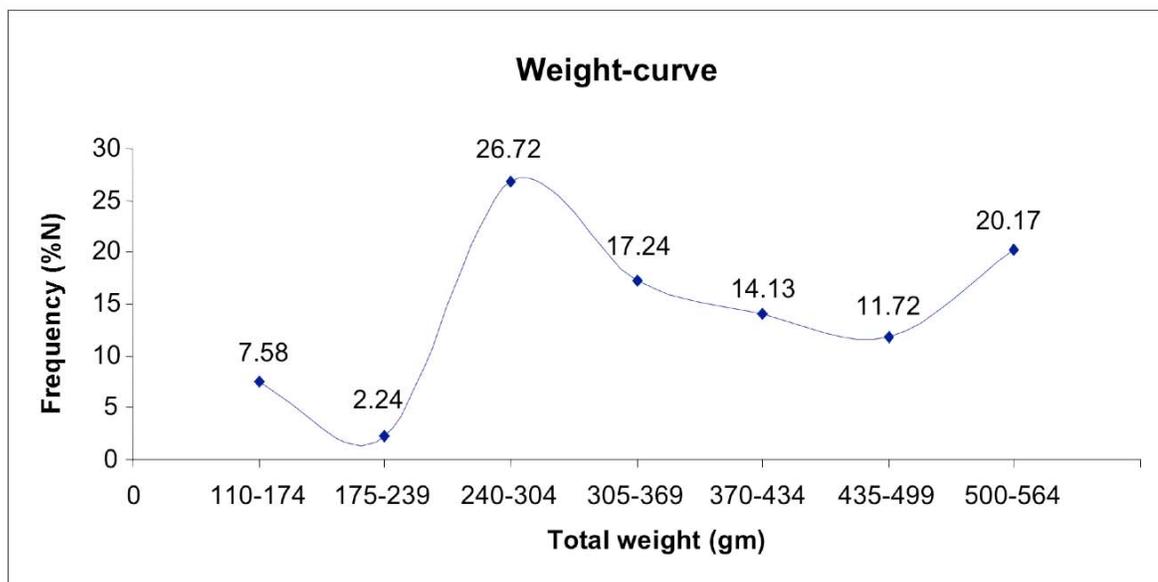


Fig. (2). Total weight of distribution of *Trichiurus lepturus*.

T. lepturus individuals. In present research it was determined that the highest total length was between 67-76 cm (24%) and the highest weight values were between 240-304gm (26.7%) (Figs. 1 and 2).

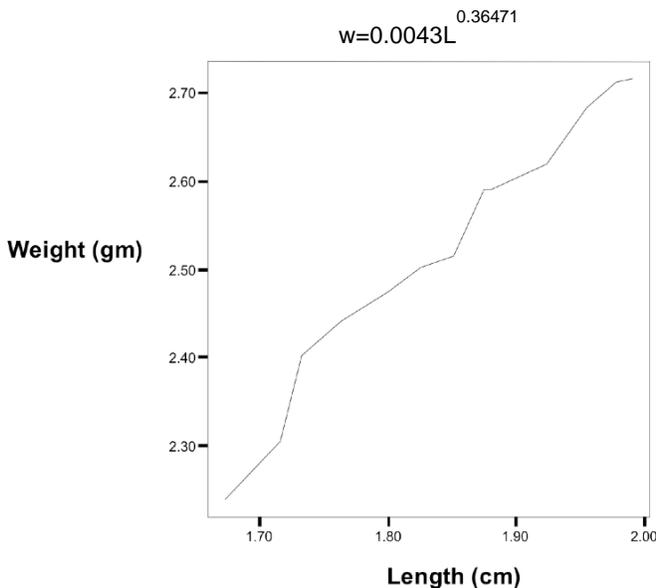


Fig. (3). Line of Length-weight relationships of *Trichiurus lepturus*.

The highest fish catch was recorded in Winter season (181) and low fish catch was recorded in Autumn (115). Factor affecting fish distribution and abundance have already been reported by different workers. Availability of food, spawning rates, breeding grounds coupled with shelter, presence of current, vegetation, depth of water breeding habits migration and low predation have been suggested as major limiting factors affecting the distribution and abundance of various fish families in Kainji Lake, Nigeria [30].

The condition factor values were examined between males and females, these values were determined that there was statistically major difference ($p < 0.05$) and the difference was high in favour in males (Table 2-5). In the seasonal calculations, these values were established that the lowest condition values were in Autumn. The condition factor being in the lowest degree in this season arised from the spawning period of *T. lepturus*. On the other hand the highest condition factor values of the samples were in Winter. [31] confirmed that the lowest K values during the more developed gonad stages might mean resource transfer to the gonads during the reproductive period. [32] through others authors, showed that values of the condition factor vary according to seasons and are influenced by environmental conditions.

CONCLUSION

The length- weight relationship of fish are important fishery management tools. Since *T. lepturus* represent commercially important fish in Karachi Coast.

The result obtained in this study showed general negative allometric growth with the highest maximum b values of 1.53 in spring wheres as minimum b values of 1.38 in winter. The mean of values of condition (K) of *T. lepturus* were determined as 0.099, the correlation coefficients (r) and (b) differ between the species considered due to variations in the length classes and number of the measurement available.

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