

SEASONAL VARIATION IN LENGTH, WEIGHT AND CONDITION FACTOR OF *THUNNUS TONGGOL* (FAMILY-SCOMBRIDAE) FROM KARACHI COAST OF PAKISTAN

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BSTRACT

Length, weight and condition factor in 361 Fish individuals of *Thunnus tonggol* were determined between (Oct. 2007 to Sept. 2008) from Karachi coast of Pakistan. Results showed highest mean length of fish of 38.3 ± 0.079 cm in winter season and lowest of 22.27 ± 0.17 cm in autumn. The Highest and mean weights of 416.4 ± 12.19 and 114.79 ± 2.29 g, respectively, were recorded in autumn. The condition factor (K) averaged to 0.941 ± 0.006 . The mean condition factor was highest in autumn (1.06 ± 0.07) and the lowest in winter (0.48 ± 0.09). The seasonal distribution of various size classes of the fish catch is followed.

Key words: Length-weight relationship, condition factor, Karachi coast, *Thunnus tonggol*

INTRODUCTION

Long tail tuna, *Thunnus tonggol* is the second smallest of eight *Thunnus* species which may grow to a maximum size of 142 cm in length and 35.9 kg in weight (Froese and Pauly, 2010). It is an economically important pelagic species inhabiting tropical and subtropical provinces of the Indo-Pacific region between 47° N and 33° S (Froese and Pauly, 2010). Their distribution is unique compared to other *Thunnus* species in that they nearly exclusively occupy neritic areas close to landmasses and are rarely found offshore (Yesaki, 1993). This species is commercially valuable.

The body length and weight are of great importance in fishery biology (Sparre *et al.*, 1989; Gulland, 1983). The two parameters are the implications of the processes of growth and reproductive success. The fish stock management underlines the importance to improve our knowledge about the complex of variation in these parameters as a reaction to the environmental and biological perturbations. For instance, the factor of condition (K) in fish reflects, through its variations, information on the physiological state of the fish in relation to its welfare (Lambert and Dutil, 1999). Such data are essential in estimating growth rates, age structure and other aspects of fish population dynamics (Kolher *et al.*, 1995). The relationship between weight and length for fish in a given population can be analyzed by measuring weight and length of the some fish throughout their life or of a sample of fish taken at a particular time (Wootton, 1998). Condition factor compares the wellbeing of a fish and is based on the hypothesis that heavier fish of a given length are in better condition (Bagenal and Tesch, 1978). Condition factor has been used as an index of growth and feeding intensity (Fagade, 1979). It decreases with increase in length (Bakare, 1970; Fagade 1979). It influences the reproductive cycle in fish (Welcome, 1979). The aim of the present studies is to record seasonal variation in length, weight and the condition factor in *Thunnus tonggol*.

MATERIALS AND METHODS

Thunnus tonggol specimens were collected from commercial landings at West-Wharf fish harbour and Korangi Fish Harbour of Karachi. Three hundred and sixty one fishes were collected during (Oct. 2007 to Sept. 2008). The samples of fishes were transported to the laboratory in polythene bags containing ice blocks to prevent spoilage. They were washed and then identified with the help of FAO guidelines (Fischer and Whitehead, 1974) and then stored in deep freezer till analysis.

The Length (L) of the fish was measured from the tip of the anterior part of the mouth to the caudal fin in centimeters. They were measured to the nearest centimeter. Fish weight was measured after blot drying with a piece of clean hand towel. Weighing was done with a tabletop weighing balance, to the nearest gram. The length measurements were converted into length frequencies with constant class intervals of three cm. The data was analyzed and arranged as per format accepted by FISAT (Gayaniilo and Pauly, 1997). The condition factor was calculated by using the formula of Pauly (1983) -

C.F. = $100 W/L^3$, Where, W= weight (g); L= length or fork length (cm).

Table 1. Mean length (L), mean weight (W), mean condition (K) values of *Thunnus tonggol* with standard deviation, in fishes of six fork length classes during (Oct.2007-Sept.2008).

| Size classes (cm) | n | L (cm) | W (g) | K |
|-------------------|-----|--------------|---------------|---------------|
| 21-24 | 226 | 22.05 ±0.31 | 101.01 ±0.296 | 1.018 ±0.007 |
| 24.1-27 | 92 | 25.42 ±0.18 | 136.36 ±0.83 | 0.861 ±0.016 |
| 27.1-30 | 23 | 27.65 ±0.045 | 151.04 ±0.301 | 0.714 ±0.005 |
| 30.1-33 | - | - | - | - |
| 33.1-36 | 11 | 71.72 ±35.40 | 390.90 ±0.42 | 0.881±0.002 |
| 36.1-39 | 09 | 38.3 ±0.07 | 448.66 ±0.52 | 0.798 ±0.002 |
| N | 361 | 23.45 ±1.36 | 141.65 ±26.67 | 0.941 ± 0.006 |

(L) Cv(%) 5.79,S.E,0.071, (W) Cv(%) 18.82,S.E,1.403,(K) Cv(%) 22.27, S.E,0.0022

Table 2. Mean length (L), mean weight (W), mean condition (K) values of *Thunnus tonngol* with standard deviation, in fishes of six fork length classes during summer.

| Size classes (cm) | n | L (cm) | W (g) | K |
|-------------------|----|--------------|--------------|-------------|
| 21-24 | 50 | 22.50 ± 0.31 | 117.68 ±3.93 | 1.02 ± 0.01 |
| 24.1-27 | 10 | 25.64 ±0.19 | 136.80 ±0.48 | 0.78 ±0.03 |
| 27.1-30 | - | - | - | - |
| 30.1-33 | - | - | - | - |
| 33.1-36 | - | - | - | - |
| 36.1-39 | - | - | - | - |
| N | 60 | 18.92 ±1.61 | 119.4 ±4.55 | 0.98 ±0.08 |

(L) Cv (%) 8.5; S.E,0.208. (W) Cv (%) 3.81; S.E, 0.587. (K) Cv (%) 8.16; S.E, 0.010

Table 3. Mean length (L), mean weight (W), mean condition (K) values of *Thunnus tonngol* with standard deviation, in fishes of six fork length classes during winter.

| Size classes (cm) | n | L (cm) | W (g) | K |
|-------------------|-----|--------------|----------------|--------------|
| 21-24 | 82 | 22.68 ± 0.29 | 117.97 ± 12.78 | 0.83 ± 0.05 |
| 24.1-27 | 35 | 26.02 ± 0.12 | 139.31 ± 0.63 | 0.48 ± 0.09 |
| 27.1-30 | 19 | 27.62 ± 0.05 | 150.84 ± 0.33 | 0.71 ± 0.004 |
| 30.1-33 | - | - | - | - |
| 33.1-36 | 11 | 35.41 ± 0.14 | 405.81 ± 14.24 | 0.88 ± 0.005 |
| 36.1-39 | 09 | 38.3 ± 0.07 | 416.4 ± 12.19 | 0.79 ± 0.004 |
| N | 156 | 25.84 ± 2.75 | 165.03 ± 7.87 | 0.74 ± 0.050 |

(L) Cv (%) 10.64; S.E, 0.22. (W) Cv (%) 20.65; S.E, 2.731. (K) Cv (%) 6.75; S.E, 0.0040

Table 4. Mean length (L), mean weight (W), mean condition (K) values of *Thunnus tonngol* with standard deviation, in fishes of six fork length classes during autumn.

| Size classes (cm) | n | L (cm) | W (g) | K |
|-------------------|----|--------------|---------------|-------------|
| 21-24 | 44 | 22.27 ± 0.17 | 114.79 ± 2.92 | 1.06 ± 0.07 |
| 24.1-27 | 24 | 24.93 ± 0.24 | 134.33 ± 1.27 | 0.86 ± 0.01 |
| 27.1-30 | - | - | - | - |
| 30.1-33 | - | - | - | - |
| 33.1-36 | - | - | - | - |
| 36.1-39 | - | - | - | - |
| N | 68 | 23.21 ± 0.46 | 121.69±3.98 | 0.98 ± 0.03 |

(L) Cv(%) 1.98,S.E,0.055, (W) Cv(%) 3.27,S.E,0.483,(K) Cv(%) 3.06, S.E,0.0036

Table 5. Mean length (L), mean weight (W), mean condition (K) values of *Thunnus tonggol* with standard deviation, in fishes of six fork length classes during spring..

| Size classes (cm) | n | L (cm) | W (g) | K |
|-------------------|----|--------------|---------------|--------------|
| 21-24 | 50 | 23.02 ± 0.21 | 123.36 ± 2.14 | 1.01 ± 0.14 |
| 24.1-27 | 23 | 24.93 ± 0.34 | 134.17 ± 1.73 | 0.86 ± 0.02 |
| 27.1-30 | 04 | 27.65 ± 0.12 | 151.5 ± 0.35 | 0.71 ± 0.008 |
| 30.1-33 | - | - | - | - |
| 33.1-36 | - | - | - | - |
| 36.1-39 | - | - | - | - |
| N | 77 | 23.84 ± 0.58 | 128.23 ± 3.84 | 0.95 ± 0.04 |

(L) Cv(%) 2.43; S.E,0.066. (W) Cv (%) 2.99; S.E, 0.433. (K) Cv (%) 4.21; S.E, 0.0045

Table 6. Seasonal distribution of relative frequency of variously-sized fishes of *Thunnus tonggol* from Karachi coast of Pakistan.

| Size class (length) (cm) | Summer | Autumn | Winter | Spring |
|--------------------------|------------|------------|------------|------------|
| 21-24 | 83.3 (50) | 64.71 (44) | 52.56 (82) | 64.94 (50) |
| 24.1-27 | 16.66 (10) | 35.29 (24) | 22.44 (35) | 29.80 (23) |
| 27.1-30 | - | - | 12.18 (19) | 5.19 (04) |
| 30.1-33 | - | - | - | - |
| 33.1-36 | - | - | 7.05 (11) | - |
| 36.1-39 | - | - | 5.77 (09) | - |
| N | 60 | 68 | 156 | 77 |

(Figures in parenthesis denote sample size). Summer (May, June, July & August), autumn (September, October), winter (November, December, January), spring (February, March & April).

RESULTS AND DISCUSSION

The length and weight data of a fish is important as a fishery management tool.. Length, weight and condition factor data were, therefore, recorded for a total of 361 individuals of fish *Thunnus tonggol* in each season of the year (Table 1-5). The highest catch was recorded in winter season (156). Highest mean length (38.3±0.07) was also recorded in winter season. The highest mean condition factor was recorded in autumn (1.06±0.07) (Table 4) and the lowest condition factor in winter (0.48±0.09). The highest mean weight was in winter (416.4±12.19g) and the lowest mean weight was recorded in (114.79±2.92) in autumn. It is important in estimating the average weight at a given length group and in assessing the relative well being of a fish population (Bolger and Connolly, 1989). Factors affecting fish distribution and abundance have been reported to be dependent upon availability of food, spawning rates, breeding grounds, helter, water currents, vegetation, depth of water, breeding habits, migration and predation have been suggested as major limiting factors affecting the distribution and abundance of various fishes (Ita, 1978). The present authors affirm that, as a general rule, most of the highest values of the condition factor occur in the lowest lengths, or rather, in the juvenile classes as increase in length is considered as growth. Vazzoler and De (1996) confirmed that lowest K-values during the more developed gonadal stages may mean resource transfer to the gonads during the reproductive period.

The condition factor is an index reflecting interactions between biotic and abiotic factors in the physiological condition of fishes. It shows the population's welfare during the various stages of the life cycle (Angelescu *et al.*, 1958). Condition factor (K) increases with increasing size in the length-weight relationship. When weight increases more rapidly than the proportionate increase in the cube of the length, condition factor would tend to increase with increasing length or vice versa (Wootton, 1998). Vazzoler (1996) confirmed that lowest K values during the more developed gonadal stages might mean resource transfer to the gonads during the reproductive period. Braga (1986), through other authors, showed that values of the condition factor vary according to seasons and are influenced by environmental conditions.

Of the six classes of the fishes, five were represented in winter, initial three classes (21 to 30 cm) in spring and two initial classes of smaller fishes (of 21-27 cm) in summer and autumn (Table 6). The mediocre class of 30-33 cm

was not represented in any catch. The smaller fishes of 21-24 cm were predominant but more so in summer when they occupied a proportion of 83% which may perhaps be attributed to breeding by this fish in summer. Larger fishes of 33.0 to 39 cm in length were only seen in winter with a proportion of 12.82 % of the total catch.

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