



Research Article

Association of Weight Against Length in *Tenualosa toli* landed at Fish Harbor Karachi, Pakistan

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Abstract | Association of weight against length in *Tenualosa toli* landed at fish harbor, Karachi was evaluated during April-July 2022 and calculated from 200 numbers (140 + 60 male + female) deviated between 15.1-30.0 cm and 60.3-120g. Equation of regression was achieved as $\log l -2.53 + 2.90$ males, $\log l -1.90 + 2.88$ females and $\log l -.2.40 + 2.89$ joint. Association of variables displayed that fish landed at harbor distinguished to be allometric style of growth with males ($b = 2.90$) were to some extent detected healthier than female ($b = 2.88$). Wellbeing index (Kn) values were computed individually for sexes and joint and observed to be deviated as, 1.01, 0.98 and 1.0 accordingly. Alike tendency in wellbeing values was detected as in the association of weight against length. Lastly, it was decided that association of variables in *T. toli* displayed near to perfect.

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Keywords | Analysis of LW, Wellbeing Index, Allometric, Fish harbor, *Tenualosa toli*



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Introduction

Fish and cattle are two main animal based protein sources in Pakistan (Raza *et al.*, 2013; Naeem *et al.*, 2016). Diverse fish species, including both indigenous and exotic forms, serve as important bioresources contributing to food security and livelihood sustainability (Khan *et al.*, 1992; Naeem *et al.*, 2005; Naeem *et al.*, 2010a; Naeem *et al.*, 2011a; Naeem *et*

al., 2012). Fish are widely recognized for their rich nutritional composition, being excellent sources of high biological value proteins, essential fatty acids, and vital micronutrients that support human health (Naeem *et al.*, 2010a; Naeem *et al.*, 2011b; Naeem *et al.*, 2016).

Fisheries related foodstuffs are high priced commodities with a mean 3 of 00-1100 energy (Khan *et al.*, 2017). White- meat contains variety

of vitamins, minerals and proteins vital for growth and development. Nevertheless, fish meat ruins very promptly in comparison to various feedstuffs, specifically weakly imported and decomposed due to bacterial decomposition around 30% of fish landed at centers (Ghaly *et al.*, 2010). Study on length in relation to its weight is applied in various aspects of the biology related to the applied fisheries which is more convenient to ascertain unknown weight from known length and vice versa (Vohra *et al.*, 2021). Analysis of length and weight helps to resolve management and environmental issues and to calculate coefficient of condition or wellbeing (Baloch *et al.*, 2019). The inference related to the association of weight against its length is of great importance for the ascertainment of population structure and to forecast wellbeing within surroundings. In fisheries science the association of weight and length give support for the estimation of populace formation, importance of growth parameters and natural multiplication (Dars *et al.*, 2010; Naeem *et al.*, 2011b; Naeem *et al.*, 2011c). The information about welfare of fish in relation to its physiological state, growth patterns, seasonal changes, reproductive stages and availability of food can be assessed with the help of condition factor analysis (Javaid *et al.*, 1992; Pervaiz *et al.*, 2012; Naeem *et al.*, 2012; Naeem *et al.*, 2015).

Clupeids are very common group of fish which exists both in Sea and Freshwater habitat some are migratory and rest is non-migratory in habit (Narejo *et al.*, 2015). *Tenualosa toli* non-migratory and known as “Dother” and toli. These are abundant in Coastal regions of Pakistan, Bangladesh and India (Mirza, 1980). There is a paucity of literature, and no published article is accessible from Pakistan.

Antioxidant agents play a vital role in maintaining the quality of aquatic products and the health of aquatic organisms by reducing oxidative stress. Natural antioxidants such as vitamins C and E, carotenoids (e.g., astaxanthin and β -carotene), polyphenols, selenium, and antioxidant enzymes (superoxide dismutase, catalase, and glutathione peroxidase) are commonly found in aquatic foods and feeds. These compounds protect cellular lipids, proteins, and DNA from reactive oxygen species, thereby improving growth performance, immune response, stress tolerance, and disease resistance in aquatic organisms. In aquatic products, antioxidants help prevent lipid oxidation, preserve nutritional value, enhance color

stability, and extend shelf life, ultimately contributing to better product quality and safer, healthier seafood for human consumption (Selamoglu *et al.*, 2012; Selamoglu, 2021a, b; AlKattan and Al-Bassam, 2024; Hassan *et al.*, 2024).

Therefore, the current research has been designed to investigate the association of two variables in *T. toli* through length and weight relationship among individuals landed at Karachi Fish Harbour, Pakistan.

Materials and Methods

Association of weight against length in *Tenualosa toli* landed at fish harbour, Karachi was evaluated during April-July 2022 and calculated from 200 numbers (140 + 60 male + female) deviated between 15.1-30.0 cm and 60.3-120g. Testers were brought to the laboratory in bags and fixed with 10% formalin. After that weight was documented on electrical balance and length through measuring tape. Association of variables and wellbeing of fish individuals was premeditated as proposed by LeCren (1951);

$\log L = \log a + b \log W$; where a is intercept and b is slope.

Relative Condition Factor (Kn): $W/a L^b$

Where:

W = observed body weight of fish

L = total length of fish

a, b = constants from the length–weight relationship

aL^b = expected weight at length (L)

Results

Association of weight against length

The association of weight against length in *Tenualosa toli* landed at fish harbour, Karachi was evaluated during April-July 2022 and calculated from 200 numbers (140 + 60, male + female) deviated between 15.1-30.0 cm and 60.3-120g. The data related to the weight length association is displayed at (Table 1). Equation of regression was achieved as

$\log l = -2.53 + 2.90 \text{ males}$

$\log l = -1.90 + 2.88 \text{ females and}$

$\log l = -2.40 + 2.89 \text{ joint}$

Association of variables displayed that fish landed at harbour distinguished to be allometric style of growth with males (b = 2.90) were to some extent detected

healthier than female ($b = 2.88$).

Wellbeing (Kn)

Wellbeing index (Kn) values was computed individually for sexes and joint and observed to be deviated as, 1.01, 0.98 and 1.0 accordingly (Table 2). Males were experimental to be somewhat decent in state as related to female and joint.

Lastly, it was decided that association of variables in *T. toli* displayed near to perfect.

Table 1: Data on the association of weight against length in *Tenukosa ilisha* landed at fish harbor, Karachi

Length group (cm)	Male		Female		Joint	
	Ave. length	Ave. weight	Ave. length	Ave. weight	Ave. length	Ave. weight
10.1-15.0	12.5 ± 0.5	15.5 ± 0.4	Nil	Nil	12.5 ± 0.6	15.5 ± 0.5
15.1-20.0	17.3 ± 0.7	26.9 ± 1.0	18.2 ± 0.8	30.3 ± 0.7	17.7 ± 0.3	28.6 ± 0.4
20.1-25.0	21.2 ± 1.0	40.0 ± 1.0	23.1 ± 0.9	49.5 ± 0.5	22.1 ± 0.9	44.7 ± 0.3
25.1-30.0	27.8 ± 1.0	66.0 ± 1.0	30.0 ± 0.5	82.0 ± 1.0	28.9 ± 0.1	74.0 ± 1.0

Discussion

Relationships between various parameters of body parts in an organism is generally employed for the assessment of variation in growth. There are two major forms of representing changes in the growth of an individual. In one, parameters of growth are studied in relation to the age of the organism. The second main way of representing growth considers the relation between rate of growth of one part of an organism to that of another or between one part and the whole organism. Relationships between various parts of fish

have been generally employed for the assessment of variation in growth. Similarly, allometric equations have been developed and used to study the changes associated with growth in different parts of fish. In the present study, association of variables displayed that fish landed at harbor distinguished to be allometric style of growth with males ($b = 2.90$) were to some extent detected healthier than female ($b = 2.88$). Equation of regression was achieved as $\log l - 2.53 + 2.90$, $\log l - 1.90 + 2.88$ and $\log l - 2.40 + 2.89$ for sexes and joint correspondingly. Dissimilar scholars are of the view and noted that association between weight and length lies from 2-4 and regarded 3 as perfect (Narejo *et al.*, 2001) in snake eel, *Pisodonophis boro* Narejo *et al.* (2002) in mud eel, *Monopterus albus*. Narejo *et al.* (2003) in spiny eel, *Mastacembelus armatus*. Mastoi *et al.* (2005) in carp *Labeo calbasu* and stated that that the females were grow well as compared to male their regression analysis and ponderal index indicated positive allometric type gesture of the experimental fish. Narejo (2006) clarified the coefficient and condition of minor carp, *C. reba* and concluded that pond condition indicated as isometric type. Win *et al.* (2011) calculate length-weight relationship of 07 different species of fish and found stronger correlation between total length and body weight in fish. Correlation coefficient (r^2) was found to be varied in *L. boga*, *M. cavasius* and *N. notopterus*. All fish displayed negative allometric and two *N. notopterus* and *A. seenghala* displayed positive allometric growth. Dastagir *et al.* (2014) analyzed five different fish from Zhob River and observed that values of b slope were varied from 3.6 to 3.8 resulted in ideal growths (three dimensional growths) of fish from Zhob River, Balochistan, Pakistan. Jamali *et al.* (2018) reported analysis five carp species from Keenjhar Lake, and revealed positive allometric growth. Lal *et al.* (2023) found correlation between LWR and suggests that the positive allometric

Table 2: Data on Wellbeing (Kn) in *Tenukosa toli* landed at Fish Harbor, Karachi

Length group (cm)	Male			Female			Joint		
	Obs. Wt	Cal. Wt	Kn	Obs.Wt	Cal.Wt	Kn	Obs.Wt	Cal. Wt	Kn
10.1-15.0	15.5 ± 0.7	13.9 ± 0.5	1.11 ± 0.3	Nil	Nil	Nil	15.5 ± 0.5	13.9 ± 0.6	1.11 ± 0.6
15.1-20.0	26.9 ± 0.52	27.1 ± 0.5	0.99 ± 0.8	30.3 ± 0.5	30.9 ± 0.3	0.98 ± 0.5	28.6 ± 0.5	29.0 ± 0.2	0.98 ± 0.5
20.1-25.0	40.0 ± 0.6	40.3 ± 0.5	0.99 ± 0.4	49.5 ± 0.5	50.2 ± 0.2	0.98 ± 0.4	44.7 ± 0.5	45.2 ± 0.6	0.98 ± 0.5
25.1-30.0	66.0 ± 0.3	68.3 ± 0.5	0.96 ± 0.5	82.0 ± 0.8	84.0 ± 0.6	0.98 ± 0.5	74.0 ± 0.3	77.4 ± 0.5	0.95 ± 0.2
Mean Kn =			1.01			0.98			1.0

growth from the specimen sampled. The mean values of computed condition factors for all the specimens of *T. mossambicus* revealed the good health condition of the specimens. The remarks of aforesaid scientists backing the outcomes of the current research.

Conclusions and Recommendations

Association of weight against length in *Tenuulosa toli* landed at fish harbor, Karachi was evaluated and it was concluded that alike tendency in wellbeing values was detected. Finally, it was decided that association of variables in *T. toli* displayed near to perfect.

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Novelty Statement

Association of variables displayed that fish landed at harbor distinguished to be allometric style of growth with males ($b = 2.90$) were to some extent detected healthier than female ($b = 2.88$).

Author's Contribution

Shafique Rehman Shaikh, Naeem Tariq Narejo and Sarfraz Ali Tunio: The experiment was designed and conceptualized

Muhammad Hanif Chandio: Contributed to the collection of books and data.

Faheem Saddar and Urooj Imtiaz: Gathered samples of young fish for the study and Contributed to the chemical analysis.

Sarfraz Ali Tunio, Asma Noureen and Majida Parveen Narejo, and Athar Mustafa Laghari: Data analysis.

Ghulam Abbas and Shahnaz Rashid: Provided assistance with the formatting and the appropriate material.

Generative AI and AI-assisted technology statement

The authors declare that no generative AI and AI assisted technology was used in the creation of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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