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Length-Weight Relationship and Condition factor of Halfbeak *Hemiramphus lutkei* (Valenciennes, 1847) found from Karachi Coast

S. TABASSUM[++], F. YOUSUF*, M. Y. LAGHARI**, N. ELAHI, U. MEHBOOB, S. ARIF

Department of Zoology, Federal Urdu University of Arts, Science and Technology, Gulshan-e-Iqbal Campus, Karachi, 75300, Pakistan

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Abstract: The length-weight relationship palys and important role in fishery management. Halfbeak *Hemiramphus lutkei* is one of the marine food fish. Hence, considering the market value, the length-weight relationship and condition factor of Halfbeak *H. lutkei* was calculated. Since January to December 2013, from the Karachi Coast, a total of 380 sample of *H. lutkei* were collected. The total (TL) length of specimens were ranged from 14 to 25cm and body weight ranged 10 to 23.5 gm. Based on length the samples were divided into two groups 'A' and 'B'. While, the LeCren (1951) formula was applied to calculate the length weight relationship (LWR). The LWR shows significant ($P < 0.05$) difference in the specimens. The intercept 'a' values was recorded in the range of -1.546 and -0.453, while the values of slope 'b' was ranged 2.089-1.271. The mean condition factor (K) of group 'A' was 0.25±0.167 and 0.042±0.008 for group 'B'. Hence, group B show the satisfactory growth condition that might be said that the early growth of *H.lutkei* is not good but as it grow in size the condition of growth become good.

Keywords: Arabian Sea, Condition factor, *Hemiramphus lutkei*, Length-weight relationship,

1. INTRODUCTION

Length weight relationship (LWR) is widely used for the estimation of stock of a fishery. Knowing the Length and weight sizes in combination to data of age enables to provide the knowledge about the stock of a fish, how long time fish takes in maturation, its life span, death rate, development and reproduction. LWR in fisheries stock assessment is consider to be an important method especially in ecology population dynamic and stock management of fishes are important (Abdoli, *et al*., 2008). In fish biology LWR is used to estimate the growth condition (isometric/allometric) of the species of a known length group (Beyer, 1987). LWR parameters are also used to know the health condition (well-being) of the fish population. They have many significant applications in estimating the fisheries stocks such as; to estimate the standing stock biomass and comparisons to ontogeny of fisheries populations of various areas (Patrakis, and Stergiou, 1995). Previously, only some nutritional and ecological study has been recorded on Halfbeak *Hemiramphus lutkei* (Sadaf, *et al.*, 2014 and 2017). It is therefore, the LWR is best tool for fishery assessment as well as to understand the fish growth pattern (Pepple, and Ofor, 2011).

Condition factor provides the knowledge about the physiological position of fishes in connection to their well-being (LeCren, 1951). Meanwhile it gives the knowledge about the two populations having the same feeding density, climate and other conditions (Weatherly, Gills, 1987). In this way it is a vital tool to know the fish life cycle and LWR shares enough contribution in management of these species, to maintain the equilibrium in an ecosystem. Pakistan has a coastline of 1,120km in the northern part of the Arabian Sea. Coastal area of Pakistan consisting of more than 16,000 fishing boats which are operated in coastal water and in offshore areas. Karachi is the main fish landing side in Pakistan and about 90% of the seafood landed at Karachi fish harbor (Pakissan.com, 2001-2007). Amongst the big fishery hubs of Pakistan Karachi is one of them. Fisheries exports contribute not only major revenue in the economy of the country but also directly offer employment to about 300,000 fishermen and about 400,000 people of the country are employed in other fisheries related industries. Halfbeak *Hemiramphus lutkei* is one of the important species found in the catch of this region. The present investigation was carried out to observe the growth condition of the *H. lutkei* from the Karachi coast, Arabian sea.

2. MATERIALS AND METHODS

Sampling collection

A total of 380 specimen of *H. lutkei* were collected from the landing sites of Karachi Coast. **(Fig. 1),** from January to December 2013. The fish were kept in icebox and carried to laboratory for further analysis.

[++]Corresponding Author E-mail: **sadafali26@yahoo.com**

*Department of Zoology, University of Karachi

**Department of Freshwater Biology and Fisheries, University of Sindh, Jamshoro : younis.laghari@usindh.edu.pk,

Morphometric analysis

The total length and weight was measured up to 0.1cm and 0.1gm respectively. Further, LWR and condition factor was calculated following the LeCren (1951) LWR formula, $W= aL^b$

In further, a logarithmic transformation was used to make the relationship linear, as Log W = log a + b log L. While, the the Condition factor was estimated followed by equation, $K=100\ W/L^3$.

3. RESULT

A total of 380 specimens of *H. lutkei* were collected for investigation. The length and weight distribution of *H. lutkei* was grouped in 'A' (14-20cm) and "B' (21-25cm) **(Table 1).** Further, data output is described as bellow.

Length weight relationship (LWR)

The estimated values of LWR were shown in **(Table 2).** All estimated values of LWR (r= 0.994 and r=0.933 for group A and B respectively) were extremely significant ($P < 0.05$). The slope of the LWR for group A and B was *b*=1.27 and *b*=2.089 correspondingly. In further, we analyzed the combined group (A and B) and found that the slope of LWR as *b*=1.77 and intercept value *a*=0.453.0.88. The highest and lowest length frequency was observed for 16.1-17.0cm and 14.0-15.0cm respectively **(Fig. 2).** While, the highest and lowest weight frequency was found in 14.1-16.0g and 22.1-24.0g respectively **(Fig. 3).** In further Log-relationship between total length and body weight of *Hemiramphus lutkei* was calculated and regression results $r^2=0.9803$ **(Fig. 4).**

Condition factor

The mean condition factor of *H. lutkei* during study period was *K*= 0.250 for length group A and for the group B, *K*= 0.167. Thus the condition factor calculated value is higher for small group **(Table 2).**

4. DISCUSSION

Halfbeaks are inhabitant of Indian, Pacific and Atlantic Oceans. Halfbeaks belong to Hemiramphidae family (Gill, 1859). That comprises on Hemiramphidae and Zenarchopterinae subfamilies (Gill, 1859; Fowler, 1934). Generally, these are surface dwelling, at a depth of 0 to 5 meters. They are basically planktivorous and also feed small fishes. The LWR is useful to know the growth patterns of organism. Fishes complete their life history through passing various stages, that could be understood by LWR. Hence, present investigation was carried out to study the linear relationship between the length and weight as well as condition factor of the *H. lutkei* of different age groups. Regression was calculated by the formula resulted:

14-20cm: Y = -0.453 + 1.27X (r = 0.994)
21-25cm: Y = -1.546+2.089X (r = 0.993)

Over all, b value (slope) 3 indicates isometric growth if b>3 then it means organism has positive allometric growth. While, b<3 indicate the negative allometric (Khairenizam, Norma-Rashid, 2002).

While, based on the present calculation the growth of *H. lutkei* is negative allometric. Bagenal & Tesch (1978a) and Goncalves, *et al.* (1997) reported that the 'b' values may varies with the change of seasons, may be daily or also in habitats due to this, it can be assumed that the LWR can be affected by various reason in fish. Such as sex, age, temperature, maturity, diet and habitats. Generally for an ideal fish the values of 'b' remain constant or sometimes observed near to 3. Therefore this is commonly known as 'cube law'. Because the growth have an impact on the shape of the fish therefore the cube law (b=3) is not confirmed (Ali, 1999). Present findings are quite different from *Hemiramphus archipelagicus* from Karachi Coast having *b*=2.87 and 2.55 (Sadaf *et al.,* (2015). Because present investigation results that the Karachi Coast of Pakistan might have some unbalance condition of habitat. It may be due to discharge of coastal wastes that pollute the environment and effect the growth of *H. lutkei*. It is therefore, suggested that there must be check and balance for polluting the ocean environment. If care will not be done so might effect the population of *H. lutkei* and will reduce the production.

Fig. 1. The collection site of Halfbeak *Hemiramphus lutkei.*

Table 1.The number (n), mean Total length (TL) and weight (W) of *Hemiramphus lutkei* by length class.

Length group	Size range (cm)	N	TL (Mean)	W (Mean)
A	14-20	230	17.0±1.706	13.0±1.683
B	21-25	150	22.0±1.234	18.5±2.243

Table 2 Length weight relationship and Condition factor (*K*) values of *Hemiramphus lutkei* in different length class

Length group	Size range (cm)	N	b	a	r	K	Regression equation
A	14-20	230	1.271	-0.453	0.994	0.25	Y = -0.453+1.271
B	21-25	150	2.089	-1.546	0.993	0.042	Y = -1.546+2.089

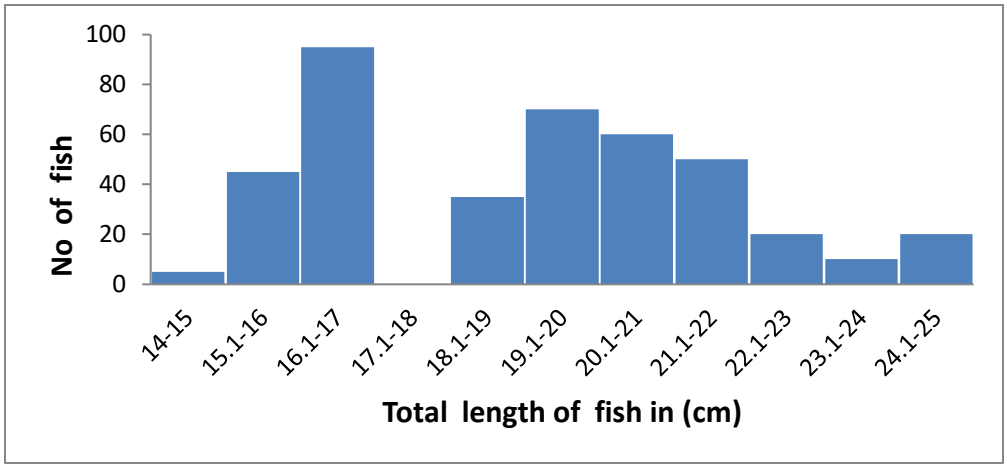

Fig. 2: Length frequency histogram of *Hemiramphus lutkei*

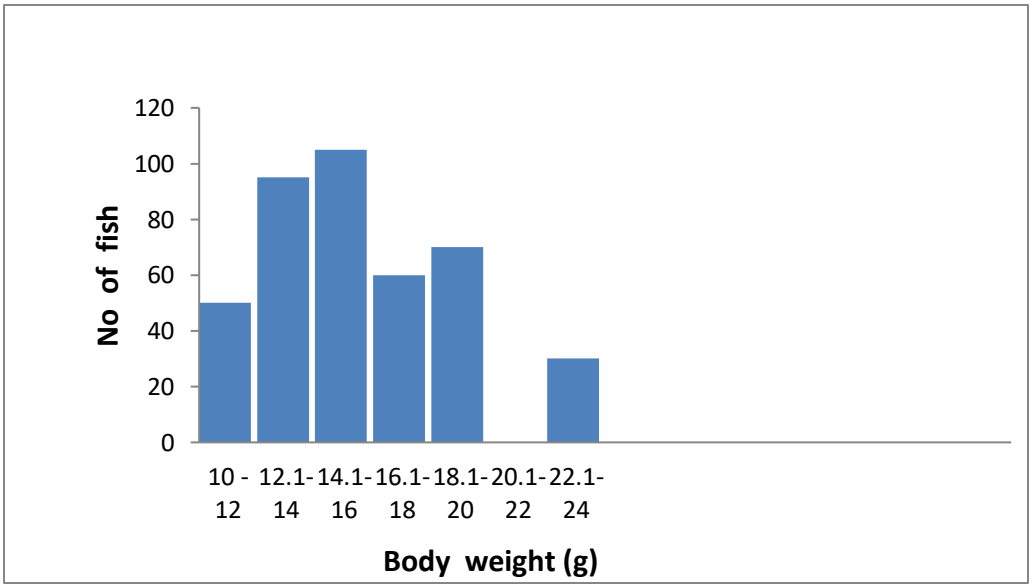

Fig. 3: Body weight frequency histogram of *Hemiramphus lutkei*

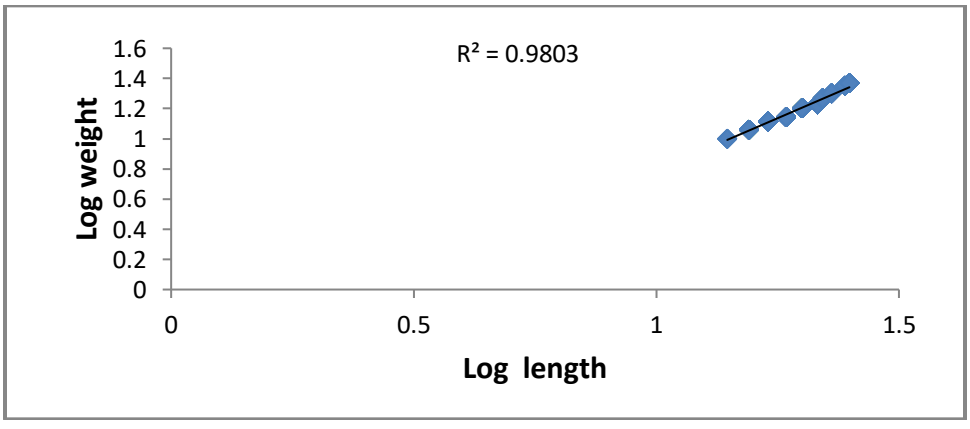

Fig. 4: Log-relationship between total length and body weight of *Hemiramphus lutkei*

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