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Seasonal Variations in Length-Weight Relationship of *Oreochromis niloticus* in Keenjhar Lake, Sindh-Pakistan

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Abstract: The Keenjhar Lake, which is one of the most important fresh water reservoir in Sindh, accommodates the wild populations of exotic species *O. niloticus*. This study is an attempt to provide information about the seasonal variations in the growth of *O. niloticus*. The length-weight relationship of 484 individuals were examined during this one year study. Overall the mean length of fish ranged between 15- 28 cm and the weight between 98-472 g. Seasonal variation in the growth of *O. niloticus* was observed as small sized fishes were abundant during summer months.

Keywords: Length, weight, *O. niloticus*, Keenjhar Lake

1. INTRODUCTION

Nile tilapia (*Oreochromisniloticus* Linnaeus, 1758), is a secondary freshwater teleost fish native to African Nilo-Sudanianecoregion (McAndrew, 2000). This fish is an invasive species in atleast 85 countries and is one of the most widely cultured fish globally (Casal,2006; Molnar, 2008). This fish have a wide range of tolerance to environmental conditions (Schofield *et al*, 2011). In recent years, production of tilapia has increased all over the world and research to increase growth in culture is available (FAO, 2012; Schofield *et al*, 2011; Daudpota *et al.,* 2016).

The condition of fish can be estimated through Length-weight relationship (Okgerman, 2005). Length-weight relationship (LWR) is helpful in the study of growth of fish and to estimate the biomass and stock assessment (Wootton, 1990; Moutopoulos and Stergiou, 2002). The Keenjhar Lake is a large fresh water reservoir in Sindh which accommodates thewild populations of many species of fish including exotic species*O. niloticus*. The aim of the present study is to provide information on the length-weight relationships (LWRs) and condition factor (Kn) of *O.niloticus*from Keenjhar Lake Sindh, Pakistan.

2. MATERIAL AND METHODS

Sampling and data collection

The fishes for this study were collected from Keenjhar Lake which is situated at a distance of 113 km from Karachi and about 20 km North – East of Thatta (**Fig. 1**).
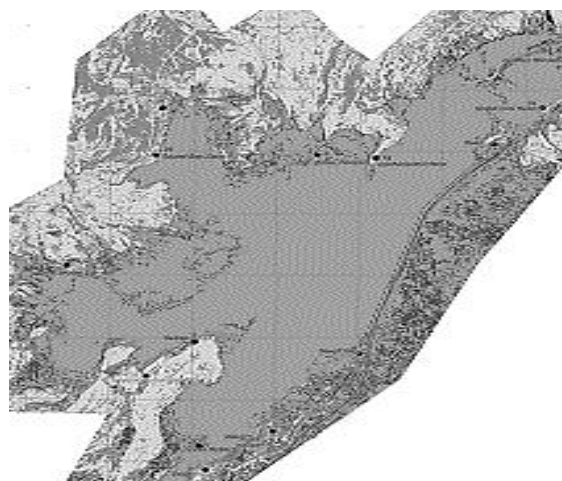

Fig. 1: Map of study site showing Keenjhar Lake.

A total of 484 individuals were examined during this study. About 40 specimens were collected each month during the period of January-December 2014. The total length (TL) of fish was measured to the nearest centimeter by using scale and weighed (TW) in grams by using digital balance as described by Legler (1970). The fishes were ranged from 15-28 cm in total length (TL) and 98-472g in weight respectively.

Data analysis and Length-weight relationship

For the study of Length-weight relationship (LWR) the collected length-weight data was transformed logarithmically. The Length-weight relationship (LWR) was estimated by using the least square method through

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equation log W = log a+b x log L and W = aL^b(Rricker, 1975), where, 'W' is the body weight of the fish, 'L' is the total length, 'a' is the intercept of the regression curve and 'b' is the regression coefficient. The condition factor of fish was calculated by using equation Kn= W/ a L^b(LeCren, 1951).The data was subjected to time series based trend analysis to study differences in population between seasons.

3.   RESULTS AND DISCUSSION

Totally 484 specimens of *Oreochromis niloticus* were collected during the period of research January-December 2014. (**Table 1**) shows the length-weight data The time series analysis of length and weight indicates lower values of TL and TW during the summer months as compared to winter (**Fig. 4**). The presence of small size fish in summer and winter indicates two recruitment in population per year. The data indicates that the peak recruitment of *O. niloticus* in the Keenjhar Lake occurred in April to May as the number of relatively small size fish in catch is higher as compared to other months. Similar observation was given by Amarasingh and Silva (1992) from Sri Lanka who reported two peak recruitments in the population.

Table 1. Monthly LWRdata of 484 specimens of *O.niloticus* from Keenjhar Lake during 2014. Length and weight parameters include minimum (Min), maximum (Max), mean and standard deviation (STD), total number (N) and slope value (b) calculated through Least Square method.

Month	Length (cm)		Weight(g)		N	b
	Min-Max	Mean (± STD)	Min-Max	Mean (±STD)		
January	18-28	22.99 ± 2.91	110-458	289.67 ± 91.82	39	2.48
February	17-27	23.69 ± 2.66	107-472	294.95 ± 84.32	40	2.288
March	17-28	22.54 ± 2.82	120-427	252.39 ± 82.26	41	2.08
April	15-27	20.61 ± 3.21	105-390	205.54 ± 92.19	41	2.486
May	16-27	20.54 ± 2.56	125-419	217.78 ± 74.57	37	2.257
June	17-26	20.48 ± 2.40	109-324	206.53 ± 58.88	40	2.084
July	16-28	21.24 ± 3.54	98-450	236.48 ± 105.9	42	2.622
August	16-27	20.79 ± 3.01	110-390	221.37 ± 77.04	38	2.203
September	17-28	22.38 ± 2.75	110-460	254.4 ± 81.32	42	2.345
October	17-27	22.48 ± 2.40	140-400	260.1 ± 68.31	42	2.16
November	17-28	22.43 ± 3.30	119-427	259.68 ± 97. 52	40	2.373
December	18-28	23.55 ± 2.79	102-424	289.16 ± 87.65	42	2.621

of *O.niloticus* collected from Keenjhar Lake. The total length of fish length ranged from 15cm to 28cm and weight from 98g to 472g (Table 1).Over all the yearly length data of fish shows the mean length of 21.99±3.11cm with smallest (20.48±2.40 cm) in June and largest (23.69 ± 2.66 cm) in February (Table 1). Monthly distribution of average weight of *O.niloticus* shows the same trend as length. The highest mean weight was recorded in February (294.95 ± 84.32 g) and lowest (205.54±94.19 g and 206.53 ± 58.88) in April and June (Table 1).The value of relative condition factor (Kn) ranged between 0.77 – 0.839.

The regression coefficient b shows the negative allometric growth of fish throughout the year (**Table 1**). The highest value of b (2.62) were obtained from July and December. The LWR for summer months (April to August) collectively shows higher value of b in contrast to winter (**Fig. 2**). Ahmed *et a*l., (2003) reported the value of b=2.844 from Bangladesh, Lalèyè (2006) observed b=2.799in west Africa and Franco et al (2014) reported value of b=2.87 from Brazil. These values are very close to value of 'b' observed in this study. The majority of fishes fall in 24-26 cm and 21-23 cm size classes (**Fig. 3**).
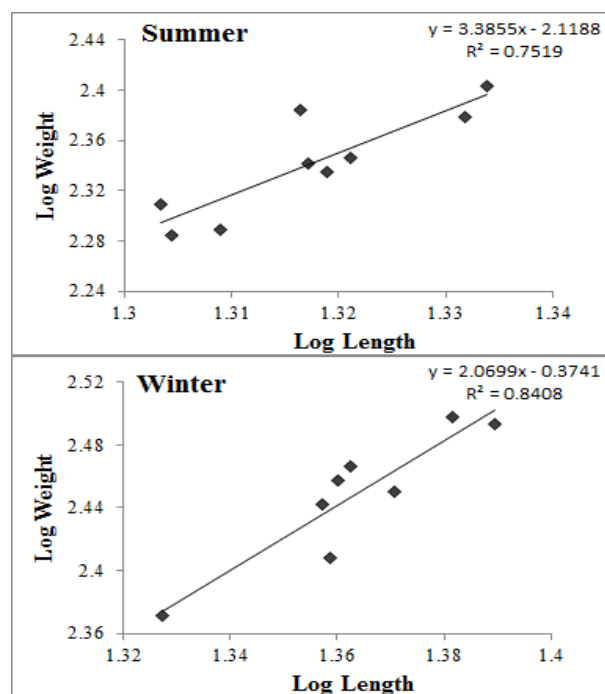
Fig.2. Length–weight relationship of *O. niloticus*during summer and winter season. Each point indicates the minimum and maximum value of the months.
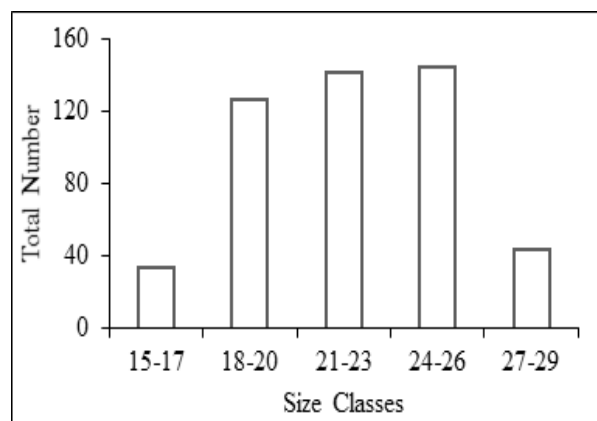
Fig.3. Distribution of *O. niloticus*individuals in length based size classes.
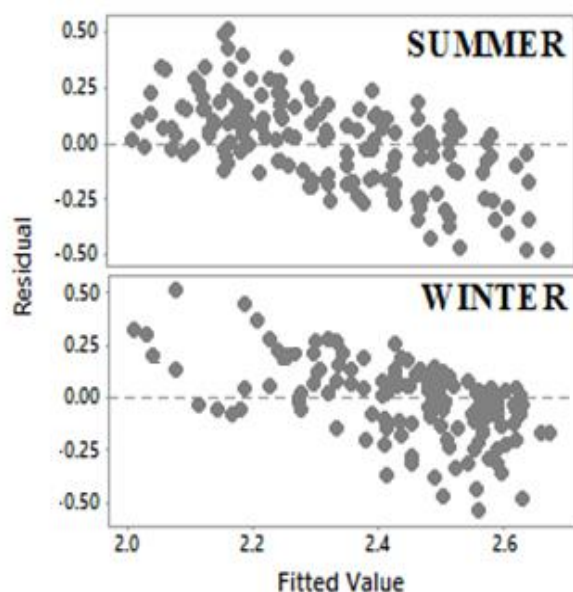

Fig. 4. Plot showing pattern of distribution of mean weights of *O. niloticus* during summer and winter.

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