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Length-Weight relationship and condition factor of striped piggy fish, *Pomadasys stridens* (Forsskal, 1775) from Karachi Coast, Pakistan.

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Abstract

In the present study 391 fish samples (155 male and 236 female) of *Pomadasys stridens* of variable sizes ranging from 3.5- 106 g weight in male; 14-130g weight in female and 56- 198 mm in total length(TL) in male while 99-210 mm (TL) in female were sampled from Karachi coast during January 2001 to April 2002. The length-weight relationships (LWR) and condition factors of striped piggy fish were studied. The estimated length-weight relationships for 155 males and 236 females were:

Male; $\text{Log Wt} = -4.25 + 2.73 \text{ Log TL}$,

Female; $\text{Log Wt} = -4.46 + 2.82 \text{ Log TL}$,

The low 'K' values at 130 - 139 mm TL group and onward in both sexes showed that both sexes mature at the same sizes. The correlation between condition factor 'K' and the total length were observed not to increase prominently with the length. The small fluctuations in either 'K' or 'Kn' values during the different months and at different length group intervals appeared to be not so significant which may be associated with physiological activities and building of fat prior to maturation.

Keywords: Condition factor, Length-weight relationship, *Pomadasys stridens*, Karachi, coast.

1. Introduction

Commercial quantities of large numbers of finfish and shellfish are present in the Pakistani coastal waters [1]. The striped piggy, *Pomadasys stridens* is among the fish species of economic importance in the Pakistani coastal waters. It belongs to the family Haemulidae and can be found at depths between 30 -68m depth in Benthopelagic and reef associated tropical areas of Western Indian Ocean, Red Sea, and east Africa to Mozambique to the Arabian Gulf [2].

Some works have been reported on different aspects of different species of family Pomadasyidae (Grunt fishes) From Pakistan [2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 & 13].

The length-weight relationship has been widely used in fish biology with several purposes (e.g. to estimate the mean fish weight of the fish, based on the known length [14]; conversion of the length equations in weight for equivalent of growth in weight [15]; morphometrics interspecific and intrapopulational comparisons; and to assess the index of well-being of the fish populations [16]. The length-weight equation is also a quantitative expression of the development at corporal level of an organism. An ample range of variation in the allometric coefficient is expected for such a widely distributed population, as results of different habitats along the Brazilian coast, with higher values been expected for estuaries and rich semi-closed environments and lower values for coastal open areas and offshore zones [17]. The condition factor "K" is a quantitative parameter of the Well-being state of the fish and reflects recent feeding conditions [18]. This factor varies according to influences of physiologic factors, fluctuating according to different stages of the development. Length-weight data of population refers as basic parameter for any monitoring study of fisheries, since it provides important information concerning the structure and function of populations. The length-weight relationship (LWR) is very important for proper exploitation and management of the population of fish species [19].

The condition factor is also a useful index for monitoring of feeding intensity, age, and growth rates in fish. It is strongly influenced by both biotic and abiotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live [20].

PME's, central white patch placed further behind. Eye measurements: AME 0.57, ALE 0.30, PME 0.10, PLE 0.31; AME-AME 0.03. Practically, no work has been under taken on length-weight relationship and condition factor ('K' and 'Kn') of *P. stridens* from Pakistan or elsewhere in the world. Since this information is vital for the proper management of the fisheries and for optimum utilization of the resources, the present study was under taken.

2. Materials and Methods

2.1 Study area

The present study was conducted at Karachi coast. The Karachi coastline is between latitude 24°53'N and longitude 67°00'E N, and lies in the Northern boundary of Arabian Sea.

2.2 Collection of specimens and sampling

Samples of *P. stridens* were collected fortnightly (A total of 32 collections) from fish harbors of West Wharf and Korangi Creek of Karachi coast. The fish was identified by using the Bianchi [3]. Simple random sampling technique was used. A total of 391 samples collected during the study period. The samples were transported to the laboratory and preserved in a deep freezer at -20 °C until examination and analysis.

2.3 Body measurements

The specimens were brought out of the deep freezer and allowed to thaw and the body length and weight were measured. Total length was measured using a one-meter measuring board graduated in mm. The fish was wiped with a dry napkin before weighing and body weight was measured using a weighing balance (Sartorius model).

There were in all 391 of these (155 males, and 236 females) measuring 56-210 mm in total length (TL). Length-weight relationship was calculated by cube law as given by Le Cren (1951).

$$\text{Log } W = \log a + b \times \log L$$

Where, W is weight, L is total length of fish and 'a' and 'n' are constants.

$$K = \frac{W \times 10^5}{L^3}$$

Where, 'K' is condition factor, 'W' is observed body weight of fish and 'L' is observed length of fish

$$Kn = \frac{W}{W'}$$

Where, 'Kn' is relative condition factor, 'W' is observed body weight of fish (g) and W' is calculated body weight of fish (g).

3. Results and Discussion

The estimates of length-weight relationships for 155 males and 236 females are given in Table 1 & Fig. 1.

Male; Log Wt = -4.25 + 2.73 Log TL,
R-Sq. = 95.9%, S.D. 'a' = 0.1011, S.D. 'b' = 0.04570.
N = 155 (56-198 mm TL).

Female; Log Wt = -4.46 + 2.82 Log TL,
R-sq. = 94.2%, S.D. 'a' = 0.1023, S.D. 'b' = 0.04595.

N = 236 (99-210 mm TL).

Where W = weight of body (g), TL = total length (mm) of fish.

The values of the exponent (2.73 & 2.82) show that females are heavier than males of the same length probably because of the differences in fat contents in females and food contents in the stomach. Nikolsky [21] reported that the weight of the stomach contents might reach to 30% of the body weight.

Analysis of Covariance for comparison of regression lines of length – weight relationship of males and females reveals significant 'F' values (3558.03 & 3769.73) (Table 1), hence the separate equations for length-weight relationships for males, females and combined are computed. The general concept that weight of the fish varies as the cube of the length was tested statistically to find whether any significant departure from cube 'law' exists in the length-weight relationship of *P. stridens*. The 't' test

$$\{t = \frac{b-3}{\text{S.D. 'b'}}\}$$

Value for males -5.908 and for females -3.917 shows non-significant values. Hence 'cube law' holds in the length-weight relationships for males and females of *P. stridens*.

The average condition factor 'K' of males varies between 1.226 in August and 1.675 in June, and of females between 1.289 in November and 1.525 in July. It is clear that there are minimum 'K' values in months of February – April and August - November in either sex (Fig. 2). The maturation of gonads was observed to occur during these months in either sex.

Considering these facts it appears that *P. stridens* has two breeding seasons in a year extending from February – April and August – November.

The low 'K' values at 130 - 139 mm in Total length group and onward in both sexes show that both sexes mature at the same sizes (Fig. 3). The correlation between condition factor 'K' and the total length were observed not to increase prominently with the length.

The relative condition 'Kn' was computed for each length separately for males and females during different months and the mean values grouped at 10 mm gaps. The values of the 'Relative condition' were plotted against the corresponding total lengths against different months (Fig. 2). The relative condition 'Kn' was estimated in reference to the ponderal index or condition factor 'K' since in the former the defects of lengths and correlated factors on condition were eliminated. It varied from 0.973 – 1.033 in males and 0.987 – 1.017 in females. During February – April (0.973 – 1.009) and August – November (0.968 – 1.00) the relative condition factor in males nearly tallies with those of females (0.993 – 1.012 & 0.987 – 1.015) respectively (Fig. 2). The maturation of gonads was observed during these months in either sex.

In females, the point of inflection was seen at 110 mm indicating that some fishes started to mature at this size. In males the point of inflection was not so clear as to indicate maturation. Most of males and females attained maturity at 140 mm of Total length as shown by minimum value of 'Kn' in either sex (Fig. 3).

The small fluctuations was seen in either 'K' or 'Kn' values during the different months and at different length group intervals appear to be not so significant which may be associated with physiological activities and building of fat

prior to maturation.

Table 1: Comparison of Regression lines of the length-weight relationship of *P. stridens*.

	Predictor	Coef	StDev	T	P	Male
	Constant	-4.2542	0.1011	-42.06	0.000	
	TL	2.72601	0.04570	59.65	0.000	
	S = 0.04585 R-Sq = 95.9% R-Sq(adj) = 95.9%					
Analysis of Variance						
	Source	DF	SS	MS	F	P
	Regression	1	7.4808	7.4808	3558.03	0.000
	Error	153	0.3217	0.0021		
	Total	154	7.8024			
	Predictor	Coef	StDev	T	P	Female
	Constant	-4.4561	0.1023	-43.56	0.000	
	TL	2.82134	0.04595	61.40	0.000	
	S = 0.04445 R-Sq = 94.2% R-Sq(adj) = 94.1%					
Analysis of Variance						
	Source	DF	SS	MS	F	P
	Regression	1	7.4476	7.4476	3769.73	0.000
	Error	234	0.4623	0.0020		
	Total	235	7.9099			
	Predictor	Coef	StDev	T	P	Combine
	Constant	-4.36353	0.07182	-60.75	0.000	
	TL	2.77804	0.03234	85.91	0.000	
	S = 0.04526 R-Sq = 95.0% R-Sq(adj) = 95.0%					
Analysis of Variance						
	Source	DF	SS	MS	F	P
	Regression	1	15.119	15.119	7380.19	0.000
	Error	389	0.797	0.002		
	Total	390	15.916			

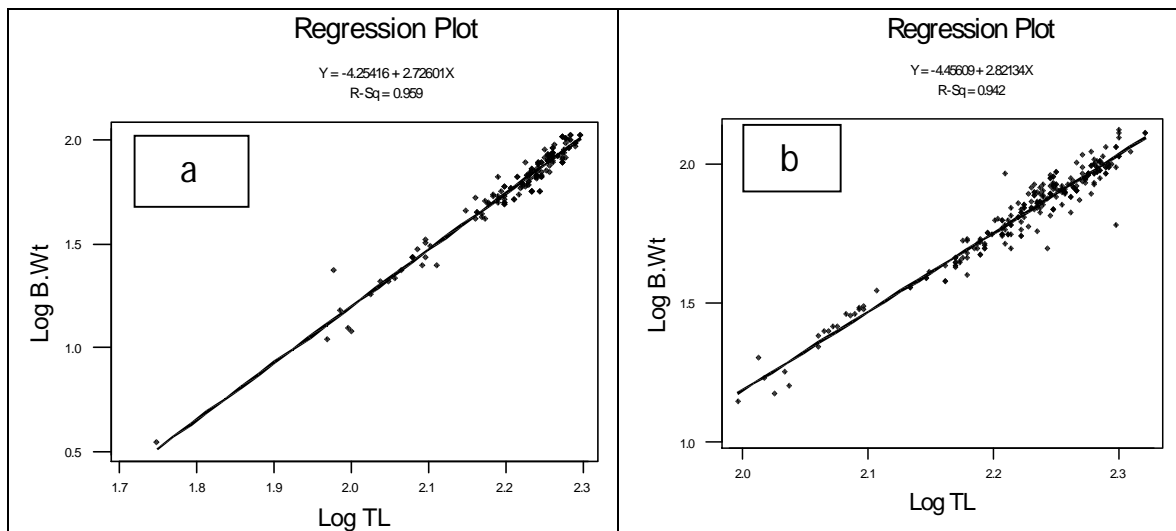


Fig 1: Log-Log length weight relationships (a) Male and (b) Female.

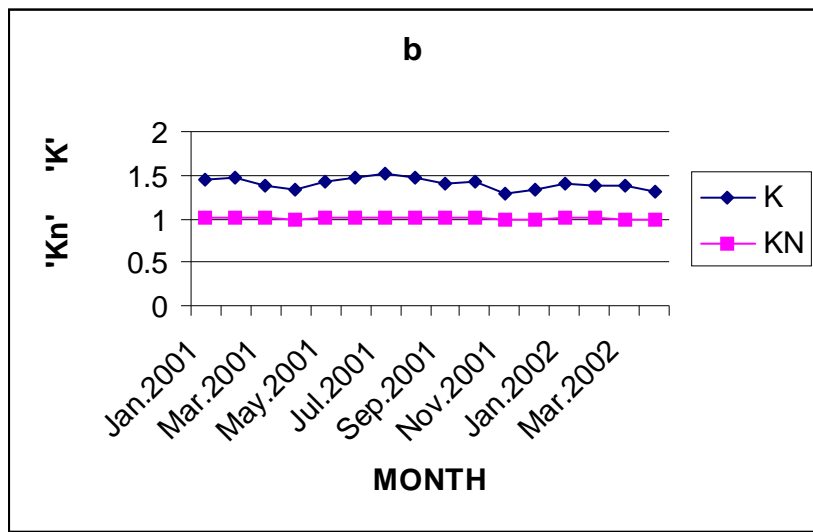
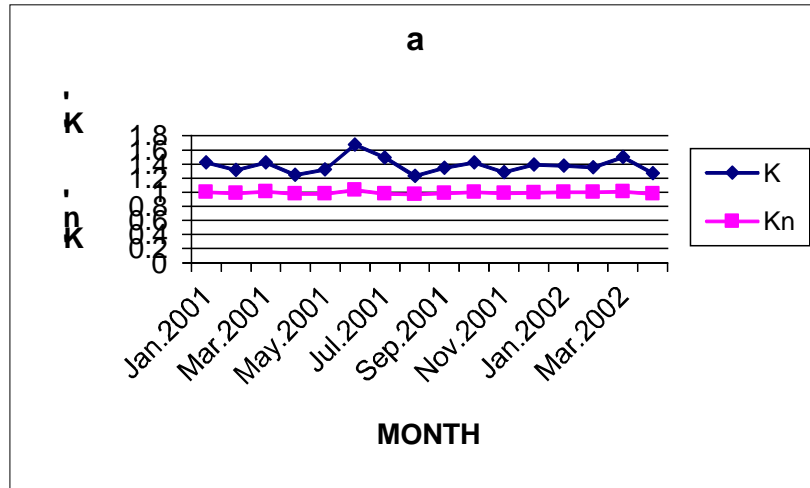
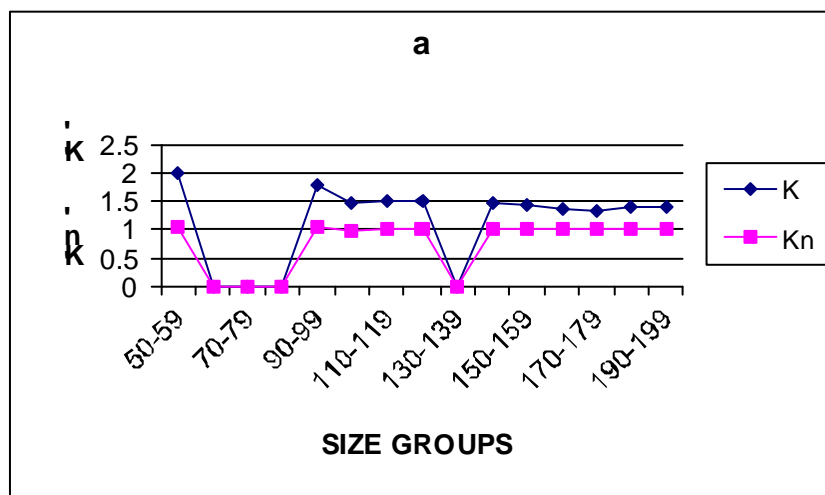


Fig 2: Fluctuations in the values of 'K' and 'Kn' in different months of *P. stridens* (a) Male and (b) Female.



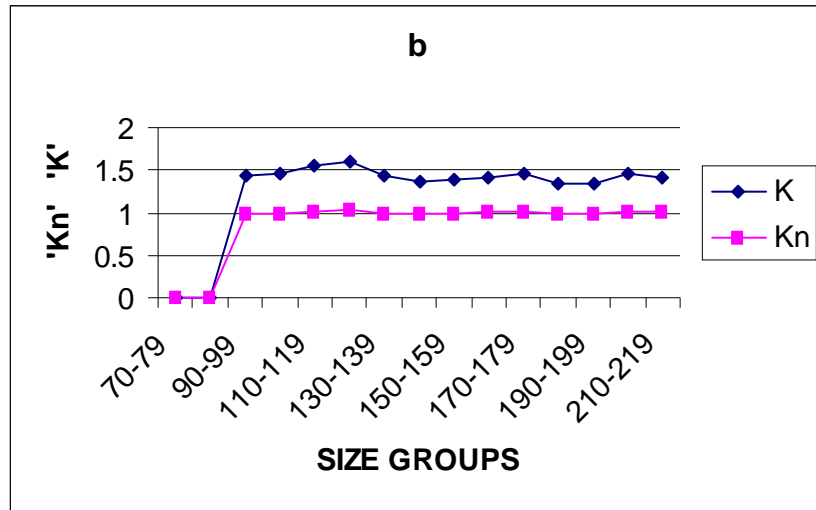


Fig 3: Fluctuations in the values of 'K' and 'Kn' in different size groups of *P. stridens*. (a) Male and (b) Female.

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 life cycle (Ahmad Dar *et al.*,^[14] Ahmed Dar^[14] stated that the condition factor does not merely reflect the feeding condition of the adult stage, but includes the state of gonadal development, based on the consumption of fat reserves during the spawning period.

4. Conclusion

For an efficient fisheries management of the stocks it is important to know important biological parameters of the commercially exploited species. Therefore, the aim of this study was to obtain necessary growth- length relationships, condition factor "K" and relative condition factor "Kn" of striped piggy fish in the study area.

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