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LENGTH WEIGHT RELATIONSHIP IN *ACANTHOPAGRUS ARABICUS* (IWATSUKI, 2013) FROM KARACHI COAST, PAKISTAN

Shagufta Riaz*, Muhammad Atiqullah Khan and Rehana Yasmeen Farooque

Department of Zoology, Faculty of Science, University of Karachi, Karachi-75270, Pakistan.
*Correspondence: shagirajput7@gmail.com

ABSTRACT

Presented study provides, length weight relationship for a total of 486 specimen of Arabian yellow-finned sea bream *Acanthopagrus arabicus* (Iwatsuki, 2013) belonging to family Sparidae from Karachi coast, Pakistan. Minimum and maximum values for total length of male and female were 165 mm to 354 mm and 165 mm to 350 mm, respectively. In male body weight recorded 90 g to 830 g while in female recorded 90 g to 1024 g. For presented length weight relationships of *Acanthopagrus arabicus*, Observed value of 'b' for male, female and combined data is 2.746 (N= 256), 2.754 (N = 230) and 2.733 (N= 486, significant, $P < 0.05$), respectively which shows negative allometric growth pattern. Values of Coefficient of correlation (r^2) for male, female and combine/unsexed data were observed 0.951, 0.958 and 0.953, respectively.

Key Words: Sea bream, Length weight relationship, Karachi coast, Sparidae, Allometric growth and *Acanthopagrus arabicus*

INTRODUCTION

The Arabian yellow-finned sea bream *Acanthopagrus arabicus* is belonging to the family Sparidae) (Iwatsuki, 2013). Length weight relationships commonly evaluated to advance biological information and in fishery biology, such evaluation become one of the standard methods (Le Cren, 1951). Length weight relationships provide help to estimate growth rates, length and age constructions, and other constituents of fish population dynamics (Kolher *et al*., 1995). It is also beneficial for comparing life history and morphological characteristics of population inhabiting different areas (Goncalves *et al*., 1997 and Stergiou and Moutopoulos, 2001). Also useful in assessing fisheries harvest by weight when only length data are obtainable (Campbell, 1984). Length weight relationship is also very important in fisheries management for relative growth studies (Moutopoulos and Stergiou, 2002). Aim of this study was to present length weight relationship of economically important fish because, length and weight relationships are basic, but it represent essential data that are vital to considerate the biological parameters of fishes, which can be useful to fisheries stock assessment and management and aquaculture practices as well (Gonzales *et al*., 2000, Muto, *et al*., 2000, Morato *et al*., 2001, Can *et al*., 2002, Wigley *et al*., 2003, Abdurahiman *et al*., 2004, Frota *et al*., 2004 and Human and Al--Busaidi, 2008).

MATERIAL AND METHOD

Total of 486 specimens collected at a monthly basis from January 2011 to December 2011, from commercial landings at Karachi Fish Harbor. Collection was comprised of 230 females and 256 males. Sea breams were measure for Total Length to nearest 0.1 mm, from the tip of the mouth to the end of the caudal fin. Specimens were weighed to nearest 0.01 g using an electronic balance.

Length-weight relationship calculated by using the formula: (Le Cren, 1951)

$$W = a L^b$$

Where, W = Body Weight (g), a = Regression intercept (constant), L = Total Length (mm) and b = Regression slope (constant).

The equation ($W = aL^b$) was then transformed into a linear equation using a logarithmic method: Log W = Log a + b Log L. Determination coefficient (r^2) was used as an indicator of the quality of the linear regression (Zar, 1984). Linear relationship, standard error and coefficient of correlation were also calculated by using SPSS (IBM 21). Scatter plot is used to show relationship of log Length and log Weight.

* Note: *Acanthopagrus arabicus* is a protandrous hermaphrodite, only functional males and functional females considered for presented observations.

RESULTS AND DISCUSSION

Mean values, Standard deviation and ranges of Total Length and Body Weight for male, female and combine sexes are presented in Table 1 and length-weight relationship for *Acanthopagrus arabicus* calculated by correlation and regression analysis for the model $W = a L^b$ (Table 2).

Value of coefficient of correlation (r^2) between logs transformed Length and Weight for male, female and combine data are 0.951, 0.958 and 0.953 respectively, which shows highly correlated significance between Length and Weight ($P < 0.05$, Table 2). Xiao and Ramm (1994) suggested that the use of log-transformed data was suitable for explaining length-weight relationships in fishes.

For presented Length Weight relationships of *Acanthopagrus arabicus*, Observed value of 'b' for male, female and combined or unsexed data is 2.746 (N = 256), 2.754(N = 230) and 2.733 (N=486, significant, $P < 0.05$) respectively which shows negative allometric growth pattern (Begenal and Tesch, 1978). Similar results observed by Hameed *et al*. (2013) in *Acanthopagrus berda* from Karachi coast. All coefficients (b) were within expected range of 2.5 - 3.5. (Ahmed *et al*., 2014, Ahmed *et al.*, 2015, Froese, 2006, Khatoon *et al*., 2014 and Safi *et al*., 2014). The value of b = 2.733, 2.746 and 2.754 in unsexed/combine data, male and female respectively was significantly lesser than 3 (t = 69.524, 48.81 and 50 51, respectively, each significant at $p < 0.05$) (Table 2).

Table 1. Range, Mean and Standard deviation for Total Length and Body Weight of Acanthopagrus *arabicus*.

Gender	N	Range		Mean		S.D	
		T.L(mm)	B. Wt(g)	T.L(mm)	B. Wt(g)	T.L(mm)	B. Wt(g)
Male	256	165-354	90-830	223.920	257.074	36.102	134.236
Female	230	165-350	90-1024	232.826	273.987	33.392	137.230
Combine	486	165-354	90-1024	228.136	265.078	35.093	135.784

*N = number of specimen, T.L = total length, B. Wt = body weight, S.D = standard deviation

Table 2. Regression equation and t-test for male, female and combine data of *Acanthopagrus arabicus*.

Gender	N	Regression		S.E (a)	S.E (b)	r^2	t-test		
		a	b				t (a)	t (b)	P
Male	256	-4.075	2.746	0.132	0.056	0.951	-30.873	48.811	.000
Female	230	-4.106	2.754	0.129	0.055	0.958	-31.867	50.505	.000
Combine	486	-4.049	2.733	0.093	0.039	0.953	-43.763	69.524	.000

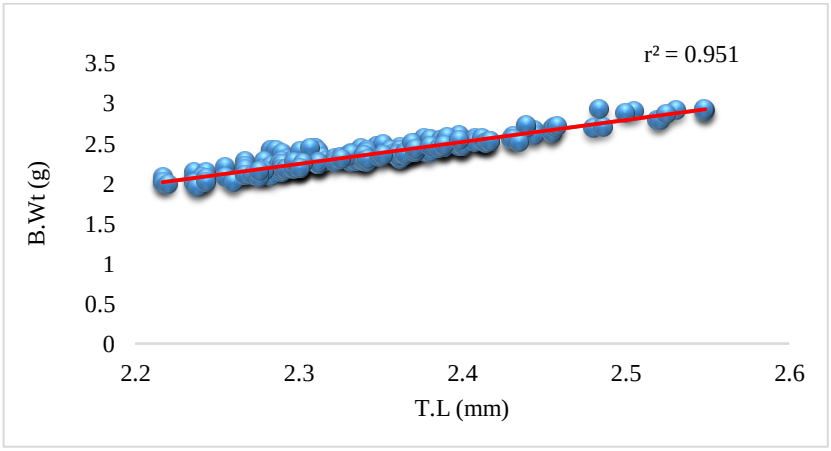
*N = number of specimen, S.E = standard error

The length-weight scatter diagram for the male, female and combine sexes (N = 256, N = 230 and N = 486 respectively) is presented in Fig. 1. Scatter diagrams presenting the accuracy of the considered mass for individual Seabream. The straight line characterizes hypothetically perfect correlation between measured and calculated values. According to Hameed *et al*., (2013) *Acanthopagrus berda* male (N = 233) and female (N = 280) samples from Karachi Coast of Pakistan showed negative allometry (b = 2.638 and 2.636, respectively) but the pooled sample of male, female and combine/unsexed individuals (N = 1074) followed cube law in LWR if we compare these result with present work (b = 2.746 and 2.754 male and female respectively) showing negative allometry along with combine/unsexed (b = 2.733) which do not follow cube law in LWR and contradicts with the results of Hameed *et al*. (2013).

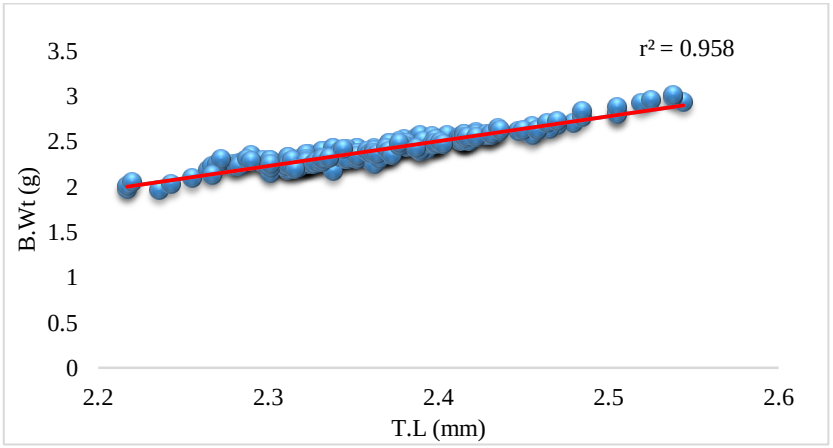
REFERENCES

Abdurahiman, K. P., T. Harishnayak, P. U. Zacharia and K. S. Mohamed (2004). Length-weight relationship of commercially important marine fishes and shellfishes of the southern coast of Karnataka, India. *Naga*, 27(1&2): 9-14.

Ahmad, Q., D. Khan and F. Yousuf (2014). Length-weight relationship in adult *Scomberomorus guttatus* (Bloch. & Schneider, 1801) from Karachi coast, Pakistan. *Intern. J. Biol. Research* 2(2): 101-107.



(a)



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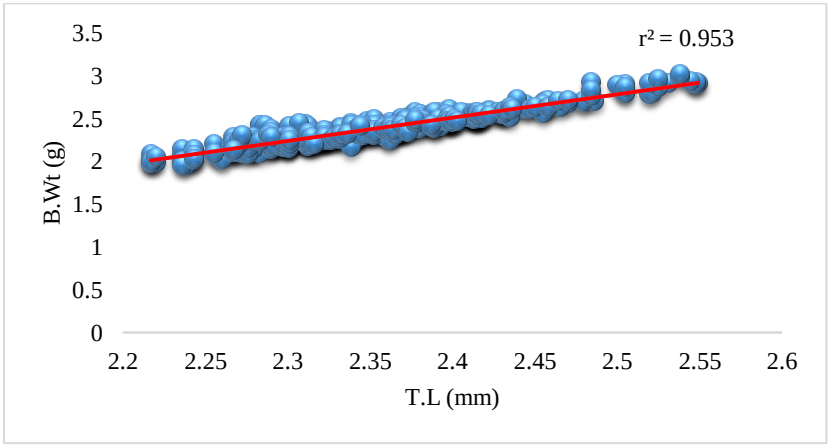

(c)

Fig. 1. Log transformed Length-weight relationship in *Acanthopagrus arabicus* (a) male (b) female and (c) combine.

Ahmed, Q., D. Khan, and F. Yousuf (2015). Interrelationships of fresh body weight and total body length and condition factor in adult *Pomadasys stridens* (Forrskal, 1775) (Family Pomadasyidae) from Karachi, Pakistan. *FUUAST J. Biol*, 5(1): 161 – 168.

Bagenal, T. B. and F. W. Tesch (1978). Methods of Assessment of Fish Production in Fresh Waters. IBP Handbook No 3, 3rd ed. *Oxford Blackwell Scientific Publication*, London. 101136.

Campbell, R.P. (1984). Weight-total length relationships for four saltwater fishes. Management Data Series Number 62. Texas Parks and Wildlife Department, Coastal Fisheries Branch. Austin, Texas.

Can, M. F., N. Başusta and M. Çekíç (2002). Weight-length relationships for selected fish species of the small scale fisheries off the south coast of Ískenderun Bay. *Turkish Journal of Veterinary and Animal Sciences*, 26:1181--1183.

Froese, R. (2006). Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations. *J. Appl. Ichthyol*. 22, 241–253.

Frota, L. O., P. A. S. Costa and A. C. Braga (2004). Length-weight relationships of marine fishes from the central Brazilian coast. *Naga*, 27(1&2):20--26.

Goncalves, J. M. S., L. Bentes, P. G. Lino, J. Ribeiro, V. M. Canario, K. Erzini (1997). Weight-length relationships for selected fish species of the small scale demersal fisheries of the south and south-west coast of Portugal. *Fisheries. Research*, 30:253-256.

Gonzales, B. J., H. P. Palla, and H. Mishina (2000). Length-weight relationship of five serranids from Palawan Island, Philippines. *Naga*, 23(3):26--28.

Hameed, L., Habib-ul-Hasan, M.Z. Khan, and M. Asim (2013). Length-weight relationship in common Sea bream *Acanthopagrus berda* (Forsskål 1775) from Karachi coast, *Pakistan. Int. J. Biol. & Biotech*. 10(4): 593-596.

Human, B.A. and H. Al--Busaidi (2008). Length and Weight Relationships for 31 Species of Fishes Caught by Trawl Off the Arabian Sea Coast of Oman. *Agricultural and Marine Sciences*, 13:43--52.

Iwatsuki, Y. (2013). Review of the *Acanthopagrus latus* complex (Perciformes: Sparidae) with descriptions of three new species from the Indo-West Pacific Ocean. *J. Fish Biol*., 83: 64-95.

Khatoon, Z., R. Paperno, and S. M. Hussain (2014). Length-weight relationship of five fish species collected from Manora Channel and associated backwaters of the northern Arabian Sea. *J. Appl. Ichthyol*. 30, 235 – 238.

Kolher, N., J. Casey, P. Turner (1995). Length-weight relationship for 13 species of sharks from the Western North Atlantic. *Fishery Bulletin*, 93:412-418.

LeCren, C. D. (1951). The length-weight relationship seasonal cycle in gonadal weight and condition in the perch (Perca fluviatilis). *J Anim Ecol*., 20:201-219.

Morato, T., P. Afonso, P. Lourinho, J. P. Barreiros, R. S. Santos and R. D. M. Nash (2001). Length-weight relationships for 21 coastal fish species of the Azores, northeastern Atlantic. *Fisheries Research* 50:297--302.

Moutopoulos, D. K. and K. I. Stergiou (2002). Length-weight and length-length relationships of fish species from Aegean Sea (Greece). *J. Appl. Ichthyol*. 18: 200-203.

Muto, E. Y., L. S. H. Soares, and C. L. D. B. Rossi-- Wongtschowshi (2000).Length-weight relationship of marine fish species of São Sebastião system, São Paulo, southeastern Brazil. *Naga*, 23(4):27--29.

Safi, A., A. Khan, M. U. A. Hashmi, and Z. M. Khan (2014). Length-weight relationship and condition factor of stripped piggy fish, *Pomadasys stridens* (Forsskäl, 1775) from Karachi coast, Pakistan. *J. Entomo. & Zool. Studies*. 2(5): 25-30.

Stergiou, K. I. and D. K. Moutopoulos (2001). A review of length-weight relationships of fishes from Greek marine waters. *NAGA, ICLARM Q.*, 24(1-2):23-29.

Wigley, S. E., H. M. McBride, and N. J. McHugh (2003). Length-weight relationships for 74 fish species collected during NEFSC research vessel bottom trawl surveys, 1992-99. Woods Hole Laboratory Massachusetts, United States of America. VI + 28pp.

Xiao, Y. and D.C. Ramm (1994). A simple generalized model of allometry, with examples of length and weight relationships for 14 species of groundfish. *Fish. Bull*. 92:664-670.

Zar, J. H. (1984). *Biostatistical Analysis*, (2nd ed.). Englewood Cliffs, New Jersey: Prentice Hall.

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