LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF SOME COMMERCIAL FISH SPECIES FROM KYAIKKHAMI FISH LANDING CENTER, MON COASTAL AREA

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Abstract

The study was conducted to analyze the length-weight relationship and condition factor of some commercial fish species from Kyaikkhami Fish Landing Center, Mon Coastal Area during June, 2018 to March, 2019. In present study period, a total of 873 fish species in size ranging from 20.2cm to 49cm for *Tenualosa ilisha*, from 20.6cm to 49.3cm for *Tenualosa toli*, from 24.8cm to 45.9cm for *Scomberomorus guttatus* and from 16.5cm to 30cm for *Setipinna tenuifilis* was recorded. In present findings, the exponential forms of equations derived between total length and total weight for *T. toli* was $W=0.1223TL^{2.2272}$ (r=0.9262), for *T. ilisha* was $W=0.0094TL^{3.001}$ (r=0.9582), for *S. guttatus* was $W=0.138TL^{2.1396}$ (r=0.9161) and for *S. tenuifilis* was $W=0.138TL^{2.1396}$ (r=0.9161). The 'b' values of length-weight relationship of *T. toli*, *S. guttatus* and *S. tenuifilis* were observed to be 2.2272, 2.1396 and 1.1262 indicating negative allometric on species. Otherwise *T. ilisha* was 3 which indicated isometric in nature. Moreover, the mean condition factor of all of fish species was 0.95±0.16, 0.95±0.12, 0.69±0.13 and 1.09±0.43, indicating that its growth has been more or less normal (k<1or k>1).

Keywords: Length-weight relationship, condition factor, some commercial fish species, fish landing center, Mon Coast.

Introduction

The length-weight relationship (LWR) is a very important parameter to understand the growth dynamics of the fish population. Length and weight data are useful standard results of any fish sampling program. LWR of fishes are important in fisheries biology because they allow the estimation of the average weight of fish of a given length group by establishing a mathematical relation between the two parameters. The LWR is particularly important in parameterizing yield equations and in estimations of stock size. The exact relationship between length and weight differs among species of fish according to their inherited body shape, and within a species according to the condition (robustness) of individual fish. The study of morphometric characters in fishes is important because they can be used for the differentiation of taxonomic units. In fisheries science, the condition factor is used in order to compare the "condition", "fatness" or wellbeing of fish. The condition factor usually increases with sexual maturation (Dutta *et al*, 2012).

Length-weight relationship has been studied for many fish species in Myanmar Coastal Waters; these included Zin Zin Zaw (2010) on *Scomberomous guttatus*, Zaw Zaw Aung (2010) on *Pampus argenteus*, Min Ye Lwin Oo (2013) on Chirocentridae, Thazin Aye (2013) on Anchovy fishes, Tint Swe (2007) on some fish of stationary bag-nets fishery, Khaing Myat Myat Htwe (2008) on two species of herring fishes, Ohmar Min (2009) on Sciaenid fishes, Mi Mi Mya Thet (2009) on polynemid fishes, Nyo Nyo Tun (2009) on Sardinella species, Nang Mya Han (2010) on Mugilidae, Khin May Chit Maung (2012) on Leiognathidae, Su Su Hlaing (2012) on Family-Engralidae, Thu Thu Min (2017) on Caragidae, Zin Mar Aye (2019) on Scombrid fishes.

The objectives of this study are 1) to estimate length-weight relationship and 2) to investigate the condition factor of some commercial fish species from Kyaikkhami Fish Landing Centre.

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Materials and Methods

Length-weight relationship of four commercial marine fish species viz. *Tenualosa ilisha* (Nga-tha-lauk)**,** *Tenualosa toli* (Nga-tha-lauk-yout-pha), *Scomberomorus guttatus* (Nga-kon-shat) and *Setipinna tenuifilis* (Nga-byar) were measured. A total of 873 individual four fish species were measured from June 2018 and March 2019 from Kyaikkhami Fish Landing Center (16°05'N and 97°34'E) (Figure 1).

Determination of Length-weight relationship

Data on length frequency distribution of fishes were collected from Kyaikkhami fish landing center was undertaken. The total length (TL) was measured in centimeters from the snout to the end of caudal fin by using measuring board. The total weight was measured in grams (g) by using digital balance.

The length-weight relationship was determined by the methods of least square using the formula, which was followed after Pauly (1984) as.

$$W = a\ L^b$$

Where, W= weight of fish (g)

L= total length (TL) of fish in (cm)

a= constant (intercept)

b= length exponent (slope)

The "a" and "b" values were obtained from a linear regression of the length and weight of fish. The logarithmic form of the equation is given as; Log W = log a + b log L. The coefficient of correlation (r) was calculated by standard statistical formula.

Determination of Fulton's Condition factor (K)

The mean weight and length of the experimental fish were used to estimate condition factor using equation followed by Fulton, 1904 (as cited in Froese, 2006):

$$K = (W \times 100)/L^3$$

Where, W= Weight in grammes (g), L= Total length of fish in centimeters (cm)

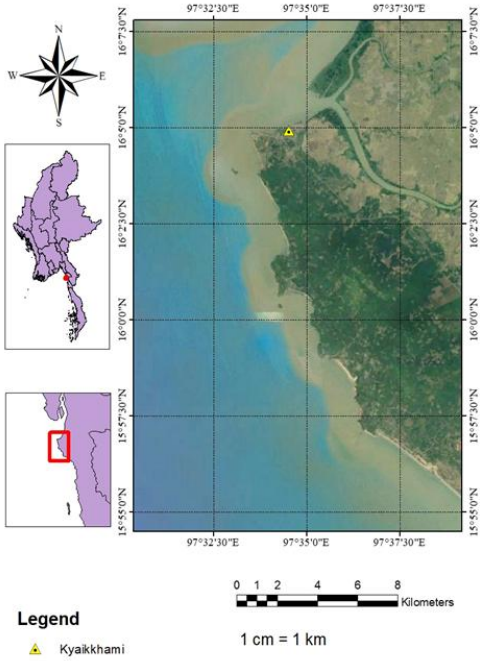

Figure 1 Map showing the fish landing centre during study period

Results and Discussion

Length-weight relationship: The length weight relationships of 873 individual fishes of four different species have been detailed on table 1.

The study of length - weight relationship of fish is of paramount importance in studying the growth, gonadal development and general wellbeing of fish population and for comparing life history of fish from different habitats stressed upon the importance of length weight relationship in modeling aquatic ecosystems (Mushtaq *et al*., 2016). For a fish having an unchanged body form and specific gravity, the value of 'b' is 3 which describe isometric growth. The value of 'b' can also fluctuate between 2.5 and 4 (Hile, 1936) and 2.2 - 4.5 (Carlander, 1969) which describe allometric growth (as cited in Balli, 2005). Allometric coefficient "b" larger or smaller than 3.0 shows an allometric growth, value b>3 shows a positive allometric growth, while value b<3 indicates a negative allometric growth. It is isometric growth when value b is equal to 3.0 (Bangenal and Tesch, 1978) (as cited in Ahmed *et al*, 2014). The value of r > 0.8 regardless of sex and season represent a strong relationship between length and weight and indicate whether the relationship was significant or not, indicated that if r > 0. 9 and weight increases in length, then it is clear that the fish maintains its shape throughout its life (Rahman *et al*., 2004).

A total of 235 individual of *Tenualosa ilisha* (Nga-tha-lauk) were measured during this study period. The length distribution of *T. ilisha* ranging in size from 20.2-49cm and the body weight varied between 92g and 1200g. The 'b' value of *T. ilisha* was 3 while the 'r' value was 0.9582. The length-weight relationship of *T. ilisha* was found to be $W=0.0094*L^{3.001}$. So, *T. ilisha* was observed to be isometric growth in nature in present study area (Figure 2). However, Khine Myat Myat Htwe (2012) reported positive allometric in nature (b=3.027) in Kyaikkhami fish landing centre and negative allometric in nature (b=2.423) in Mawlamyine fish landing centre. Mohamed Abdul-Razak and Qusim Audai (2004) also reported the positive allometric in

Iraqui Marine Waters, northwest Arabian Gulf. From Bangladesh water, the exponential form of equation ($W = 0.00305\ TL^{3.381}$) of *T. ilisha* (*Hilsa Shad),* which indicated that the growth relationship between length and weight of the fish was positive allometric in nature (b=3.381, b >3) (Nurul Amin, 2005). Moreover, positive allometric in Northern Bay of Bengal was reported by Dutta, *et al*, 2012. However, Reuben et al (1997) was established that the negative growth of *T.ilisha* from northeast coast of India (b<3) (as cited in Dutta, et al, 2012). And the relationship between length and weight of *T. ilisha* was significant and the negative allometric was found in Chilika Lake, Odisha was described by Mohanty and Nayak, 2017.

In present study, a total of 200 *Tenualosa toli* (Nga-tha-lauk-yout-pha) of various size groups were measured every month. Based on data measurement, the total length ranged and total weight ranged of *T. toli* was 20.6cm and 49.3cm and 126g and 960g. The LWR of *T. toli* was $W=0.1223*L^{2.2272}$ where the correlation coefficient value (r) was 0.9262. The negative allometric growth of *T. toli* was found so that the 'b' value is less than 3 (b<3) (Figure 3). Similarity, Khin Myat Myat Htwe (2012) reported that the growth of *T. toli* was negative allometric in nature while the length weight relationship was $W=0.012*L^{2.904}$ and the "b" value was less than 3 in Kyaikkhami fish landing centre. And then the LWR of *T. toli* was found as $W=0.012*L^{2.822}$ showing negative allometric growth where the "b" value was 2.822 (Dar Shabir, Thomas Saly, Chakraborty, and Jaiswar, 2014).

Scomberomorus guttatus (Nga-kon-shat), a total of 220 individual of fish species were measured in present study. The ranges of length and weight of were between 24.8cm and 45.9cm and between 115g and 530g. The length-weight relationship of *S. guttatus* was $W=0.1396*L^{2.1396}$, where "r" value was 0.9161. From this relationship, the 'b' value was 2.1396, it can be inferred that their growth is negative allometric in nature (Figure 4). Similarity, Zin Zin Zaw (2010), reported the LWR of *S. guttatus* was $W=0.0203*L^{2.687}$ and the regression coefficient r= 0.9894 so the growth indicated negative allometric in nature (b<3) in Mawlamyine fish landing centre. Moreover, Rashid, Mustafa and Dewan (2010) indicated growth of *S. guttatus* was also negative allometric as the value of allometric coefficient "b" was less than 3. Moreover, the LWR of *S. guttatus* was $W = 0.00001\ L^{2.894}$, where the r^2 value was 0.9915, from this relationship it can be inferred that their growth is negative (b<3) at different fish landing centers of West Bengal (Dutta, *et al*, 2012).

A total of 218 *Setipinna tenuifilis* (Nga-byar) were measured during this study period. The length distribution of *S. tenuifilis* ranging in size from 16.5cm-30cmcm and the body weight varied between 65g and 230g. The growth of *S. tenuifilis* is negative allometric as its 'b' value was found to be 1.1262 and the LWR was $W=3.6842*L^{1.1262}$. The correlation coefficient 'r' was 0.3585 in present study (Figure 5). In Su Hlaing Hlaing (2016), the negative allometric growth of *S. tenuifilis* was observed in Mon Coastal Water beacause the mean 'b' was lower than 3.

Condition factor: Fulton's condition factor (K) represents health condition or well-being of fish (Nash, Valencia and Geffen, 2006). The value of K > 1 indicates the well-being of the fish to be good. The higher values of 'K' in a particular period seem to be the preparation for the reproductive activities (Telvekar, Chakraborty and Janissary, 2006). The mean K values of commercial fish species in current study fluctuated between 0.56 and 0.95 as shown in table 1. From present study period, the condition factor (K) value for *Tenualosa ilisha* ranged from 0.49 to 1.46 and mean value was 0.95 ±0.12, for *Tenualosa toli* ranged from 0.40 to 1.46 and mean value was 0.95 ±0.16, for *Scomberomorus guttatus* ranged from 0.35 to 1.33 and mean

value was 0.69 ±0.13 for *Setipinna tenuifilis* ranged from 0.56 to 2.89 and mean value was 1.09 ±0.43. So, the mean value of K of some commercial fish species was lower than 1 which indicates the well-being of the fish to be poor but *Setipinna tenuifilis* was good health in nature (Table 2 and Figure 6).

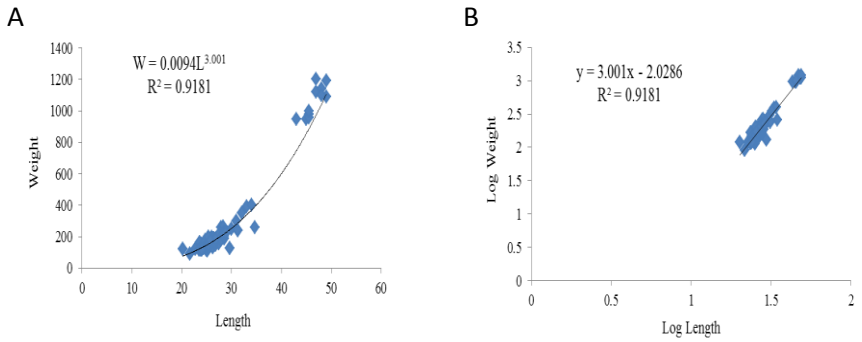

Figure 2 Length-weight relationship of *Tenualosa ilisha*; A) Non Linear relationship and B) Linear relationship

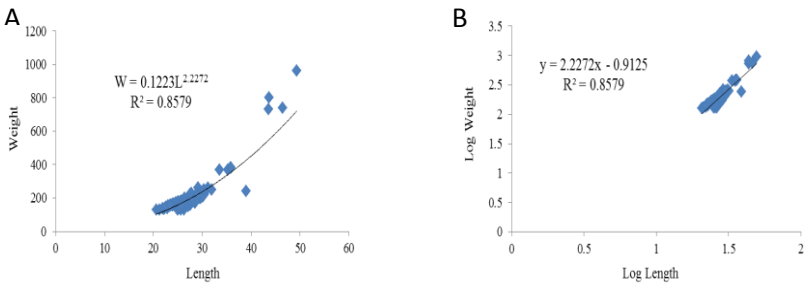

Figure 3 Length-weight relationship of *Tenualosa toli*; A) Non Linear relationship and B) Linear relationship

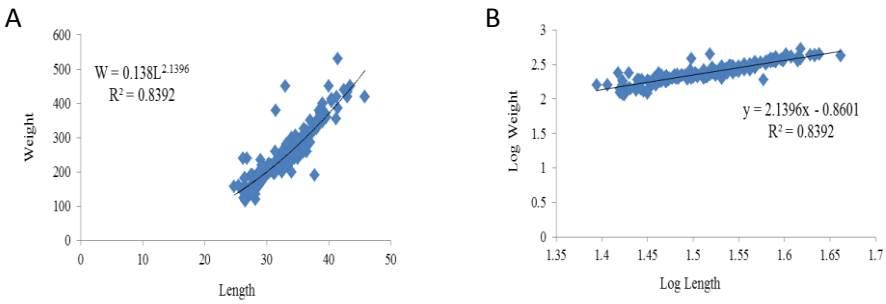

Figure 4 Length-weight relationship of *Scomberomorus guttatus*; A) Non Linear relationship and B) Linear relationship

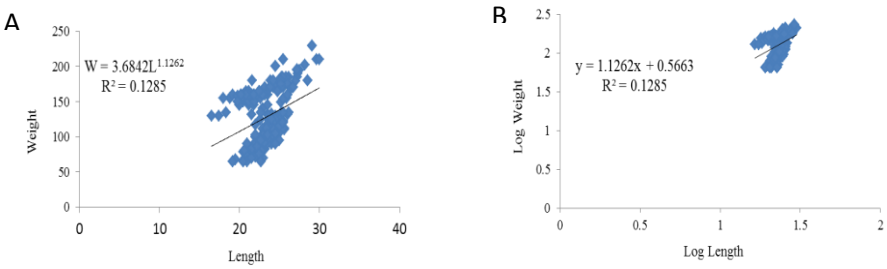

Figure 5 Length-weight relationship of *Setipinna tenuifilis*; A) Non Linear relationship and B) Linear relationship

Table 1 Summary of length-weight relationship parameters of some commercial fish species from Kyaikkhami Fish Landing Center in present study.

Species	N	Characteristics (TL)		Characteristics (TW)		L W R			Exponential Equation
		L_{min}-L_{max}	$\bar{X}\pm SD$	W_{min}-W_{max}	$\bar{X}\pm SD$	a	b	r	
Tenualosa ilisha	235	20.2-49	25.51±3.07	92-1200	210.89±194.66	-2.02	3	0.958	$W= 0.0094*L^{3.001}$
Tenualosa toli	200	20.6-49.3	24.37±1.51	128-960	218.59±131.60	-0.91	2.23	0.926	$W= 0.1223*L^{2.2272}$
Scomberomorus guttatus	220	24.8-45.9	15.01±1.73	115-530	259.79±84.47	-0.86	2.14	0.916	$W= 0.138*L^{2.1396}$
Setipinna tenuifilis	218	16.5-30	30.54±2.93	65-230	132.54±39.02	0.57	1.13	0.358	$W= 3.6842*L^{1.1262}$

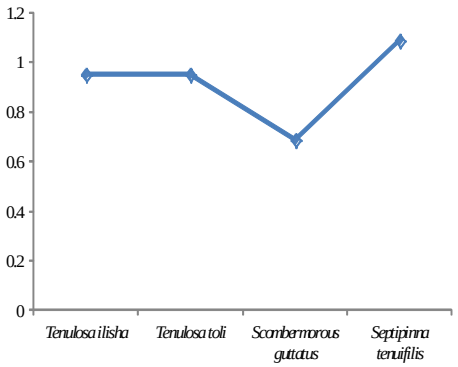

Figure 6 Mean Condition factor (K) of some commercial fish species from Kyaikkhami fish landing centre

Table 2 Mean Condition factor (K) of some commercial fish species from Kyaikkhami fish landing centre in present study.

Mean Condition Factor (K)	***Tenualosa ilisha***	***Tenualosa toli***	***Scomberomorus guttatus***	***Setipinna tenuifilis***
	0.95 ±0.12	0.95 ±0.16	0.69 ±0.13	1.09 ±0.43

Conclusion

The LWR of these commercially important marine fishes helps to manage their stock in the present study area. From the length weight relationship study, it is clear that the growth of *Tenulosa ilisha* was isometric in nature but *Tenulosa toli, Scomberomous guttatus* and *Setipinna tenuifilis* were negative allometric in nature and the length and the weight of fish species are significantly correlated (r<1, nearly 1) except *Setipinna tenuifilis* (r=0.358). Present studies indicated negative allometric and poor growth of the fish. So the coefficient "b" of *T. toli, S.*

guttatus and *S. tenuifilis* became to be less rotund when the length of fish increases. So the mean condition factor value (K) of all fish species was lower than 1 except *Setipinna tenuifilis*, the condition of all species was poor health of fishes in present study. The condition factor of *Setipinna tenuifilis* was good in present study. It is concluded that the result of the study will be useful to the researchers and policy planners in this study area.

Acknowledgements

I am indebted to Dr Aung Myat Kyaw Sein, Rector of Mawlamyine University and Dr Mie Mie Sein, Pro-Rector and Dr San San Aye, Pro-Rector, Mawlamyine University, for their encouragement and supports in preparing this work. I am very grateful to Dr San Tha Tun, Professor and Head of the Department of Marine Science, Mawlamyine University, for his valuable suggestions and constructive criticisms on this study. Finally, my infinite thanks are to my beloved family for their kind and financial support throughout this study period.

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