



LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF *Megalops atlanticus* REARED IN CIRCULAR PLASTIC TANKS

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ABSTRACT

Length-weight relationship (LWR) and condition factor of *Megalops atlanticus* fed three formulated diets of varying percentage crude protein from 35% CP (T1), 40% CP (T2) to 45% CP (T3) and a control feed (Coppens®) were reared in partial flow-through circular plastic tanks. LWR was estimated using the equation $W = aL^b$ and the condition factor (K) was determined using the equation $K = 100.W/L^3$. The b value of T1, T2, T3 and control were 2.9595, 2.5286, 3.6310 and 1.8767 respectively. The average K value for T1, T2, T3 and control were 0.43, 0.49, 0.59 and 0.39 respectively. The determination of 'b' and 'k' of *Megalops atlanticus* was very important since it is a useful tool in assessing the wellbeing, growth performance and feed utilization in cultured fish.

Keywords: Atlantic tarpon, growth relationships, culture systems

INTRODUCTION

Megalops atlanticus is found in marine, brackish and fresh water (Zerbi, 1999 and Anyanwu, 2004). The family Megalopidae belongs to the class Osteichthys, subclass Actinopterygii and order Elopiformes which represent soft-rayed finned teleost fishes. The Elopiformes include the *M. atlanticus* and the ten pounder (*Elop lacerta*). They have gular plates ventrally located between the two branches of the lower jaw (Lowe, 1999). *M. atlanticus* is the largest of the herring fish attaining over 90 kg in body weight and 2.0 meters total length (Crabtree *et al.*, 1992 and Crabtree *et al.*, 1995). The body is deeply compressed and covered with cycloid scale with 40 - 48 lateral line scales (Breder and Rosen, 1966; Whitehead *et al.*, 1984 and Anyanwu, 2004).

M. atlanticus is the oldest marine fish species to be declared a game fish (Fitzgerald and Lamonte, 1949 and IGFA, 1987). According to IGFA, (1987), the favourite fishing grounds include Florida, Arkansas, Mexico and Cuba. Also the flats between Ambergris and the Mainland of Belize were one of the wonders of the fishing world being the home of *M. atlanticus* (Garcia and Salano, 1995). In Africa, sizes ranging from 99 - 122.60 kg were commonly caught at Port Michael in Gabon and they won 1st position during the 11th Annual International Game Fish Association. The species is common off the Coast of Florida, USA and around Puerto Rico where it is said to spawn and is successfully established (Crabtree *et al.*, 1992; Stamatopoulus, 1993; Garcis and Solano, 1995). Gravid males and females occur in Nigerian coastal waters and have been found to

spawn in ponds in South-west Nigeria (Anyanwu, 2004; Breder and Rosen (1966).

Length-Weight Relationship (LWR) is of great value in fishery assessments (Garicia, *et al.*, 1998; Haimovici and Velasco, 2000) and in conjunction with age at maturity, life span, mortality, growth and production (Bayer, 1987; King, 1996, Diaz *et al.*, 2000). Length-Weight is also a very important factor to be considered in brood fish production as reported by King (1996), Kulbicki *et al.* (1993), Gracia *et al.*, (1998) and Haimovici and Velasco (2000). The condition factor often referred to as the "K" factor provides information on wellbeing of the fish which is usually affected by age of the fish, sex, season, and maturity stage (Anyanwu *et al.*, 2007).

This study was carried out to examine the length-weight relationship of *M. atlanticus* fingerlings reared in plastic tanks using three formulated feed and one commercial feed as a control. This is aimed at establishing a good culture protocol for *M. atlanticus* which is commonly found around Lagos lagoons between February and June every year.

MATERIALS AND METHODS

This experiment was carried out at the Nigerian Institute for Oceanography and Marine Research, Badore Research Center, Lagos using twelve circular plastic tanks installed in a complete flow-through design. One thousand (1000) mixed sex *M. atlanticus* fingerlings of average weight $5.11 \text{ g} \pm 1.39$ to $5.26 \text{ g} \pm 1.63$ and average length $9.59 \text{ cm} \pm 1.15$ to $9.72 \text{ cm} \pm 1$ were obtained from Lagos lagoon, Nigeria in February 2010 using gill net. The

transportation was done in small batches of 300 fingerlings in a 100 L capacity vat between 0500 and 0600 hrs. daily for four days from the lagoon to the experimental station. This was to reduce mortality due to transportation stress. The fish were acclimatized for two weeks. Acclimatization was done in three tanks of 2000 L capacity each in freshwater. During the acclimatization period, the fish were initially starved for four days. Live tilapia fingerlings were then introduced into the tank as source of live feeds for Megalops. Following this, Coppens® feeds were fed to the fish for 10 days.

Experimental Design

The experiment was designed as a Completely Randomized Experiment (CRD) with three dietary treatments, a control and three replicates. Each treatment unit consisted of 40 experimental fish (fingerlings) and a treatment of specific crude protein levels 35% CP (T₁), 40% CP (T₂), 45% CP (T₃) and control (T₀). Thus each treatment group consisted of 120 fingerlings of 40 fingerlings per treatment. The treatment diets were randomly assigned as shown Table 1.

Table 1: The experimental layout of the dietary trial

Treatment (% Crude Protein)			
T ₀ (Control)	T ₁ (35)	T ₂ (40)	T ₃ (45)
A (40)	B (40)	C (40)	C (40)
B (40)	C (40)	B (40)	A (40)
C (40)	A (40)	A (40)	B (40)

ABC = Replicates randomly assigned to treatments

40 = Number of fingerlings per treatment

T₀ = Coppens® commercial feed

Three types of feed of varying protein levels were formulated using soybean and fishmeal as protein sources at the rate of 2:1 respectively. Feeding was done with the three formulated feeds and one control feed two times daily between 0700 and 0800 hours in the morning, and 1600 and 1700 hours in the afternoon. The fish were fed 5% of their body weight. Their feed was measured out using electronic

balance, model type: DT-302A. Sampling was done every two weeks till the end of the experiment; the weight was taken using electronic balance, while a meter rule was used to measure the head length (HL), standard length (SL) and total length (TL) for 12 weeks. The data collected were recorded. The ingredients and percentage (%) inclusions are shown in Table 2.

Table 2: Percentage inclusion of ingredients in the formulated treatment diets

Ingredient	T ₁	T ₂	T ₃
Fish meal	22	26	30
Soyabean meal	44	53	61
Maize	34	21	9
Premix	0.5	0.5	0.5
Vitamin C	0.1	0.1	0.1
Salt	0.1	0.1	0.1
Oil	0.2	0.2	0.2

Determination of length weight relationship (LWR) and condition factor (K)

The Length-Weight relationship (LWR) was estimated using the equation:

$$W = aL^b$$

Where W = body weight (g)

L = total length (cm)

The values of regression constant and regression coefficient "a" and "b" respectively were estimated according to Ricker, 1973.

The condition factor "K" were determined using the equation

$$K = 100W/L^3$$

Where W = weight (g)

L = Length (cm)

The analysis was carried out using Microsoft Excel 2007.

RESULTS

Length-Weight relationship and condition factor of fingerlings of *M. atlanticus* cultured in circular tanks for 12 weeks using formulated diets of varying crude protein levels of 35% cp (T1), 40% cp (T2), 45% cp. (T3) and a control (Coppens® feed) were determined. The total length ranged from 15.2 – 17.6 cm for T1, 16.6 – 19.3 cm for T2, 15.3 – 17.5 cm for T3 and 18.0 – 23.4 cm for control while the

weight ranged from 14.67 – 25.15 g for T1, 19.49 – 33.69 g for T2, 17.70 – 30.48 g for T3 and 25.41 – 50.67 g for control. The scattered diagrams of LWR for various treatments are presented in Figures 1 – 4 respectively. The values of ‘b’ for T1, T2, T3 and control were 2.9595, 2.5286, 3.631 and 1.8767 respectively (Table 3). The condition factor ‘K’ for T1, T2, T3 and control were 0.43, 0.49, 0.52 and 0.39 respectively.

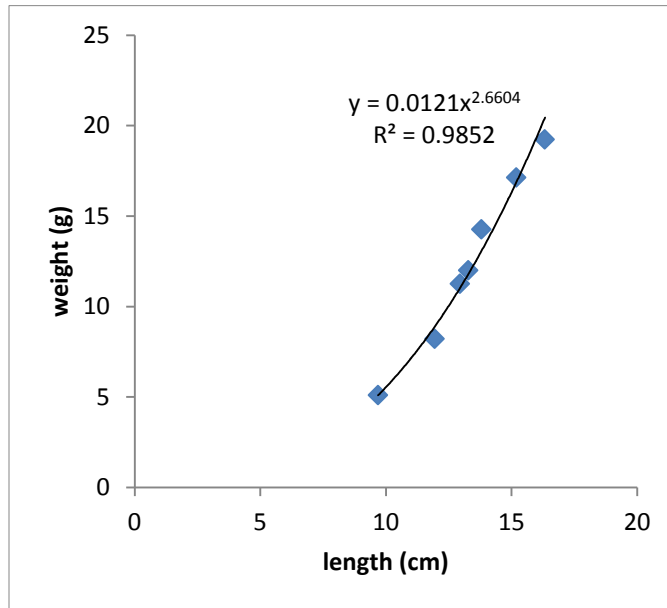


Fig. 1: Length-Weight relationship of fingerlings of *Megalops atlanticus* fed 35% crude protein diet (T1)

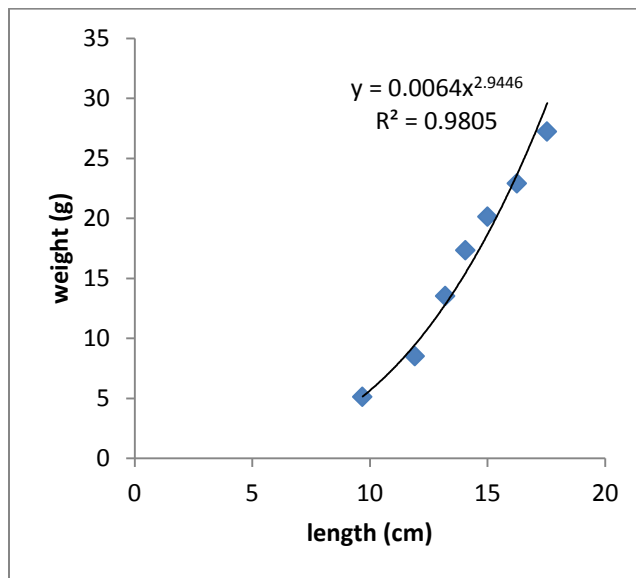


Fig. 2: Length-Weight relationship of fingerlings of *Megalops atlanticus* fed T2

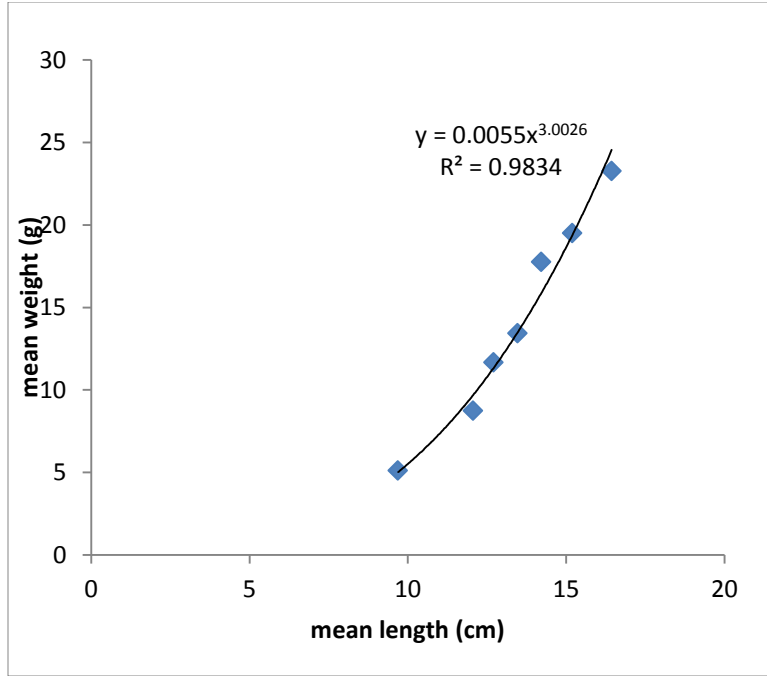


Fig. 3: Length-Weight relationship of fingerlings of *Megalops atlanticus* fed T3

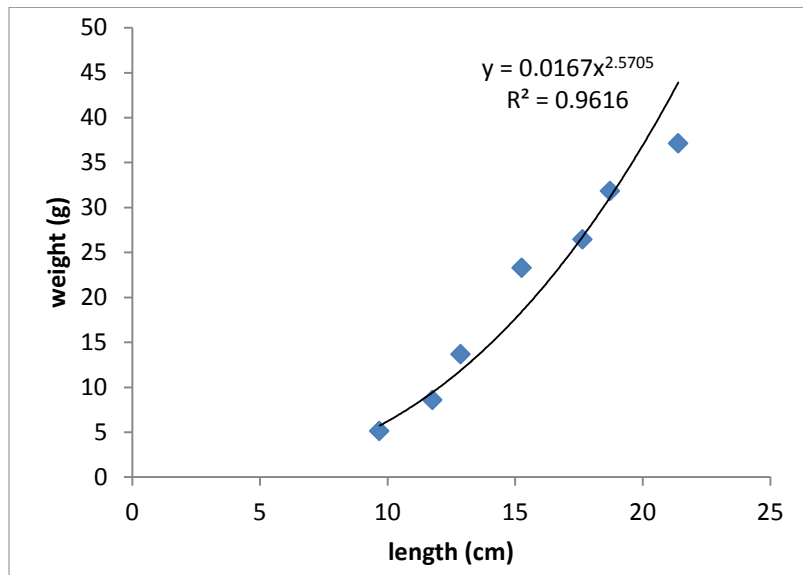


Fig. 4: Length-Weight relationship of fingerlings of *Megalops atlanticus* fed control feed

Table 3: Regression co-efficient of *Megalops atlanticus* fingerlings reared in circular plastic tanks with formulated diets of varying protein content

Diets	Regression constant (a)	Regression co-efficient (b)	Correlation co-efficient (r)
T ₀	-1.7767	2.5705	0.9806
T ₁	-1.9158	2.6604	0.9925
T ₂	-2.1918	2.9446	0.9902
T ₃	0.9834	3.0026	0.9917

DISCUSSION

The 'b' values recorded in treatments 1, 2, 3 and control are in agreement with result reported by Cinco (1982) and King (1996) that a general 'b' value of fish are closer to 3. Abdallah (2002) reported 'b' value between 2.5 and 3.44 for fishes from different marine water bodies. The 'b' value above 3 indicates that fish become wider or deeper as they grow while an exponent below 3 indicates they become more slender (Safram, 1992). From the result recorded in this study, the values of 'b' recorded in T1, T2, T3 and control falls within the normal range confirming that *M. atlanticus* is culturable in tanks with formulated diet against the previous assumption that *M. atlanticus* cannot be cultured with formulated diets.

Anyanwu *et al.* (2007) reported condition factor (K) of *Clarias gariepinus* reared in water recirculation system to be 0.6948 ± 0.25 , 0.6953 ± 0.09 and 0.6540 ± 0.19 for male, female and combined sex respectively. Fafioye and Oluajo (2005) reported that 'K' for *C. gariepinus* in Epe lagoon was 0.76 ± 0.15 while the 'b' value was 2.790. In this study, the 'K' for control, T1, T2 and T3 were 0.39, 0.43, 0.49 and 0.59 respectively. The condition factors obtained in this study were lower than the values (2.9 – 4.8) documented by Bagenal and Tesch (1978), for mature fresh water fish. Further studies will be carried out on the cause of the poor condition recorded in this work.

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