Science World Journal Vol 12 (No 2) 2017
www.scienceworldjournal.org
ISSN 1597-6343

Full Length Research Article

LENGTH-WEIGHT RELATIONSHIP OF *HEPSETUS ODOE* IN LAPAI - AGAIE RESERVOIR, NIGER STATE, NIGERIA

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ABSTRACT
Study on the length-weight relationship (LWR) of *Hepsetus odoe* in Lapai-Agaie Reservior, Niger State was carried out between April 2016 and August 2016. One hundred and twenty samples, which comprised of 70 males and 80 females were used for this study. These were collected from fishermen that use gillnet. Females were bigger than males though did not show any significant difference (P<0.05). Length-weight (b) values showed that males (b = 2.6), females (2.7) and pooled (b = 2.7) exhibited negative allometric growth pattern hence, length and weight did not grow at the same proportion. There was positive correlation (r) between length and weight of males (r = 0.74), females (r = 0.78) and pooled (r = 0.85). It is recommended that similar study should be done for dry season, other aspects of the biology of the fish should be studied and water quality assessment through determination of physico-chemical parameters to know the pollution status of the reservoir should also be carried out. This would go a long way to better managed *Hepsetus odoe* and other fish species in the reservoir.

Keywords: Growth pattern, *Hepsetus odoe*, length-weight relationship, reservoir, Niger state.

INTRODUCTION

Fish is known to be a valuable and important source of rich protein to man. In addition, it generates income and employment hence serves as source of livelihood. Fisheries management is an important tool for proper utilization and sustainability of the aquatic resources. To achieve this, it often requires the use of biometric relationship so that data collected from the field can be transform into appropriate indices (Ecoutin *et al*., 2005). Length and weight are two useful parameters used especially in fisheries assessment. This relationship known as length-weight relationship (LWR), is commonly used in the analysis of fisheries data. It helps to determine the average weight of fish at a certain length class and widely used in natural fish population study to provide methods for management (Nash *et al*., 2006). The relationship describes the growth pattern of fish based on the value of b known as regression coefficient. If b = 3 the growth is isometric, and less than or greater than b-value it is then known as allometric growth. Fluctuations in fish growth are common in tropical and subtropical waters because of environmental variations, spawning, and dynamics of food composition (Adeyemi *et al*., 2009). Studies on length-weight relationship of *Hepsetus odoe* was done in some water bodies. This included that of Benedict *et al*. (2009) in Cross River inland wetlands, Adedokun *et al*. (2013) in Ogbomosho Reservoir, Ezekiel and Abowei (2014) from the Amassoma flood plains in Niger Delta and Oso *et al*. (2014) in Ado-Ekiti Reservoir, Southwest Nigeria. However, there is no information on the growth pattern of this fish in Lapai - Agaie reservoir.

Hepsetus odoe commonly known as African pike belong to the family Hepsetidae. It is the only species represented in this family. It is a commercially important freshwater fish found in catches of fishermen on Lapai - Agaie reservoir. There is therefore, the need to manage this important fish species in the reservoir. This study tends to determine the growth pattern of this fish in Lapai - Agaie reservoir from the length-weight relationshipFish is known to be a valuable and important source of rich protein to man. In addition, it generates income and employment hence serves as source of livelihood. Fisheries management is an important tool for proper utilization and sustainability of the aquatic resources. To achieve this, it often requires the use of biometric relationship so that data collected from the field can be transform into appropriate indices (Ecoutin *et al*., 2005). Length and weight are two useful parameters used especially in fisheries assessment. This relationship known as length-weight relationship (LWR), is commonly used in the analysis of fisheries data. It helps to determine the average weight of fish at a certain length class and widely used in natural fish population study to provide methods for management (Nash *et al*., 2006). The relationship describes the growth pattern of fish based on the value of b known as regression coefficient. If b = 3 the growth is isometric, and less than or greater than b-value it is then known as allometric growth. Fluctuations in fish growth are common in tropical and subtropical waters because of environmental variations, spawning, and dynamics of food composition (Adeyemi *et al*., 2009). Studies on length-weight relationship of *Hepsetus odoe* was done in some water bodies. This included that of Benedict *et al*. (2009) in Cross River inland wetlands, Adedokun *et al*. (2013) in Ogbomosho Reservoir, Ezekiel and Abowei (2014) from the Amassoma flood plains in Niger Delta and Oso *et al*. (2014) in Ado-Ekiti Reservoir, Southwest Nigeria. However, there is no information on the growth pattern of this fish in Lapai - Agaie reservoir.

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MATERIALS AND METHOD

Study Area

Lapai - Agaie Reservoir (Latitude 9º39N and Longitude 6º33E) is among the water bodies found in Niger State. It is a small water body with a mean depth of 6.1 meters, constructed for the supply of portable drinking water and irrigation.

Fish Identification and Sample Collection

Hepsetus odoe were identified according to the methods described by Idodo-Umeh (2003) based on morphometric and meristic characteristics. The different sexes were also identified using external features.

Three landing sites on Lapai - Agaie Reservoir were chosen and visited for sample collection from fishermen's catch that used gillnets. These are the major landing sites on the reservoir and also easily accessible. One hundred and fifty (150) samples of *Hepsetus odoe* of various sizes to ensure representation of different lengths and weights were carefully collected and used for this study. This was done for five (5) months from April, 2016 to August, 2016. Samples were collected in plastic bucket containing ice in order to maintain freshness and transported to Biology Laboratory, Ibrahim Badamasi Babangida University, Lapai, Niger State for analysis.

Fish length and weight measurements

Standard length (from the tip of snout to the caudal peduncle) and total length (tip of the snout to the longer part of the caudal fin) and weight of each fish sample were measured to the nearest 0.1 cm and weight taken to the nearest tenth of a gram respectively. The length was measured using measuring board, while the weight was taken using spring and weighing balance depending on the size of the same fish.

Length-weight relationship (LWR) determination

The formular described Pauly (1984) was used to determine the length-weight relationship of male, female and pooled sexes:-

$$W = aL^b$$

This was transformed to logarithm in order to give a straight line graph in the form Log W = Log a + b Log L to obtain the values of a, b and r.

Where :-
W = Body weight of fish (g)
L = Standard length of fish (cm)
a = intercept
b = growth exponent

Data Analysis

Descriptive statistics was used to calculate means, standard deviation, minimum and maximum values of data (Length in centimeter and Weight in grams), analysis of variance (ANOVA) were used to test for any significant difference at 5% confidence level. Linear Regression was also carried out to test for any correlation between the parameters.

RESULTS AND DISCUSSION

The body measurements of *Hepsetus Odoe* in Lapai-Agaie Reservior is shown in table 1. There were variations in the sizes of fish samples used for this study. 120 samples comprised of 70 males (9.40-20.00cm SL, 11.00-25.00cm TL, 10.90- 191.50g Wt) and 80 females (9.00-27.00cm SL, 11.00-30.00cm TL, 11.90-200.00g Wt) showed different sizes used for this study. Females were bigger than males (Table 1) but this did not differ significantly (P<0.05).

Table 1: Body measurments of *Hepsetus odoe* in Lapai-Agaie Reservior, Niger State Nigeria

	Sex		
	Male	Female	Pooled
Number of Sample	70	80	150
Standard Length (cm)	9.40-20. 00	9.00-27.00	9.00-27.00
Mean ± Standard Deviation	15.26±2.46	16.08±3.81	15.70±3.26
Total Length (cm)	11.00-25.00	11.00-30.00	11.00-30.00
Mean ± Standard Deviation	18.58±2.90	19.11±4.29	18.86±3.70
Weight (g)	10.90-191.50	11.90-200.00	10.90-200.00
Mean ± Standard Deviation	72.66±43.30	80.80±55.41	77.00±50.13

Oso *et al*. (2011) reported standard length ranged from 14.3 to 29.4cm and body weight ranged from 48.2 to 339g; males and females weights ranged between 48.1-339g and that of females was between 93.20-346.20g. Although, these were smaller than those used in this study, females were bigger than males. Adedokun *et al*. (2013) reported mean standard lengths and weights of 109 samples examined from Ogbomosho Reservoir were 2.2 cm and 183.00g respectively. This is in line with the finding of this study. Similarly, Ezekiel and Abowei (2014) reported standard length and weight of *Hepsetus odoe* as 2.5-62.50cm and 22.50-526g respectively, which was also bigger than samples collected for this study. This could also be due to available or sizes of fish caught at that particular time, habitat differences amongst other factors. Although, the lengths and weights between sexes differ, it did not show any significant difference (P>0.05). Different lengths and weights of the species were also reported by Oso *et al*. (2011), and Ezekiel and Abowei (2014).

Length and weight are two key parameters used to determine the growth of an organism including fish. Relationship between these parameters shows growth pattern of fish in the aquatic environment. The b-values of seventy (70) males, eighty (80) females and pooled *Hepsetus odoe* for this study is shown in figures 1, 2 and 3. The values were 2.6, 2.7 and 2.7 respectively. In an ideal situation, b-value is expected to be 3, which is known as isometric growth. As b-value increases the size of fish also increases because fish grows in all proportionately and in all direction. This shows that both sexes and pooled exhibited negative allometric growth pattern because b-values were less than 3. This shows that the length and weight of fish are not growing at the same proportion in the reservoir. This tallies with the findings of Konan *et al*. (2007) and Benedict *et al*. (2009) though values reported were lower than the ones in this study, but contradicts the findings of Adedokun *et al*. (2013) and Ezekiel and Abowei (2014) in Ogbomosho Reservoir and Amassoma flood plains in Niger Delta respectively that exhibited positive allometric growth.

There were fluctuations in growth pattern (b-value of 2.2-3.2) in months (Table 2). May (b=3.20) and July (b=3.01) both showed isometric growth but the remaining months showed negative allometric growth. Entsua – Mensah *et al.,* (1995) reported b-values to have fluctuated between 2 and 4 for fishes from tributaries of Volta River, Ghana. The values reported in this study fall within this range. This could be due to difference or condition of the environment such as pollution, spawning period and fishing pressure, availability of food to mention but a few.

Table 2: Monthly length – weight parameters of *Hepsetus odoe* in Lapai – Agaie Reservoir, Niger State, Nigeria

Month	a	b	r
April	1.9839	2.9139	0.9506
May	2.3383	3.2030	0.9716
June	0.9736	2.1585	0.8215
August	1.5069	2.7184	0.8548

a = Proportionality constant
b = Growth coefficient
r = correlation coefficient

Coefficient of regression also known as r - value is used to define the level of association between the length and weight of fish. The values for males (r = 0.7384), females (r = 0.7776) and pooled (r = 0.8494) as indicated in Table 3 showed positive correlation between the lengths and weights. This means there was strong relationship between these parameters even though the fish grow slimmer.

Table 3: Length – weight parameters for male, female and pooled sex of *Hepsetus odoe* in Lapai – Agaie Reservoir, Niger State, Nigeria during the study period (April – August, 2016)

Length – weight parameters	Male	Female	Pooled
r	0.7384	0.7776	0.8494
a	1.6832	1.5234	1.4342
b	2.6132	2.1432	3.1214

a=Proportionality constant
b = Growth coefficient
r = correlation coefficient

Positive correlation were also reported by Benedict *et al*. (2009) in Cross River wetlands (r = 0.81), Leonard *et al*. (2011) in Buyo and Ayame Reservoirs (r = 0.874; 0.973) respectively and Ezekiel and Abowei (2014) in Amassoma flood plain of the Niger Delta (r = 0.850). The variations in the values could be due to sizes and number of *Hepsetus odoe* sampled, period of the year, environmental and location differences. The positive correlation showed that growth pattern did not negate the fact that there is strong relationship between length and weight of the fish. These observations could also be due to fluctuations in food availability, number of fish and water quality amongst others.

Conclusion and Recommendation

Males and females of *Hepsetus odoe* used for this study did not show much size difference and both exhibited negative allometric growth in the reservoir, hence the environment has negative effect on the growth of the fish. Fluctuation observed in growth pattern in the months could be due to changes in the environmental conditions. There was positive relationship between the length and weight of *Hepsetus odoe* in Lapai-Agaie Reservoir. It is recommended that similar study should be done for dry season, other aspects of the biology of the fish and water quality studies should done.

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