LENGTH-WEIGHT RELATIONSHIP, CONDITION FACTOR AND GROWTH OF *Alestes baremose* (JOANISS, 1835) IN ZOBE DAM, KATSINA

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ABSTRACT

Studies on Alestes baremose caught in Zobe dam were carried out from April to November, 2018, with the aim to describe its aspect of length-weight relationship, condition factor and age. Morphometric parameters of 193 specimens obtained during the study showed a total length range from 8.00cm to 23.00 cm, body weight ranged from 5.00g to 132.3g. The length-weight relationship was $W= aL^{2.919}$ for sex combined. This indicates negative allometric growth pattern for Alestes in Zobe dam. There was a strong correlation between length and weight (r= 0.8901). The condition factor (k) for females is 1.00 ± 0.10 and that of males was 0.96 ± 0.10. Age determination using annuli count of the scale showed the presence of only 3 age groups during the study period i.e. 0+, 1+ and 2+. Where age 0+ were 39.38 %, 1+ dominated the catch with 56.99 % and age 2+ were only 3.63%. The fact that majority of the Alestes in the catches were of small sizes indicates overexploitation of fish in dam.

Keywords: Length-weight relationship, Condition Factor, Zobe dam and Alestes baremose

INTRODUCTION

Silver side, *Alestes baremose,* is native to freshwater systems in Africa, flourishing well in both lentic and lotic environments. It belongs to order *Characiformes*, family *Alestidae.* In Nigeria, specifically in Katsina State, *Alestes* is well known, it is called "*kawara*" and it is one of the most important fish species of Zobe Dam, Dutsin-ma. Knowledge of some aspects of reproduction biology such as length-weight relationship is important in studying fish biology. Length-weight relationships can be used to predict weight from length measurements (Pauly, 1993). Length-weight relationship is a significant biological parameter in fishery science as it helps in easy assessment of stock variation and general well-being of fishes (Kalita *et al.,* 2016).

A need exist to determine the population biology of wild species for exploitation models. Progressively, studies in different parts of the world continue to investigate the length-weight relationship, fecundity, condition factor, gonadosomatic index etc. to update the dynamics in biology of fish species. Length-weight relationship and condition factor are of great importance

to the fishery industry as they help to predict the best length and time suited to harvest a particular species of fish (Abobi, 2013). Fish exploitation in Nigeria is not sustainable as the age of fishes need to be documented. However, information on *Alestes* species in our study area is scanty and knowledge about the population biology will therefore help researchers to have firsthand information that will help to guide the management of wild fish species. This study aimed at providing biological information that is required for future monitoring and guidance on the conservation and management of fisheries resources of Zobe dam.

MATERIALS AND METHODS

Study Area

Zobe Dam is in Dutsin-ma Local Government Area of Katsina State in the Northern part of Nigeria. It is an earth-fill structure with a height of 19m and a total length of 2.75km. The dam has a storage capacity of 179 Million Cubic Acres and irrigation potential of 8,000 hectares. It lies between latitude $12^023'18^0N$ and longitude $7^028'29^0E$ (Muyideen, 2010).
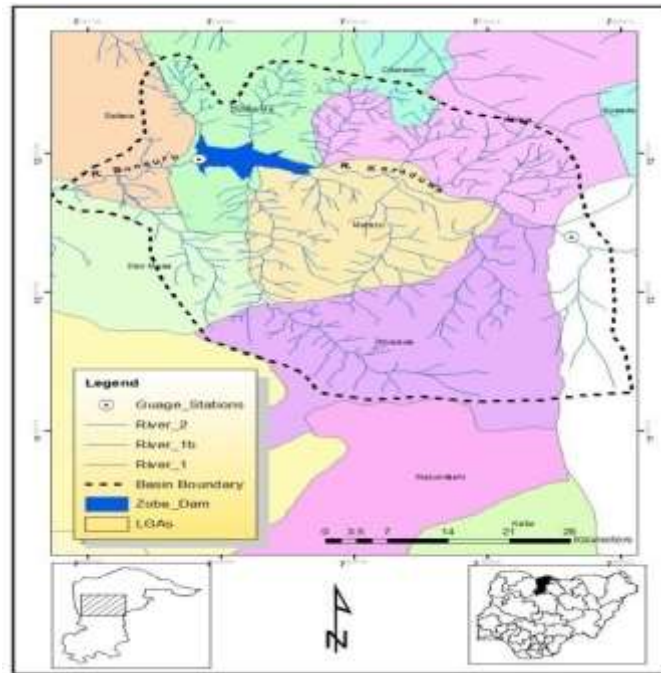
Fig. 1: Katsina State showing inland waters and location of Zobe dam

Sample Collection

A total of 193 fish samples of different sizes were collected from local fishermen at one of Zobe dam's landing site at Garhi village, Dutsin-ma Local Government Area of Katsina State. The study was carried out for Eight (8) months from April to November, 2018. Samples were collected and transported to the laboratory in clean iced containers. Total weight (TW) and Gonad weight (GW) were measured to the nearest 0.1g and 0.01g respectively. Total lengths (TL), Standard length (SL) and Fork length (FL) were measured using measuring board calibrated in centimeters (Otero *et al.*, 2008).

Length-weight Relationship

The statistical relationship between parameters of fish was established using the Parabolic equation; $W = aL^b$ (Froese, 2006) where W is the total weight and L is the total length of the fish. The values of (a) and (b) were obtained from the logarithmic transformation; $\log W = \log a + b \log L$ (Gayanilo *et al.*, 1997). The correlation i.e., the degree of association between the variables was determined by computing the correlation co-efficient (r) using $r = \sqrt{R^2}$ where R is the slope (Ogbeibu, 2005).

Condition factor (K)

The fish condition factor (k) was determined using the formula; $K = (W/L^3) \times 100$ (Pauly, 1984). Where W = Body weight (g), L = Length (Standard length) in cm.

Age determination

Age of the fish was studied using scales. Scales were removed below the lateral line close to the operculum using scalpel. Scale samples were cleaned using tap water and preserved in 5% formalin until analysis. For annuli observation, wet scales were viewed directly under low power objective (x4) (Bhatt and Jahan, 2015).

RESULT AND DISCUSSION

Length-weight Relationship

A. baremose showed negative allometric growth with b-value of 2.919 (Figure 2) indicated the degree of association between length and weight. The findings of this research indicated a strong linear relationship between length and body weight of the fish. Abobi and Ekau (2013) reported b-value of 2.9502 in *A. baremose* from lower reaches of White Volta river, and is in line with findings of the current study. *A. baremose* are very abundant from April to August in the open water of Zobe dam. During this period, the fish constitute a significant part of the fish diet of the local inhabitants. Ogbe *et al.*, (2008) reported on the growth pattern of *Alestes nurse* and *Hydrocynus forskalii* in river Benue; the slope b in the length-weight relationship of both species was 1.1958 and 1.5362 respectively. *A. nurse* showed negative allometric growth pattern which conforms to the current study.

Similar negative allometric growth pattern has been reported in fishes like *Shilbe mystus* (Mzungu *et al.,* 2017), and *Bagrus bayad* (Dan-Kishiya *et al.,* 2018) in Zobe dam. *Tilapia zilli, Oriochromis niloticus, Hemichromis bimaculatus* and *clarias gariepinus* in Wasai reservoir (Imam *et al.* 2010). *Labeo senigalensis* from White Volta Ghana (Abobi *et al*., 2015).
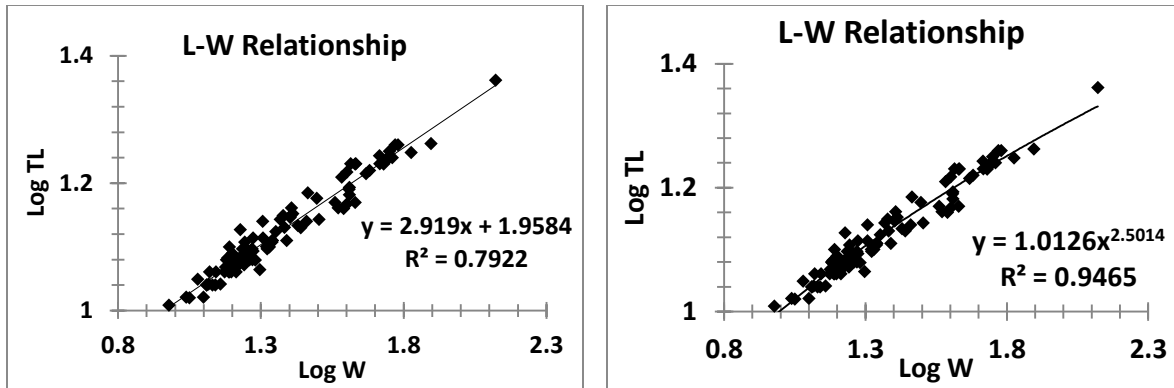
Fig. 2: Length- Weight relationship of *Alestes baremose* in Zobe dam between April and November, 2018

Condition factor (K)

The maximum condition factor recorded was 0.96±0.10 for males and 1.00±0.10 for females all in October (Table 1). The lowest condition factor was however recorded in the month of August with 0.72±0.13 for males and 0.69±0.12 for females. Low condition factor observed in this study is attributed to changes in physical and chemical state of the water body and physiological stress (Abdullahi *et. al*, 2019). Female silver side showed more robustness to the condition of the dam with k-value of 1.00±0.10 while average condition factor of the combined sexes is 1.0. Apochi *et al.* (2017) reported a condition factor of *A. baremose* from Lower River Benue where females showed more adaptation to the river with k-value of 1.01 than

males with k-value of 0.86. Similar finding have been reported by Oso (2007) on *Clarias gariepinus* in Ero reservoir (Ekere *et al.,* 2017). K-value of 1.03 for the combine sexes of *Bagrus bayad* collected from Zobe dam have been reported by Dan-Kishiya *et al.* (2018) which is in line with the findings of this study.

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 reserve during spawning period (Abobi *et al.,* 2015). Ndimele *et al.,* (2010) reported that condition factor is a useful index for monitoring of feeding intensity, age and growth rates in fish.

Table 1. Condition factor (K)) of Silver side in Zobe dam from April to November, 2018

Month	Sex	Mean Condition Factor (K) ± SD	Number of specimens
April 2018	Male	0.85±0.09	08
	Female	0.79±0.64	18
May 2018	Male	0.77±0.10	19
	Female	0.84±0.10	19
June 2018	Male	0.70±0.09	15
	Female	0.86±0.12	16
July 2018	Male	0.76±0.11	13
	Female	0.78±0.13	06
August 2018	Male	0.72±0.13	09
	Female	0.69±0.12	09
September 2018	Male	0.84±0.09	15
	Female	0.86±0.09	16
October, 2018	Male	0.96±0.10	12
	Female	1.00±0.10	08
November, 2018	Male	0.95±0.11	06
	Female	0.90±0.06	04

Age Determination

Alestes baremose has a cycloid scale as in other teleost fish (Figure 3). One hundred and ninety three fish samples have been studied and classified into 3 different age groups i.e. year 0+, 1+ and 2+ respectively. Out of 193 samples studied, 76 samples are

in the 0+ year group, 110 samples are in year 1+, 4 fish samples are categorized into year 2+ groups respectively. The use of bony parts in the determination of the age of Nigerian fishes has been studied by Bayagbona (1968) used the Otoliths of croakers; Fagade (1974) used opercula bones of *Tilapia*

melanotheron; Ezenwa and Ikusemiju (1981) used the first dorsal spine of *Chrisichthys nigrodigitatus* and Willoughby (1979) used vertebrae from Lake Kainji's *Synodontis species* Sagua *et al.,* (1985). Bhatt and Jahan (2015) reported 3 different

age groups of *Labeo rohita*: Group 1 comprises of 1 to 1+ years, group 2 comprises of 1+ to 2 years as group 2 and 2+ to 3 years as group 3 samples which was in line with findings of this study.

Fig. 3: *A. baremoze* scale (age 2+) as viewed under microscope (magnification × 400)

CONCLUSION

Alestes baremose undergoes negative allometric growth pattern (b<3) in Zobe dam and there is strong positive linear relationship between total length and body weight. According to Carlander (1969); Gayanilo *et. al,*(1997) and Froese (2006), the slope *b* values may range between 2.5 to 3.5. The *b* of length-weight relationships of *A. baremose* was within the 2.5 to 3.5 range which is typical for tropical fish stocks. The findings of age study also indicated that *Alestes baremose* is being highly overexploited in the dam.

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