Comparative Intestine And Weight Morphometry Of The Farmed African Catfish (*Clarias Gariepinus* B.): An Age Related Study.

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ABSTRACT : The morphometric measurements of the farmed African catfish were investigated. This was done to fill the knowledge gap on the basic morphometeric features of this species in restricted concrete ponds. The information obtained will help in management of feeding of these species to changing diets, environment and habits. Seventy five apparently healthy fish comprising 25 fingerlings, 25 juveniles and 25 adults were used for the study. The body lengths, weight and intestinal lengths were measured, after immobilization of the animals by chloroform euthanasia. The data obtained was subjected to statistics using one way analysis of variance and p<0.5 was taken to be significant. The result was significant in body length, weight and relative intestinal length. This suggests an age variation or an adaptation to changing feed especially in the juveniles that were fed increased dietary fibre. Positive body weight and length allometry suggest better feed conversion as the animal grows directly proportionately in age and length.The farmed African catfish is adapting to new environment by adjusting the intestinal length to maximize food digestion and absorption. Also the low relative intestinal length may be compensated for by increased mucosal fold complexity in the intestines.

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1. INTRODUCTION

Morphometric features are important in identifying fish species and their interactions in various habitats like freshwaters, lakes, rivers and seas (Akombo et al., 2011). Morphometrics measurements have been used to easily classify fishes (Bagenal and Tesch, 1978). Fish body length-weight relationship referred to as growth index is employed in fish management to estimate average weight at a given length group (Abowei and Davies, 2009). Interspecific and intraspecific morphometric values are used to compare population well being status in fish studies (Bolger and Connolly, 1989).

An inverse relationship between intestinal length and trophic level has been well documented in fishes (kapoor et al., 1975; Ribble and Smith, 1983; Kramer and Bryant, 1995a, 1995b; German and Horn, 2006). This relationship is believed to reflect the greater digestive processing time required by primary consumers due to the lower nutrient content and greater resilience to digestion of plant tissue compared with animal tissues (Horn, 1989). Hence, in fish species that eat only algae or higher plants-herbivores, tend to have longer relative intestinal length (RIL) values than species that eat both plants and animals-omnivores, and these in turn tend to have higher RIL than species that eat only other animals- carnivores (Al-Hussaini, 1947, 1949; Fryer and Iles, 1972; Kapoor et al., 1975).

Whereas, the feeding habit of African catfish has been designated as omnivore (Olojo et al., 2005), the morphometric features of the fish relative to adaptation in concrete ponds is lacking in available literature, as fish is known to quickly change morphology to variation in habitats and food availability (Smith, 1978, Starck, 1999; Pigliucci, 2005; Olsson, et al., 2007; Ghalambor et al., 2007). Hence, this paper presents an age related morphometric study of the farmed African catfish form fingerlings to juveniles and adults.

2. MATERIALS AND METHODS

Seventy apparently five African catfish made up of 25 fingerlings, 25 juveniles and 25 adults sourced from Yuep Farms Umuahia, Abia State of Nigeria, were used for the study. The fish were weighed, and the standard and total body lengths were measured. The fingerlings and juveniles were euthanized with chloroform, while the adults were humanely immobilized by stunning. The digestive tracts were dissected out and the intestinal lengths were measured. The relative intestine lengths were also determined.

Data were analysed statistically using one way analysis of variance. Duncan's multiple range test was used to separate variant means, and significance was accepted at $p < 0.05$.

3. RESULTS

Table 1. Comparative intestine and weight morphometric results at different ages (Mean±SE)

Parameters	Fingerling	Juvenile	Adult
Weight (g)	1.32 ± 0.15^{a}	30.76 ± 3.30^{a}	803 ± 28.31^{b}
SBL(cm)	4.57 ± 0.26^{a}	12.03 ± 0.27^{b}	44.91 ± 0.79^{c}
TBL(cm)	5.35 ± 0.31^{a}	13.66 ± 0.27^{b}	50.71 ± 0.88^{c}
INT(cm)	4.01 ± 0.42^{a}	15.56 ± 0.89^{b}	35.37 ± 2.19^{c}
RIL	0.87 ± 0.07^{a}	1.28 ± 0.06^{b}	0.78 ± 0.04^{a}

Key: SBL - Standard Body Length; TBL- Total Body Length; INT – Intestinal Length
RIL- Relative Intestinal Length = INT/SBL
*Different superscripts in a row indicate significant difference ($p < 0.05$).

4. DISCUSSION

The classification of African catfish is based mostly on dietary constituteunts (Olojo et al., 2005) but from this result it appears there is a change as the animal grows in age or that the feed content of more dietary fibre especially in the juvenile stage may have reflected in the result. This high rate of intestinal plasticity has been reported in other teleosts and is related to the need for adaptation in new environment (Smith, 1978). The relative intestinal length of 0.87 and 0.78 for fingerlings and adults respectively, though within the values recommended for omnivores (Al-Hussaini, 1947, Kapoor et al.,1975), but it is very close to values for carnivores. This finding is supported by a previous suggestion by Smith (1978) that African catfish though an omnivore, prefers more animal content in diet, hence tending towards a carnivore. The juvenile value though within the values of 0.5 to 2.4 for omnivores, but the significantly higher value is due to more palm kernel cake content in feed as the farmers tried to reduce cost of feed compounding (Elliott and Bellwood, 2003). The higher value reflects the ability of fish to adapt to increased fibre content in feed through increased intestinal length to enable it sift through the food, maximizing metabolite digestion and absorption (Al-Hussaini, 1949). But the small value of RIL may be compensated for by the complex anastomosing seen in the proximal intestinal mucosal folds that will increase surface area for food digestion (Ikpegbu, 2012). This is in agreement with earlier report in literature that small values of RIL may be compensated for by complex intestinal mucosal folds (Al-Hussaini, 1949). Also the presence of grinding mills represented by cornified plates of the lips and well developed pharyngeal pads in the adults may help reduce intestinal length as the food is well crushed by these structures (Verighina and Medani, 1968; Verighina, 1969; Linser et al., 1998)). In the fingerling, the feed content of high animal protein and Atemia may reduce the need for longer intestine as these feed stuffs are readily digested and absorbed.

This result agrees with the report of Kramer and Bryant (1995a), which suggested that diet-intestinal length relationship is very variant in omnivores; and Horn (1989), who asserted that relationship between diet, age and intestinal length is far from being consistent, but the significantly different values obtained in this study is not in agreement with previous studies which reported positive RIL allometry with increasing size and age (Emery, 1973; Kline, 1978; Zihler, 1982; Ribble and Smith,1983). Also intestinal lengths have been reported to vary between sexes like in Rhodeus sericus amarus (Dumitru and Mihal, 1962).

The positive allometry of body length and weight with increasing age has been reported and suggests the influence of age on the growth index of this species is directly proportional (Kramer and Bryant, 1995a).

In conclusion , the study suggest the plasticity of farmend African catfish to changing environment and diet. But more work should be done on this age related variation in RIL to ascertain the actual cause.

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