

## ALLOMETRIC AND ISOMETRIC GROWTH OF EXTERNAL BODY PARTS OF *AUCHENOGLANIS OCCIDENTALIS* (PISCES: BAGRIDAE).

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### Abstract

Allometric and isometric growth were studied in eighty-eight (88) specimens of *Auchenoglanis occidentalis*. The head length, pectoral, pelvic and caudal fins lengths and trunk length were measured. The growth of these parts were characterized into allometry or isometry using slope (b) values. The results indicated that growth was allometric in head and trunk length, the fins: pectoral, pelvic and caudal also showed allometric growth while the standard length showed isometric growth.

Key words: Allometry, isometry, growth, *Auchenoglanis occidentalis*

### INTRODUCTION

*Auchenoglanis occidentalis* occurs commonly in swamps and in small pools of Water. The head is pointed and armoured but there is no nasal barbell. The colour is yellowish or olive brown and the body is covered with black blotches. There is paucity of knowledge on characterization of growth of external body parts into allometry or isometry in *A. occidentalis*.

In fishes, studies on allometric and isometric growth have largely focused on length –weight relationship (Bagenal 1978, Weatherly and Gill 1983). Prominent among the authors who have worked on characterization of growth of our Nigerian species are: Ikusemiju (1975) who worked on *Chrysichthys nigrodigitatus*, Nzeh and Fagade (1994) showed allometric and isometric growth of fins and other external parts in *Sarotherodon galilaeus*.

Adedeji and Araoye (2006) observed isometric and allometric growth in *Synodontis schall*. Newt (1970) stated that in fish, growth of external body parts is allometric when the calculated slope (b) value is less or greater than one while isometric is when the calculated slope (b) value is one. The objective of this study is to characterize growth of external body parts of *A. occidentalis* into allometric and isometric growth.

### MATERIALS AND METHODS

Samples of *A. occidentalis* were collected from a small lake in Ilorin. A total of 88 specimens were collected. The standard length, head length, trunk length, pectoral fin length, pelvic fin length, caudal fin length and total body weight were measured. The equation of Huxley (1932) which stated that  $y=ax^2$  was used to characterize growth into allometric and

isometric. The logarithmic transformation of the equation =  $\text{Log } y = \log a + b \log x$

Where Y= dependent variable

a=intercept

b=slope

x=independent variable

A value of b equal one signifies isometric growth and b value greater or less than one signifies allometric growth. Regression analysis was carried out between each external body part and the fish body length.

### RESULTS

The standard length of *A. occidentalis* ranged from 11.4cm to 21.4 cm and the total Weight ranged from 23.0g to 332.0 g. The plot of standard length against body weight is shown in figure 1, the calculated slope value was 1.1185 signifying that growth was isometric. The correlation coefficient value was 0.478. Fig 2 shows the plot of head length against standard length. The slope (b) value was 0.357 implying that growth was allometric. The correlation coefficient value of 0.383 was obtained. Fig 3 shows the relationship between the standard length and the pectoral fin length. A high correlation coefficient of 0.6017 was obtained. The slope value was 0.7957 indicating that growth was allometric. The relationship between pelvic fin length and standard length (fig.4) shows that the slope value obtained was 0.167 showing allometric growth and the correlation coefficient was 0.153. Figure 5 shows the plot of caudal fin length against standard length. The slope value was 0.712 indicating allometric growth and the correlation coefficient was 0.383. The plot of trunk length against body length is shown in fig .6, the slope (b) value was 0.629 showing allometric growth and the correlation coefficient was 0.668. Table 1 shows the type of growth observed in the external body parts.

Table 1 : Linear Regression Equation of standard length , Head length, Pectoral fin, Pelvic fin, Caudal fin and Trunk length in *Auchenoglanis occidentalis*

| Body parts             | a      | b      | r      | Type of growth    |
|------------------------|--------|--------|--------|-------------------|
| Standard length Y=     | 0.6673 | 1.1185 | 0.4784 | isometric growth  |
| Head length Y=         | 0.3048 | 0.3569 | 0.3683 | allometric growth |
| Pectoral fin length Y= | 0.4536 | 0.7967 | 0.6017 | allometric growth |
| Pelvic fin length Y=   | 0.2671 | 0.1665 | 0.1532 | allometric growth |
| Caudal fin length Y=   | 0.2379 | 0.7125 | 0.3835 | allometric growth |
| Trunk length Y=        | 0.2822 | 0.6286 | 0.4784 | allometric growth |

Where Y= length of external body part in cm

X=length of the fish in cm

r=correlation coefficient

### DISCUSSION

The results of the correlation coefficient indicated that the trunk and the pectoral fin increased in length proportionally with the body length. The pectoral fin acts as brakes when the fish is swimming, the result obtained is in line with the function it performs in the fish. Similar result was obtained with the caudal fin whose beating propels the fish forward during swimming. The slope (b) values obtained in the two parts were higher than 0.5 showing that their growth were more towards allometry indicating that different dimensions of the fish change with growth. Similar results were obtained by Nzeh and Fagade (1994) in *Sarotherodon galileus* where the head length, trunk length, pectoral, pelvic caudal showed allometric growth. Adedeji and Araoye (2006) obtained similar result in *Synodontis schall*.

Newt(1970) observed that in the study of organ parts, if the slope value is greater than 1 growth of the part is disproportionally fast and if it less than one growth is disproportionally slow. In the present work, all the values obtained for Trunk and head length, pectoral, pelvic, anal and caudal fins were less than 1 indicating that although growth is allometric, these body parts were growing at a rate that was disproportionally very slow. This study has shown that although fishes show indeterminate growth which implies that growth continues throughout the life span of the fish with growth rate decreasing with age, however the growth of the body parts were negatively allometric indicating that growth was disproportionally slow.

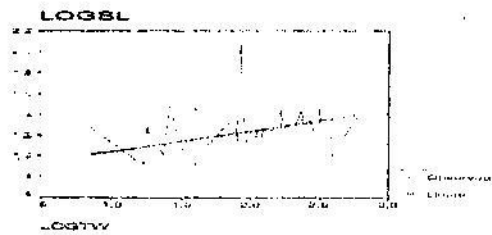


**Fig 1** Curve Fit of log standard length against total weight

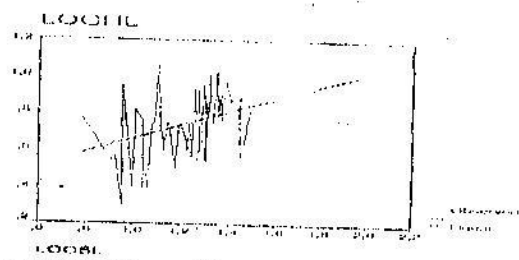


Fig 2 Curve Fit of log standard length against log head length

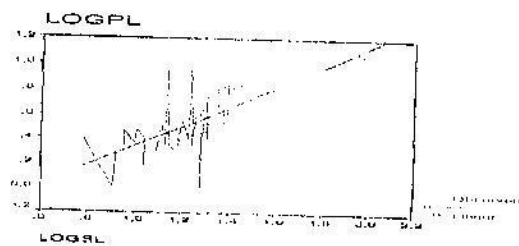


Fig 3 Curve Fit of log standard length against log Pectoral length

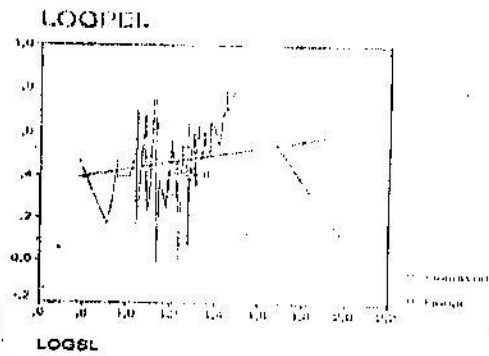


Fig 4 Curve Fit of log standard length against log pelvic length

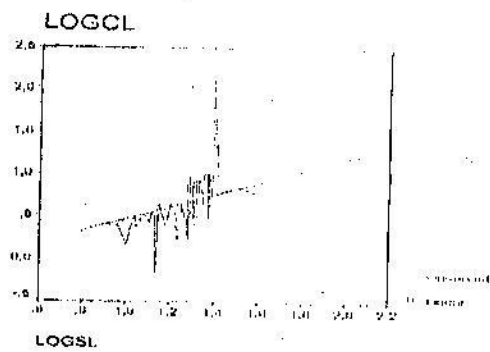


Fig 5 Curve Fit of log standard length against log caudal length

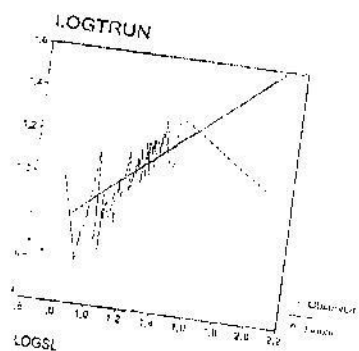


Fig 6 Curve Fit of log standard length against log trunk length

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