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LENGTH-WEIGHT RELATIONSHIP OF *PARREYSIA FAVIDENS* OF FRESHWATER DRAINAGE SYSTEMS OF BURHI GANDAK, NORTH BIHAR (INDIA)

SHAMA BEGUM AND A. K. SINHA.
Post Graduate Department of Zoology, T. M. Bhagalpur University, Bhagalpur (Bihar)

INTRODUCTION

Parreysia favidens (Benson) belongs to family Unionidae, order Schizondonta and class Bivalvia.These freshwater bivalves are abundantly found in rivers, streams, lakes, channels and drainage systems of North Bihar especially in the river Burhi Gandak. It lives on the bottom burried in mud and sand.

Many workers have investigated on the shell growth and length weight of the bivalves, (Teissier, 1948; Patil, 1976; Ambrose, 1977 Seed and Connor, 1980; Welch and Joy, 1984; Mattice and Wright, 1986; Belanger *et al.*, 1986a; Franeis *et al.*, 1990 and Fatima, 1993).

In this work an attempt has been made to study the length weight relationship of *Parreysia favidens* of freshwater drainage systems of Burhi Gandak of North Bihar..

MATERIAL AND METHODS

One hundred species (0.21-9.7g) of *Parreysia favidens* were collected from drainage of Burhi Gandak of North Bihar by Ekman dredge (Fig. 1). Each specimen were measured. After measurement wet tissue weight was noted by weighing it on an electric balance accurate to 0.1 mg. The weighted specimens were dried in an oven at 105^0 upto a constant weight. Data were examined by testing the fit of pairs of variable to the allowmetric growth equation y =axb, where 'y' is the independent variable and 'x' the independent variable. The constant 'a' and 'b' were determined by least squares regression analysis. The value of 'b' indicates the ratio of growth rate of the two variables the value of 'b' equal to three means that the rate of growth of the two variable is the same and the relationship is known as isometric. A smaller value means that 'y' is increasing at a slower rate than the variable 'x' and the allometric relationship is termed negative allometry.

RESULTS

On the dorsal region of the shell, rings and lines appear in semi-circles keeping umbo as the central point. There is so many light and dark bands. The dark bands show the maturity of the shell and the light bands indicate growth.

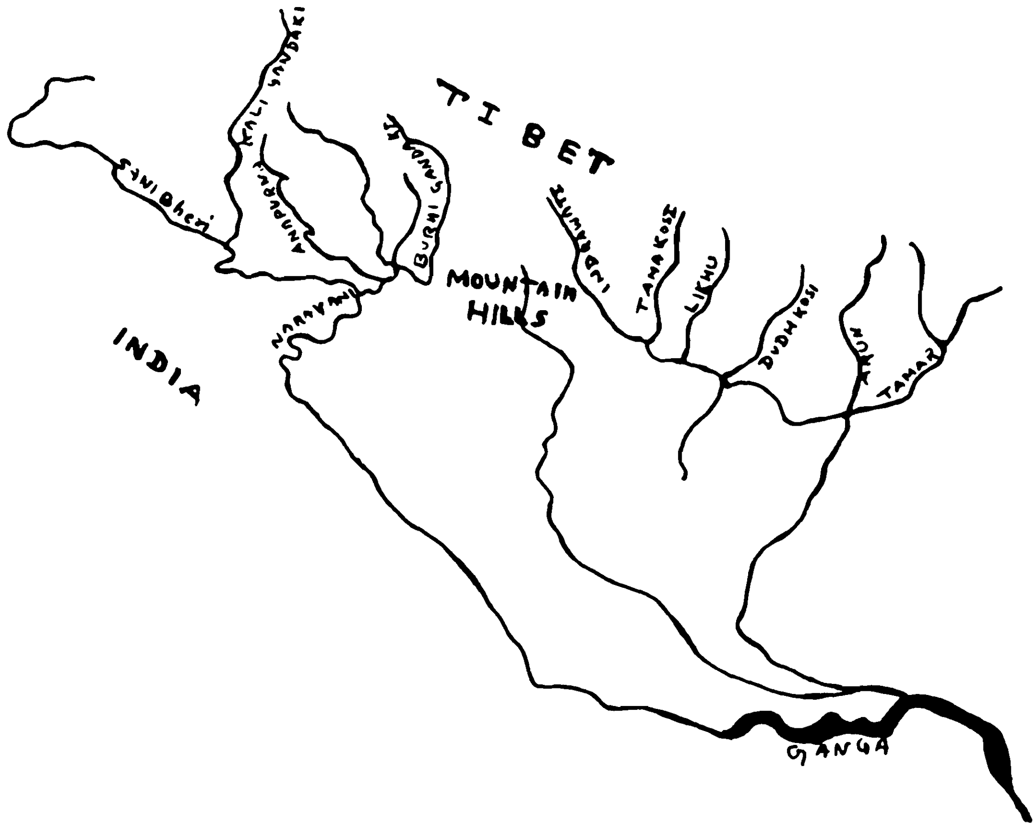

Fig. 1. Drainage system of Gandak and Kosi rivers.

Teissier (1948) has shown that the slope of functional line denotes the ratio of the standard deviations of y and x. It is also the geometric mean of the ordinary regression of X and Y (or vice versa) and for that reason it has been called the geometric mean (+GM) of functional regressions.

Length (L) Vs Breadth of the shell (B) :

$$B = 0.719589 \ L^{0.5985179}$$

Where,

B represents breadth and L represents length.

This relationship obeys the following equation :

The regression analysis ($b = 0.5985179 < 1$; $r = 0.948 P < 0.001$) shows higher degree of relationship between length and breadth of the shell of bivalve (*P. favidens*). But regression coefficient (b) tells us that breadth will decrease in size in relation to length. This is quite evident from our experimental outcome. This is highly significant.

$$W = 0.149541 \ L^{3.2371158}$$

Regression coefficient (b) shows its closeness to cube law of growth of animals which indicates that the bivalve, *Parreysia favidens* increase its flesh weight with shell at a rate required for the maintenance of constant body proportion and vice versa. This is also highly significant.

Length (L) Vs Flesh weight without shell (W) :

The correlation (r = 0.98511. P<0.001) and regression coefficients (b = 3.676332 (3) were computed between length and flesh weight without shell and were found highly significant at 0.1% level. There is a positive and significant relationship between two variables ('b' value is greater than). This indicates that the increase in flesh weight without shell increase at a faster rate that required to maintain stable body proportions and vice versa. Its most probable functional relationship may be expressed as :

$F_w = 0.076876\ L^{3\,676332}$;
Where F_w = Flesh weight, L =Length

Length (L) Vs Dry weight of flesh (DW) :

The regression analysis were (b = 2.91822, r = 0.846156, P < 0.001) was performed to get an appropriate model between these two variables. The significant value of 'r' suggest that the increase in length of the bivalve (*P. favidens*) causes the increase of dry weight of the entire flesh, its value shows that dry weight of entire flesh weight is increasing at greater rate compared as in the case of flesh weight without shell, which is due to variation in moisture content. Its functional relation may be written as

$D_w = 0.315211,\ L^{2.91822}$, Where D_w = Dry weight of flesh, L = Length.

Breadth (B) Vs Flesh weight with shell (W) :

The correlation coefficient (r = 0.937357; P < 0.001) and regression coefficient (b = 2.901316 (3) were computed between breadth and flesh weight with shell. It was found highly significant at 0.1% level. It may be concluded that increase in breadth of the (*P. favidens*) increases with the weight of the flesh and the shell. The value of regression coefficient pointed out that per unit change in breadth the flesh weight with shell increase by 2.901316. Its functional relation may be expressed as :

$DF_w = 0.562109\ \ B = 2.901316$ Where, DF_w represents Dry weight of flesh with shell and B is breadth.

Breadth (B) Vs Flesh weight without shell (W) :

The positive and highly significant correlation coefficient (r = 0.922055; P < 0.001) has been observed between breadth and flesh weight without shell.

$DF = 0.86088,\ B^{3\,329802}$ Where, DF_w = Dry weight of flesh only.

Breadth (B) Vs Dry weight of flesh (DW):

The regression analysis (b = 2.892985 <3; r = 0.866953, P<0.001) was also performed between two variables which shows that it is not very much close to the cubic law. It gives an idea that in the absence of moisture flesh weight is not growing at much faster rate as compared to the breadth of the shell. Its probable model may be written as : $DF_w = 0.27349, B^{2.89295}$ (Plate-1).

DISCUSSION

Two different types of growth in animals have been recognised. They are isometric and allometric growth. In isometric growth b = 1 which shows growth of the different body parts are growing proportionally. In allometric growth b>1= or b<1. It shows the growth rate of different parts differ.

In the case of heterogony (dysharmony) the change of weight (W) is increasing faster or slower than length (L). Patil (1976) worked and found that in the *Lamellidans consobrinus* the shell is elliptical and bivalved. The two shell valves are hinged together by means of teeth ligament. The outer surface of the shell shows concentric lines of growth. Its inner surface has the impression of crystals of calcium carbonate of aragonite type bound together by the organic matrix called conchiolin.

Morton (1954) found that *Làsaea* grows to a larger average size (3.0 mm or more) in more sheltered conditions under deep crevices.

In certain species of bivalves allometric relationship in shell growth were examined. Width increased relatively faster than either length or height so that shell became progressively more spherical as they increase in size (Seed and Connor, 1980).

The annual nature of growth bands in the *Surf clam* has been documented (Ambrose, 1977; Jones *et al.*, 1978). The growth pattern of *Surf clam* range shows some overlap with that of *Arctica islandica.* Both of them have a sigmoidal growth curve (Arnold and Holland, 1976).

Longevity of bivalve is greater in contrast to previously documented for invertebrate group. Individuals over 90 years are not uncommon. One specimen had 149 bands.

Deposition of the lines which delimit the bands appears to coincide with spawning in late summer and complete change occur during abundant food supply.

Franeis *et al.* (1990) studies the juvenile and adult *Corbicula fluminea* in different months in 1985 from the New River in Narrows, Verginia. Shell weight and soft tissue dry weight were recorded for each individual. Regression analysis among all pairs of data were calculated monthly. All comparision among shell dimensions and dry tissue weight generated coefficient of determination $(R)^2$ 0.801. In all instances comparisons between shell dimensions and the cube root of dry tissue weight generated higher R^2 values than comparisons between shell dimensions and dry weight. Comparison of monthly regression lines generated between shell secretion and the cube root of dry weight suggests that accretion and tissue growth are not equivalent for all individuals in a population and are dependent on initial size of individuals and seasons.

The increase in tissue mass in larger individuals in May was most likely in preparation for reproductive activities. While the marked decrease in slope of the regression lines from May to June reflect initiation of spawning.

Both Fuji (1957) and Joy (1985) observed no growth in clams maintained at water temperature below 14°C, while the greatest rate of growth were observed at 24° to 30°C. In one work we have been seen that *P. favidens* growing faster in the spring season at 31.5°-32.9°C. Britton *et al.*(1979) reported a slowing of shell deposition in clams with shell - 10 mm in length during winter. While McMohan and Williams (1986) found growth rates of *Corbicula fluminea* individual to be characterized by large seasonal variation. Mattice and Wright (1986) observed varying growth rates for the Asiatic clam in field studies and had suggested that temperature plays a major role in growth determination.

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SUMMARY

Length- weight relationship of *Parreysia favidens* (Benson) collected from different drainage systems of North Bihar, were established. Allometric growth pattern were found in the case of length Vs breadth of the shell ($b = 0.5985$, $r = 0.948$; $p<0.001$), length Vs flesh weight with shell ($b = 3.2371$, $r = 0.9606$; $P<0.001$), length Vs flesh weight without shell ($b = 3.6763$, $r = 0.9851$; $p<0.001$), length Vs dry weight of flesh ($b = 2.9182$, $r = 0.8461$; $p<0.001$), breadth Vs flesh weight with shell ($b = 2.9013$, $r = 0.9373$; $p<0.001$), breadh Vs flesh weight without shell ($b = 3.3298$; $r = 0.9229$; $p<0.001$) and breadth Vs dry weight of the flesh ($b = 2.8929$, $r = 0.8668$; $p<0.001$). The growth pattern of different parts of the body has been discussed in the text.

Key words : Length weight relationship, *Parreysia favidens*

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