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NOTE

ALLOMETRIC STUDIES IN THE CLAM, *MERETRIX CASTA* CHEMNITZ

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ABSTRACT

In the clam, *M. casta* Chemnitz collected from Munampam, Cochin, the allometric relationships between height (H)/depth (D)/dry flesh weight (W)/shell weight (S), and length (L) and W/S and H are different for the smaller ($<$ 20.4 mm) and larger ($>$ 20.4 mm) size groups. But the H/D relationship remained the same for both size groups. The relativistic principles involved are discussed.

Key-words : Clam, allometry, *Meretrix casta*.

Allometric relationships of bivalves have received considerable attention in view of their application, particularly in the commercial exploitation of the species in India (Nayar, 1955; Durve and Dharma Raja, 1965; Alagarswami, 1966; Parulekar, Dwivedi and Dhargalkar, 1973; Cheriyan and Cherian, 1974; Talikhedkar, Mane and Nagabhushanam, 1976; Ansari, Ayyappan Nair, Harkantra and Purulekar, 1978; Shafee, 1978; Mohan, 1980; Mohan and Damodaran, 1981). In the clam, *Meretrix casta*, Durve and Dharma Raja (1965) have observed that the slope of the fitted regression line is the same for the entire size range of animals examined. But in some other bivalves, the allometric relationship is reported to be different for the smaller and larger size groups of animals (Cheriyan and Cherian, 1974, Shafee, 1978; Mohan, 1980; Mohan and Damodaran, 1981). Hence, an attempt has been made here to determine whether the same relationship exists for the entire size range of the clam, by taking into consideration the measurement of even the smallest animals.

Clams of different sizes (5.1 to 36.8 mm L) were collected from the sandy shores of Munampam coast (10°11′12″ N; 76°10′20″ E) on the southwest coast of India. The length (L : greatest dimension along the anterio-posterior axis), height (H : maximum distance between the hinge and the opposite end of the shell) and depth (D : greatest distance between the outer surfaces of the two valves, when closed, in a direction perpendicular to the anterio-posterior axis) were measured to the nearest 0.1 mm using a venier calipers (Durve and Dharma Raja, 1965). Clams were kept in aerated seawater for 24 hrs to defecate and the soft body parts (W) were dried at 60°C to a constant weight. The dried shells were also weighed (S). The L of the animals examined varied from 5.1 to 36.8 mm.

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The relationship between the various body parameters, can be represented by the following equation

$$\log Y = \log a + b = \log X$$

where log a and b are constants. It was found to be different for clams below and above 20.4 mm. Hence, the regression coefficients were calculated separately for the smaller (< 20.4 mm) and larger (> 20.4 mm) size groups of clams.

The relationship between H, D and L is shown in Fig. 1. It reveals that even though the H/L and D/L relationships are different for the smaller and larger size groups, the H/D relationship is the same for both the size groups. Fig. 2 shows the interrelationship between L, H, W and S which reveals that L/W/L/S H/W and H/S relationships are different for the smaller and larger size groups of clams.

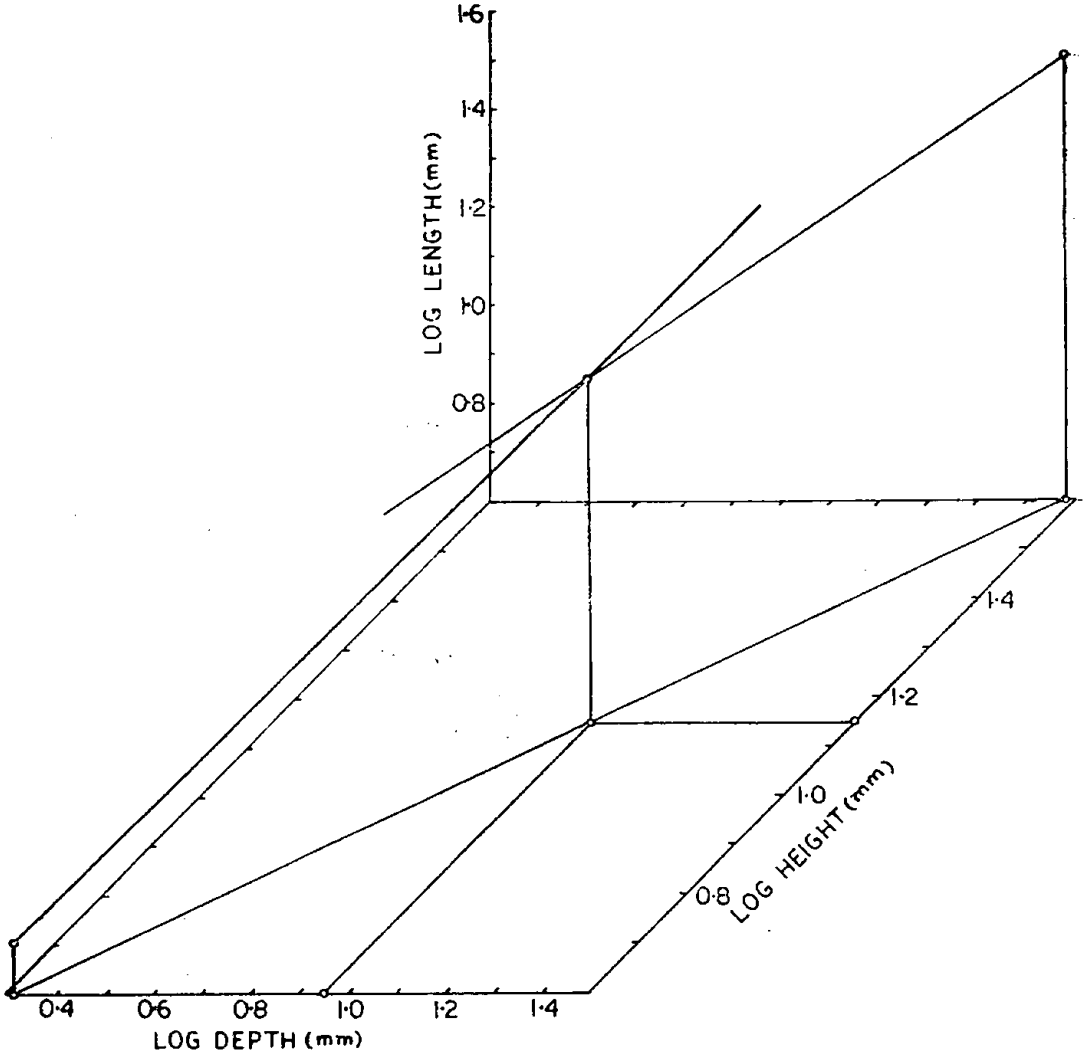

Fig. 1. Interrelationship between length, height and depth.

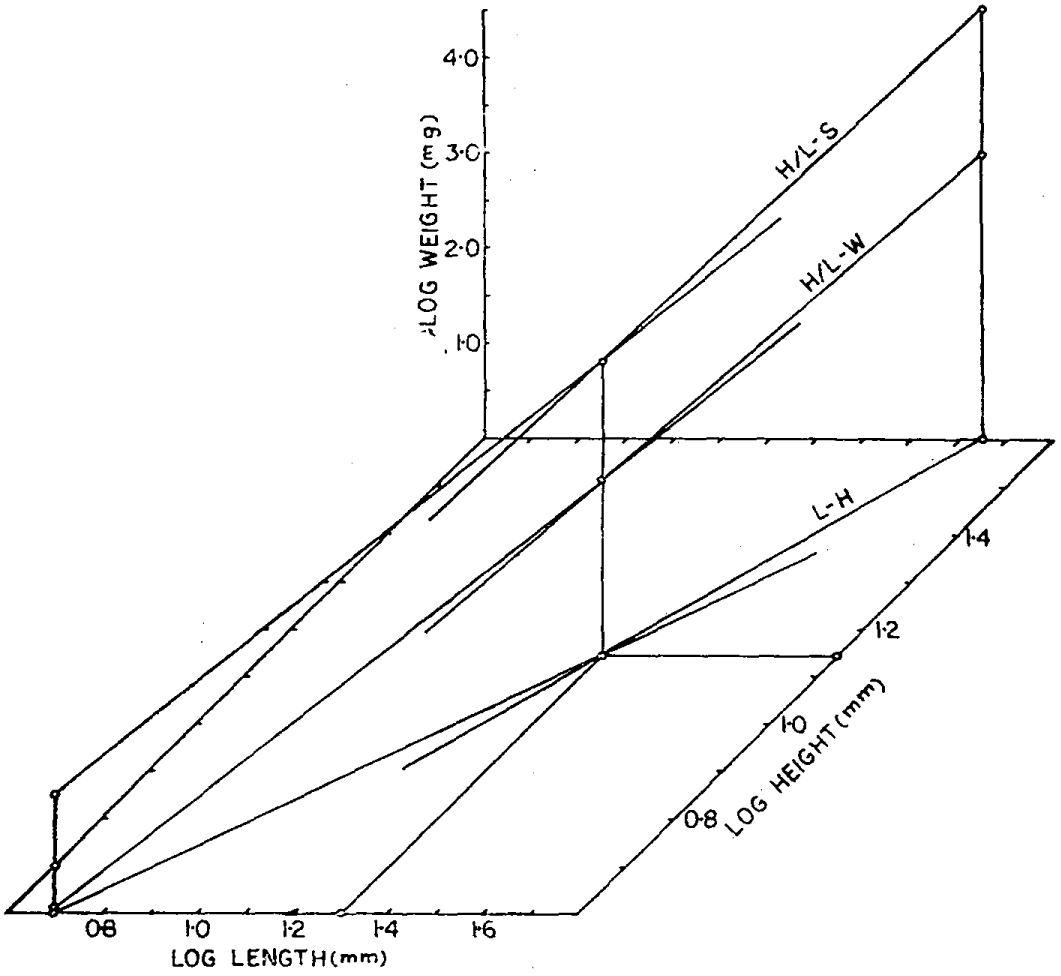

Fig. 2. Interrelationship between length (L), height (H), shell weight (S) and dry flesh weight (W).

For the smaller size group of clams, H varied from 4.4 to 14.1 mm, D from 2.0 to 8.9 mm, W from 0.003 to 0.069 g and S from 0.019 to 1.318 g. For the larger size groups H varied from 14.5 to 30.9 mm, D from 9.3 to 21.9 mm, W from 0.071 to 0.550 g and S from 1.41 to 16.98 g. The Y intercept (log *a*), slope (*b*) correlation coefficient (*r*) and number (N) are presented in Table I.

In *M. casta*, the allometric relationship (H/D/W/S-L and W/S-H) for smaller (< 20.4 mm) and for larger (> 20.4 mm) size groups are separate (Table I). The *b* value in H/D/W/S-L relationship of the larger size group is higher than that of the smaller size group, unlike in *Perna viridis*, *Modiolus demissus* and *Martesia striata* (Cheriyan and Cherian, 1974). But in the case of W/S/H relationship, the opposite trend exists. The present observations are in agreement with the findings in clam *Sunetta scripta* (Mohan and Damodaran, 1981) in which the shell growth pattern is identical to that of *M. casta*. The

Table 1. Allometric relationships between length (L), height (H), depth (D), shell weight (S) and dry flesh weight (W) in *M. casta* [log a (Y-intercept), D (slope), r (correlation coefficient)]

Parameters	log a	b	r	N
		< 20.4 mm L		
L & H	0.0041	0.8709	0.9688	104
L & D	–0.4023	1.0323	0.9743	104
L & S	–0.9690	3.1290	0.9356	104
L & W	–1.9532	2.9032	0.8421	104
H & D	–0.4010	1.1852	0.9661	104
H & S	–0.9835	3.5926	0.9219	104
H & W	–1.9666	3.3343	0.8921	104
D & S	0.2503	3.0313	0.9471	104
D & W	–0.8219	2.8125	0.8643	104
		> 20.4 mm L		
L & H	–0.6563	1.3750	0.9564	93
L & D	–1.1515	1.6042	0.9814	93
L & S	–1.1821	3.2917	0.9483	93
L & W	–2.3125	3.7500	0.8779	93
H & D	–0.4010	1.1852	0.8661	93
H & S	0.3889	2.3939	0.9416	93
H & W	–3.8936	5.0126	0.9021	93
D & S	1.1807	2.0519	0.9627	93
D & W	–2.2214	4.2857	0.8771	93

studies on the dimensional relationship of *M. casta* by Durve and Dharma Raja (1969) were restricted to the larger size groups and hence the change in the relationship for the smaller size group could not have been observed.

The variations in the body relationship of the smaller and larger size groups of *M. casta* is chiefly a result of the nature of shell form and growth, analogous to the findings of Mohan, 1980 in *P. viridis* and Mohan and Damodaran, 1981 in *S. scripta*, The inflection point (Kuenzler, 1961) in *M. casta* is at a shell L of 20.4 mm. Interestingly, it is at a shell H of 13.8 mm, the value interpolated corresponding to the inflection point (20.4 mm L). From the 3 dimensional diagram (Fig. 1) that the direction of growth in H changes appreciably such that the point of maximum growth in H (growth generating line) describes a logarithmic spiral. Shell growth in L is also non-linear and shifts more ventrally from the anterioposterior direction of growth in shells > 20.4 mm L. Analysis of the relativistic mechanisms governing the allometric relationships by the method of resolving the resultant relationship into components (Mohan, 1980) shows that the degree of non-linear growth of the shell in H is less than that in L but equal to that in D and that there is a decrease in growth rate of W/S in clams > 20.4 mm L. The above findings which are comparable to the observations in another clam *S. scripta*, determines the type of allometric relationship in smaller and larger size groups of *M. casta*.

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