

MORPHOMETRIC AND MERISTIC STUDIES OF THE SPOTTED ESTUARINE PRAWN, *MACROBRACHIUM EQUIDENS* (DANA) OF VEMBANAD LAKE, KERALA STATE

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ABSTRACT

The paper reports on the statistical analysis of growth pattern and meristic studies of body parts of the spotted estuarine prawn, *Macrobrachium equidens* (Dana) of Vembanad Lake, Kerala State. The results showed that the growth pattern of carapace length, telson length, ischium length and dactylus length in relation to total length were significantly different between the sexes at slope itself (at 1% level) and growth pattern of abdominal length, merus length, carpus length, propodus length and palm length were significant at elevations (5%, 1% levels). The average sizes of all these characters were greater in males than in females. Regression equations have been calculated for the characters and presented in the text. Among the characters of the carapace, rostrum length, post-orbital length showed significant difference between sexes at 1% level (slope value) and width of carapace at 1% level (elevations). The average sizes of all these characters were higher in males. Among the meristic characters studied, the species exhibited sexual dimorphism with regard to dorsal teeth, post-orbital teeth and ventral teeth. The fundamental data generated is essential for establishing the species status as well as it is useful for making comparison with other species.

Key words: Growth pattern, Meristic studies, *Macrobrachium equidens*.

INTRODUCTION

Taxonomic studies in crustaceans are largely based on the morphological as well as proportions of different body parts. It is species specific also. However, in crustaceans allometric studies on different body parts are seldom being made. Such studies will help in establishing the sexual dimorphism also (Farmer, 1986; Jayachandran and Joseph, 1985, 1988; Jayachandran *et al.*, 1996; Koshy, 1969, 1971; Mathews, 1992; Sriraman *et al.*, 1987). *Macrobrachium equidens* (Dana) exhibits close relationship with *M. sulcatus* (Henderson and Matthai, 1910), because of this reason, the two names were synonymised (Holthuis, 1950). A recent study revealed that

these two species are distinct (Jayachandran, 2001). In order to establish the species status of *M. equidens*, morphometric and meristic studies have been attempted and the present paper is a report on the same.

MATERIAL AND METHODS

A total of 143 specimens of *M. equidens* (73 males, ranging in total length from 51 to 97 mm and 70 females, ranging in total length from 49 to 81 mm) were collected from the Vembanad Lake, Cochin, Kerala State. The characters studied are total length (length from the tip of rostrum to tip of telson, TL), carapace length (from tip of rostrum to

postero-dorsal limit of carapace, CL), post-orbital length (from the level of orbit to postero-dorsal limit of carapace, PoL), abdomen length (from antero-dorsal part of abdomen to antero-dorsal limit of telson, AbL), telson length (from antero-dorsal part of telson to tip of telson, LT), body length (from the level of orbit to antero-dorsal limit of telson, BL), rostrum length (from the level of orbit to tip of rostrum, RL), width of carapace (maximum width of carapace, WC), second pereopods: ischium length (from the tip of basis to tip of ischium, LI), merus length (from the tip of ischium to tip of merus, LM), carpus length (from the tip of merus to tip of carpus, LC), propodus length (from the tip of carpus to tip of fingers, LP), palm length (from the tip of carpus to the base of movable finger, LPa), dactylus length (from the base of movable finger to its tip, LD). Lengths were accurately measured to the nearest mm. In the present study, the characters namely CL, BL, AbL, LT, LI, LM, LC, LP, LPa, LD were related to TL and PoL, RL, WC were related to CL. The data were subjected to statistical analysis by adopting the method of analysis of covariance (Snedecor and Cochran, 1975). The meristic characters studied included range of rostral

teeth on both the dorsal (post-orbital and rostral) and ventral margins. From the data, the range of teeth and percentage frequency distribution of teeth have been calculated. Chi-square test also has been applied to find out whether any significant difference exists in these characters between the sexes.

RESULTS AND DISCUSSION

Characters related to total length

The results are given in Table 1. The results showed that the growth pattern of CL, LT, LI, and LD were significantly different between the sexes at slope itself (at 1% level). Growth pattern of LM, LC, LP and LPa were significant at 5% level whereas that of abdomen length significant at 5% level (elevations). However, growth pattern of body length was not significantly different. Average sizes of body measurements were also worked out and presented in Table 1. It can be seen that the average sizes of all these characters were greater in males than in females. Regression equations have been calculated for the characters and presented in the table.

Table 1: Comparison of regression equations (males and females) of *M. equidens*

Characters (Y) M-male F- female	Regression equation Y=(n = 73 M; 70 F)	Comparison of Slope Elevation	Mean values
A. Growth in relation to total length (X) and			
Carapace length - M	0.47064 X - 0.3606	9.709* 3.181**	34.480
- F	0.4592 X -1.05879		27.586
Abdomen length - M	0.3847 X - 0.6174	2.839 4.021**	29.096
- F	0.40607 X + 0.4344		25.764
Telson length - M	0.11393 X + 1.8813	18.597* 0.293	10.315
- F	0.1248 X + 0.7078		08.493

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Body length	- M	$0.23299 X + 30.9251$	0.085	0.417	48.173
	- F	$0.60704 X + 4.6126$			42.479
Ischium length	M	$0.20554 X - 3.4899$	17.089*	3.726**	11.726
	- F	$0.14474 X - 0.62848$			08.400
Merus length	- M	$0.37492 X - 11.5214$	1.770	64.977*	16.233
	- F	$0.19132 X - 2.4126$			09.521
Carpus length	- M	$0.69299 X - 24.9990$	0.713	64.182*	26.301
	- F	$0.31063 X - 5.7910$			13.586
Propodus length	- M	$0.7871 X - 27.5646$	1.077	56.230*	30.699
	- F	$0.38575 X - 6.8695$			17.193
Palm length	- M	$0.55718 X - 22.0139$	0.663	46.585*	19.233
	- F	$0.24554 X - 4.93048$			10.386
Dactylus length	- M	$0.23506 X - 5.27724$	7.650*	59.453*	12.123
	- F	$0.24554 X - 4.93048$			10.386
Dactylus length	- M	$0.23506 X - 5.27724$	7.650*	59.453*	12.123
	- F	$0.14188 X - 1.7073$			07.143

B. Growth in relation to carapace length (X) and					
Rostrum length	- M	$0.27969 X + 6.2783$	19.423*	02.972	15.747
	- F	$0.38897 X + 1.3273$			12.057
Post - orbital length	- M	$0.5774 X - 0.65331$	25.13 *	18.190*	18.893
	- F	$0.5672 X + 0.62543$			16.271
Carapace width	- M	$0.4180 X - 1.13076$	0.016	6.655*	13.020
	- F	$0.37895 X + 0.66795$			11.121

(* P < 0.01; ** P < 0.05)

Characters related to carapace length

Among the characters of the carapace, post-orbital length and rostrum length showed significant difference between sexes, at 1 % level (slope value) (Table 1) whereas WC at 5% level (elevations). The average sizes of all these characters were higher in males. Regression equations for these characters are available in the table.

Meristic characters

The range of dorsal rostral teeth in males was 9-12 and that of females 8-12. The range of post-orbital teeth was 3-4 and ventral teeth was 4-6 in both sexes. Percentage frequency distribution of teeth: in males most frequent number of dorsal teeth was 10, followed by 11 and 9. In females the frequency was 10, 9, and 7. Regarding the post-orbital teeth, maximum percentage occurrence was 3 in both the sexes of this species. In the case of ventral teeth, the maximum frequency was 5 in both the sexes followed by 4 in males, 6 in females.

Table 2: Range, percentage frequency distribution of teeth on the dorsal and ventral rostrum and chi-square test value of meristic characters of *M. equidens*

Characters	Male	Female	Observed Chi-square
No. of specimens analyzed	70	70	
<u>Range of teeth</u>			
Dorsal	9-12	8-12	
Post-orbital	3-4	3-4	
Ventral	4-6	4-6	
<u>Percentage frequency distribution</u>			
Dorsal teeth			11.409 (P <0.05)
9	9.7	17.4	
10	51.4	68.1	
11	34.7	11.6	
12	4.2	2.9	
Post orbital teeth			8.104 (P <0.05)
3	80.0	95.7	
4	20.0	4.3	
Ventral teeth			6.268 (P <0.05)
4	20.0	5.7	
5	63.4	77.1	
6	16.9	17.1	

Chi-square test

It is interesting to note that the pattern of distribution of teeth showed sexual dimorphism with regard to all the characters studied ($P < 0.05$). It has been reported that *M. rosebergii* of Hooghly estuary was sexually dimorphic (Bhimachar, 1965; Rajyalakshmi, 1980). The growth pattern of CL in relation to TL in the two sexes of this species was significantly distinct in the species (Raman, 1967; Rao, 1967). Similarly, *M. malcolmsonii* of Godavari and Hooghly river systems showed significant relationship between TL and CL. CL and LT in relation to TL in *M. scabriculum* and *M. idella* and also RL in relation to CL in *M. scabriculum* showed significant difference in the growth pattern between sexes (Jayachandran and Joseph, 1985; 1988). WC in relation to CL in *M. idella* was also significantly different. In *M. lamarrei* the growth rate is higher in females than in males (Koshy, 1969). In *M. idella* the growth rates of CL and LT in relation to TL were greater in males whereas that of WC in relation to CL was greater in females (Jayachandran and Joseph, 1988). In *M. scabriculum* the growth rate was higher in males in all the characters studied (Jayachandran and Joseph, 1985). In this species, the average size of all the characters were greater in males than in females. In many species of *Macrobrachium*, the males grow larger than females. Thus *M. rosenbergii*, *M. malcolmsonii*, *M. idella*, *M. gangeticum*, *M. villosimanus*, *M. scabriculum* come under this category (Jayachandran, 2001). In variance with this, the average length and WC, RL and LT of *M. idella* are reported to be higher in females than in males (Jayachandran and Joseph, 1985; 1988). Detailed morphometric relationship of various body parameters of commercially important penaeid prawns have been worked out (Farmer, 1986; Mathew, 1992; Sriraman et al., 1987). The fundamental data generated at present for the species will be highly essential

for the establishment of the species status and for making comparison with related species.

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