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Morphological Characteristics and Sexual Maturity in M.masonina, a Freshwater Crab from Jammu Waters

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Abstract: **The present study aims to assess the status of fresh water crab resources in the area. The study was made on species diversity including its taxonomic position, morphological characteristics, habits, habitat and distribution. Out of various water bodies scanned so far two species of crabs were recorded viz Maydelliathelphusa masoniana Henderson, (1893) from plain areas and Himalayapotamon emphysetum Alcock (1909) from hilly stretches of the region. A total of 592 crabs were obtained, 282 being males and 310 females. The maximum carapace in female was 6.0 cm with abdominal width of 4.5 cm. Males exhibited carapace width of 6.3 cm and chela length of 5.7 cm and chela depth of 3.5 cm.**

Keywords: **M.masoniana, Morphological features, sexual maturity.**

1. INTRODUCTION

The term fresh water crabs refer to those crabs that have adapted fresh water, semi terrestrial or terrestrial modes of life and characterized by their ability to complete their life cycle independently of the marine environment .These decapods have been reported in almost all fresh water bodies from clear fast flowing streams to sluggish lowland rivers and streams, fresh water swamps, stagnant ponds and rice fields and even in pools in tree holes and leaf axils. Fresh water crabs constitute a very important group ,both from ecological as well as economical point of view.

Freshwater crabs belong to the order decapoda, the crustacean group that also includes lobsters, prawns, crayfish and hermit crabs, which share the characteristic presence of five pairs of thoracic legs (pereiopods). In freshwater crabs, the first pereiopods are modified as pincers (chelipedes), and the remaining four pairs are relatively unspecialized walking legs. Decapod crustaceans generally show sexual dimorphism in their external morphology. The general body plan of fresh water crabs consist of a head, thorax and abdomen , with the head and thorax (cephalothorax) covered by a broad carapace and the abdomen reduced, flattened and flexed under the thoracic sternum. In adults, the male abdomen is slim and narrow, and is either triangular or T shaped, while the female abdomen is broad and round and covers nearly the entire thoracic sternum.

Sexual difference observed in the growth of several body parts relative to carapace size have often been used to examine the relationship between morphometric and sexual activity in addition to morphometric difference among populations or species (Aikens and Waddy 1989).

Knowledge of these distinguished character and size relationship in sexually mature individuals is of particular importance in the study of commercially valuable crustaceans.

With these research inputs, the aim of this study is to provide baseline data on length weight relationship, morphometric & meristic analysis of fresh water crab *M.masoniana* widely distributed in the Gho-manhasan stream of Jammu region (J&K) North India.

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2. MATERIAL & METHODS

Field survey was carried out for a period of two years. Survey was classified on the basis of water bodies of plain and hilly areas of the region. Water bodies of plain scanned so far include Gho-Manhasan, Gadigarh, Sehi, Sarore Kheri,Tarnah, Mansar & Srunisar and that of hilly areas scanned were Ban Ganga, Jajjarkotli, Poonch, Sunderbani, Chenani & Dhansar.

Crabs were randomly collected from the selected sites by netting or hand picking by taking the help of local fisherman. Specimens were collected in plastic containers and carried to Fisheries laboratory, Deptt. of Zoology, University of Jammu to record morphological parameters.

Morphological analysis has been carried out by using normal scale and vernier callipers. The crabs were identified following the identification keys Henderson (1893) and Alcock (1909) further authentification was done with the help of checklist of Indian fauna of fresh water crabs Pati, *et al* (2013) from Zoological Survey of India (ZSI) Kolkatta.

In the laboratory, specimens were identified and sexed according to secondary sexual characters (abdomen morphology and number of pleopods). A total of 592 crabs were studied out of which 310 were females and 282 were males.

3. RESULTS AND DISCUSSION

Two species of freshwater crabs belonging to different genera have been recorded during present study period. (Tab-1; fig 1)

Table: 1 Showing distribution and morophological features of two species of crabs observed in various water bodies of Jammu region.

Species	Water bodies	River System	Status	Morphological Features				
				Size (CW)		Colour		
				Male	**Female**	**Dorsal**	**Ventral**	**Chelas**
Maydelliathelphusa masoniana	Gho-manhasan Gadigarh Sehi Sarore Kheri Tarnah Nagri Mansar Srunisar	Indus	+ + + + - - - - -	<7Cm	<5.5	Dark choclate brown	Greyish white	Brown at tips
Himalayapotamon emphysetum	Banganga Jajjarkotli Poonch Sunderbani Chenani		+ + + + +	<5 Cm	< 4 Cm	Reddish orange/	Pale white	Bluish Purple at tips

I. *Maydelliathelphusa masoniana* (Henderson, 1893)

Family-Gecarcinucidae Rathbun, 1904.

Specimens examined – 24 males and 24 females per year.

Morphological analysis: (Fig.1; table 2): Showing morphological analysis of species 1. *Maydelliathelphusa masoniana*

Morphometric Analysis	**Male (Cm)**		**Female (Cm)**	
	Min	**Max**	**Min**	**Max**
Carapace width, (CW)	2.0	7.0	2.0	6.0
Carapace Length, (CL)	2.0	5.0	2.0	4.5
Chela Length (Chl)	1.0	6.0	1.0	5.7
Chela Depth (Chd)	0.5	3.5	0.5	2.5
Abdominal Width (Abdw)	-	-	1.0	4.5
Body Weight in (gms)	16.674 gms	90.186 gms	18770 gms	64,850 gms

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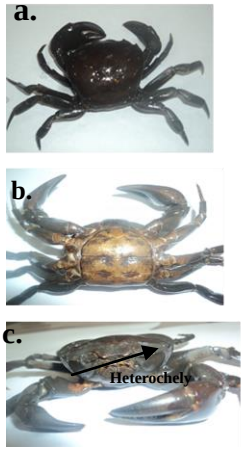

Colour: All the specimens examined are characteristic in colour with dark chocolate brown, shining carapace on dorsal side. The ventral surface of carapace being light brown in colour.

Size: Species attains the size upto 7cm of carapace width (C.W), especially in males. Where as females of the same species are smaller with size upto 6 cm. of carapace width (cw).

Heterochelous chelas, has been observed to be present in both the sexes with heavy, unequal and bigger size chelipeds in males than females. Cutting edges of chelas are armed with teeth of variable size.All the teeth and tips of both fingers are dark brown in colour .

Fig 1; Female showing variations in coloration, size and chelas. Fig 1-a. dorsal view b. Ventral view c. heterochelous chelas

A look at the table 2 exhibits males of *M.masoniana* in the range of 2.0 to 6.3 cm with respect to carapace width (CW) . The chela length (CHL) range from 1.0 to 25.7 cm and Chela depth (CHD) ranged from 0.5 cm to 3.5 cm in the same species of male crabs. The mean body weight (MBDwt) of the male crabs ranged from 16.674 to 90.186 gms. In females of the same species, the carapace width (CW) ranged from 2.0 to 6.0 with abdominal width ranging from 1.0-4.5cm. The mean body weight (MBDwt) in females ranged from 18.7770-64.850gms.

Table 3: Showing relationship of carapace width CW (cm) with Abdominal width ABDwt. in female of *M.masoniana*.

S.No	Mean Carapace width CW (Cm)	Mean Abdominal Width ABDW (cm)	Mean Body Wt (MBDwt) (Gms)	Colour Variation in Ovaries
1	2.5	1.7	18.7770	Transparent to Yellowish
2	3.5	3.2	22.490	
3	4.5	4.2	37.018	Orange Red Coloration
4	5.5	4.2	46.741	
5	6.5	-	64.850	Pale Yellow Coloration

A total of 592 crabs, 282 males and 310 females were analyzed in the present study. It was observed that there were more females than males. Sexual dimorphism was quite conspicuous. Sex differentiating characters were observed in morphometric and meristic features of both crabs. Male crabs have an inverted 'T' shaped abdomen and mature females have an 'inverted U' shaped abdomen (Fig a and b). *M. masoniana* exhibit heterochely, one cheliped being larger than the other and this was observed in both the sexes. The CW of males ranged from 2.0 to 6.3 cm, with chela length (CHL) and chela depth (CHD) falling in the range of 1.0-5.7cm and 0.5-3.5 cm respectively (Table 2). The mean body weight (MBDwt) of male *M. masoniana* under study ranged from 16.674 to 90.186 gms (Table 2).

The CW of females under study ranged from 2.0 to 6.0 cm with abdominal width falling in the range of 1.0 to 4.5 cm (Table 2). The mean body weight (MBDwt) of female *M. masoniana* under study was in the range of 18.7770 gms to 64.850 gms (Table 2).

4. DISCUSSION

The present study identified the growth pattern of cheliped in case of males and abdomen in case of females and body weight acting as the best indicators of morphological sexual maturity. The relationship between chela size and carapace width (CW) in the present study resulted in the morphological sexual maturity for males of *M. masoniana*. The present observation, reports a positive allometry of cheliped in adult individuals of *M. masoniana* which is consistent with the predictions made by Hartnoll (1974), who compared the growth related to secondary sexual characteristic in Brachyurans.

In crab a pubertal molt is often associated with an increase in cheliped size and allometric growth rate. Brachyuran males develop cheliped for combat, display and courtship (Hartnoll, 1982). The significance of heterochely in crab is unclear, but according to Daniels (2001) it may be related to sexual signaling and defence and in females may indicate reproductive vigour as well as the ability to take care off and protect their brood.

The present observation exhibited males with greater chela depth then of the females indicating larger cheliped in males as compare to females (Table1). In accordance to our findings, Akin Oriole *et.al* (2005) to have reported that the right chelae diameter of males were significantly bigger ($P \leq 0.05$) than that of females in *C.armatum*. On the similar lines other relevant parameters like body weight, chelae diameter condition factor of male *C. Pallidus* were higher than those of females.

During the present investigation it was found that the females reached morphological sexual maturity at smaller size than the males. A look at the table 3 revealed that females of carapace width 2.5 cm showed isometric growth, whereas, females of carapace width ranging from 3.5 to 4.5 cm showed positive allometric growth and there after again isometric growth was exhibited at 5.5 cm carapace width in females. Thus indicating 3.5 cm (CW) to be the size of morphological sexual maturity.

Males exhibited allometric growth at 4.5 cm indicating size of sexual maturity as after this size cheliped showed isometric growth with respect to length and depth measurements. The difference in the size at morphological sexual maturity between males and females is consistent with the pattern proposed by Shine (1988) for brachyurans. According to which, this pattern explained the requirement for reproduction in two sexes. When females allocate their energy for reproductive purpose, such as spawning and egg incubation, they tend to mature at smaller size than males, who invest their resources in somatic growth and reach maturity at greater size.

Our findings are also in tune with the observations of Carsen *et.al* (1996) who reported that sexual maturity occured at 4.0 and 5.0 cm carapace width in males *Platyxanthus patogonicus* and ovigerous females of same species who reach sexual maturity between 42.7 and 72.0 mm of carapace width.

In the present study the positive allometric growth during the adult stage correspond to the increase in the reproductive potential of the females in *M. masoniana*. The characteristic of the adult stage has also been verified in other brachyuran species (Pinheiro & Fransozo, 1993; Mantelatto & Fransozo, 1994; Negreiros-Fransozo *et.al*, 2003). The abdomen of females present an important reproductive function for most freshwater crabs as they form a 'chamber incubatory' with function of retaining the eggs and newly hatched juveniles, as reported by Hines (1982). On similar lines our observation on present study gets further authenticated, with respect to abdominal growth as indicator of morphological sexual maturity.

5. SUMMARY

On the basis of distribution pattern of two species viz *Maydelliathelphusa masoniana* and *Himalayapotamon emphysetum*, it is observed that these two species reported from the water bodies of Jammu region have contrast morphological features as well as their distribution pattern (Table-I). This variation in distribution pattern of the two species clearly indicates the probability of presence of many more species in the water bodies of different geographical conditions.

If the survey is under taken throughout the state it is hope more species can be recorded that will enrich the date on the existing crab resources of the state which will help to formulate management action plan on crabs of J&K, North India.

Based on the data obtained from morphometric analysis in male and female of n*M. masoniana* the size at sexual maturity happened to be 3.5 cm carapace width in females and 4.5 cm carapace width in males. The carapace width/weight relationship will enable crab biologists to derive length weight estimates for *M. masoniana* that are weighed and measured. The data provides the information to determine the minimum size of males and females of *M. masoniana* below which harvesting should not be practiced because it will enable the population to reproduce and maintain juveniles and adult in the optimum proportions. Hence the results of present study can serve as useful tool for the effective management and utilization of this resource in the area where *M. masoniana* can make a good fishery possible.

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