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RESEARCH ARTICLE

FEEDING ECOLOGY OF FRESHWATER CRAB, MAYDELLIATHELPHUSA MASONIANA AT GHO-MANHASAN STREAM, JAMMU

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ABSTRACT

Crabs are never considered to be an important group in trophic webs, and this might be due to lack of knowledge about their trophic roles in aquatic ecosystem. The main objective of present study was to examine the feeding ecology of freshwater crab, *M. masonina* (Henderson) between April 2013 to March 2014. The diet composition and the feeding activity of *M. masoniana* were evaluated through the examination of the stomach contents and their degree of emptiness. The feeding ecology of crabs were categorised both sexwise as well as class wise. Among 134 different stomach examined, it was recorded that the crabs consumed several algae, insects larvae (chirnomous), earthworm, molluscs, crustaceans such as prawn, crabs and fishes. In adults and sub-adults, animal matter such as Chironomous larvae, earthworm and molluscs formed the dominant group while in smaller crabs plant matter and detritious constitute the dominant group. On the basis of gut content analysis, the trophic role of the organisms in the community is omnivorous and detritivorous.

INTRODUCTION

Freshwater crabs are widely distributed in India (Agrawal and Tyagi, 1965) and are adapted to the aquatic medium by having lecitotrophic eggs, direct development and brood care (Gross and Klaus, 2005). In Jammu region of J&K (India), freshwater crab viz., *Maydelliatelphusa* and *Himalyan potamon* has wide distribution. Like their marine counterpart freshwater crabs, *M. masoniana* exhibits heterochely, wherein one chela exhibits large size compared to other (Gupta, 2012, Meenakhsi, 2015). *M. masoniana* holds a very nutritive value compared to fishes (Manhas, 2013,).

Though a considerable amount of work being carried out in brachyuran crab fauna throughout the world, the compilation of studies conducted on *M. masoniana* is comparatively few in number particularly with reference to India.

In India, there are several reports on the food and feeding of various species of marine crabs like *Scylla serrata* (Williams, 1978 and Parsad and Neelakantan, 1988), *Callinectes sp.* (Tagatz, 1968 and Paul, 1981) however, not a single reference on the habitat preference or food preference of *M. masoniana* in India is in record. Despite their wide distribution in India as well as in Jammu region of J&K state, strangely their role in the ecology of freshwater is very poorly known. Keeping in view this lacuna, present investigation have been undertaken.

MATERIAL AND METHODS

Crabs were collected from Gho-manhasan stream once a month for a period from April 2013- March 2014, by using hand, drag net as well as cast net and brought to the laboratory. In the laboratory, crabs were counted and segregated on the basis of their sex and size. By dissecting the crabs from dorsal side of the body carefully, stomach were removed and preserved in 5% formalin. As the stomach of *M. masoniana* was translucent and thin walled, so a visual estimate of the stomach replention index (SRI) was made immediately according to the relative degree of fullness assessed by scale ranked from 0 (empty) to 5 (full) (Dahdouh-Guebas *et al.* 1997). For each specimen, the cardiac stomach was removed and dissected and the stomach content was immediately transferred into petridish, few drops of water added to it and then viewed under a bionocular microscope. Each prey item was identified to the lowest possible taxonomic level.

As characteristic of brachyurans, most of the food items were found to be highly crushed down into small fragments and hence only those structures that could be identified were relied upon for determining food composition and evaluation. As suggested by Sukumaran and Neelakantan (1977) and Josileen (2011), the different food items were identified and classified based on following characteristics:

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1. Algae was identified on the basis of intact filaments, presence of fragment of leaves was useful in detecting macrophytic remains.
2. Oligochaetes were identified by the presence of their setae while chironomid by their head capsule.
3. Molluscs were identified on the basis of their shell ramnets.
4. Crustaceans were recognised based on their skeleton and appendages.
5. Fishes were identified on the basis of undigested fragments of scales and fins.

Only stomachs with food were considered for calculation. The whole stomach contents were segregated food group wise and each group's contribution was assessed visually.

Dominance of food groups was evaluated by ranking them by its percentage frequency of occurrence and as per the percentage point method, each of the more common food categories (in the present study) is given a value, ranging from 0 to 100, according to the percentage of content it represents within each stomach in which it was found.

Frequency of occurrence is calculated by dividing the number of stomachs which contained a food category by the total number of stomachs observed. The following percentages were calculated for each prey type (Williams, 1981):

Percentage point for ith prey = $(\sum_{j=1}^{n} a_{ij}/A)^{*}100$
(ith- particular prey)
Percentage occurrence for ith prey = $(b_i/N)100$

Where a_{ij}= the number of points for prey item i in the stomach of the jth crab; A- the total points for all the crabs and all the prey items in all the forgut examined; N- the number of crabs examined with food in the forgut; and b_i- the number of crabs with forguts containing prey category i.

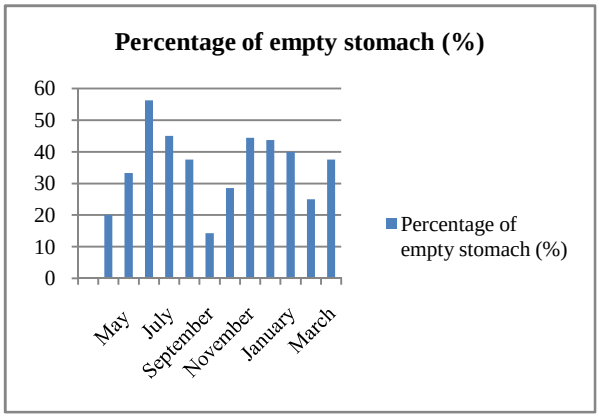
RESULTS AND DISCUSSION

The stomach contents of crab appeared to contain highly digested matter and hence identification of food organisms was found difficult. The stomach fullness index revealed variations in the feeding activity of the crabs throughout the year. Out of the total 134 stomach analyzed, 22 were 100% full, 18 were 75% full, 16 were 50% full, 24 were 25% full and 48 were empty. The maximum percentage of empty stomachs were recorded in crabs having size >3.5cm (40mm) during months of June-July and November-December which happens to be their breeding period (Gupta, 2012) indicating that like fishes crabs feed less during breeding season (Ruiz-Tagle *et al.* 2002 and Devi *et. al*, 2013).

Number of empty stomachs, however, exhibited decreasing trend from higher to lower class size (Table 1) and were recorded almost full in crabs having size 2-3.5cm indicating that small size crabs may have high feeding intensity compared to larger one (Bridges & Brand 1980, Emmerson 1985, Schmidt-Nielsen 1997, Łapucki *et al.* 2005).This is further the fact supported by fact that adult crabs have only one feeding chela while smaller crabs have two and therefore, rate of feeding is higher in smaller crabs than larger ones (Valiela *et al*., 1994). High feeding rate in young crabs may correspond to their more energy demand for the purpose of rapid growth and moulting which is quite slow in adult (Jewett and Feder, 1983).

Further point method and percentage of frequency occurrence revealed that natural diet of animals mainly consisted of detritus, plants, algae, crustacean remains (prawn and crabs), chironomous, molluscs and fish remains.

Thus, detritus was recorded to be predominant in both small as well as large size crabs. The ingestion of detritus in adult crabs may be accidental (Devi *et. al*., 2013), however, in smaller crabs it is because of their inability to crush their pray, because of their less developed mouth parts (Collins, 1999). High amount of vegetal matter ingested by the adult crabs suggest a way to enhance the energy supply derived from less nutritional food (Williner *et al*., 2014)



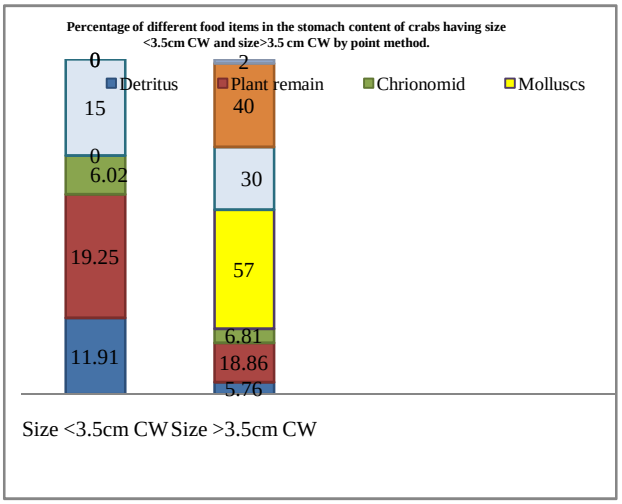


Fig Graph showing percentage of empty stomach on monthly basis.

Presently both small as well as large size crabs were observed to consume algae, chironomids and earthworms and therefore, showing their preference for slow moving benthic invertebrates. Similar to the present observations, Cardoso *et al*., (2004) while working on *Carcinus maenas* held that these crabs prefer slow moving benthic invertebrates due to their high energy contents.

Table 1 Monthly variations of empty stomach in crabs of different class size.

Months	No. of crabs examined	Empty stomachs of crabs of different class size				Total no. of empty stomachs	Percentage of empty stomach (%)
		2-3cm CW	3-4cm CW	4-5cm CW	5-6cm CW		
April	16	0	0	1	1	2	20
May	9	0	0	1	2	3	33.33
June	16	0	0	4	5	9	56.25
July	20	0	0	2	7	9	45
August	8	0	0	1	2	3	37.50
September	7	0	0	0	1	1	14.28
October	7	0	0	2	0	2	28.57
November	9	0	1	0	2	3	44.44
December	16	0	1	1	5	7	43.75
January	10	0	0	1	3	4	40
February	8	0	0	0	2	2	25
March	8	0	0	1	2	3	37.50

Table 2 Major food items of crab *M. masoniana* collected from Gho-manhasan stream, Jammu

Food items	Point method		Occurrence method		
	Point	%age	Number	%age	Size of crabs
Detritus	182	11.91	31	38.75	<3.5cm CW
	88	5.76	26	32.50	>3.5cm CW
Plant remain	294	19.25	36	45	<3.5cm CW
	288	18.86	33	41.25	>3.5cm CW
Chironomid	92	6.02	24	30	<3.5cm CW
	104	6.81	28	31.25	>3.5cm CW
Molluscs	18	0	0	0	<3.5cm CW
	0	12.32	46	57.50	>3.5cm CW
Crustacean	0	0	0	0	<3.5cm CW
	172	11.26	20	40	>3.5cm CW
Earthworm	40	2.61	12	15	<3.5cm CW
	76	4.97	24	30	>3.5cm CW
Fish	0	0	0	0	<3.5cm CW
	13	0.85	5	10	>3.5cm CW
Total	1527				

Further unlike large size crabs, no crustacean or mollusc could be recorded at any point of time in the stomach of small size crabs (size<3.5cm Cw) possibly due to their ill developed chelae which were not strong enough to crush the exoskeleton of arthropoda as well as molluscs (Sukumaran and Neelakantan, 1997).

Therefore in the present study it is quite evident that there is a gradual shift of diet from soft algae & detritus to plant and invertebrates. The difference in diet composition among the size classes of crabs can be explained by a change in the hardening and degree of calicification of gastric mill and feeding appendages (Caine, 1975).

Further there was no significant difference in the quantity of food consumed by male and female as also held by various workers (Williams 1981, Jewett, Feder 1982 and Josileen 2011).

CONCLUSION

From the results given on feeding ecology of *Maydelliatelphusa masoniana* it is evident that this species exhibits a gradual shift in their diet from plant (algae and fungus) and soft animal (chironomids and oligochaetes) to plant and hard animal matter (molluscs, crustacean and fishes).

Thus the crabs under study are ominivorous and detrivorous consuming plant as well as animal.

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