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Diet composition of freshwater crab, *Potamon koolooense* Rathbun, 1904 from hillstream of Uttarakhand

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Abstract: The present study was carried out to study the diet composition of freshwater crab, *P. koolooense* in hill-stream Khoh of Uttarakhand during November, 2013 to October, 2014. Total 105 crab samples were used for the study, 35 male and 47 female were found with food in their stomach while rest of the 23 had empty stomachs. The carapace length (CL) ranged from 12mm to 49mm, carapace width (CW) from 15mm to 59mm and total weight (TW) from 2.08g to 60.12g. Stomach content analysis of the animal showed that the diet of the animal composed of animal matter, plant matter, algae, fungi, debris and unidentified materials. Animal matter ranged from (3.27-11.93%), plant matter (4.37-14.44%), algae (1.73-6.15%), fungi (0.17-1.43%), debris (28.18-40.47%) and unidentified materials (36.46-50.05%) in males while in the female animal matter ranged from (3.09-12.34%), plant matter (4.45-12.73%), algae (1.03-7.61%), fungi (0.02-3.34%), debris (23.18-43.34%) and unidentified (30.31-51.04%). Unidentified materials recorded maximum and fungi recorded minimum in both the sexes of *Potamon koolooense*. A significant difference was observed at $p<0.05$ between food groups- algae and unidentified matter in both sexes. This is the first report, to key out and quantifies the dietary items and feeding habits of crab in Uttarakhand which would be helpful in interpreting the ecological niche of the animal in mountain stream communities.

Keywords: Diet components, Freshwater crab, Hillstream, Khoh, Uttarakhand

INTRODUCTION

Food is most important for any living organism and the body also requires a range of nutrition to keep certain organs alive and to keep the correct balance in the body. This nutrition is taken from the food. The distribution, growth, reproduction, behaviour and migration rate of crabs are largely dependent on the availability of preferred prey organisms (Vinagre *et al.*, 2007).

Crabs consume a great variety of food and there are many modes of feeding. Stomach content analysis has been used to investigate the diet of brachyuran crabs, mainly those belonging to the Grapsoidae, Portunidae and Majidae (Bernardez *et al.*, 2000) but there is little information available regarding the feeding preferences of the Potamidae, regardless of the large number of potamid species in tropical and subtropical freshwater environments (Yeo *et al.*, 2008). The analysis of stomach contents of crab provides information about particular the crab in the ecosystem. A large number of studies have been done on marine crabs by Patel *et al.* (1979), Chande and Mgaya (2004) and Josileen (2011) in relation to many aspects, but fewer studies have been done on freshwater crabs by Williner and Collins (2013); Kobayashi (2012). Knowledge of an animal's dietary habit is essential for studies of nutritional requirements, interactions with other organisms and for its aquaculture practice.

P. koolooense, a potamid crab usually inhabits the freshwater bodies e.g. rivers, streams, canals, lakes and ponds etc., found under the stones, logs and dead leaves, grassy vegetation, lives in burrows along the bank of the river and in the crevices of rocks. It plays an important role as a scavenger in the aquatic ecosystem. Like other brachyuran crabs, it has the same mouth structure for feeding. Examining the food and feeding habits or diet composition of crab is obviously considered very important in crustacean biology and ecological studies of crabs. As there is no information on diet composition of crab *P. koolooense* till date. Therefore an attempt has been made to study the dietary components of this animal.

MATERIALS AND METHODS

For the present study, monthly samples of crab were collected with the help of a fisherman during November 2013 to October 2014 from hillstream Khoh in district Pauri Garhwal Uttarakhand. The study area lies between 25^{o} 45' to 30^{o} 15' latitude and 78^{o} 24' to 79^{o} 23' longitude. Samples were brought from study sites to the laboratory where their carapace length, width were measured with the help of vernier calliper and weight

taken in grams by electronic digital balance. Stomach content was taken out from the crab by operating it from dorsal side and a little water was added to it so as to make suspension of food material. The suspension was taken into the Sedge wick rafter chamber with micropipette followed by covering with a cover slip and examined under the Nikon ECLIPSE TS100 inverted binocular microscope. The food materials were then identified with the aid of keys provided by Needham and Needham (1962); Ward and Whipple (1959). Average number of each food item was calculated and converted into contributing percentage to the total food content by the formula

$$\text{Percent by number, } N = (N_i/N_t) \times 100$$

Where,

N_i = Number of food category **i** and

N_t = Total number of food particles

Observed data were subjected to SPSS software version 16.0 for statistical analysis.

RESULTS AND DISCUSSION

Crabs occupy different niches and inhabit many different habitats in a variety of geographical areas and this is reflected in the variety of food consumed by them (Bryceson and Massinga, 2002). Our study included total 105 crabs, out of them 35 males and 47 females were found with food in their stomach while the rests 23 were with empty stomach. The carapace length (CL) ranged from 12mm to 49mm, carapace width (CW) from 15mm to 59mm and total weight (TW) from 2.08g to 60.12g. Stomach content analysis in both sexes of *P. koolooense* showed that the diet composed of animal matter, plant matter, algae, fungi, debris and unidentified materials (Plate 1).

Average quantity of different food components in male were animal matter (6.76±2.5%), plant matter (9.29±2.51%), algae (3.12±1%), fungi (0.72±0.33%), debris (34.67±2.79%) and unidentified (44.97±3.07%) while the average quantity of different food components in female were animal matter (7.09±2.42%), plant matter (9.13±2.1%), algae (3.74±1.52%), fungi (0.85±0.59%), debris (34.41±4.06), and unidentified (42.61±5.39%) that contributed to the total food contents consumed by the animal (Table 1).

The unidentified material was observed maximum and fungi was recorded minimum in both sexes during the study. A large amount of unidentified material was found in the stomach was the result of an advanced digestion degree. Crustacean jaws and gastric mills provide food triturating. This action makes the food material an unidentified mass item and suggests that these crabs present a high digestive ratio. The study showed that the animal is capable of ingesting both plant and animal matter along with dead and decaying matter that indicated the omnivorous nature of the animal. This is in agreement with Devi *et al.* (2013) as they observed *V. litterata*, herring bow crab was a predatory omnivore capable of ingesting both animal and plant tissues. The similar opportunistic omnivorous nature of painted pebble crab, *Leucosia anatum* was found by Varadharajan and Pushparajan (2012) in their study. The study also revealed that the animal is a bottom feeder because examination of stomach contents of the animal showed that the deposit feeding method was more usual.

It was based on the fact that percentage of debris, including sand particle, clay was always observed in considerable amount in the stomach of both sexes irrespective of size. It suggests the sandy and muddy substratum of the habited area. Our results got support from the study of Chatterjee (2014) as they had recorded *O. macrocera, D. blanfordi* and *D. brevitarsis* were exclusively deposit feeders and omnivores due to the maximum occurrence of sand particles, algae and detritus in their stomach. A significant difference was observed for food groups algae and unidentified material while the other food groups viz. animal matter, plant matter and debris were not statistically different at $p<0.05$ in both sexes (Table 1). Neither the quantity of food nor the food components were significantly different in males and females except unidentified matter and algae, which may be different due to selective feeding at some stages of life. Viswanathan and Raffi (2015) also observed no significant difference between the quantity of food consumed by males and females except slight variations in mud crab *S. Olivacea*. The different constituents of food more or less same, this evidences the same feeding habits of male and female probably due to the fact that they do-occur in the same regions. Identical food preference and intake pattern were also reported by Mohapatra *et al.* (2005) in male and female of *S. serrata*. Observations on average amount of feeding in both-sexes showed that for some food groups males exhibit a little higher feeding intensity than females and vice versa. This may be due to changes in diet and feeding habits during their growth period from juveniles to adults. This was the first and a preliminary study of food and feeding habits of *P. koolooense* in the study region, more investigations are needed to complete the paucity of the present study and to understand the actual position of the animal in the ecosystem.

Conclusion

From the present study, it was concluded that *Potamon koolooense* was omnivorous in nature and bottom feeder. It feeds on whatever is present in their surroundings and rarely feeds selectively at some stages during their life cycle. Diet components were almost same in both sexes and composed of animal matter, plant matter, algae, fungi, debris and unidentified matter. Among identified food components debris formed the major food component followed by plant matter. This is the first report, to key out and quantifies the diet items and feeding habits of crab in Uttarakhand which would be helpful in interpreting the ecological

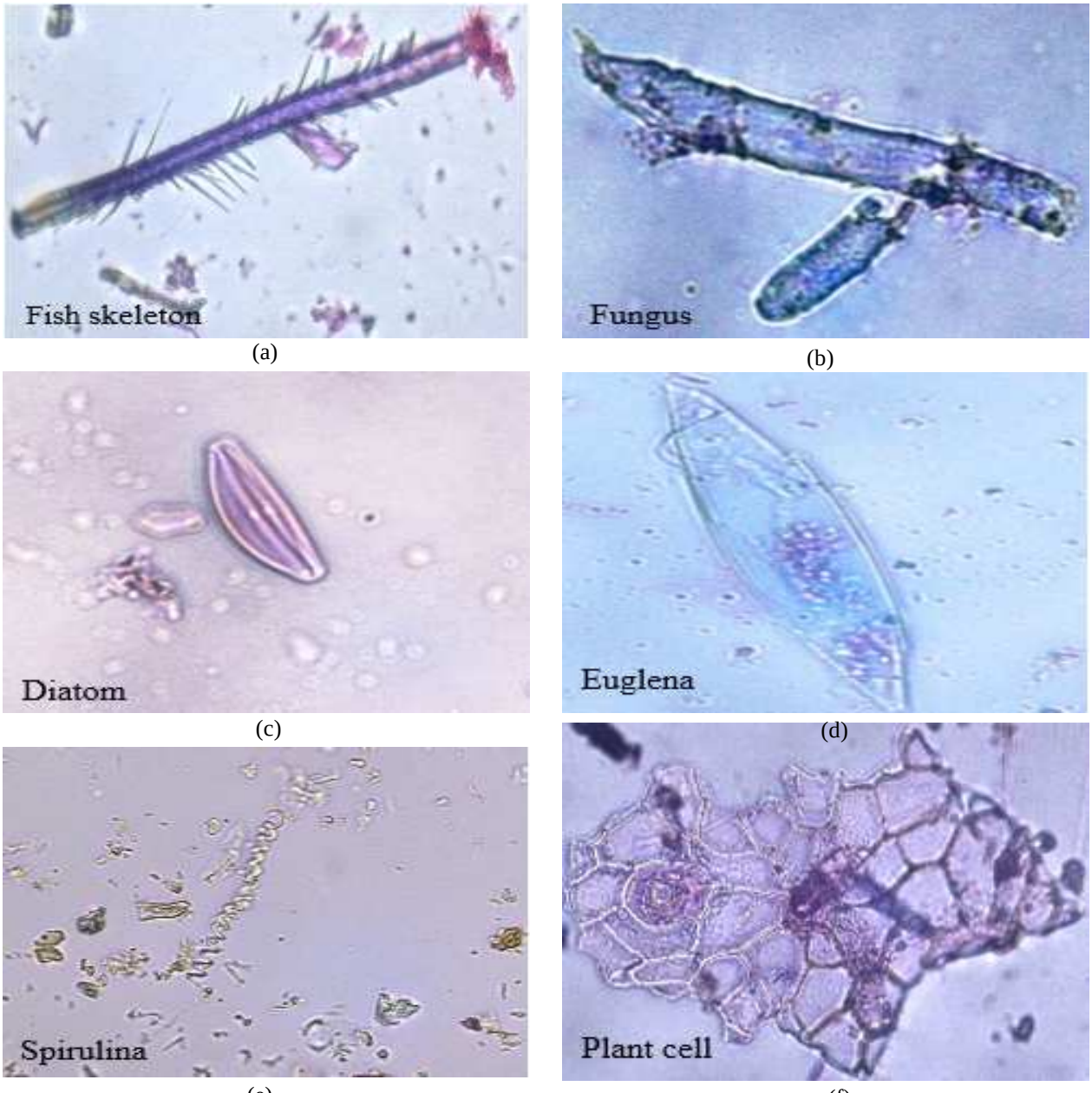

Plate 1. Different food components of the diet of male and female P. koolooense (a) Animal matter, (b) Fungi, (c, d and e) Algae, (f) Plant matter

Table 1. Average quantity of different food components in male and female of *P. koolooense.*

	Model animal sex	N	Mean±SD (%)	t	Sig.
Animal Matter	Male	35	6.76±2.5	-0.597	0.661
	Female	47	7.09±2.42		
Plant Matter	Male	35	9.29±2.51	0.315	0.138
	Female	47	9.13±2.1		
Algae	Male	35	3.12±1.0	-2.066	0.020*
	Female	47	3.74±1.52		
Fungi	Male	35	0.71±0.33	-1.165	0.112
	Female	47	0.85±0.59		
Debris	Male	35	34.67±2.79	0.328	0.149
	Female	47	34.41±4.06		
Unidentified	Male	35	44.97±3.07	2.325	0.000*
	Female	47	42.61±5.39		

***** Significant at 0.05 level of significance

niche of the animal in mountain stream communities.

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