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RESEARCH ARTICLE

ROLE OF APPENDAGES IN FEEDING BEHAVIOR IN FRESHWATER CRAB *BARYTELPHUSA CUNICULARIS* AND PRAWN *MACROBRACHIUM KISTNENSIS*, (DECAPODA, CRUSTACEA)

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ABSTRACT

Feeding behavior is analyzed in two freshwater decapods, freshwater crab *Barytelphusa cunicularis* and prawn *Macrobrachium kistnensis*. Freshwater crab *Barytelphusa cunicularis* are omnivorous and carnivorous, while prawn *Macrobrachium kistnensis* is more herbivores then carnivorous. The appendages like cephalic and thoracic collectively play an important role in feeding behavior in both decapods crustaceans. Food particles are pickup by chelate legs and third maxilliped. Chelate and third maxillipeds are important appendage for catching, handling of big mass of food and also placed the food up to the mouth. In mouth these food particles are first tear or grinded into fine particle by mandible when held in a convenient position by second maxilliped. The second maxillipeds are very important appendage and play an indispensable role in passing food to the mandibles. Again the mandibles play good role for cut the food into pieces.

INTRODUCTION

The feeding behavior of decapods is largely driven by chemoreception in the location of food sources, rather than mechanoreceptor or vision. Chemoreceptors are present on every part of the body of crustacean, including feet thus appendages play very important role in feeding. Feeding includes searching of food, then catch and finely eating. From searching to eating processes various appendages are involve. In searching a food, animal can walk along the floor of habitat such as ocean, and another water body; then smelling the ground, once a food source has been located (literally walked over), they uses its legs to catch and bring it to the front of the body, and then proceeds to eat. Chemoreceptors are present on the first antennae, mouthparts and tips of legs as olfactory organ; chemoreceptor on legs and mouthparts of crustacean function in the sensing of taste (Atema 1977, Ache1982). Antennae, mouthparts and pereiopods collectively play a major role in feeding process. For several reasons crustacean are very excellent experimental animals to carry out studies on feeding behavior and foraging strategies.

The role of chemoreceptive sensilla, most concentrated on the appendages, particularly the antennules, antennae, dactyls and mouthparts, help in sensing the food material (Ache and Macmillion 1980, Derby 1982, Schmidt 1989, Schmidt and Gnatzy 1984, Cate and Derby 2001, 2002 a, Garm *et al* 2003). Feeding appendages include not only the mandibles, maxillulae and maxillae, but frequently a number of thoracic appendages and occasionally also the ambulatory legs that are provided with long setae which filter food particles from the water (Pearse 1945, Pohl 1946, Manton 1977). Many crustaceans are deposit feeders, herbivores, omnivores, and scavengers. Deposited feeders often also may be filter feeders. The endopodes of the maxillipeds, particularly the third in decapods, commonly adapted for filtration those are with dense tufts of plumose or serrate setae (Pearse 1913, 1914, Nicol 1932, Dennell 1937, MacGinite 1937, Crane 1975).

Freshwater crab studies of feeding behavior on freshwater crustaceans are very rare so the present investigation were carried out on freshwater crab *Barytelphusa cunicularis* and prawn *Macrobrachium kistnensis* focusing on role of particular appendages in each activities during feeding behavior.

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MATERIALS AND METHODS

Animals were collected from June 2014 to December 2014 from Godavari River near Kaygaon Toka in Aurangabad region. In this study the prawns and crabs were maintained separately in aquariums. The laboratory acclimatized animals were used for the experiment. Two different experimental setup were done for two animals (crab and prawn). In early hours of morning the when feed was added to the aquarium the continuous observations were made with the help of magnifier. The movements of all appendages during feeding were noted down and some video clips were recorded with the help of digital camera. At least 5 repetitions of each behavioral study were performed to reach final conclusions

RESULTS

Feeding behavior

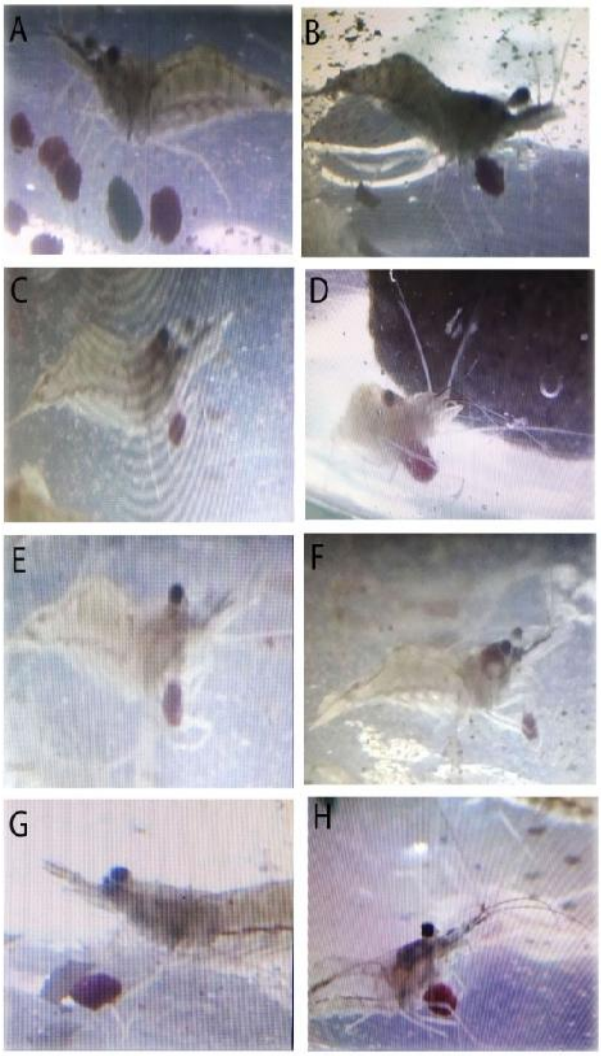

Fig. 1. Feedind behavior in *Macrobrachium kistnensis*. A. searching of food; B. catching of food by first pereiopod; C and E third maxillipedes convey food to the mouth; D, F and G. holding the food in chelate; H. eating the food by mandible.

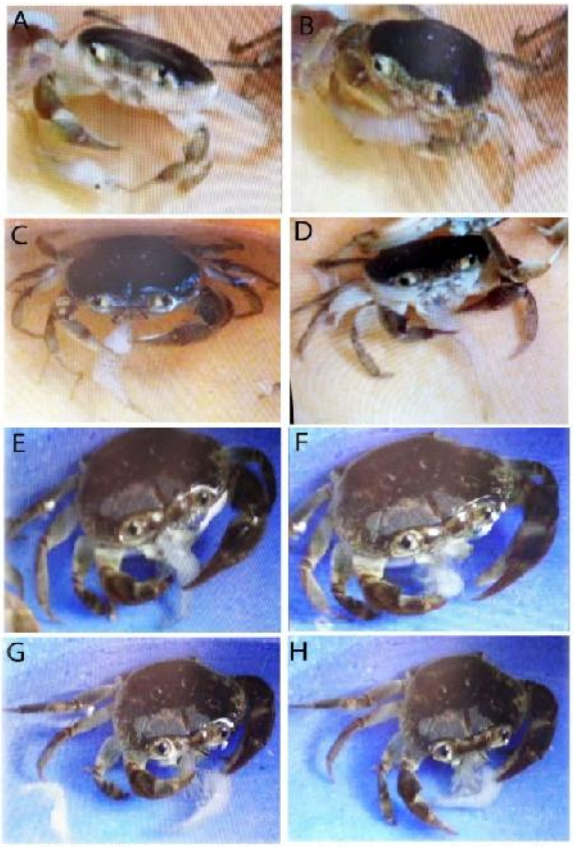

Fig. 2. Feeding behavior in *Barytelphusa cunicularis*. A. searching of food; B. catching of food; C. chelate leg convey food to the mouth; D eating of food; E, F, G and H. food cutting into pieces and eaten by third maxillipede.

Freshwater crab *Barytelphusa cunicularis* is carnivores and omnivorous feeding on small crustacean, snail, insects, and crabs. Sometimes also found to feeding on dead part of crab. During feeding behavior crab first search the food by walking. As the food is found subsequently it is collected and picked up by the chelate leg (see in plate XXI). The food particles are conveyed to the mouth by chelate and third maxillipedes. In mouth first food is cut into pieces or grinded by mandible. Chelate, third maxillipede and mandibles are very important for complete feeding. Chelate is used to handle the bulky mass of food. Shell of snail can be easily broken by the chelate.

Freshwater prawn *Macrobrachium kistnensis* are more herbivores then carnivorous, while crab *Barytelphusa cunicularis* are omnivorous and carnivorous. The appendages like cephalic and thoracic collectively play a vital in feeding behavior (see in plate XIX). Prawn is fully aquatic feeding on algae and aquatic plat leaves. Sometimes also feed on sand particles, along with food particles. Many times they are found to feed on dead and decaying part of prawns. During the feeding activity prawn first search the food by antennules and antennae as they are olfactory in function. After finding the location of food, prawn moves toward the food. The food particles are picked up by chelate legs and third maxillipede. Then the food particles are handled properly with chelate and third maxillipede and for eating purposes conveyed to the mouth. Chelate and third maxillipedes are important for catching, handling of big mass of food and also placing the

food in to the mouth. In mouth these food particles are first tear or grinded into fine particles by mandible when held in a convenient position by second maxillipede (see in plate XX). The second maxillipedes are very important appendages and play an indispensable role in passing food to the mandibles. Again the mandibles play a good role for cutting the food into pieces.

DISCUSSION

Freshwater prawn *Macrobrachium kistnensis* are more herbivores then carnivorous, while crab *Barytelphusa cunicularis* are omnivorous and carnivorous. The appendages like cephalic and thoracic collectively play a vital in feeding behavior. Freshwater crab *Barytelphusa cunicularis* is carnivores and omnivorous feeding on small crustacean, snail, insects, and crabs. Crab first searches the food by walking. As the food is found subsequently it is collected and picked up by the chelate leg. The food particles are conveyed to the mouth by chelate and third maxillipedes. In mouth first food is cut into pieces or grinded by mandible. Prawn is fully aquatic feeding on algae and aquatic plat leaves. Sometimes also feed on sand particles, along with food particles. Many times they are found to feed on dead and decaying part of prawns. Prawn first searches the food by antennules and antennae by their olfactory setae. After finding the location of food prawn moves toward the food and picked up by chelate legs and third maxillipede. Then the food particles are handled properly with chelate and third maxillipede conveyed to the mouth for eating.

The first and second pereiopods and the mouth parts are the appendages directly involved in the feeding behavior of laomadiid shrimp *Axianassa austrialis* (Coelho and Rodrigues 2001). Nickell and Atkinson (1995), observed in *Jaxea nocturna*, second pereiopods to resuspend the sediment, the third pair of maxillipedes collects the particles in suspensions and transfer them to the second pair of maxillipede. The main function of the appendages have been described for some species of thalassinidean shrimp through direct observation or inferred from morphological differences (Nickell *et al* 1998, Stamhuis *et al* 1998, Coelho *et al* 2000b, Coelho and Rodrigues 2001). The mechanisms of particle selection have been observed in many crustaceans (Nicol 1932, Thomas 1970, Kunze and Anderson 1979, Schembri 1982, Alexander and Hindley 1985, Coelho *et al*. 2000b, Coelho and Rodrigues 2001). Nickell *et al* (1998) analyzed the setaeal morphology of three thalassinidean species, and concluded that dense amount of pappose, plumose and plumodenticulate setae are adaptations to filter feeding. More number of denticulate setae and cuspidate setae are specialized for filter and deposit feeding and high count of serrate and cuspidate setae are related to deposit feeding.

Feeding behavior in decapods crustaceans is activated by sensing the differing chemical stimuli (Zimmer-Faust and Case 1982) which are detected by chemosensory organs (Derby and Atema, 1982). Stimuli are probably integrated from different receptors to activate particular behavior (Derby and Atema 1982), with final consumption of prey possibly determined by relative stimuli from chelae and pereopods receptors (Jubb *et al* 1983). The presence of shell and gravel pieces gives diverse stimuli, creating an abundance of chemical and mechanical stimuli, and necessitates more time for prey detection. The *Ovalipes guadulpensis* (Caine 1977) is nocturnal organism and the detection of food or prey achieved with the dactylus of the walking legs. The chemosensory properties of the dactylus of brachyuran, *Carcinus meanas* have been observed by Case and Gouillians (1961) and Case (1964). The oral appendages are articulated in such a way so the mandibles move ventrolaterally and are capable of both medio-lateral and dorso-ventral movement (Borradaily 1922).

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