

Predatory and Mating Behaviour of *Eocanthecona furcellata* (Wolff.) (Heteroptera: Pentatomidae) a Promising Natural Enemy of Lepidopterous Larvae

P. USHA RANI and ILKKA HAVUKKALA

Biology Division, Indian Institute of Chemical Technology
Tarnaka, Hyderabad - 500 007

ABSTRACT

The carnivorous stink bug *Eocanthecona furcellata* (Wolff.) is a polyphagous insect and is a potential biocontrol agent of several lepidopterous pests. The present study describes the predatory behaviour, the mechanism of feeding, intra-specific responses and cannibalism. The predators could withstand up to 72 h starvation and temperature upto 40°C. Females ingested more prey tissue than males. The efficient killing ability and polyphagy make *E. furcellata* a promising predator for biocontrol of lepidopterous larvae in tropical and semi-tropical climates.

KEY WORDS: *Eocanthecona furcellata*, predator, mating behaviour, rostral sensilla, feeding mechanism

Eocanthecona (= *Cantheconidia*) *furcellata* (Wolff) belongs to the predatory Asopinae, a sub family of the otherwise phytophagous pentatomidae. It is found on crop plants and orchard trees, and is markedly predaceous, readily feeding on soft-bodied insects using its suctorial mouth parts. Although lepidopterous larvae are the common victims of this bug, it is also known to feed occasionally on coleopterans (Srivastava *et al.*, 1987). A few reports are available concerning its predation on several agricultural pests (Gope, 1981; Ghorpade, 1972; Pant, 1960; Rai, 1978). However, information on feeding and mating behaviour is lacking. This paper deals with the predatory and mating behaviour of *E. furcellata*, the effect of various periods of starvation and age and stage of development of the predator on quantity of prey consumption.

MATERIALS AND METHODS

The predators were reared in the laboratory at 25°C and 16:8 LD photoperiod regime. First instar nymphs were held in plastic Petri dishes and provided with water.

Second to 5th instar and adults were kept in groups of 5 to 10 individuals in polystyrene containers (7 cm dia x 4 cm h) capped with polyethelene lids having a mesh at the centre. The floors of the containers were lined with absorbant paper. Water was supplied through a hole at the bottom of the container. Larvae of *Spodoptera litura* F. reared on artificial diet (Wakamura, 1988) were provided as food.

Observations on feeding and mating behaviour were made in glass Petri dishes (12 cm dia) lined with filter paper discs. A moist cotton pad attached to the inner side of the lid provided water and humidity.

RESULTS AND DISCUSSION

E. furcellata fed eagerly on soft-bodied larvae in the laboratory. Several successive stages could normally be distinguished in the preying response which is, in general, similar to that recorded by Parker (1960) for *Rhinocoris bicolor* (Fabricius) and *R. tropicus* (Herrich-Schaeffer) (Hemiptera: Reduviidae), except that in these reduviid species, the legs are also used in capturing the prey. When a

larva is introduced into a container, almost immediately the antennae are stretched straight out in front of the head towards the prey from the bent resting position. The predator then orientates towards the prey directly by turning if necessary and advancing. The tips of the antennae often touch the larva, but antennal contact is not necessary for accepting the prey. Proboscis is extended in the vicinity of the prey which is later punctured with a quick pouncing movement. When a soft-bodied larva is presented, no particular part of the body seemed to be specially favoured as the site of puncture.

Larvae, including the larger ones, attacked by this predator were observed to cease struggling and become immobile shortly after the body wall was pierced. It has been suggested that Asopinidae kill their prey by injecting toxic saliva (Cobben, 1978). Struggling of the prey ended 3-10 min. after being pierced by the stylets. With such delayed reactions, it is difficult to discriminate between toxic and feeding effects because the bugs immediately start to suck after stylet insertion. The feeding site is rarely altered during the 2-5 h feeding that follow. While the mandibular stylets are penetrated shallowly, their recurved hooks secure the prey at the site of puncture and the maxillary stylets are continuously extended, retracted and moved about within the prey which normally happens in pentatomids

(Cobben, 1978). During the course of feeding, antennae are directed horizontally. Often, the bug drags the prey, impaled in the stylets and moves to a vertical surface staying there head downwards as it continues feeding until the prey becomes sac-like.

The threshold of stimulation varies and appears to be directly related to the state of starvation and the degree of dehydration. Difference between the body weights taken before ingestion and after ingestion provided the quantity of food consumed by the predators. The rate of ingestion of the bugs starved at various periods were compared (Table-1). Most predators detected the presence of prey larva and started feeding within 2 min. after placement in the arena. Younger instar nymphs were faster in responding to prey than older individuals, and were capable of attacking prey larger than themselves. Adult females were more efficient than males in recognizing and attacking prey and also consumed more quantity of food (Table 2). The food consumption of fifth instar was the highest of all. Normally adults survived upto 4 days without food in the presence of water and withstood temperatures upto 40°C.

E. furcellata is an aggressive predator and fed communally in laboratory conditions. Cannibalism occurred frequently in all

Table 1. Effect of various starvation periods on the quantity of food intake by the carnivorous stink bug, *Eocanthecona furcellata*

Period of starvation (h)	Body weight (A) before feeding $\bar{X}(\text{mg}) \pm \text{S.D.}$		Mean rate of ingestion (B) $\bar{X}(\text{mg}) \pm \text{S.D.}$		Percentage of predators feeding	
	male	female	male	female	Male	Female
0	52.0±0.5	91.3±2.0	18.1±0.4	24.2±5.4	100.0	100.0
24	48.5±2.9	71.0±2.0	28.2±3.8	56.0±6.5	100.0	100.0
48	45.0±4.0	66.0±5.0	21.9±8.5	36.4±4.6	100.0	89.0
72	39.0±3.0	58.0±4.0	22.0±5.1	35.3±6.9	80.00	78.2

(A) Total number of bugs used in each experiment = 30

(B) Mg of prey ingested by a single predator in one feed

Table 2. Effect of age and stage of carnivorous stink bug, *Eocanthecona furcellata* on the amount of prey *Spodoptera litura* ingested

Stage/age of the insect	Quantity of prey ingested (mg/24 h)*
IV instar	12.8 ± 4.2
V instar	28.9 ± 4.1
1 day old Adult	F17.6 ± 3.4 M 9.2 ± 0.8
20-30 day old Adult	F27.4 ± 2.6 M18.2 ± 3.8
50-60 day old Adult	F22.5 ± 4.5 M15.6 ± 3.4

* Mean ± S.D (N=30) F = female, M = male

stages, except during the I and II instars. In spite of abundant food supply, often a predator attacked another at the ventral side of the abdomen. After initial attack, other predators joined and fed communally, until the bug was completely consumed. Cannibalism was particularly frequent among the freshly moulted adults and the late fifth stage nymphs often fed on either sex of moulting individuals with soft integument.

Mating was often initiated by antennal contact by both sexes. The male moved slowly behind the female and touched her posterior abdomen by his antennae, followed by swift mounting. Some times several mounting attempts were needed for successful copulation. Other bugs, usually males, often gathered near the copulating pair, sometimes trying to touch them with an extended proboscis. Duration of copulation was 6 to 8 h at 25°C. Occasionally males adopted a riding position on other males. Females were polygamy. Unfavourable conditions, such as lack of food or temperatures below 20°C inhibited pre-copulatory and mating behaviours.

Although the predatory efficiency under field conditions are yet to be known, the laboratory study indicated that *E. furcellata* is rather a dominant predator of *S. litura*, as both nymphal and adult stages were active feeders.

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