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LIFE HISTORY AND BIOLOGY OF *LEMA SEMIFULVA* JAC. (COLEOPTERA: CHRYSOMELIDAE: CRIOCERINAE) AT BHILAI-DURG

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web supplement

ABSTRACT

Life-history, including three larval instars, pupa formation within a cocoon, adult leaving the cocoon, after spending some time within it so that it is fully pigmented when coming out, has been described. In addition, winter diapause, seasonal change of host plant, association with other species of Lema *and niche separation have been presented.*

KEYWORDS

Chrysomelidae, diapause, ecological niche, host plant, Lema semifulva

Studies on the biology, ecology and behaviour of Criocerinae are only a few in India, namely those of Sengupta and Behura (1953, 1956, 1957); Srivastava and Bhagat (1966) and Visalakshi and Nair (1978); hence this communication.

MATERIAL AND METHODS

Adults of *Lema semifulva* species were collected at Maitri Bagh and Sector 8 Park of Bhilai Township, Durg, central India in July 2001 and 2002 from *Commelina nudiflora* and *C. bengalensis* plants. They were kept in two litre culture jars, with mouth covered by thin cloth. Fresh leaves of the host plants were provided regularly to the cultures. Developmental stages appearing in the cultures were studied. Observations on ecology and behaviour, and of immature stages were made in the field.

OBSERVATIONS

I Developmental stages

(a) Adult: The adult of this species has been described by Jacoby (1908). The main features of the adult are as follows. Sides of the elytra fulvous, the fulvous area in the form of longitudinal band narrowing posteriorly. Sides of the breast, antennae legs and most of elytra are black. The prothorax shows, in addition to a deep transverse sulcus near the basal margin, a shallow transverse anterior sulcus.

(b) Mating: Mating starts after 1 to 1.5 days from eclosion. Number of attempts at mating are increased during the cloudy days in the monsoon season. A male rides on the back of a female. The female moves and even flies, while in copulation. Mating period: About 40 minutes. Mating may occur many times in a day. Besides intraspecific mating, interspecific mating may occur between *L. tibiella* and *L. semifulva* (see Kalaichelvan *et al*., 2003). If one comes too close to the insects the mating partners immediately separate and fly away.

(c) Eggs: Egg laying starts after a day from mating. Colour of eggs: Pale yellow immediately after oviposition and then it turns gradually into dark yellow. Before 12 to 14 hours from hatching a dark spot appears at one pole, which corresponds to the head of the emerging larva.
Egg size and shape: 0.9mm to 1.0mm in length, cylindrical and elongated. In the field, the female oviposits mostly on the lower surface the leaf. But in a culture jar the eggs may be on both sides of leaf and even on walls of the jar, and also on stem. Maximum oviposition is in July and August. The eggs are laid mostly singly, sometimes in pairs, and even in sets of three. When eggs are in groups of 2 or 3, they may be arranged side by side or in a linear manner. It has been observed that in a culture if a wilted wet leaf or a piece of wet paper is kept the insect lays more profusely on such wet surfaces.
Egg period: 88 to 92 hours. A female lays at an average of 8 to 12 eggs per day, and in total 280 to 325 eggs in her life time.
Female longevity: Up to 52 days in a culture jar.

(d) Larva: As in other Criocerinae (White, 1993; Visalakshi & Nair, 1978; Srivastava & Bhagat, 1966) there are three larval instars.

First larva:
Size: 1.1mm to 2.6mm in length. When hatching, head is black and remaining body pale yellow. After a few minutes from hatching, legs become black, while the remaining body changes gradually to become dark grey. The larva carries an irregular faecal mass on its body, leaving only the head exposed in a dorsal view. It starts feeding after about 5 to 10 minutes from hatching. If touched, the larva regurgitates a pale green liquid from its mouth.
First larval period: About 32 to 46 hours.

Second larva:
Size: 2.7 to 5.2mm.
Colour: Blackish-brown. Faecal mass similar to that of the first larva, but a little darker and a little larger. At the time of first moult, the legs, head and body are whitish in colour. Head and legs gradually become dark, while the remaining parts turn blackish-brown. Before moulting it stops feeding, body becomes hunched, and remains inactive for about 15 minutes. The skin breaks from the head.
Larval period: 1.5 to 2 days.

Last instar larva:
Size: 6.0-6.2mm in length. Body, including legs, is blackish in colour.

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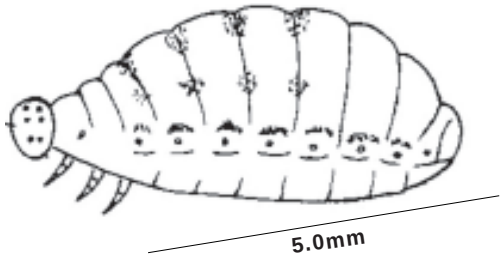

Figure 1. Last instar larva of* Lema semifulva*, in lateral view, with the fecal mass, on the last part of the abdomen, removed.

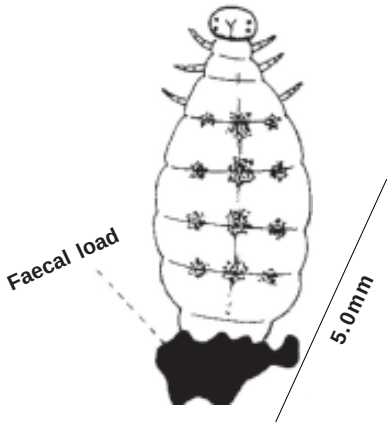

Figure 2. Last larva of* Lema semifulva *in dorsal view carrying faecal mass.

Head: Dark yellow.
The nearly translucent and soft integument, covering the abdomen, shows, on the dorsum, dark patches, where gaps are left between fat body masses, adherent to the inner surface of the thin body wall. There are three longitudinal rows of such patches, a median row and two lateral rows. The dorsum of abdomen is bulged. It carries an irregular black faecal mass on the hinder part of the abdomen (Fig. 2). Each side of the head carries six ocelli in two groups, a group of four ocelli, and a group of two ocelli lower down on the head, close to the base of the mandible (Fig. 1). On each side of the body there are nine spiracles, one on the prothorax, one on the metathorax and seven on the first seven visible abdominal segments. (Snodgrass, 1935, has pointed out that in insects, among thoracic spiracles the mesothoracic spiracles particularly are subject to this anterior migration and hence they often occur in larval or adult insects on the sides of the prothorax, for which reason they are frequently called "prothoracic" spiracles.). When the larva is touched, it regurgitates a dark green liquid, which is perhaps semi digested food. It feeds vigorously on leaf and stem.
Larval period: Two days.

Prepupa:
Body colour: White. It does not feed for 12 hour before hardening of cocoon. It remains in the cocoon for 1-1.5 days before moulting into pupa.

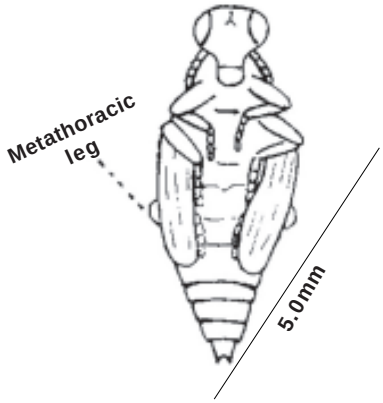

Figure 3. Pupa of* Lema semifulva*, in ventral view, with the cocoon removed.

(e) Cocoon: Cocoon is made up of a white frothy fluid, coming out through the mouth of the prepupa and subsequently hardening into an irregular mass (Image 1[w]). The cocoon takes about 12 to 14 hours to harden. It is made between two neighbouring leaves, joined together by a larval secretion or inside a curled leaf. If the cocoon material is removed from around the prepupa when it is still wet, the animal does not pupate and dies.
Cocoon size: 6.7-7.2mm.

(f) Pupa: Pupa is formed inside the cocoon (Fig. 3). It is white or pale yellow in colour.
Size: 5.2-6.0mm.
Total period inside the cocoon: Nine to 11 days.

(g) Newly emerged adult: A newly emerged adult is fully pigmented, though the elytra are soft. Perhaps this is because the adult, after eclosion remains inside the cocoon for a few days. Mode of emergence of the pupa from the cocoon has not been closely observed.

II Behaviour
It can fly very fast, and takes to wings, even if a disturbing factor is 3 or 4 feet away. For feeding pattern of larva and adult see Figure 5 (a, b, c and d).

III Diapause
Adult diapause period: Last week of October up to May end. During this period, feeding is much reduced and there is no breeding. In the field a diapausing adult has not been located so far; perhaps diapause occurs in a concealed location. The above mentioned observations on diapause were made in culture jars.

IV Ecology
(a) Change of host plants: It is generally found on *Commelina nudiflora,* which has lanceolate leaves and grows in shallow water, or in marshy areas, but in rainy season it is also seen on *Commelina bengalensis* which grows away from water.

[w] See Image 1 in the web supplement at www.zoosprint.org

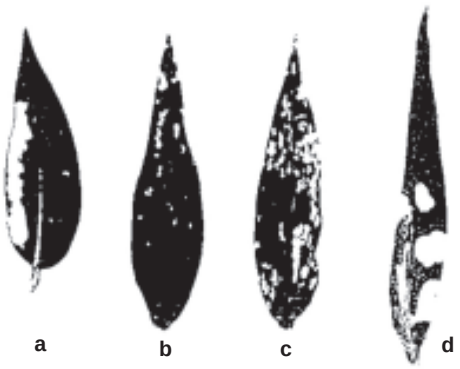

***Figure 5. Feeding pattern of* Lema semifulva**
a - Adult; b - First larva; c - Second larva; d - Last larva

(b) Association with other Criocerinae: It is associated with *Lema coromandeliana* Fabr., *L. maheensis* Jac., *L. praeusta* Fabr., *L. terminata* Lacord. and *L. rufotestacea* Clark.
(c) Ecological niche: It feeds on the marginal area of a leaf leaving thread like filaments, whereas *Lema coromandeliana, L. maheensis, L. praeusta, L. terminata* and *L. rufotestacea* make holes in the middle part of the leaf. (For figures of feeding pattern see Kalaichelvan *et al*., 2003.)

Discussion

That in Criocerinae larval instars carry a faecal load or shield, and that pupation occurs within a cocoon, have also been described and recorded by Sengupta and Behura (1957), Srivastava and Bhagat (1966), and Visalakshi and Nair (1978). Pupation within a cocoon has been mentioned by Cox (1996, 1998). White (1993) has pointed out cocoon formation in North American species of *Lema*. Visalakshi and Nair (1978) have recorded formation of cocoon by hardening of a frothy white material exuding from the mouth of the last instar larva, as observed in the present project too. That in captivity pupation occurs between leaves of the host plant has been observed by Sengupta and Behura (1957) in *Lema praeusta*, an observation repeated in the present study in another species of *Lema*. In the present study it has been noted that the adult, after eclosion from the pupal skin, remains within the cocoon for some time, so that the adult leaving the cocoon, is fully pigmented. This situation has been recorded also for North American species of *Lema* by White (1993).

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NEW RECORD **ZOOS' PRINT JOURNAL 20(6): 1898-1899**

ASTERIDIELLA PYGEI HANSF. VAR. *MICROSPORA* HOSAG., A NEW RECORD FROM SOUTHERN INDIA

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During a survey of the foliicolous fungi in the Silent Valley National Park, Palakkad district of Kerala State, we collected a specimen of *Pygeum wightianum* Blume (Rosaceae) with infection. Microscopic examination of the material revealed that it is a hitherto unrecorded member of the family Meliolaceae from southern India and hence the note.

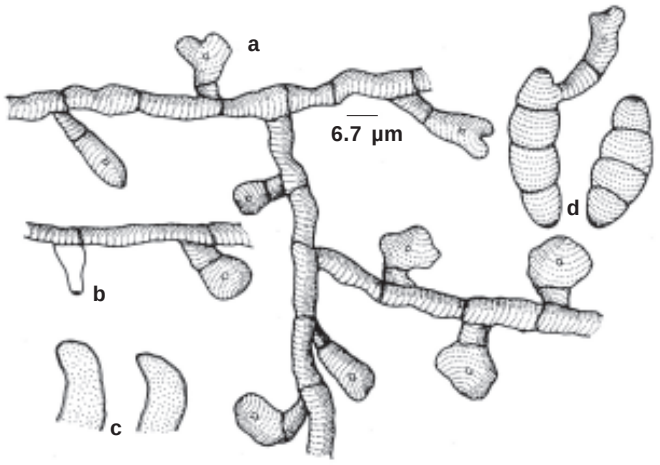

***Figure 1. Asteridiella pygei* Hansf. var. *microspora* Hosag.**
a - Appressorium; b - Philalida;
c - Perithecial wall cells; d - Ascospores

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