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LIFE HISTORY OF *Musca (Byomya) emdeni* (SINHA & NANDI) (DIPTERA : MUSCIDAE), A DUNG BREEDING FLY IN THE SUNDARBANS BIOSPHERE RESERVE, INDIA

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INTRODUCTION

The dung breeding muscid fly *Musca (Byomya) emdeni* (Nandi & Sinha, 2004) are found extensively in the open pastures, near the cow sheds and in the manure pit. The adult fly is usually found on freshly deposited cow dung (Fig. 1). Cattle dung pats naturally dropped in pastures are the microhabitat for an abundant and diversified arthropod fauna (Merrit & Anderson 1977, Anderson et. al., 1984, Blume 1985, Cervenka & Moon 1991). The adults of different species of muscid fly under genera *Brontaea, Neomyia* & *Musca* in Sundarbans Biosphere Reserve are attracted to dung of different animals & the eggs are laid on freshly deposited dung of cow & buffalo in the field. *Neomyia indica* (Robineau-Desvoidy) is generally found on freshly deposited cattle dung and the larvae breed there in (Sinha & Nandi, 2005). Larvae of the dung breeding muscid utilize dung as food resources. Morphologically *Musca (Byomya) emdeni* is almost similar to *Musca (Byomya) pattoni* (Austen, 1910) but differs from it by the grayish abdomen with silvery-checkered pattern and dorsocentral bristles 2+3 (Nandi & Sinha, 2004). It is the purpose of the present paper to provide the life history details and morphological descriptions of the larval instars of *M. emdeni.*

MATERIAL AND METHODS

Fifty depositions of cow dung, not more than one hour old were collected from the open pastures of different islands in the Sundarbans Biosphere Reserve (21°31′ -21°53′ N, 88° 37′ - 89° 09′E), and brought to the laboratory for rearing. Adult flies reared from the cow dung were identified as *Musca (Byomya) emdeni.* The flies were cultured in five separate glass jars (10 X 8 cm). A single male and female fly were kept with freshly deposited cow dung in each glass jar under laboratory conditions at room temperature (26 ± 4° C) and a RH of 82 ± 4%. The mouth of the jar was covered with silken cloth, and cotton soaked in a sugar solution was applied above the silken cloth of the jar four times in a day to provide the adult flies with a sufficient and continuous energy supply. The larvae collected just after the deposition, were reared separately on cow dung to study the different larval instars. Collection of larvae was repeated at six hour intervals till the formation of puparia to study the exact duration of each instar. The collected larvae were killed by dropping them into sub boiling water and preserving them in 70% alcohol for future study. Larvae were treated in a hot 10% KOH solution for 1-3 minutes and then washed in water. After removing the internal contents, the larvae were dehydrated through an ethanol series of 30-50-70-90% and finally to absolute

alcohol. After dehydration, the larvae were cleared with clove oil and finally mounted in Canada Balsum. For studying the anterior and posterior spiracles and the cephaloskeleton, these parts were dissected out under a stereoscopic dissecting microscope with fine forceps, transferring them to a cavity block and treating them with hot KOH as described earlier. Illustrations were prepared by means of a Camera Lucida before mounting on slides with Canada Balsam.

OBSERVATION

The flies were found to mate on the second day after emergence. A female fly mated only once for her entire life. Mating was initiated by the male fly suddenly jumping onto the female and holding her body with his fore and mid legs. Each mating lasted about 26 minutes. On the 6th day of emergence, the gravid female started to deposit eggs, and the last batch was deposited on the 15th day after emergence. A total number of 105 eggs were deposited in five batches (Table 1) under laboratory conditions at room temperature (26 ± 4° C) and a RH of 82 ± 4%, with the highest number delivered in the 2nd batch on the 7th day after emergence, and then number of eggs decreased gradually (Fig. 3).

Among the total eggs deposited by a female fly, 96% of eggs hatched out. Eggs are white, tapering at both ends, with 1.2 - 1.7 mm in length and 0.4 - 0.5 mm in diameter (Fig. 2) Eggs were hatched after 4 - 6 hours of oviposition. The larva moulted from first to second instar after 4 - 6 hours, from second to third instar after 12 - 14 hours, and the third instar transformed in to a puparium after 36 - 38 hours. The pupal stage lasted for an average of 94 - 96 hours. Total time required to complete the life cycle of this species under laboratory conditions from deposition of eggs to new fly emergence is about 6 days. It was observed that the gravid female flies were never attracted to the dung deposits that were one day old. Among the Total number of larvae hatched out from the eggs deposited by the single female fly under laboratory conditions, 71% of the larvae survived up to pupation. Longevity of the male and female flies was on average 16 days and 23 days respectively. The flies could survive an average of 1 day without food after emergence. The sex ratio of males to females was 1:2.

Fig. 1: A female *Musca (Byomya) emdeni* laying egg in freshly deposited cow dung.

Fig. 2: Eggs of *Musca (Byomya) emdeni* in cow dung.

Batches	Days of emergence	Number of eggs
1st	6	12
2nd	7	38
3rd	9	31
4th	12	16
5th	15	8
		Total 105 eggs

Table 1: A total number of 105 eggs were deposited by a gravid female *Musca (Byomya) emdeni* in five batches under laboratory conditions at room temperature (26 ± 4° C) and a RH of 82 ± 4%.

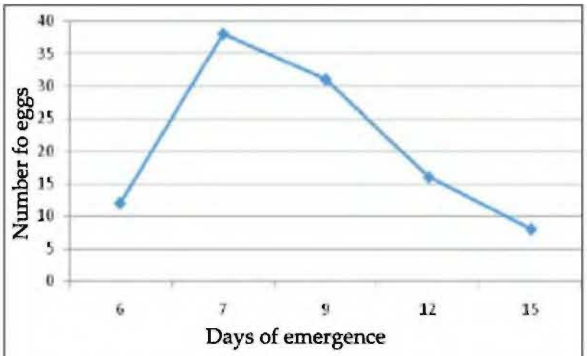


Fig. 3: Number of eggs deposited by a gravid female fly on different days of emergence.

DESCRIPTION OF LARVAL INSTARS

(Figures of the larval body parts not to scale)

First instar (Fig. 4 – 5). Length 2.5 – 3.0 mm, greatest diameter 0.3 – 0.4 mm; spines on segments 1 – 7 conspicuous; spine band on segment 1 broad ventrally; spines on segment 8 – 10 not completely developed; last segment with a pair of anal tubercle. Cephaloskeleton small, incompletely developed and not uniformly sclerotized; oral hook part not strong; dorsal and ventral cornu not well pigmented. Segment 2 with short anterior spiracles. Posterior surface of the last segment shows pigmentation; no prominent posterior spiracle.

Second instar (Fig. 6 – 9). Length 4.5 – 5 mm, greatest diameter 0.3 – 0.5 mm; segments 6 – 12 with prominent spine band on ventral surface; anal tubercle present. Cephaloskeleton lightly sclerotised; dorsal cornu smaller than ventral cornu; window absent; parastomal sclerite absent; anterodorsal process pointed. Anterior spiracles yellowish and each with 4 lobes. Posterior spiracles kidney shaped; slits sinuate; button clear and situated at inner side.

Third instar (Fig. 10 – 13): Length 7.5 – 10mm, greatest diameter 0.6 – 1.0 mm.; segments 6 – 12 with small spine bands on the anterior margin of lateral and ventral surfaces; anterior spine band present on segments 3 – 5; two rows of spine bands present on segment 10 ; anal plate more or less broad. In cephaloskeleton, mouth hook broad and horn-shaped; hook part heavily pigmented; dental sclerite triangular; ventral cornu with triangular projection on the dorsal margin; basal part of dorsal cornu poorly pigmented. Anterior spiracles with 8 lobes. Posterior spiracles kidney shaped, heavily pigmented; button clear, reddish in colour; peretreme thick and pigmented; slits strong and sinuate.

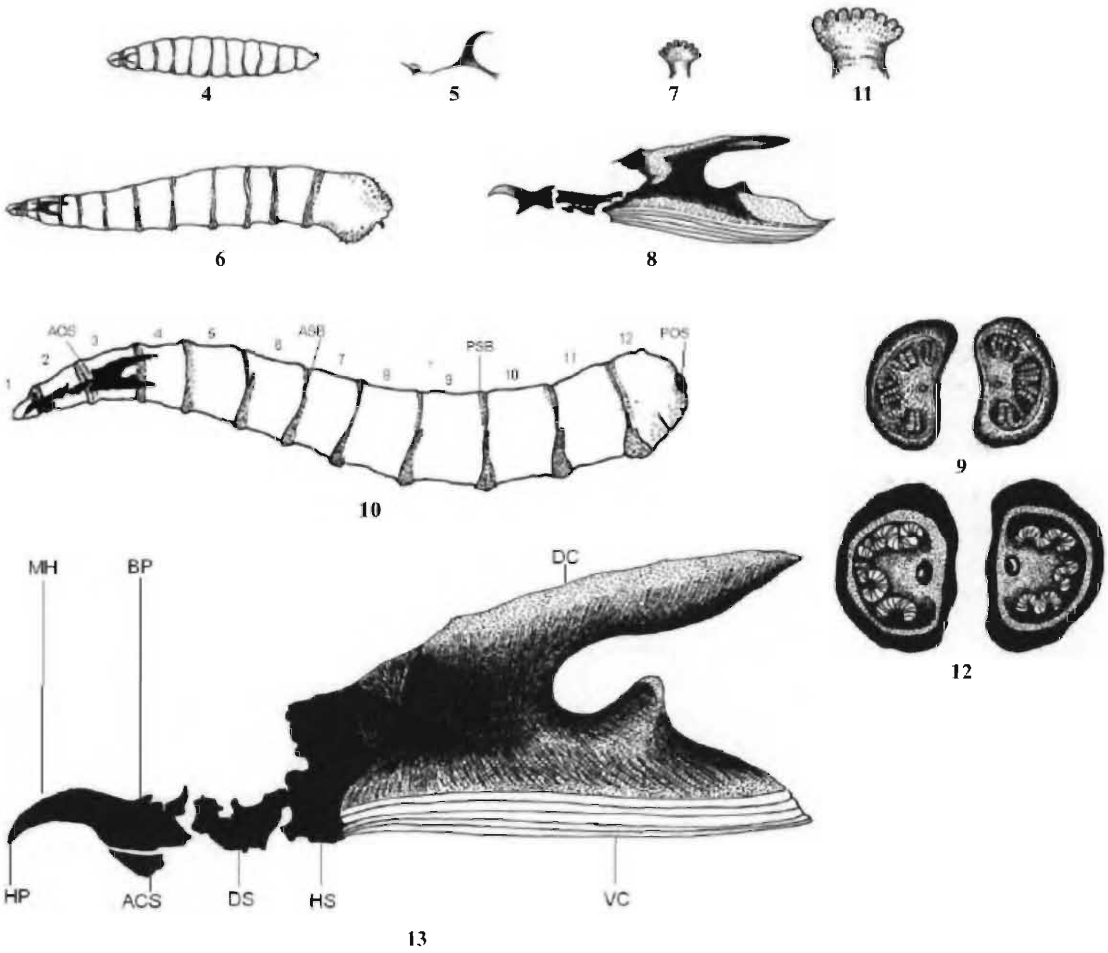
Puparium: Length 4 – 4.5 mm, greatest diameter 1.5 – 1.8 mm; cylindrical in shape; color blackish – brown; spine bands on segments prominent.

DISCUSSION

Musca (Byomya) emdeni was known only from the Sundarbans Biosphere Reserve (Nandi & Sinha, 2004), and recently collected from other parts of West Bengal, India. These are widely distributed in the Sundarbans Biosphere Reserve but had not been extensively sampled until the first author worked out on the calyptrate fly fauna in the Sundarbans. *Musca (Byomya) emdeni* completes its life cycle in cow dung. The female fly avoid laying eggs on the deposit on which other dung breeding muscoid flies (for example *Neomyia, Brontaea,* and *Musca*) already seated to lay eggs. It was found that fly population reaches its peak from June to September in a year. The life history of *Musca (Byomya) emdeni* shows an interesting resemblance to that of *Neomyia indica* (Robineau Desvoidy), considering the behavior of the flies to use freshly deposited cow dung as breeding material, and also the saprophagous nature of the larvae (Sinha & Nandi, 2005). The association and distribution of *Musca (Byomya) emdeni* strongly reflects that, it is exclusively cattle dung breeder and do not shows any coprophagous habit like some *Neomyia* and *Musca* which regularly visit human excrement and also breed there in.

SUMMARY

The life history of freshly deposited cow dung visiting muscid fly *Musca (Byomya) emdeni* (Sinha & Nandi, 2004) was studied in laboratory. The three larval instars are described in detail.



Figs. 4 – 13. Larval body parts of *Musca (Byomyia) emdeni* Sinha and Nandi

4 – 1st instar Larva
5 – Cephaloskeleton of 1st instar larva
6 – 2nd instar larva
7 – Anterior spiracles of 2nd instar larva
8 – Cephaloskeleton of 2nd instar larva
9 – Posterior spiracles of 2nd instar larva
10 – 3rd instar larva
11 – Anterior spiracles of 3rd instar larva
12 – Posterior spiracles of 3rd instar larva
13 – Cephaloskeleton of 3rd instar larva

Fig. 4-13 : not to scale

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TERMINOLOGY

ACS = Accessory sclerite, AOS = anterior spiracle, ASB = anterior spine band, POS = posterior spiracle, PSB = posterior spine band, BP = basal plate, DC = dorsal cornu, DS = dental sclerite, HP = hook part, HS = hypostomal sclerite, MH = mouth hook, VC = ventral cornu.

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