octanoate but not the higher chain fatty acids—palmitate and stearate even when the leg muscles were metabolically active (as indicated by succinate oxidation in the exercised muscles). That the butyrate acts as primer in the oxidation of higher chain fatty acids in the locust thoracic muscles[10], and also as energy source during flight in the flight muscles of the honey bee *Apis dorsetta*[5] have been very well demonstrated. It has also been shown that the flight muscles of the dragonfly *Pantala flavescens*[7], which are involved in sustained action utilize short chain fatty acids to begin with, and subsequently switch on to its reserves of palmitic acids. It may be inferred from these observations that the leg muscles of this beetle which take part in short and abrupt actions derive their metabolic energy through limited oxidation of low chain fatty acids—butyrate and octanoate.

It is well understood now that carnitine stimulates the rate of oxidation of fatty acids both in the homogenate as well as in the mitochondrial fraction[11]. In the present investigation also palmitate oxidation in the homogenate as well as in the mitochondrial preparation was indicated after the addition of carnitine. This may suggest that in the leg muscles of this insect carnitine acts as an extra mitochondrial factor accelerating palmitate oxidation. It may be that the leg muscles of the *Cybister* beetle have insufficient carnitine reserves to support palmitate oxidation.

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CHANGES IN THE CORPUS ALLATUM VOLUME OF FEMALE *SPODOPTERA LITURA* (FABR.) RELATED WITH AGE AND REPRODUCTION

THE importance of the corpus allatum in growth and reproduction of insects was first demonstrated in *Rhodnius prolixus*[1] (Hemiptera : Heteroptera). Since then it has been confirmed in a number of species belonging to Orthoptera, Hemiptera, Coleoptera, Lepidoptera and Diptera. Several workers reported larger corpora allata in females than in males of different species and emphasized its role in oocyte growth and yolk deposition during the maturation of eggs. Further, in *Calliphora erythrocephala*[2,3], *Sarcophaga bullata*[4], *Iphita limbata*[5], *Leucophaea maderae*[6], *Locusta migratorea*[7] and *Schistocerca* sp.[8], the increase in the volume of corpora allata of the females was related with oocyte growth and the maturation of the eggs in different reproductive cycles. But in moths, except *Bombyx mori*[9], males have larger corpora allata than females and gland was not necessary for the ovarian maturation. On the contrary, in butterflies *Pieris brassicae*[10], *P. napi*[11] and *Danaus plexippus*[12], studied so far, the corpora allata are larger in females than in males and these are necessary for the oocyte growth and egg maturation.

The present observation on the female *Spodoptera litura*, not only compares the volume of corpora allata with that of other moths but also indicates the changes in their volume related with age and reproduction. Further, the present data on *S. litura* particularly add information on the role of corpora allata in the short lived moth which requires food in imaginal life unlike *B. mori* and others which emerge only to lay eggs.

From a stock culture maintained at 27° C ± 1° C and 70–80% relative humidity, newly emerged *Spodoptera litura* were isolated in single pairs and maintained age-wise at the above-mentioned temperature and humidity. Their corpus allatum volume was determined by the method of Highnam (1958)[13]. The mean values of the corpus allatum volume of the females of different age groups was compared and significant difference was known by using the formula of Rao (1952)[14].

The data in Table I show the changes in the corpus allatum volume of the females of different ages. The volume of the gland was also determined in the newly emerged males and its mean value ($5{\cdot}47 \pm 0{\cdot}36 \times 10^6\mu^3$) was lower than that of the females of the corresponding age ($5{\cdot}51 \pm 1{\cdot}26 \times 10^6\mu^3$). However, in the females of the subsequent age, the gland volume significantly decreased and in the four day old females

this volume was almost half of that of the newly emerged females. When the females were starved from emergence, the corpus allatum volume of the females of different age was significantly lower than that of the fed females of the corresponding age.

TABLE I

Showing changes in the corpus allatum volume of female Spodoptera litura *following emergence*

Age of female following emergence	Volume of corpora allata in $10^6 \mu^3$ (Mean value)	
	Fed	Unfed
Newly emerged	5·51±1·26	..
One day	3·90±0·53	3·46±0·46
Two day	3·30±0·51	2·96±0·54
Three day	2·75±0·31	2·63±0·59
Four day	2·63±0·43	2·42±0·14

The dimorphism in the corpus allatum volume of the newly emerged adults suggests that the gland of the newly emerged females have more cells and higher quantity of secretory material both in extra- and intracellular spaces of the gland. The subsequent decrease in the volume of the corpus allatum of fed females following emergence indicates gradual retardation in the secretory activity of the gland. Further, starvation following emergance markedly reduces the activity of the corpus allatum.

Anatomical observations of the ovary of *S. litura* showed that in the newly emerged females the anterior one-third of the ovarioles had immature eggs with still large nurse cells. Further, the commencement of oviposition of eggs in *S. litura* occurs after 60 to 70 hours following emergence. Therefore, the large size of the corpora allata of the newly emerged females of *S. litura* is most likely related with the synthesis and release of the secretory material for the completion of the maturation of the growing oocytes.

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ON THE OCCURRENCE OF TWO NEW PARASITIC NEMATODES, *ECHINOCEPHALUS SPINOSISSIMUS* (LINSTOW, 1905) AND *E. UNCINATUS* IN THE EAGLE RAY, *AETOBATIS NARINARI* (EUPHRASAN) FROM BAY OF BENGAL

IN the course of a survey of the parasites of commercially important elasmobranchs, a careful examination of the guts, sampled on two different occasions, yielded specimens of two species of nematodes. These nematodes were recovered from the intestines of *Aetobatis narinari* (Euphrasan), a common eagle ray of the region. The specimens were assigned to the genus *Echinocephalus* because of the presence of the generic characters such as the head bulb with transverse rows of hooks and the neck glands[1]. Subsequently they were identified as *Echinocephalus spinosissimus* (Linstow, 1905) and *E. uncinatus* (Molin, 1858). The specimens have been deposited in the Marine Biological Station Reference Museum collection.

As these parasites were collected from a hitherto unreported host and since *E. spinosissimus* has not so far been reported from Indian waters, the present communication adds further information and a brief description.

Echinocephalus spinosissimus (Linstow, 1905)

Material : Three males, 14 mm ; 15 mm and 16·5 mm in length collected on October 1, 1971.