Caterpillar and beetle pests of cocoa (*Theobroma cacao* L.) in India*

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A survey carried out to catalogue and study the pests occuring in cocoa showed sixteen lepidopteran and fourteen coleopteran pests in the cocoa growing areas of Kerala, Karnataka and Tamil Nadu in South India. Lymantria obfuscata *Walk.*, Lymantria ampla *Walk.*, Zeuzera coffeae *Nietn.*, Adoxophyes privatana *Walk.*, Euproctis subnotata *Walk.*, Euproctis quttata *Walk. are observed to be the major caterpillar pests. The important beetle pests include* Popillia complanata *Newm.*, Monolepta longitarsus *J.G.*, Sinoxylon *sp. and* Glenea *sp. A brief description of their biology, nature of damage, seasonal occurrence and alternate hosts are given.*

Cocoa (*Theobroma cacao* L.) was introduced into India recently. Though the area under cultivation was negligible during the early period, it has increased tremendously recently and by 1978 the area was raised to 13 500 hectares in the three South Indian states of Kerala, Karnataka and Tamil Nadu. In these states cocoa is mostly grown as an inter-crop with coconut and arecanut and as a monocrop in the forest areas.

Over 1500 different insects are known to feed on cocoa (Entwistle, 1972), but in India information regarding the pest complex is very meagre. A survey was therefore carried out in the three states. The survey revealed the presence of sap-feeding insects, leaf-feeding caterpillars and beetles, and stem-boring caterpillars and beetles. The effects of these pests on the crop is slight at present. Some of the serious pests recorded elsewhere *viz., Sahlbergella singularis* and *Distantiella theobroma,* leaf-cutting ants like *Atta cephalotes* and *Acromyrmex octospinosus,* the weevil *Pantorhytes* sp. and the cocoa moth *Acrocercops cramerella* were not seen during the present survey. This article gives a brief description on the nature of damage, biology, seasonal occurrence, the amount of damage, and alternate hosts, of the common caterpillar and beetle pests.

LYMANTRIA OBFUSCATA WALK (LYMANTRIIDAE)

Lymantria obfuscata has proved to be a serious pest of cocoa in all the cocoa growing tracts in India. It was reported as a pest of cocoa from the Karnataka area (Prem Kumar, 1974a). The brownish hairy caterpillars feed voraciously on tender leaves *(Figure 1).* During day time, the caterpillars congregate on the fallen leaves and twigs around the base of the plant or on the basal surface of the main stem.

* Publication no. 174, Central Plantation Crops Research Institute, Regional Station, Vittal 574243 Karnataka, India.

The female moths are bulky and have rudimentary wings. The abdomen of the female is almost entirely filled with eggs *(Figure 2).* They lay eggs near sites of pupation, among the fallen leaves. Oviposition starts within twelve hours of adult emergence and continues for two to three days. A female moth, on an average, lays about 300 eggs. Once the egg laying is complete the abdomen of the female shrivels and the insect dies. Eggs hatch in eight days. The larval period lasts for twenty-five to thirty-eight days and the pupal period for seven days. The adult females live for three to four days and males, four to six days. Males are winged, slender and brownish in colour with wavy markings on the fore-wings *(Figure 3).*

The phenomenon of 'pheromonal' sex attraction is strongly exhibited by the females. When the female moths emerge in the laboratory rearings, male moths from the field are attracted and are found to fly around the glass containers in which female moths are kept.

The caterpillars are seen in large numbers in the field during the months following the monsoon showers, when the plants put forth new flushes. Widespread damage is caused by the caterpillars feeding on the tender flushes.

It was observed these caterpillars feeding on tender cashew leaves also.

LYMANTRIA AMPLA WALK. (LYMANTRIIDAE)

The red branch borer (Entwistle, 1972) is a closely related species of *L. obfuscata,* resembling it in biological features and damage caused.

The female moth lays eggs near the sites of pupation. A single female lays about 1000 eggs. The incubation period lasts for nine days. The larval period lasts for thirty-one to thirty-eight days for females, which have five instars and for males, which have four instars twenty-seven to thirty-four days.

The caterpillars are seen in the field after monsoon showers, and the damage is caused by feeding on the tender flushes.

Veeresh & Putturudriah (1968) reported this pest to be feeding on pomegranate, guava, cashew, mango, citrus and cotton. Entwistle (1972) reported it as a pest of cocoa from Sri Lanka.

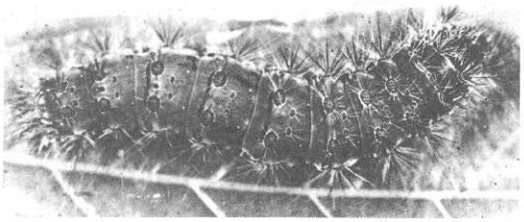

Figure 1. Lymantria obfuscata *larva.*

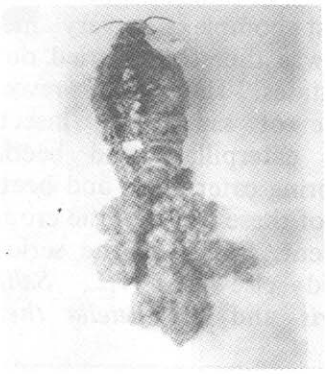

Figure 2. Egg-filled abdomen.

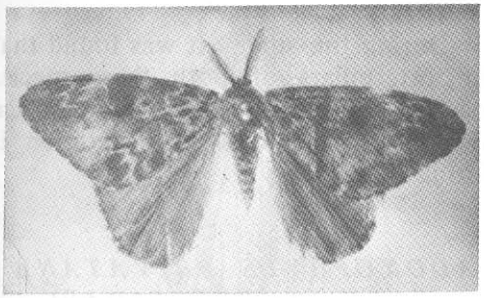

Figure 3. Lymantria obfuscata, *adult male.*

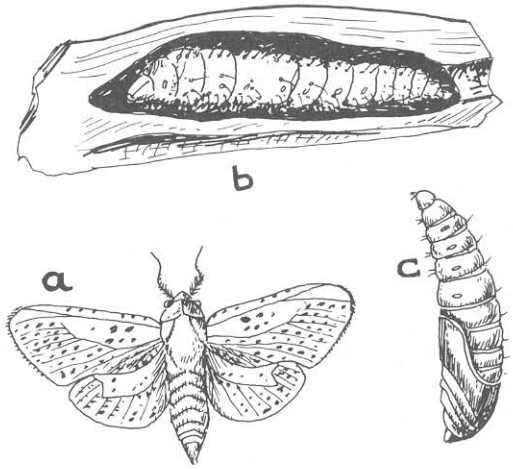

Figure 4. Zeuzera coffeae, *various stages.*

ZEUZERA COFFEAE NIETN. (COSSIDAE)

Zeuzera coffeae is a pest of cocoa (Sathiamma & Bhat, 1974) and is important as a branch and trunk borer of many trees.

The eggs are yellowish and are laid in groups on the small stems and branches. They turn dark yellow prior to hatching. The young larvae remain together for some time, and then disperse by a silken thread which is caught by wind and carried to different branches. The full-grown larva has a brownish head and is predominantly reddish brown in colour, with an average length of 6.5 cm. The larval period lasts for sixty to hundred days. Before pupation the larva makes an exit hole covered by a loosely severed piece of bark. Pupation occurs inside the larval tunnels, and the life cycle takes about four to five months for completion. The adult is a leopard moth *(Figure 4)* with wings which have dark spots on a white translucent background.

The young caterpillars make galleries in the newer portion of branches and fan shoots, and then progress to more mature parts. The galleries are long and irregular. A characteristic yellowish or reddish mixture of fluid and frass particles is present on the attacked portion. The region above this on the bark is darkened and soaked. Bore holes are seen on the branches through which pellet-like excreta are ejected. The excreta are seen in lumps sticking on to the bark or in a heap on the ground below. The attacked part dies eventually, and in saplings, the whole plant may be killed from a single attack.

This pest is found distributed in all the cocoa growing areas. The population is greater during post monsoon months when up to 65 per cent of the plants may be damaged by the pest, in an endemic area. Entwistle (1972) reported this pest on cocoa from Sri Lanka, Malaysia, Java, West Irian and the territory of Papua New Guinea, and a similar species on cocoa from Sabah and Peninsular Malaysia. Coffee, cotton and pomegranate are also recorded as alternate hosts (Nair, 1975).

EUPROCTIS SUBNOTATA WALK (LYMANTRIIDAE)

The hairy caterpillars are found feeding on tender leaves as well as on the surface tissue of young pods. Pods are preferred to leaves for feeding, and the attacked young pods dry up.

The yellowish moth lays eggs in masses of eight to ten on the lower surface of leaves. Egg masses are covered with hairs. The egg, larval and pupal stages last for five, fourteen to seventeen and eight to ten days respectively.

The caterpillars when fully grown are about 4 cm long.

EUPROCTIS GUTTATA WALK (LYMANTRIIDAE)

This is a related species of *Euproctis subnotata* which is observed to feed on cocoa leaves and pods causing similar damage. The moth is yellowish *(Figure 5),* lays eggs in groups on the lower surface of the leaf. The egg stage is from six to eight days, the larva eighteen to twenty-seven days, and the pupa nine to fifteen days.

During the survey it was found that the caterpillars of both these species together cause about 28 per cent damage to pods. The period of infestation is during June – July.

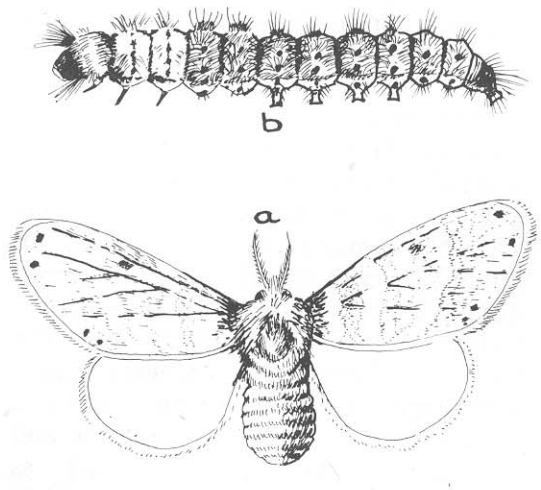

Figure 5. Euproctis guttata *Walk, adult female, and larva.*

ADOXOPHYES PRIVATANA WALK (TORTRICIDAE)

The caterpillar of this moth web together young leaves and feed from within, making irregular holes in them *(Figure 6).*

The tiny moth *(Figure 7)* lays eggs on tender twigs which hatch in about six days. The larval period is completed in sixteen to twenty days and the pupal period in four days. Pupation is within the webbed leaves. The total life cycle is completed in twenty-six to thirty days.

This pest is recorded here for the first time as a pest of cocoa in India. Entwistle (1972) recorded a species of *Adoxophyes* on cocoa from New

Figure 6. Adoxophyes privatana *Walk, on infected leaves.*

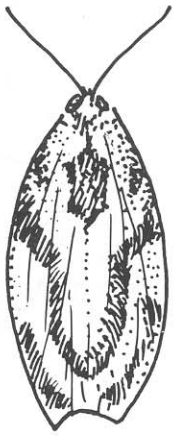

Figure 7. Adoxophyes privatana, *adult female.*

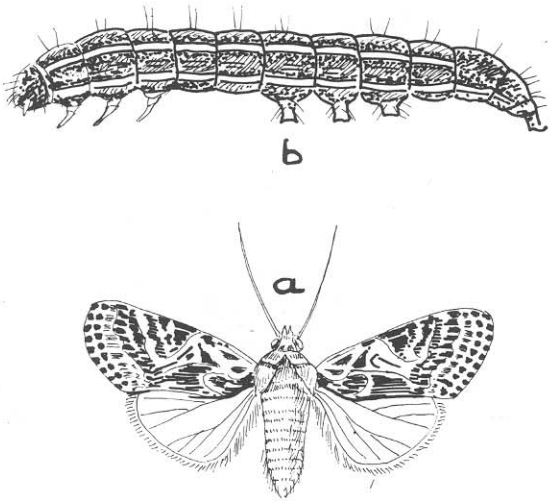

Figure 8. Spodoptera litura *Boisd, adult and larva.*

Hebrides. The pest is found in all the cocoa growing areas and the maximum infestation is recorded during January–March. On an average, leaves in about 28 per cent of the shoots are infested by the caterpillars during heavy infestation.

SPODOPTERA LITURA BOISD (NOCTUIDAE)

The caterpillars *(Figure 8)* cause serious damage in the nursery plants by completely defoliating seedlings and feeding on buds. The feeding takes place during the night. Due to frequent defoliation by the larvae the seedlings show a tendency for premature branching. During summer months it is absent in the field.

The eggs are laid on the leaves and covered with buff coloured hairs. About 500 eggs are laid by a female. Egg, larval and pupal period last for five, sixteen to eighteen and eight to fourteen days respectively.

The pest is observed in all the cocoa growing areas. Entwistle (1972) recorded it as an occasional pest from New Guinea, Fiji and Ghana.

Up to 42 per cent of the seedlings in the nursery were found damaged by this pest at Central Plantation Crops Research Institute (CPCRI), Regional Station Farm at Vittal in 1976. It is a polyphagous pest which feeds on many crop plants, like banana, castor, tomato and vegetables (Nair, 1975).

HYPOSIDRA TALACA WALK (GEOMETRIDAE)

The caterpillars of this sporadic pest feed heavily on foliage *(Figure 9).*

The female moth *(Figure 10)* lays eggs on the leaves, and on an average about 250 are laid. The egg period lasts for four days and larval period for nineteen to twenty-four days. The life cycle has a duration of thirty to thirty-five days. Pupation is on fallen leaves. The newly emerged caterpillar is brown in colour and on mature larvae, orange coloured dots are seen on the sides. The adult moth is a light pink colour.

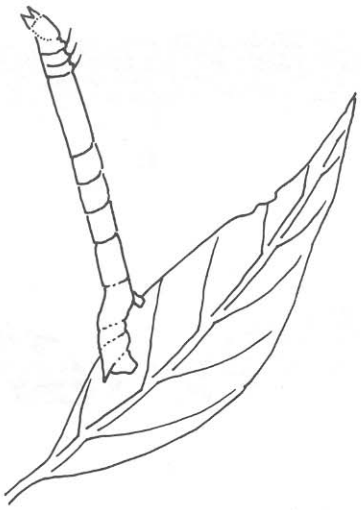

Figure 9. Hyposidra talaca *Walk, larva.*

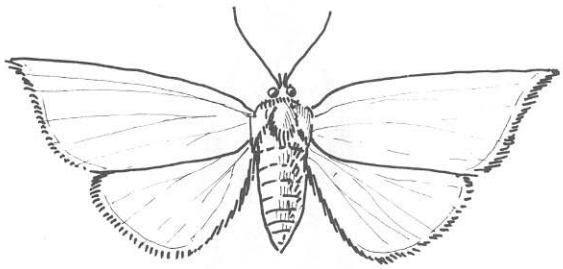

Figure 10. Hyposidra talaca, *adult female.*

This insect is present in all the cocoa growing areas surveyed and is recorded as a pest of cocoa by the authors for the first time. Entwistle (1972) recorded this pest on cocoa from Sabah and New Britain as a leaf and flower feeder. Millets, castor, sweet potato, mango and rose are its alternate hosts (Nair, 1975).

DIACRISIA OBLIQUA WALK (ARCTIIDAE)

The hairy caterpillar *(Figure 11)* feeds on tender leaves of cocoa. The caterpillar is orange coloured with brown hairs and bands on the body. The adult is a pale buff coloured moth with black dots on the wings. The body is crimson coloured, with black spots.

The adult female lays about 600 eggs during its life period. Egg, larval and pupal periods last for five, five to eighteen and seven days respectively.

This pest is mostly seen sporadically during September – October.

This insect is found to occur in the cocoa gardens of Karnataka and was not recorded earlier as a pest of cocoa in India. Pulses, castor, groundnut, banana, sesame and sweet potato are some of its alternate hosts (Nair, 1975).

DASYCHIRA MENDOSA HB. (LYMANTRIIDAE)

The adult moth lays yellowish coloured eggs on leaves. On emergence the caterpillars *(Figure 12)* feed on tender leaves, buds and the surface of tender pods.

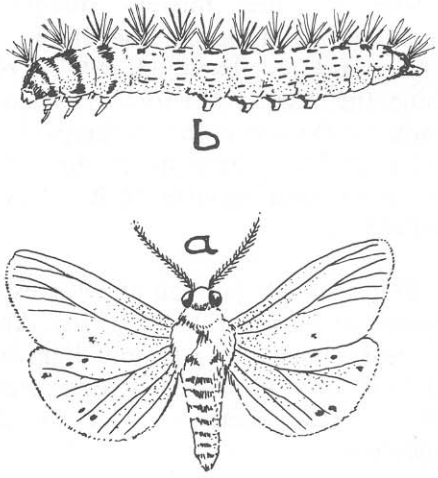

Figure 11. Diacrisia obliqua *Walk, adult and larva.*

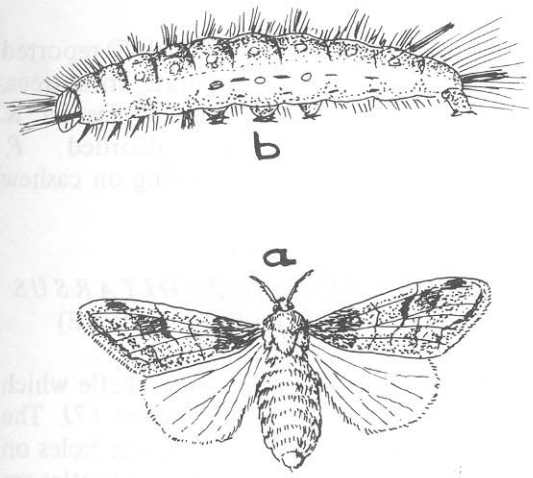

Figure 12. Dasychira mendosa *HB., adult and larva.*

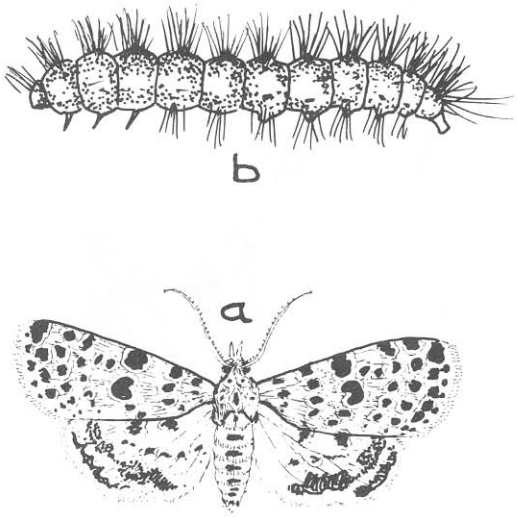

Figure 13. Pericallia ricini *F., adult and larva.*

The eggs are laid in masses. On the thorax of larva there are yellowish spots and red stripes. Paired lateral tufts of white hairs are present on each segment and on the dorsal side of third thoracic segment an additional pair of long white hairs are present. Pupation is in a cocoon of silk and white hairs. The adult is smoky brown with pale grey hind wings, with the forewing having a central patch.

This is the first record of this pest on cocoa from India, but it is observed as a pest of arecanut. Other alternate hosts include banana, mango and coffee (Nair, 1975). The pest is seen throughout the year with lowest population levels in summer months.

PERICALLIA RICINI F. (ARCTIIDAE)

The black hairy caterpillar *(Figure 13)* feeds in large numbers on cocoa leaves and in severe cases all the tender leaves are eaten. The full grown caterpillars are voracious feeders. The female moth lays eggs in groups on the undersurface of leaves. The egg period lasts for four days. The larval period is completed in thirty days. Pupation is in a cocoon , and it lasts for about ten days.

Banana, castor, pulses, cotton and vegetables are a few of a large range of alternate hosts (Nair, 1975).

ACHAEA JANATA L. (NOCTUIDAE)

The caterpillars feed voraciously on leaves, leaving behind only midribs and stalks of leaves.

The caterpillar *(Figure 14)* is long, slender and dark in colour with prominent blue black, reddish and yellow stripes and a dorsal projection near the hind-end of the body. The adult is greyish brown with wavy markings on the forewings and black and white markings on the hindwings.

Eggs are laid singly on the leaves. The egg period, larval period and pupal period last for about four days, twenty

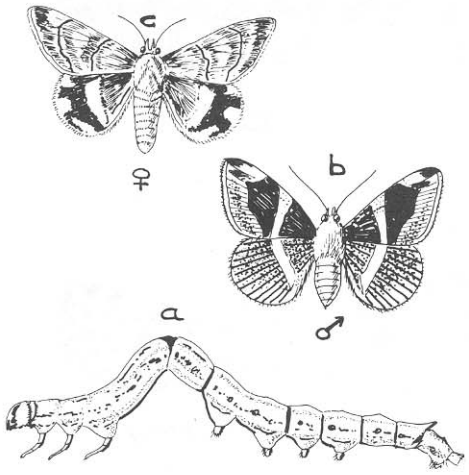

Figure 14. Achaea janata *L., larva, and adults, (b) male, (c) female.*

days and eight days respectively. Full grown larvae are light brown with white stripes on the body and pupate in leaf folds.

Alternate hosts include castor, citrus, pomegranate and rose (Nair, 1975).

POPILLIA COMPLANATA NEWM. (SCARABAEIDAE)

These beetles *(Figure 15)* damage the leaves severely. They have a preference for tender leaves. A single beetle eats an average of 176.5 cm^2 of leaves during its life (Prem Kumar, 1974b).

The beetles are very active, swift fliers and they feed during the night. The adult beetles remain on the underside of tender leaves and start feeding. In the beginning small circular holes are made and these holes coalesce and the leaf is heavily damaged by irregular perforations *(Figure 16).* The midrib portion is not eaten.

The pest is found throughout the year but the incidence is more during August–September. Nair (1975) reported this as a pest of temperate fruit trees. Sreeramulu, Prem Kumar, Daniel & Sathiamma (1975) recorded *P. complanata* as a pest feeding on cashew leaves.

MONOLEPTA LONGITARSUS J.G. (CHRYSOMELIDAE)

This is a small reddish flea beetle which feeds on cocoa leaves *(Figure 17).* The adult beetles cut small circular holes on the leaves. A large number of beetles are seen feeding on a single leaf. With the slightest disturbance, they jump away. In severe infestations the tender leaves are riddled with feeding holes and tender stems are also eaten. This is a first record on cocoa in India.

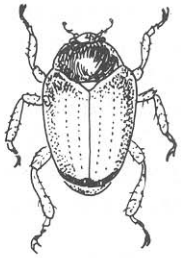

Figure 15. Popillia complanata, adult.

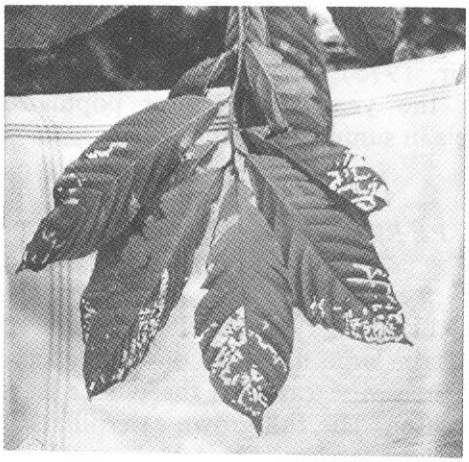

Figure 16. Damaged leaves caused by Popillia complanata.

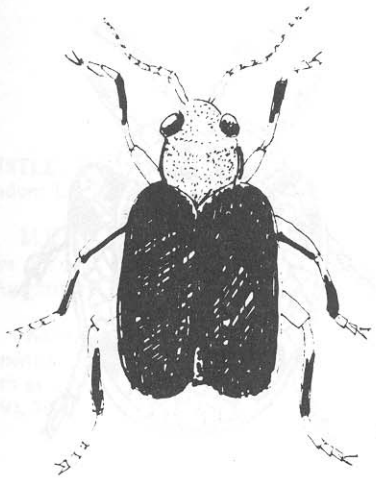

Figure 17. Small, red flea beetle.

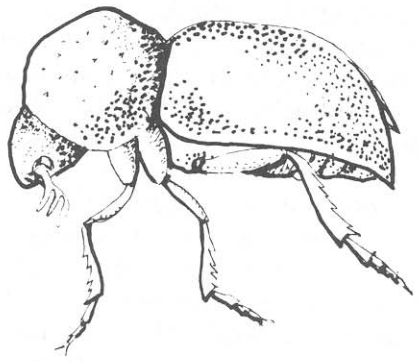

Figure 18. Sinoxylon *sp., adult beetle.*

SINOXYLON SP.
(BOSTRICHIDAE)

The adult beetles *(Figure 18)* bore into green shoots and twigs. The beetles are found infesting young seedlings planted in the field, which are killed due to the attack. Beetles bore into the stem and horizontal tunnels are made. The larvae also bore into the twigs of mature plants and remain in galleries which are circular and tightly packed with the sawdust-like material. Due to the combined attack of adults and grubs, the twigs dry up gradually. The attack by this pest can be identified by the presence of dried-up leaves.

Sinoxylon sudanicaum L. is reported as a pest of cotton (Nair, 1975). This is a first record on cocoa from India.

GLENEA SP.
(CERAMBYCIDAE)

This beetle *(Figure 19)* occurs in neglected plantations. Usually more than one grub is present in a stem. Attack is mostly on lower trunks and the branches are rarely attacked.

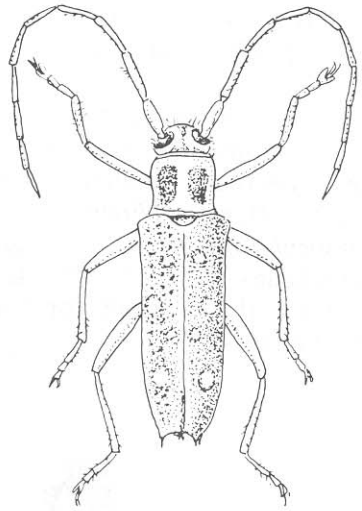

Figure 19. Glenea *sp. adult.*

The larva tunnels into the trunk and penetrates deeper, making galleries within. Wood as well as bark are consumed. When the dried-up wood is cut open, adults are found inside. Sometimes girdling of stem and branches is also noticed. Entwistle (1972) reported five species of *Glenea* attacking cocoa and this is the first record of the pest on cocoa from India.

Other caterpillar pests of cocoa observed are *Amsacta gangis* W. (Arctiidae), *Metanastria hyrtaca* Cram (Lasiocampidae), *Parasa lepida* G. (Cochlididae, *Figure 20*) and *Heliothis armigera* H. (Noctuidae) which are found only occasionally feeding on cocoa foliage.

The other stem boring beetles found on the dying and dead shoots are *Pterolophia annobonae* Aur. (Cerambycidae), *Brysax tuberculatus* Gra., *Ceropria induta* Weid. (Tenebrionidae), *Epistictia weisei* Spaeth, *Hyperaxis fulvohirsuta* Jac. (Chrysomelidae), *Lepropus oculatus* Heller., *Crinorrhinus crassirostris* Fst. (Curculionidae), *Rhychites* sp. (Attelabidae).

The role of these pests on cocoa is to be fully ascertained. Minor leaf feeding beetles include *Metriona circumdata* Hebst. *(Figure 21)* and *Aspidomorpha miliaris* Fabr. (*Figure 22,* Chrysomelidae). These beetles are recorded by the authors for the first time during the survey.

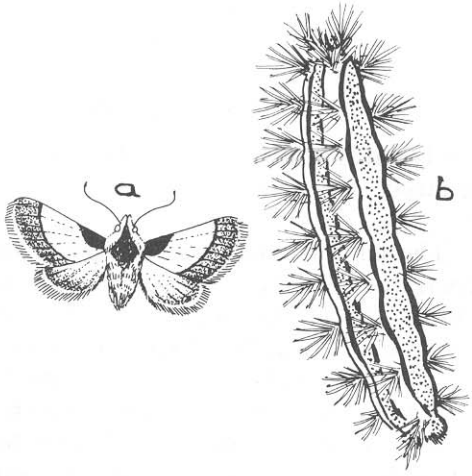

Figure 20. Parasa lepida *G., adult and larva.*

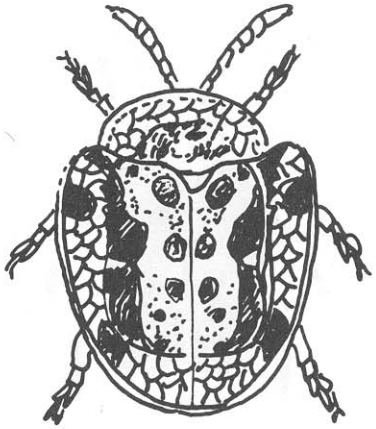

Figure 21. Metriona circumdata *Hebst., adult.*

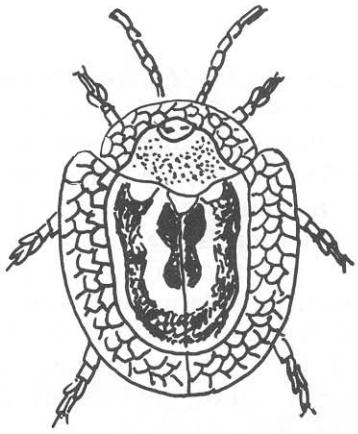

Figure 22. Aspidomorpha miliaris *Fabr., adult.*

ACKNOWLEDGEMENT

The authors are grateful to Dr N.M. Nayar, Director, Central Plantation Crops Research Institute, Kasaragod 670124, Kerala, India for the constant encouragement and to the Director, Commonwealth Institute of Entomology, London for identifying the pests.

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