

# TAXONOMY OF THE BRUCHIDAE (COLEOPTERA) OF NORTHWEST INDIA PART II LARVAE

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**ABSTRACT.** The larvae of Bruchidae are serious pests attacking mostly the edible seeds of leguminous plants and the seeds of the forest trees, the medicinal and the ornamental plants, rendering them unmarketable and unfit for human consumption and useless for propagation. All this results in a heavy damage and loss to our food stuffs and other utility products. Some of the larvae attack the seeds of the noxious weeds and are, thus, of biological weed-control significance.

The larvae are more or less C-shaped, soft-bodied or tough. The head is sclerotized and retracted for the most part into the prothorax. The number of ocelli varies from one pair to three pairs except in *Bruchus* in which they are lacking. The maxillae and the labium form a labio-maxillary complex. The mala carries 4-6 spatulate processes. The length of the antennal seta, the presence or absence of the postmental sclerite, and the armature of the labrum, frons, clypeus and epipharynx are some of the important taxonomic characters separating the different species.

Detailed descriptions of the final instar larvae of 36 species have been included in the present studies with larval keys to the subfamilies, genera and species of Bruchidae from North-west India.

## INTRODUCTION

The larvae of the family Bruchidae are serious pests mostly of the leguminous plants, attacking their seeds either in the stores or in the pods of their host-plants in the fields. Notable contributions to the larval morphology of bruchids have been made by Kunhi Kannan (1923), Boving (1927), Henriksen (1927), Mukerjee (1938), Steffan (1946), Genduso (1958), De Luca (1959, 63), Parneell (1964) and Prevett (1971). Boving (1927) and Prevett (1971) have indicated some of the guidelines for larval classification.

The larvae are curved, more or less C-shaped, swollen in the anterior region and gradually tapering behind. They may be globular and soft-bodied or elongated and tough. They are usually dull-white to light-brown in body coloration. The head is sclerotized, short, dark brown and retracted for the most part into the prothorax. A pair of ocelli is present in most of the species but there are three pairs of ocelli in the genus *Caryedon* and none in the genus *Bruchus*. The maxillae and the labium are fused into a labio-maxillary complex. The maxillary palp is one-segmented except in the genus *Caryedon* where it is three-segmented. The mala carries 4-6 spatulate processes. The shape of the

premental sclerite and whether the post-mentum is membranous or provided with a postmental sclerite are some of the other important taxonomic characters for separating the different species. The first instar larva possesses an H-shaped prothoracic plate of taxonomic importance which has not been included in the present study. The legs may be rudimentary or knob-like, may be missing in some of the larvae, or may be well developed and segmented in others, and functional in *Caryedon*.

The larvae of bruchids breed inside the seeds of their host-plants, pass through their larval stages and usually pupate within the seeds, ultimately emerging as adults. The larvae of *Caryedon* are exceptional in preparing papery cocoons on the surface of the seeds of their host-plants or within the seeds when the cocoons are seen protruding out partially. The larval attack, thus, renders the edible seeds of some plants such as the pulses, peas, beans and lentils as unmarketable and unfit for human consumption, and the seeds of some of the forest trees, the medicinal and the ornamental plants as useless for propagation, resulting in a heavy damage and a great loss to our food stuffs and other utility products. It is, therefore, our concern to take effective steps to control these larvae. There are still some other larvae which breed on the pods and in the seeds of some noxious weeds and are considered of great economic importance in keeping the population of such weeds under control. The exploitation of weeds-control has a greater practical significance.

Detailed descriptions of the final instar larvae of 36 species of bruchids have been included in the present studies with larval keys to the subfamilies, genera and species of the family Bruchidae from Northwest India. Of the 36 species of larvae, 26 belong to the subfamily Bruchinae (1 to the genus *Bruchus*, 3 to *Callosobruchus*, 2 to *Specularius*, 2 to *Conicobruchus*, 1 to *Sulcobruchus* and 17 to *Bruchidius*), 2 to the subfamily Amblycerinae (1 to the genus *Spermophagus* and 1 to *Zabrotes*), and 8 to the subfamily Pachymerinae (all to the genus *Caryedon* only). The study of larval morphology would give us a thorough insight into the adult-larval relationship.

## SYSTEMATICS

### KEY TO THE LARVAE OF SUBFAMILIES AND GENERA OF BRUCHIDAE

1. Larvae elongated and tough; three pairs of ocelli present; maxillary palp three-segmented; antenna with 2-3 secondary setae; labrum with two pairs of basal setae; six marginal epipharyngeal setae and one pair of lateral epipharyngeal setae; salivary glands long, reaching up to middle of abdomen; 11 pairs of air sacs present; 2 pairs of malpighian tubules (SUBFAMILY PACHYMERINAE) . . . . . Genus *Caryedon* only

Larvae globular and soft; ocelli when present not more than one pair; maxillary palp one-segmented; antennae with one secondary seta when present; labrum with one pair of basal setae; marginal epipharyngeal setae variable but never six, lateral epipharyngeal setae absent; salivary glands

- short, not surpassing the thorax; air sacs not more than five pairs; three pairs of malpighian tubules. . . . . 2
2. Antennae without secondary setae; legs distinctly 3 or 4 segmented; epipharynx with 2 pairs of marginal setae (SUBFAMILY BRUCHINAE) . . . 3
- Antennae with one secondary seta when present; legs vestigial, knob-like or absent; epipharynx with more than 4 marginal setae (SUBFAMILY AMBLYCERINAE) . . . . . 8
3. Labial palpi absent . . . . . 4
- Labial palpi present . . . . . 6
4. Ocelli absent . . . . . **Bruchus**
- One pair of ocelli . . . . . 5
5. Malar processes six . . . . . **Callosobruchus**
- Malar processes less than six . . . . . **Bruchidius**
6. Postmental sclerite present . . . . . **Conicobruchus**
- Postmental sclerite absent . . . . . 7
7. Premental sclerite conically produced posteriorly . . . . . **Specularius**
- Premental sclerite rounded posteriorly . . . . . **Sulcobruchus**
8. Epipharynx with 7 marginal setae; legs knob-like . . . . . **Zabrotes**
- Epipharynx with 5 marginal setae; legs absent . . . . . **Spermophagus**

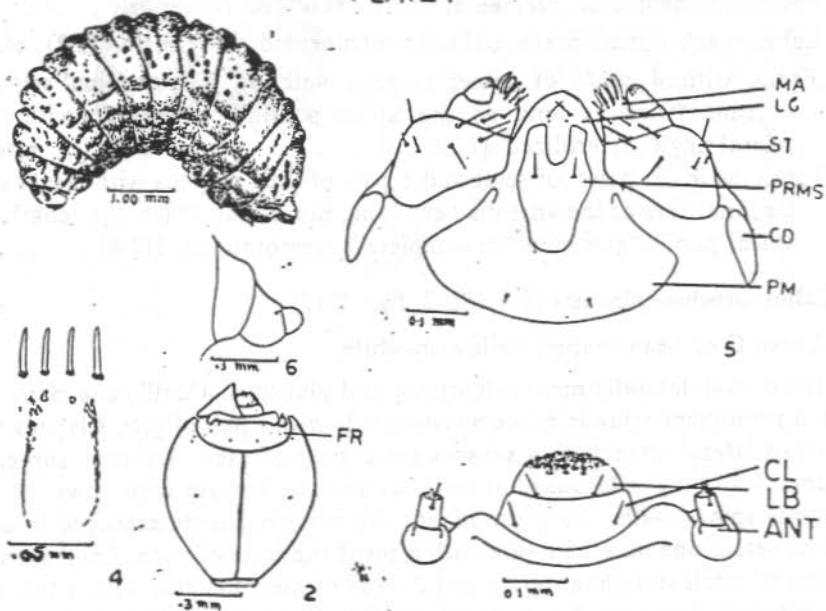
# 1. *Bruchus pisorum* L. (Pl. 1, figs. 1-6)

Larva bean-shaped, white.

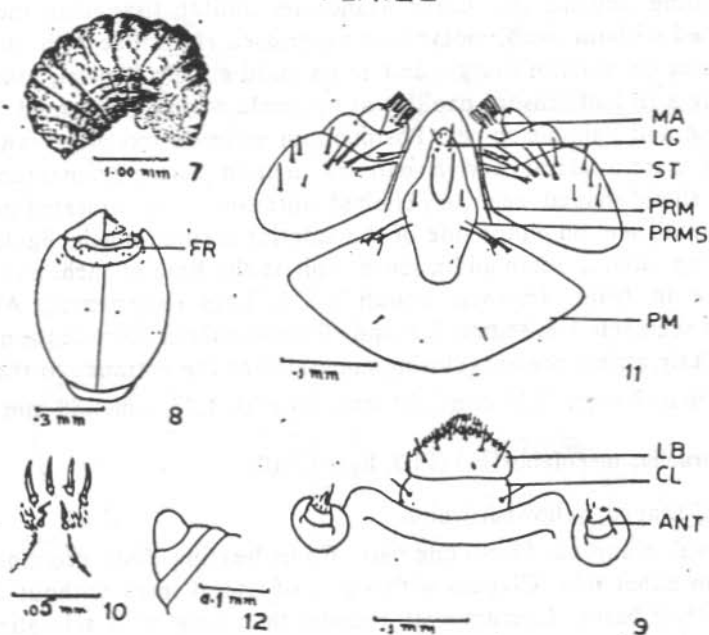
Head oval, glabrous. Ocelli absent. Frons with 3 prominent setae and a sensory pit on either side. Clypeus with a pair of prominent lateral setae with no sensory pit at their bases. Labrum oval, broader than long and sclerotized at base, with rows of small terminal spines, three long submarginal setae and a pair of basal setae, one on either side with a sensory pit at the base of each. Epipharynx with two pairs of marginal and two pairs of median setae, and numerous short spinules. Antennae two-segmented, basal segment membranous, distal sclerotized and long, terminal seta of antenna projecting beyond the tip of apical papilla. Mandibles similar, triangular; incisor area of each chisel-shaped, without teeth; molar area suppressed. Maxillae with stipes having long setae on anterior side and in its middle; palp conical, one-segmented, bearing a group of sensory papillae at its tip; mala with four broad processes at distal end. Postmentum more or less c-shaped, membranous, not distinctly separated from prementum, with a pair of anterolateral and a pair of median setae; prementum with an elongated shield-shaped sclerite, bilobed anteriorly and broadly rounded posteriorly, with a seta on either side near the median notch; ligula with a pair of long aboral setae and a sensory pit at the base of each. Thoracic annuli 2, 2, 3. Legs 3-segmented. Abdominal annuli 2 each in segments 1-8, 9th and 10th segments uniannulate. Spiracles annular with hair, atrium present, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 3.83 mm-4.84 mm. Breadth 2.11 mm-2.49 mm.

## PLATE-1



## PLATE-2

Plate 1. *Bruchus pisorum* L.

Figs. 1, Lateral view of the larva; 2, Dorsal view of the head; 3, Aboral view of labrum and antennae; 4, Epipharynx; 5, Aboral view of the labium and maxillae; 6, Leg.

Plate 2. *Callosobruchus chinensis* (L.)

Figs. 7, Lateral view of the larva; 8, Dorsal view of the head; 9, Aboral view of labrum and antennae; 10, Epipharynx; 11, Aboral view of labium and maxillae; 12, Leg.

KEY TO THE LARVAE OF *CALLOSOBRUCHUS*

1. Labrum semicircular; premental sclerite rounded posteriorly . . . . . 2  
     Labrum subconical; premental sclerite truncated posteriorly. (Pl.2). *chinensis*
2. Frons with 4 pairs of setae; clypeus without pits; terminal seta of the antenna twice as long as the apical papilla; postmentum with antero-lateral angles sclerotized. (Pl.3). . . . . *maculatus*  
     Frons with 3 pairs of setae and 1 pair of pits; clypeus with a pair of pits; terminal seta of the antenna very long, more than twice the length of the apical papilla; postmentum completely membranous. (Pl.4) . . . *analis*

2. *Callosobruchus chinensis* (L.) (Pl. 2, figs. 7-12)

Larva C or bean-shaped, yellowish-white.

Head oval, laterally more sclerotized and glabrous. Ocelli one pair. Frons with 3 prominent setae in a line on either side with a pair of pits. Clypeus having a pair of lateral setae, with a sensory pit at base of each. Labrum sub-conical. broader than long, sclerotized at base; its anterior margin with rows of small marginal spines, with 4 long prominent sub-marginal setae arranged in an arc, 2 basal setae, one on either side with a pit at the base of each. Epipharynx with 2 pairs of small straight anterior and 2 pairs of median setae with a few marginal spinules. Antennae 2-segmented, basal segment membranous, distal sclerotized, terminal seta nearly twice as long as the conical, apical, sensory papilla and projecting beyond the latter. Mandibles similar, triangular, incisor area chisel-shaped without teeth, molar area suppressed. Maxillae with stipes bearing long setae on anterior margin and in its middle; palp conical, one-segmented, bearing a ring of sensory papillae at tip; mala with 6 truncated processes at distal end and 3 simple spines. Postmentum more or less membranous with 2 pairs of antero-lateral and a pair of median setae; prementum with an elongated shield-shaped sclerite, bilobed anteriorly and truncated posteriorly bearing a small seta on either side of the anterior median notch; ligula with a pair of long aboral setae and a sensory pit at the base of each, and a pair of short setae in front. Thoracic annuli 3, 2, 3. Legs 3-segmented. Abdominal annuli 2 in segments 1-8, segment, 9 and 10 uniannulate. Spiracles annular with branching hair, atrium presents closing apparatus at the entrance to the trachea.

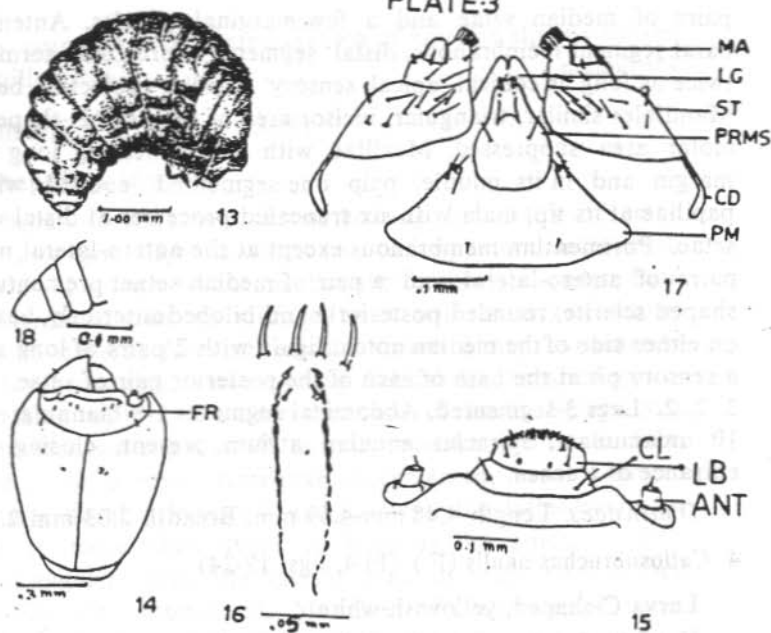
*Dimensions:* Length 3.36 mm-3.69 mm. Breadth 1.47 mm-1.89 mm.

3. *Callosobruchus maculatus* (F.) (Pl.3, figs. 13-18)

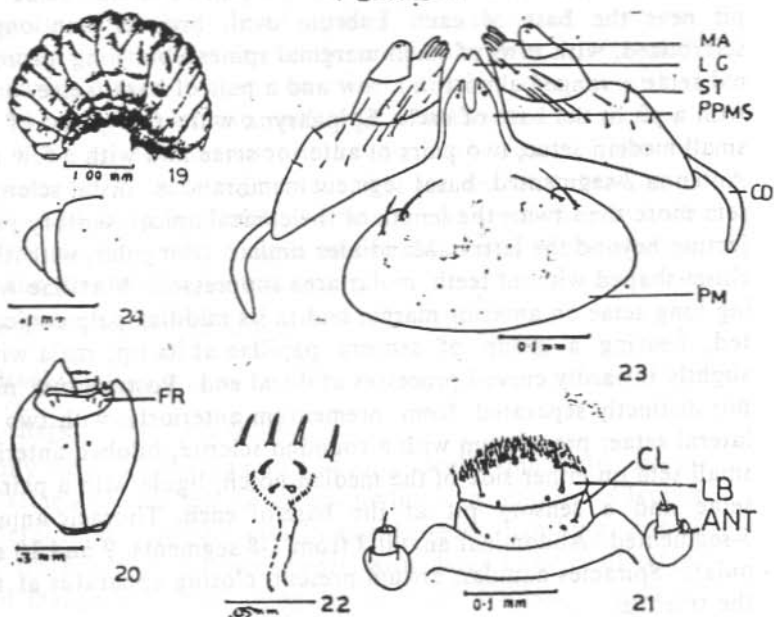
Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons bearing four prominent setae in an arc on either side. Clypeus with a pair of lateral setae without any sensory pit at their bases. Labrum oval, broader than long, with sclerotized base; provided with rows of small marginal spines, four long prominent submarginal setae and two large basal setae, one on either side with a sensory pit inner to the base of each. Epipharynx with two pairs of slightly curved marginal and 2

## PLATE 3



## PLATE 4

Plate 3. *Callosobruchus maculatus* (F.)

Figs. 13, Lateral view of the larva; 14, Dorsal view of the head; 15, Aboral view of labrum & antennae; 16, Epipharynx; 17, Aboral view labium & maxillae; 18, Leg.

Plate 4. *Callosobruchus analis* (F.)

Figs. 19, Lateral view of the larva; 20, Dorsal view of the head; 21, Aboral view of labrum & antennae; 22, Epipharynx; 23, Aboral view labium & maxillae; 24, Leg.



pairs of median setae and a few marginal spinules. Antennae 2-segmented, basal segment membranous, distal segment sclerotized, terminal seta almost twice as long as conical, apical, sensory papilla, projecting beyond the latter. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed. Maxillae with stipes bearing long setae on anterior margin and in its middle; palp one-segmented, conical, with a few sensory papillae at its tip; mala with six truncated processes at distal end and 5 simple setae. Postmentum membranous except at the antero-lateral margins with two pairs of antero-lateral and a pair of median setae; prementum with a shield-shaped sclerite, rounded posteriorly and bilobed anteriorly, bearing a small seta on either side of the median notch; ligula with 2 pairs of long aboral setae, and a sensory pit at the base of each of the posterior pair of setae. Thoracic annuli 3, 2, 2. Legs 3-segmented. Abdominal segments 1-8 biannulate, segments 9 and 10 uniannulate. Spiracles annular, atrium present, closing apparatus at the entrance of trachea.

*Dimensions:* Length 4.48 mm-4.69 mm. Breadth 2.03 mm-2.24 mm.

#### 4 *Callosobruchus analis* (F.) (Pl.4, figs. 19-24)

Larva C-shaped, yellowish-white.

Head oval, lateroventrally and posteriorly more sclerotized, glabrous. Ocelli one pair. Frons with three setae on either side arranged in an arc and a pair of posteromedian pits. Clypeus bearing a pair of lateral setae with a sensory pit near the base of each. Labrum oval, broader than long, with the base sclerotized, with rows of small marginal spines, four long prominent submarginal setae arranged almost in a row and a pair of basal setae, one on either side, with a pit at the base of each. Epipharynx with two pairs of slightly curved small median setae, two pairs of anterior setae and with a few marginal spines. Antenna 2-segmented, basal segment membranous, distal sclerotized, terminal seta more than twice the length of the conical apical, sensory papilla and projecting beyond the latter. Mandibles similar, triangular, with the incisor area chisel-shaped without teeth, molar area suppressed. Maxillae with stipes bearing long setae on anterior margin and in its middle; palp conical, one-segmented, bearing a group of sensory papillae at its tip; mala with six truncated slightly inwardly curved processes at distal end. Postmentum membranous and not distinctly separated from prementum anteriorly, with two pairs of antero-lateral setae; prementum with a rounded sclerite, bilobed anteriorly, bearing a small seta on either side of the median notch; ligula with a pair of long aboral setae and a sensory pit at the base of each. Thoracic annuli 3, 2, 3. Legs 3-segmented. Abdominal annuli 2 from 1-8 segments, 9 and 10 segments unian-nulate. Spiracles annular, atrium present, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 3.64 mm-3.92mm. Breadth 1.89 mm-1.96 mm.

#### KEY TO THE LARVAE OF *SPECULARIUS*

Clypeus with a pair of setae; terminal seta of antenna more than twice as long as sensory papilla. (Pl.5) . . . . . *bridwelli*

Clypeus with two pairs of setae; terminal seta of antenna slightly longer than sensory papilla. (Pl.6). . . . . **maindroni**

5. *Specularius bridwelli* Arora (Pl.5, figs. 25-29)

Larva C-or bean-shaped, pale white.

Head oval and glabrous. Ocelli absent. Frons bearing three pairs of setae and one pair of sensory pits. Clypeus with a pair of long lateral setae, each with a conical nodule at the base. Labrum broadly conical, broader than long, with a narrow sclerotized area; its surface beset with a large number of setae of varying sizes, several rows of minute spines along its anterior border, two pairs of sub-marginal setae arising behind the marginal spines and a pair of basal setae with a pit near the base of each. Epipharynx with 2 pairs of thick median setae and small, minute spinules on its surface, and four anterior setae in a row. Antennae 2-segmented, basal segment membranous and short, distal sclerotized and conical, the latter bearing a terminal seta which is more than twice as long as the apical papilla. Mandibles similar, triangular, with the incisor area of each chisel-shaped without any teeth; molar area suppressed. Maxillae with surface of stipes covered with long setae in its middle and on the anterior margin; palp one-segmented, conical, bearing a group of small sensory papillae at its tip; mala with five spatulate processes at its distal end. Postmentum more or less membranous, with two pairs of antero-lateral and a pair of median setae; prementum with an elongated shield-shaped sclerite, bifurcated anteriorly, conical and tapering posteriorly, having a pair of short conical labial palpi, one on either side of the notch of the premental sclerite, each with a small seta near its base; ligula with a pair of setae and a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs nipple-like, three-segmented, ultimate segment bearing a seta and a sensory pit. Abdominal segments 1-8 biannulate, segments 9 and 10 uniannulate. Spiracles annular, with simple hair in distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 2.92 mm. Breadth 1.58 mm.

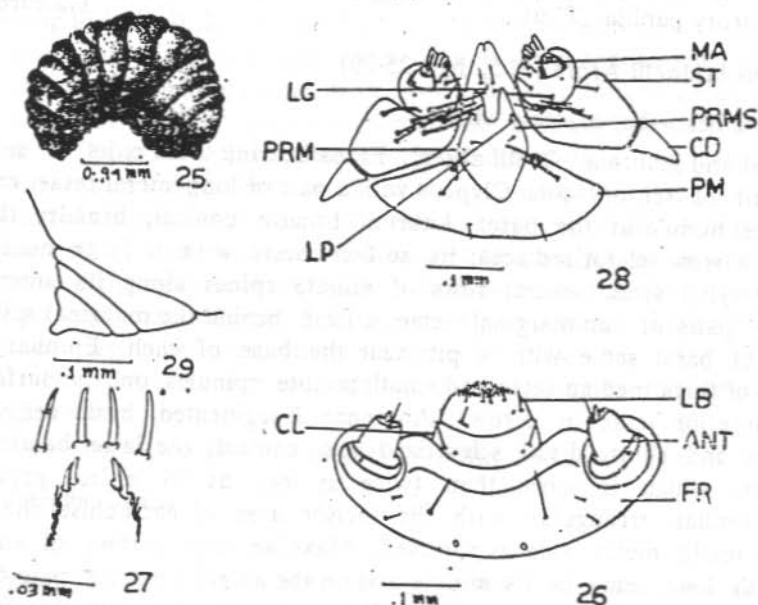
6. *Specularius maindroni* (Pic) (Pl. 6, figs. 30-35)

Larva C-or bean-shaped, yellowish-white.

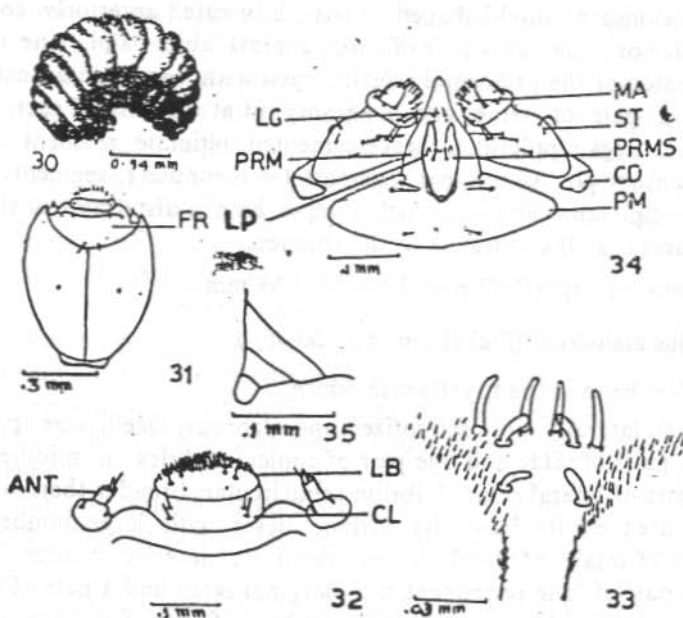
Head oval, laterally more sclerotized and glabrous. Ocelli one pair. Frons bearing two pairs of setae and one pair of conical nodules in middle. Clypeus with two pairs of lateral setae. Labrum semicircular, broader than long, with a sclerotized area at its base; its surface beset with large number of setae, several rows of small marginal spines along its anterior border, a pair of marginal, a pair of long prominent sub-marginal setae and a pair of basal setae one on either side with a sensory pit at the base of each. Epipharynx with two pairs of small blunt broad median setae. two pairs of short setae at its anterior border and numerous minute spinules on its surface. Antennae two-segmented, basal segment small and membranous, distal segment sclerotized, the latter



## PLATE-5



## PLATE-6

Plate 5. *Specularius bridwelli* Arora

Figs. 25, Lateral view of the larva; 26, Aboral view of the labrum & antennae; 27, Epipharynx; 28, Aboral view of labium & maxillae; 29, Leg.

Plate 6. *Specularius maindroni* (Pic)

Figs. 30, Lateral view of the larva; 31, Dorsal view of the head; 32, Aboral view of labrum & antennae; 33, Epipharynx; 34, Aboral view of labium & maxillae; 35, Leg.

bearing terminal seta which is slightly longer than apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped and without teeth, molar area suppressed. Maxillae with surface of stipes covered with a few long setae; palp one-segmented bearing a group of small sensory papillae at its tip; mala with five truncated processes at distal end. Postmentum more or less membranous and not distinctly separated anteriorly from prementum, with 2 pairs of antero-lateral and a pair of median basal setae; prementum with an elongated sclerite bifurcated anteriorly and conical posteriorly, bearing a small seta on either side of median notch; ligula with a pair of setae and a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs nipple-like, three-segmented. Abdominal segments 1-8 biannulate, 9 and 10 unianulate. Spiracles annular with simple hair; atrium present, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 2.59 mm-2.88 mm. Breadth 1.49 mm-2.44 mm.

#### KEY TO THE LARVAE OF *CONICOBRUCHUS*

Body bean-shaped, yellowish white; labrum with two pairs of long submarginal setae in a row; posterior margin of premental sclerite rounded.

(Pl. 7) . . . . . *albopubens*

Body C-shaped, white; labrum with two pairs of long submarginal setae in two rows, one behind the other; posterior margin of premental sclerite emarginate. (Pl. 8) . . . . . *indicus*

#### 7. *Conicobruchus albopubens* (Pic) (Pl. 7, figs. 36-40)

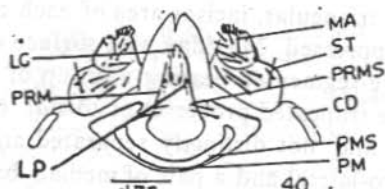
Larva bean-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons provided with three pairs of setae and a pair of pits. Clypeus provided with a pair of lateral setae and a sensory pit at the base of each, with a narrow transverse sclerotized area along its anterior margin. Labrum semicircular, with a narrow sclerotized area along its base; its surface beset with setae of varying sizes, several rows of small marginal spines arranged along its anterior margin, 4 long submarginal setae behind the margin and a pair of basal setae with a pit at the base of each. Epipharynx with 2 pairs of curved, slender, short median setae, two pairs of long blunt setae along its anterior border and numerous fine hairs on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna nearly twice as long as apical papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed. Maxillae with surface of stipes covered with long setae; palp one-segmented, bearing a group of small sensory papillae at its tip; mala with five spatulate processes at distal end. Postmentum C-shaped with a transverse sclerite, with 2 pairs of anterolateral and a pair of median setae; prementum with an elongated shield-shaped sclerite, bilobed anteriorly and with rounded posterior margin; sclerite bearing a pair of median setae one on either side of the median notch; ligula with a pair of setae and a sensory pit

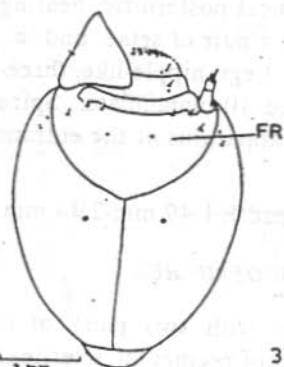
## PLATE-7



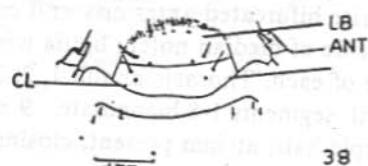
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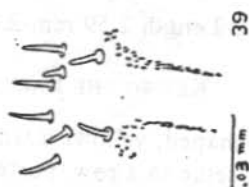
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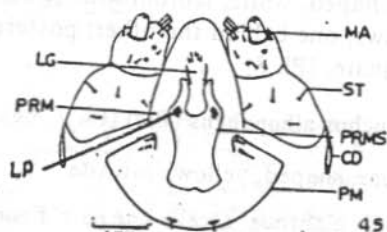


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## PLATE-8



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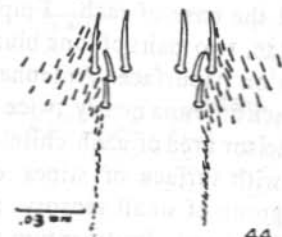
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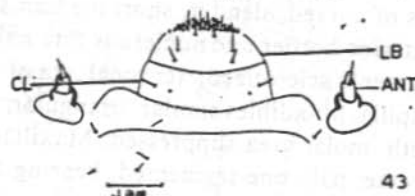
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43

Plate 7. *Conicobruchus albopubens* (Pic)

Figs. 36, Lateral view of the larva; 37, Dorsal view of the head; 38, Aboral view of labrum & antennae; 39, Epipharynx; 40, Aboral view of labium & maxillae.

Plate 8. *Conicobruchus indicus* (Pic)

Figs. 41, Lateral view of the larva; 42, Dorsal view of the head; 43, Aboral view of labrum & antennae; 44, Epipharynx; 45, Aboral view of labium & maxillae; 46, Leg.

at the base of each. Thoracic annuli 1, 2, 2. Legs three-segmented. Abdominal segments 1-7 biannulate; 8th, 9th and 10th segments uniannulate. Spiracles annular, with fine hair on the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 1.68 mm-2.28 mm. Breadth 0.91 mm-0.96 mm.

**Conicobruchus indicus (Pic) (Pl. 8, figs. 41-46)**

Larva C-shaped, white.

Head more or less rounded, laterally more sclerotized and glabrous. Ocelli one pair. Frons with three pairs of prominent setae and a pair of median pits. Clypeus bearing a pair of lateral setae with a sensory pit at the base of each, with a narrow sclerotized area along its anterior margin. Labrum semicircular, broader than long, with a broad sclerotized area along its base, its surface beset with a large number of setae of varying sizes, several rows of small marginal spines along its anterior border, two pairs of prominent submarginal setae, one pair behind the other, and one pair of basal setae. Epipharynx with two pairs of straight median setae, two pairs of long setae along its anterior margin and some spinules on its surface. Antennae 2-segmented, basal segment membranous, distal sclerotized, terminal seta of each antenna nearly twice as long as the conical, apical sensory papilla. Mandibles similar, triangular, incisor area of each simple without any teeth, molar area suppressed. Maxillae with cardo narrow, elongate; surface of stipes with a few setae in its middle; palp conical, one-segmented, bearing a ring of sensory papillae at its tip, with a sensory pit and a seta in its middle; mala with five truncated processes at distal end. Postmentum C-shaped sclerotized completely, distinctly demarcated from prementum, with two pairs of antero-lateral and a pair of median setae; prementum with an elongated saddle-shaped sclerite, bifurcated anteriorly, emarginate posteriorly, with a small seta on either side of median notch; ligula with a pair of long setae and a sensory pit at the base of each, with a few spines between them. Thoracic annuli 1, 2, 3. Legs: vestigial, three segmented. Abdominal segments 1-8 biannulate, 9th and 10th uniannulate. Spiracles annular, with simple hair lining the atrium, closing apparatus at the entrance to the trachea.

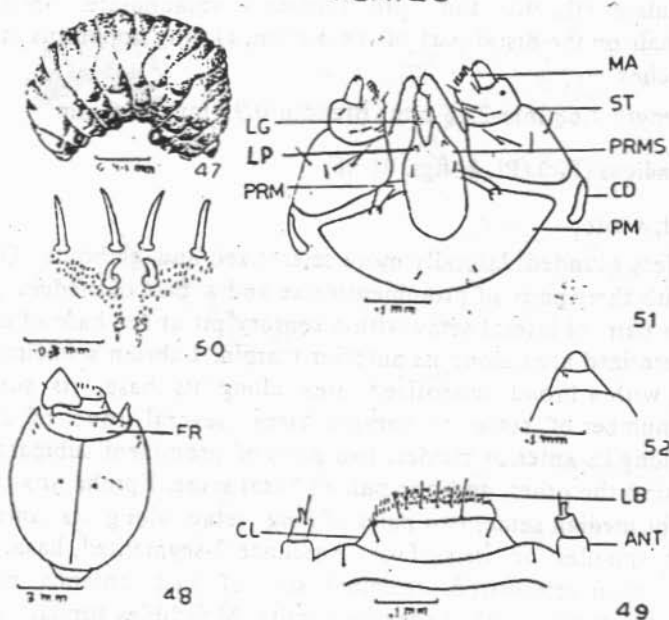
*Dimensions* : Length 6.09 mm-6.59mm. Breadth 2.21 mm-2.64 mm.

**9. Sulcobruchus kingsolveri Arora (Pl. 9, figs. 47-52)**

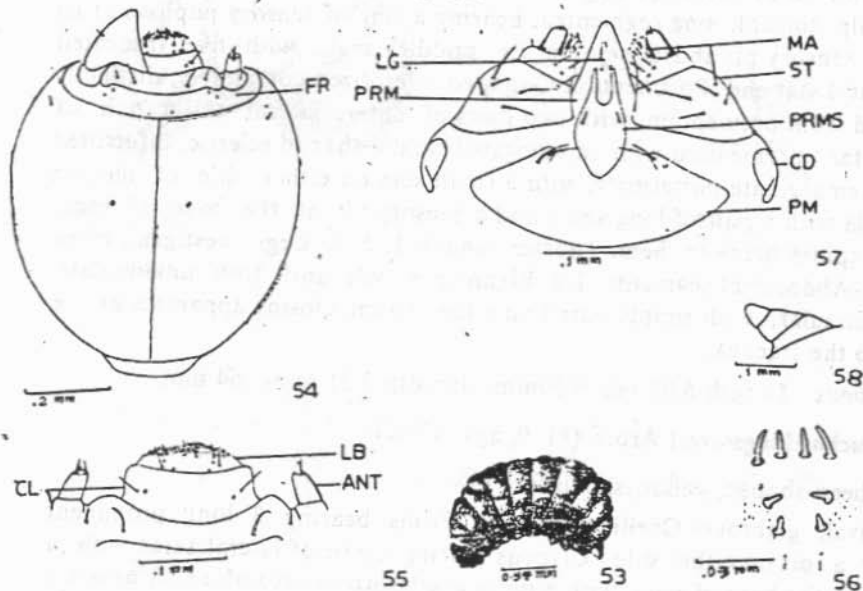
Larva bean-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons bearing 3 long prominent setae and a pit on either side. Clypeus bearing a pair of lateral setae with a sensory pit at the base of each, with a narrow sclerotized area along its anterior margin. Labrum more or less rectangular, much broader than long, with a narrow sclerotized area along its posterior margin, its surface beset with large number of setae of varying sizes, several rows of small marginal spines along its anterior border, two pairs of prominent submarginal setae arising

## PLATE-9



## PLATE-10

Plate 9. *Sulcobruchus kingsolveri* Arora

Figs. 47, Lateral view of the larva; 48, Dorsal view of the head; 49, Aboral view of labrum & antennae; 50, Epipharynx; 51, Aboral view of labium & maxillae; 52, Leg.

Plate 10. *Bruchidius angustifrons* Schilsky

Figs. 53, Lateral view of the larva; 54, Dorsal view of the head; 55, Aboral view of labrum & antennae; 56, Epipharynx; 57, Aboral view of labium & maxillae; 58, Leg.

behind the marginal spines and a pair of basal setae with a pit at the base of each. Epipharynx with 2 pairs of small, hooked, median setae, 2 pairs of long anterior setae and a number of spinules on the surface. Antennae 2-segmented, segments sclerotized, terminal seta almost twice as long as the apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped and without any teeth, molar area suppressed, with a seta in the middle of outer side of each mandible. Maxillae with cardo narrow and curved; surface of stipes covered with a few long setae in middle; palp one-segmented, bearing a group of sensory papillae at its tip, a pit at its base and a seta in its middle; mala with five truncated processes at distal end. Postmentum C-shaped, not distinctly separated from prementum in front, with two pairs of long anterolateral and a pair of short median setae; prementum with an elongated shield-shaped sclerite, bilobed anteriorly and rounded posteriorly with a pair of small setae, one on either side in its middle, behind the labial palp; ligula with a pair of long setae and a sensory pit at the base of each seta. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdomen with 1st to 7th segments biannulate; 8th 9th and 10th segments uniannulate. Spiracles annular with simple hair, atrium present, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 2.88 mm-3.31 mm. Breadth 1.43 mm-1.68 mm.

#### KEY TO THE LARVAE OF *BRUCHIDIUS*

1. Malar processes 5 . . . . . 2  
    Malar processes 4 . . . . . 14
2. 4 submarginal setae on labrum . . . . . 3  
    3 submarginal setae on labrum . . . . . 7
3. Premental sclerite variable but not rounded posteriorly . . . . . 4  
    Premental sclerite broadly rounded posteriorly . . . . . 5
4. Terminal seta slightly projecting beyond apical papilla; premental sclerite conical posteriorly (Pl. 10). . . . . *angustifrons*  
    Terminal seta twice as long as apical papilla; premental sclerite emarginate and bilobed posteriorly (Pl. 11). . . . . *sahlbergi*
5. Ligula without small spines between the pair of long setae. . . . . 6  
    Ligula with small spines between the pair of long setae (Pl. 12). . . . . *tephrosiae*
6. Terminal seta nearly  $2\frac{1}{2}$  times as long as apical papilla; frons with 2 pairs of setae (Pl. 13). . . . . *andrewesi*  
    Terminal seta only slightly projecting beyond the tip of apical papilla; frons with one pair of setae and a pair of pits (Pl. 14). . . . . *cassiae*
7. Ante-clypeus with a pair of lateral sensory pits. . . . . 8  
    Ante-clypeus without any lateral sensory pits. . . . . 13
8. Ligula with some spinules between pair of large setae. . . . . 9  
    Ligula without spinules between pair of large setae. . . . . 10



9. Labrum oval, terminal seta of the antenna twice as long as apical papilla (Pl. 15). . . . . **urbanus**  
 Labrum trapezoidal, terminal seta of the antenna slightly longer than apical papilla (Pl. 16). . . . . **aureus**
10. Postmentum completely membranous; antennal seta longer than papilla. 11  
 Postmentum with a postmental sclerite; antennal seta reaching tip of papilla (Pl. 17). . . . . **saundersi**
11. Premental sclerite broadly rounded posteriorly. . . . . 12  
 Premental sclerite bluntly pointed posteriorly (Pl. 18). . . . . **schilskyi**
12. Segmental annulations indistinct or absent (Pl. 19). . . . . **pygomaculatus**  
 Segmental annulations well marked (Pl. 20). . . . . **albizziae**
13. Labrum semicircular; the posterior margin of the premental sclerite uneven and wavy; ligula with spinules between setae (Pl. 21). . **lineolatus**  
 Labrum more or less rectangular; the posterior margin of the pre-mental sclerite emarginate; ligula without spinules (Pl. 22). . . . . **flavovirens**
14. Premental sclerite with a small process in the anterior median notch; terminal seta four times as long as apical papilla; clypeus without pits (Pl. 23) . . . . . **multilineolatus**  
 Premental sclerite without process in the anterior median notch; terminal seta not more than 3 times as long as apical papilla; clypeus with a pair of pits. . . . . 15
15. Postmentum with a postmental sclerite; antennal seta about  $1\frac{1}{2}$  times the length of terminal papilla; ligula with intersetal spinules (Pl. 26) . . . . . **dimorphous**  
 Postmentum membranous, without a sclerite; antennal seta much more than twice the length of terminal papilla; ligula without intersetal spinules. . . . . 16
16. Premental sclerite rounded posteriorly; epipharynx with one pair of median setae (Pl. 24). . . . . **mimosae**  
 Premental sclerite truncated posteriorly; epipharynx with 2 pairs of median setae (Pl. 25). . . . . **maculipygus**

# 10. *Bruchidius angustifrons* Schils. (Pl. 10, figs. 53-58)

Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with two setae and a pit on either side. Clypeus bearing a pair of lateral setae with a sensory pit at the base of each, with a narrow transverse sclerotized area along its anterior margin. Labrum more or less spindle-shaped, broader than long, with a broad transverse sclerotized area along its base; its surface beset with large number of setae of varying sizes, several rows of small marginal spines along its anterior border, 2 pairs of sub-marginal setae arising behind the marginal spines

and a pair of basal setae, each with a sensory pit near its base. Epipharynx with two pairs of small almost blunt median setae, two pairs of long blunt setae along its anterior margin and numerous fine spinules on its surface. Antennae two-segmented, with the basal segment membranous and small, distal segment large and sclerotized, the terminal seta longer and slightly projecting beyond the conical, apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed, with a seta in the middle of outer surface of each mandible. Maxillae with cardo broad and curved, surface of stipes covered with a few setae in middle, with a pit at the base; palp one-segmented with a group of small sensory papillae at its tip; mala with five truncated processes at distal end. Postmentum C-shaped, membranous, not distinctly separated from prementum in front, with 2 pairs of long antero-lateral and a pair of short median setae; prementum with an elongated shield-shaped sclerite, bilobed anteriorly, conical posteriorly, with a small seta on either side of anterior median notch; ligula with a pair of long setae and a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdominal segments 1-7 biannulate, segments 8 to 10 uniannulate. Spiracles annular with hair in the distal part of the atrium, closing apparatus at the entrance of the trachea.

*Dimensions* : Length 2.40 mm-2.54 mm. Breadth 1.44 mm-1.55 mm.

**11. *Bruchidius sahlbergi* Schils. (Pl. 11, figs. 59-64)**

Larva bean-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons bearing a pair of pits only, one on either side of median longitudinal line. Clypeus bearing a pair of setae with a sensory pit at the base of each, with a narrow sclerotized area along its anterior margin. Labrum oval with a narrow sclerotized transverse area along its base, its surface beset with large number of setae of varying sizes, several rows of small marginal spines arranged along its anterior border, two pairs of long submarginal setae arising behind the marginal spines and a pair of basal setae with a sensory pit at the base of each. Epipharynx with 2 pairs of short slightly curved median setae, two pairs of long blunt setae along its anterior margin and fine spinules on its surface. Antennae 2-segmented, segments sclerotized, terminal seta nearly twice as long as conical apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped and without teeth, molar area suppressed, with a seta in the middle of outer surface. Maxillae with cardo rectangular; surface of stipes covered with a few setae; palp short, conical, one-segmented, highly sclerotized, bearing a group of small sensory papillae at its tip, a pit at its base and a seta in its middle; mala with five truncated processes at the distal end. Postmentum C-shaped, membranous and not distinctly separated from prementum in front, with 2 pairs of antero-lateral pits and a pair of median setae; prementum with a more or less pear-shaped sclerite, forked anteriorly, and notched and bilobed posteriorly, and a seta on either side of anterior median notch and a posterior median seta;

ligula with a pair of long setae with a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs three-segmented. Abdominal segments 1 to 7 biannulate, segments 8 to 10 uniannulate. Spiracles annular, with pubescence in the distal part of the atrium and closing apparatus at the entrance to the trachea.

*Dimensions* : Length 3.55 mm. Breadth 1.92, mm.

**12. *Bruchidius tephrosiae* Arora (Pl. 12, figs. 65-68)**

Larva C-shaped, yellowish.

Head oval, glabrous. Ocelli one pair. Frons with 3 pairs of setae, 2 pairs behind the post-clypeus and one pair on its posterior margin, and a pair of median pits. Clypeus with a pair of lateral setae and a sensory pit at the base of each, a very narrow sclerotized area along its anterior margin. Labrum more or less oval, broader than long with a narrow transverse sclerotized area along its posterior border; its surface beset with large number of setae of varying sizes, several rows of small marginal spines along its anterior border, 2 pairs of long prominent submarginal setae behind the marginal spines and a pair of basal setae, each with a sensory pit near its base. Epipharynx with 2 pairs of very small curved median setae, 2 pairs of long curved setae along its anterior margin and numerous small spinules on its surface. Antennae 2-segmented, basal segment more or less membranous, distal segment sclerotized, terminal seta of each antenna more than twice as long as sensory apical papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without any tooth, molar area suppressed, with a seta in the middle of outer surface of each mandible. Maxillae with cardo rectangular; surface of stipes covered with a few long setae; palp one-segmented, bearing a group of small sensory papillae at its tip, with a seta and a pit at its base; mala with five small truncated processes. Post-mentum C-shaped, membranous, not distinctly separated from prementum, with two pairs of long antero-lateral and a pair of short median setae; prementum, with a shield-shaped sclerite, bilobed anteriorly and broadly rounded posteriorly, with a pair of setae, one on either side of anterior median notch; ligula carrying a pair of setae with a sensory pit at the base of each and small spinules between them. Thoracic annuli 1, 2, 2. Legs three-segmented. Abdominal segments 1-8 biannulate, 9th and 10th uniannulate. Spiracles annular, with hair in the distal part of the atrium and closing apparatus at the entrance to trachea.

*Dimensions* : Length 2.64 mm. Breadth 1.58 mm.

**13. *Bruchidius andrewesi* (Pic) (Pl. 13, figs. 69-74)**

Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with two setae on either side. Clypeus carrying a pair of lateral setae with a sensory pit at the base of each and a very narrow sclerotized area along its base. Labrum more or less semi-circular, broader than long, with a narrow transverse sclerotized area at its base; its surface beset with large number of setae of varying sizes, several rows of

small marginal spines, 4 submarginal setae arising behind the marginal spines and a pair of basal setae with a sensory pit at the base of each. Epipharynx with two pairs of small median curved setae, 2 pairs of long blunt setae along its anterior margin and small spinules on its surface. Antennae 2-segmented, distal segment sclerotized, terminal seta of each antenna almost  $2\frac{1}{2}$  times as long as conical apical sensory papilla. Mandibles similar, triangular; incisor area of each chisel-shaped, without teeth, molar area suppressed, with a seta in the middle of outer surface of each mandible. Maxillae with cardo elongated, slightly curved; surface of stipes covered with a few setae in middle; palp one-segmented, bearing a group of sensory papillae at its tip, a sensory pit at its base and a seta in its middle; mala with five truncated processes at its distal end. Postmentum C-shaped, membranous, not distinctly separated from prementum in front, with 2 pairs of long antero-lateral and a pair of short median setae; prementum with an elongated shield-shaped sclerite forked anteriorly, broadly rounded posteriorly and with a pair of setae behind the anterior median notch; ligula with a pair of setae, each having a sensory pit at its base. Thoracic annuli 2, 2, 3. Legs three-segmented. Abdominal segments 1 to 7 biannulate, segments 8 to 10 uniannulate. Spiracles annular with hair in the distal part of atrium, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 3.54 mm. Breadth 1.89 mm.

#### 14. *Bruchidius cassiae* Arora (Pl. 14, figs. 75-80)

Larva C-shaped, yellowish white.

Head oval, glabrous. Ocelli one pair. Frons with a seta and a pit on either side. Clypeus bearing a pair of lateral setae with a sensory pit at the base of each, with a very narrow sclerotized area along its anterior margin. Labrum oval, much broader than long, with a narrow transverse sclerotized area along its base; its surface beset with a large number of setae of varying sizes, several rows of small marginal spines along its anterior border, two pairs of long prominent submarginal setae behind the marginal spines and a pair of basal setae with a sensory pit at the base of each. Epipharynx with two pairs of small curved median setae, two pairs of long blunt setae arranged along its anterior margin and fine spinules on its surface. Antennae 2-segmented, basal segment small and membranous, distal segment longer and sclerotized; terminal seta of each antenna slightly longer than apical conical sensory papilla. Mandibles similar, triangular, the incisor area of each chisel-shaped and without teeth, molar area suppressed, with a seta in the middle of outer surface of each mandible. Maxillae with cardo broad, curved; surface of stipes covered with a few long setae in the middle; palp one-segmented, bearing a group of small sensory papillae at its tip, a pit at its base and a seta in its middle; mala with five truncated processes at distal end. Postmentum C-shaped, membranous, not distinctly separated from prementum in front, with two pairs of long antero-lateral and a pair of short median setae; prementum with an elongated shield-shaped sclerite; the latter forked anteriorly, broadly rounded posteriorly, with a pair of small setae one on either side of

median notch; ligula with a pair of long setae and a sensory pit at the base of each. Thoracic annuli, 1, 2, 2. Legs three-segmented. Abdominal segments 1-7 biannulate, segments 8-10 uniannulate. Spiracles annular, with hair in the distal part of atrium, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 2.16 mm-2.40 mm. Breadth 0.96 mm-1.20 mm.

**15. *Bruchidius urbanus* (Sharp) (Pl.15, figs. 81-86)**

Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with 3 prominent setae and a pit on either side. Clypeus bearing a pair of lateral setae, with a sensory pit at the base of each. Labrum oval, broader than long, with a narrow sclerotized area at its base; its surface beset with numerous setae of varying sizes, several rows of small marginal spines along its anterior margin, 3 long prominent submarginal setae arranged in a line and a pair of basal setae, one on either side, not accompanied by a sensory pit. Epipharynx with two pairs of small, curved, pointed median setae, two pairs of short blunt setae along its anterior border and numerous fine spinules on its surface. Antennae two-segmented, the segments sclerotized, terminal seta of each antenna twice as long as the conical apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped and without teeth, molar area suppressed. Maxillae with surface of stipes covered with long setae; palp one-segmented, bearing a group of sensory papillae at its tip; mala with five truncated processes at its distal end. Postmentum membranous, not distinctly separated from prementum, with two pairs of anterolateral and a pair of median basal setae; prementum with an elongated shield-shaped sclerite; the latter bilobed anteriorly and broadly rounded posteriorly, with a small seta on either side of the median notch; ligula with a pair of long setae, with a sensory pit at the base of each and a number of minute spines between them. Thoracic annuli, 1, 2, 2. Legs 3-segmented. Abdominal segments 1 to 7 biannulate, 8 to 10 uniannulate. Spiracles annular, with hair in the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 3.40 mm-3.98 mm. Breadth 1.48 mm-2.11 mm.

**16. *Bruchidius aureus* Arora (Pl. 16, figs. 87-92)**

Larva bean-shaped, yellowish.

Head oval, glabrous. Ocelli one pair. Frons with 3 pairs of prominent setae, 2 pairs of setae behind the post-clypeus and a pair of short setae along its posterior border. Clypeus bearing a pair of lateral setae and a pair of pits with a narrow sclerotized area along its anterior margin. Labrum more or less trapezoidal, broader than long, with a narrow sclerotised area along its base; its surface covered with numerous setae of varying sizes, several rows of small marginal spines along its anterior border, 3 long prominent submarginal setae arising behind the marginal spines and a pair of basal setae, one on either side. Epipharynx with two pairs of small median curved setae, two pairs of blunt



setae along its anterior border and numerous thin spinules on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each slightly longer than conical apical, sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped and without any teeth, molar area suppressed. Maxillae with surface of stipes covered with long setae on the anterior margin and in its middle; palp one-segmented, bearing a group of small sensory papillae at its tip; mala with 5 truncated processes at the distal end. Postmentum more or less membranous, not distinctly separated from prementum in front, with two pairs of anterolateral and a pair of median setae; prementum with an elongate sclerite; the latter bilobed anteriorly and rounded posteriorly, with a small seta on either side of median notch; ligula with a pair of long setae with a sensory pit at the base of each and small spinules between them. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdominal segments biannulate from segments, 1 to 7, segments 8 to 10 uniannulate. Spiracles annular with simple hair, atrium present, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 5.95 mm-6.38 mm. Breadth 2.64mm-3.12 mm.

17. *Bruchidius saundersi* (Jek.) (Pl. 17, figs. 93-99)

Larva bean-shaped, yellowish.

Head oval, glabrous. Ocelli one pair. Frons with 3 pairs of prominent setae and a pair of sensory pits. Clypeus bearing a pair of lateral setae with a sensory pit at the base of each, and a narrow sclerotized area along its anterior margin. Labrum oval, broader than long, its surface beset with a large number of setae of varying sizes, several rows of small marginal spines along its anterior border, three long submarginal setae behind the marginal spines and a pair of basal setae one on either side. Epipharynx with two pairs of small, curved, pointed median setae, two pairs of long pointed setae along its anterior margin and numerous fine spinules on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna reaching the tip of conical, apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without any teeth, molar area suppressed. Maxillae with surface of stipes covered with long setae; palp one segmented, bearing a group of small sensory papillae at its tip, with a pit near its proximal end; mala with 5 truncated processes at distal end and a simple seta below. Postmentum with a curved transverse sclerite, carrying two pairs of anterolateral and a pair of median setae; prementum with an elongated shield-shaped sclerite, the latter bilobed anteriorly and somewhat truncated posteriorly, anterior notch produced into a short median process, with a seta on either side of the median notch; ligula with a pair of long setae and a sensory pit at the base of each. Thoracic annuli, 1, 1, 1. Legs three-segmented. Abdominal segments 1-4 triannulate, 5-7 biannulate, 8 to 10 uniannulate. Spiracles annular with hair on the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 6.04 mm-6.28 mm. Breadth 2.55 mm-2.97 mm.



**18. *Bruchidius schilskyi* Arora (Pl. 18, figs. 100-105)**

Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with two pairs of long setae behind postclypeus, a pair of short setae along its posterior border and a pair of pits. Clypeus bearing a pair of lateral setae with a sensory pit at the base of each, with a narrow sclerotized area along its anterior margin. Labrum more or less semicircular, broader than long, with a narrow sclerotized area at its base, its surface beset with numerous setae of varying sizes, several rows of short spines arranged along its anterior border, 3 long prominent submarginal setae arranged more or less in a line behind the marginal spines and a pair of basal setae, one on either side with a sensory pit at its base. Epipharynx with two pairs of long curved median setae, two pairs of short blunt setae along its anterior border and numerous thin spinules on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna long, projecting beyond the conical, apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped and without any teeth, molar area suppressed, with a seta in the middle of outer surface of each mandible. Maxillae with stipes bearing long setae on the anterior margin and in its middle; palp one-segmented, with a group of small sensory papillae at its tip; mala with five truncated processes at its distal end, and 2 pointed setae and a pit below. Postmentum, C-shaped, membranous, not distinctly separated from prementum in front, with two pairs of long antero-lateral and a pair of short median setae; prementum with an oval sclerite, the latter bilobed anteriorly and bluntly pointed posteriorly, with a small seta on either side of median notch; ligula with a pair of long setae and a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdominal segments 1-7 biannulate, 8-10 uniannulate. Spiracles annular with simple hair, atrium present, closing apparatus at the entrance to the trachea.

*Dimensions* : Length 2.78 mm. Breadth 1.24 mm.

**19. *Bruchidius pygomaculatus* Arora (Pl. 19, figs. 106-111)**

Larva bean-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with 3 pairs of setae along its anterior margin and a pair of pits. Clypeus provided with a pair of lateral setae, with a sensory pit near the base of each, with a broad transverse sclerotized area along its distal margin. Labrum much broader than long, with its anterior margin arched, with a narrow sclerotized area along its base; its surface beset with numerous setae of varying sizes; several rows of small marginal spines arranged along its anterior border, three long prominent submarginal setae arising behind the marginal spines and a pair of basal setae with a pair of pits between the two setae. Epipharynx with two pairs of curved short median setae, two pairs of short blunt setae along its anterior border and numerous thin pubescence on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna nearly twice as long as conical, apical sensory

papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed. Maxillae with surface of stipes covered with 8-11 long setae; palp one-segmented, bearing a group of small sensory papillae at its tip; molar with five truncated processes at distal end and 3 pointed setae below. Postmentum C-shaped, membranous, not distinctly separated from prementum in front, provided with two pairs of anterolateral and a pair of median setae; prementum with an elongated, shield-shaped sclerite, the latter bilobed anteriorly and broadly rounded posteriorly, with a long seta on either side of median notch; ligula with a pair of setae and a sensory pit at the base of each. Thoracic annuli, 1, 1, 1. Abdominal segments uniannulate mostly. Spiracles annular with fine hair on the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 2.97mm-3.69 mm. Breadth 1.43mm -1.82 mm.

**20. *Bruchidius albizziae* Arora (Pl.20, figs. 112-117)**

Larva bean-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with three pairs of setae and a pair of pits. Clypeus provided with a pair of lateral setae and a sensory pit near the base of each, with a transverse sclerotized area along its anterior margin. Labrum much broader than long, with a narrow transverse sclerotized area along its posterior margin; its surface beset with numerous setae of varying sizes, several rows of small marginal spines arranged along its anterior margin, three long submarginal setae, arising behind the marginal setae and a pair of basal setae with a pit at the base of each. Epipharynx with two pairs of curved median setae, two pairs of long blunt setae along its anterior border and numerous small spinules on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna nearly twice as long as apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped, without teeth, molar area suppressed. Maxillae with surface of stipes covered with long setae; palp one-segmented, with a group of small sensory papillae at its tip; mala with five truncated processes at its distal end and 3 pointed setae below. Postmentum C-shaped, membranous, not distinctly separated from prementum in front, provided with two pairs of antero-lateral and a pair of median setae; prementum with a shield-shaped sclerite, the latter bilobed anteriorly and with a broadly rounded posterior margin; ligula with a pair of setae and a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdominal segments 1st to 7th biannulate, the remaining three segments uniannulate. Spiracles annular with fine hairs on the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 2.90 mm-3.64 mm. Breadth 1.41 mm-1.78mm.

**21. *Bruchidius lineolatus* Arora (Pl.21, figs. 118-122)**

Larva C-shaped, yellowish-white.

Head oval, glabrous. Frons with 3 pairs of prominent setae, two pairs of

long setae behind the post-clypeus and a pair of short setae along its posterior border. Clypeus bearing a pair of lateral setae, with a narrow sclerotized area along its anterior margin. Labrum semi-circular, broader than long with a narrow transverse sclerotized area along its base; its surface beset with numerous setae of varying sizes, several rows of small marginal spines arranged along its anterior border, 3 long prominent submarginal setae arranged in a line and 2 basal setae, one on either side. Epipharynx with two pairs of small median setae, two pairs of long blunt setae along its anterior border and numerous thin spinules on its surface. Antennae two-segmented, terminal seta of each curved and longer than apical, conical, sensory papilla, and projecting beyond the latter. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed. Maxillae with surface of stipes covered with long setae; palp one-segmented, bearing a group of small sensory papillae at its tip; mala with five truncated processes at distal end and 4 simple setae below. Postmentum C-shaped, membranous, not distinctly separated from prementum, with two pairs of anterolateral and a pair of median long setae; prementum with an elongated sclerite, the latter bilobed anteriorly and with an irregular posterior margin, with a small seta on either side of the median notch; ligula and a pair of long setae and a sensory pit, at the base of each and few very minute setae between them. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdominal segments biannulate from 1st to 8th, 9th and 10th segments uniannulate. Spiracles annular with hair in the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 2.97 mm-3.24 mm. Breadth 1.58 mm-1.68 mm.

## 22. *Bruchidius flavovirens* Arora (Pl.22, figs. 129-134)

Larva bean-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with one pair of prominent setae; 2 pairs of long setae on the post-clypeus. Clypeus bearing a pair of lateral setae, with a narrow sclerotized area along its anterior margin. Labrum more or less rectangular, much broader than long, with a narrow transverse sclerotized area at its base; its surface covered with large number of setae of varying sizes, several rows of small marginal spines along its anterior border, 3 long prominent submarginal setae arranged in a line behind the marginal spines and a pair of basal setae one on either side. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna nearly twice as long as conical, apical, sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed. Maxillae with surface of stipes covered with a few setae; palp one-segmented bearing a group of sensory papillae at its tip and a sensory pit at its proximal end; mala with five truncated processes at distal end and a pointed simple seta below. Postmentum membranous, not distinctly separated from prementum, with two pairs of antero-lateral and a pair of median setae; prementum with an elongated shield-shaped sclerite, the latter bilobed anteriorly and emarginate posteriorly, with a

small seta on either side of anterior median notch; ligula with a pair of long setae and a sensory pit at the base of each. Thoracic annuli, 1, 2, 2. Legs 3-segmented. Abdominal segments biannulate from 1st to 7th, rest three segments uniannulate. Spiracles annular, with hair on the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 3.36 mm-3.55 mm. Breadth 1.48 mm-1.68 mm.

**23. *Bruchidius multiligneolatus* Arora (Pl. 23, figs. 123-128)**

Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with three pairs of prominent setae, 2 pairs of long setae behind the post-clypeus and a pair of short setae along its posterior border. Clypeus trapezoidal, with a narrow sclerotized area along its anterior margin and a pair of lateral setae. Labrum semi-circular, broader than long, with a narrow sclerotized area along its base, its surface covered with large number of setae of varying sizes, several rows of small marginal spines along its anterior border, 3 long prominent submarginal setae arranged in an arc behind the marginal spines and a pair of basal setae, one on either side. Epipharynx with two pairs of thick curved median setae, 2 pairs of long blunt setae at the anterior border and a large number of fine spinules on its surface. Antennae 2-segmented, segments sclerotized and sub-equal, terminal seta of each antenna about four times as long as conical, apical sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without teeth, molar area suppressed. Maxillae with large triangular cardo, surface of stipes covered with (11-17) long prominent setae; palp one-segmented with a group of small sensory papillae at its tip and a pore near its proximal end; mala with four truncated processes at distal end and 6 simple setae below. Postmentum membranous not distinctly separated from the prementum, with two pairs of antero-lateral and a pair of median setae; prementum with an elongated sclerite, the latter bilobed anteriorly and with a concave posterior margin, with a small median process in the anterior notch, bearing a pair of setae one on either side of anterior notch; ligula with a pair of long setae and sensory pit at the base of each, with a few short spinules situated between them. Thoracic annuli 2, 2, 2. Legs three-segmented. Abdominal segments biannulate from 1st to 7th, 8th to 10th segments uniannulate. Spiracles annular with hairs in the distal part of the atrium, closing apparatus at the entrance to the trachea.

*Dimensions:* Length 6.00 mm-6.62 mm. Breadth 3.12 mm-3.16 mm.

**24. *Bruchidius mimosae* Arora (Pl. 24, figs. 135-140)**

Larva C-shaped, yellowish-white.

Head oval, glabrous. Frons bearing 6 prominent setae, three on each side. Clypeus with a pair of lateral setae and a sensory pit at the base of each, with a narrow, transverse sclerotized area along its anterior margin. Labrum more

or less semicircular, broader than long; its surface beset with large number of setae of varying sizes, several rows of small marginal spines arranged along its anterior border, 3 submarginal setae arising behind the marginal spines and two basal setae, one on either side. Epipharynx with a pair of small median setae, two pairs of long setae arranged along its anterior border and small spinules on its surface. Antennae 2-segmented, segments sclerotized, terminal seta of each antenna nearly three times as long as conical, apical, sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped without any teeth, molar area suppressed. Maxillae with cardo oval, surface of stipes covered with long setae on the anterior margin and in its middle; palp one-segmented, bearing a group of sensory papillae at its tip, a pit at its base and a seta in its middle; mala with four truncated processes at the distal end and 3 simple setae below. Postmentum C-shaped, membranous, not distinctly separated from prementum in front, with 2 pairs of antero-lateral and a pair of median long setae; prementum with an elongated shield-shaped sclerite, the latter two-pronged anteriorly and rounded posteriorly, with a small seta on either side of the anterior median notch; ligula with a pair of long setae and a sensory pit at the base of each. Thoracic annuli 1, 2, 2. Legs 3-segmented. Abdominal segments biannulate from 1st to 7th, uniannulate from 8th to 10th. Spiracles annular with hair in the distal part of the atrium, closing apparatus at the entrance to the trachea.

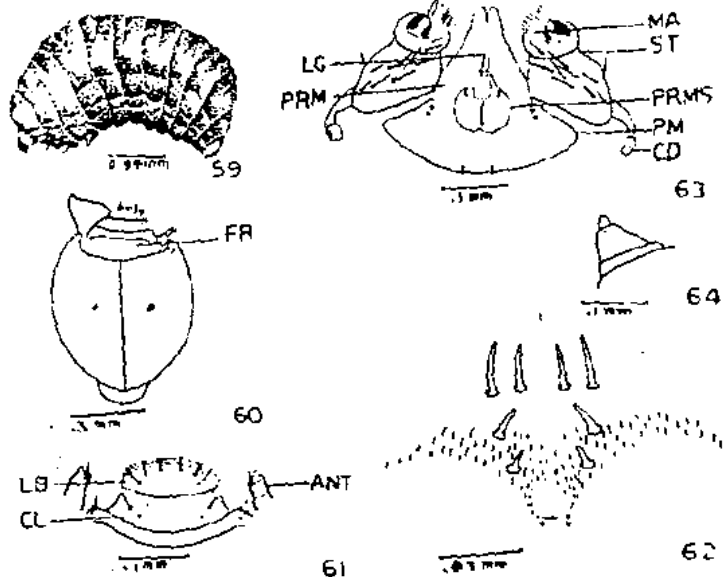
*Dimensions:* Length 2.88 mm-3.40 mm. Breadth 1.20 mm-1.68 mm.

## 25. *Bruchidius maeulipygus* (Champion) (Pl. 25, figs. 141-146)

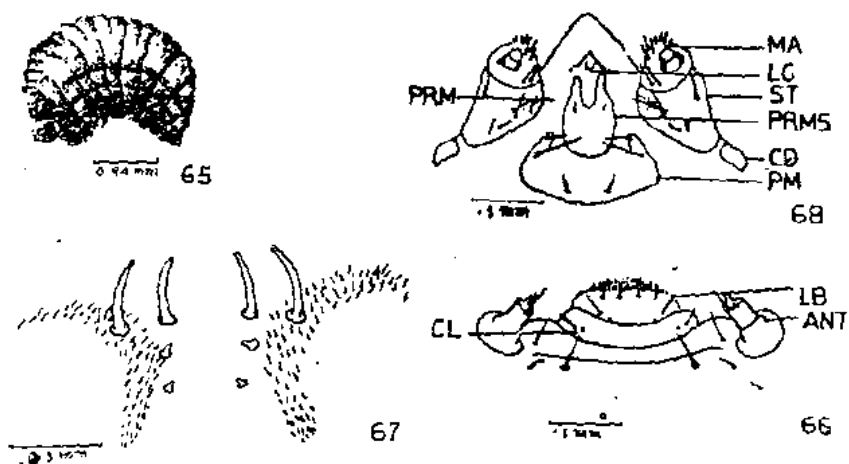
Larva C-shaped, yellowish-white.

Head oval, glabrous. Ocelli one pair. Frons with three pairs of setae. Clypeus bearing a pair of lateral setae with a sensory pit near the base of each, with a narrow sclerotized area along its anterior margin. Labrum semicircular, broader than long, with a narrow transverse sclerotized area along its posterior margin; its surface beset with large number of setae of varying sizes, several rows of small marginal spines along its anterior border, 3 long prominent submarginal setae arising behind the marginal spines and a pair of basal setae, one on either side. Epipharynx with two pairs of very small curved median setae, two pairs of long blunt setae along its anterior margin and numerous small spinules on its surface. Antennae two-segmented, segments sclerotized, terminal seta of each antenna nearly two and a half times as long as apical, conical, sensory papilla. Mandibles similar, triangular, incisor area of each chisel-shaped, without any teeth, molar area suppressed with a long seta in the middle of outer surface of each mandible. Maxillae with cardo narrow, curved; surface of stipes covered with 6-8 long setae; palp one-segmented, bearing a group of small sensory papillae at its distal end and a long seta near its middle; mala with four truncated processes at its distal end and 4 simple, pointed setae below. Postmentum membranous, C-shaped, bearing two pairs of long antero-lateral and a pair of short median setae; prementum with an elongated shield-shaped

## PLATE 11



## PLATE 12

Plate 11. *Bruchidius sahlbergi* Schilsky

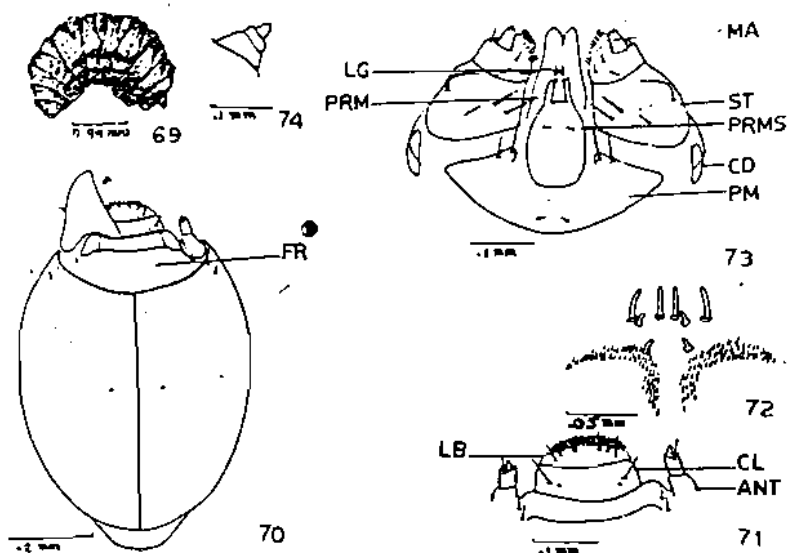
Figs. 59, Lateral view of the larva; 60, Dorsal view of the head; 61, Aboral view of labrum & antennae; 62, Epipharynx; 63, Aboral view of labium & maxillae; 64, Leg.

Plate 12. *Bruchidius tephrostae* Arora

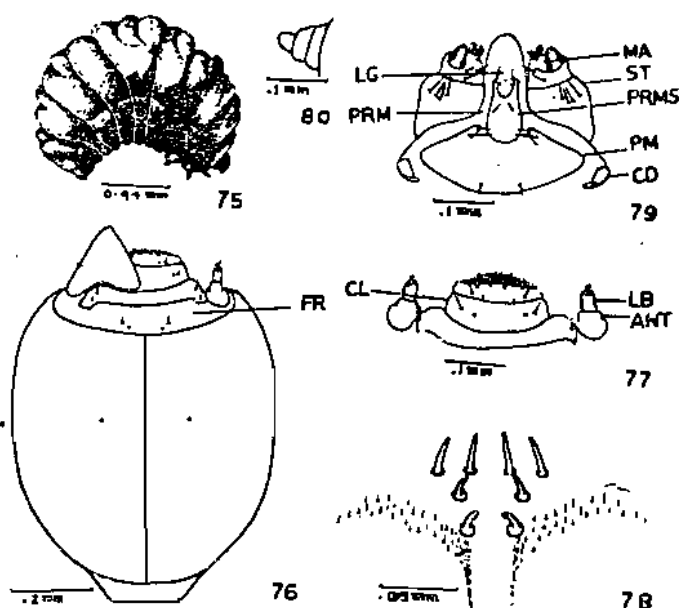
Figs. 65, Lateral view of the larva; 66, Aboral view of labrum & antennae; 67, Epipharynx; 68, Aboral view of labium & maxillae.



## PLATE-13



## PLATE-14

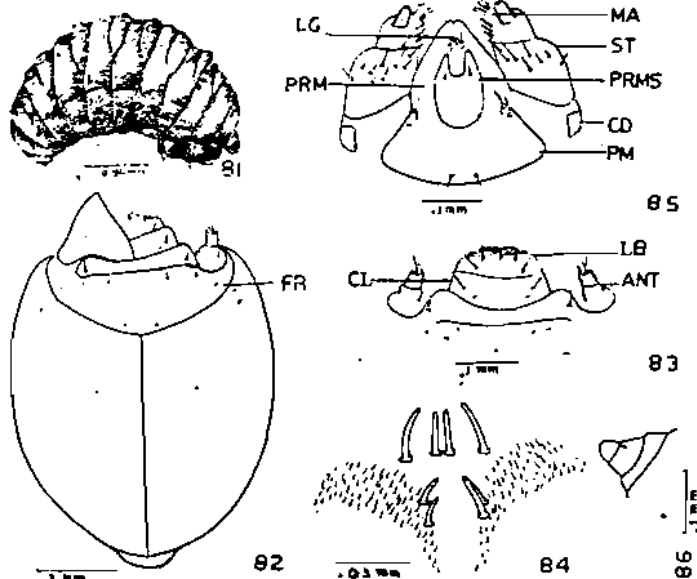
Plate 13. *Bruchidius andrewesi* (Pic)

Figs. 69, Lateral view of the larva; 70, Dorsal view of the head; 71, Aboral view of labrum & antennae; 72, Epipharynx; 73, Aboral view of labium & maxillae; 74, Leg.

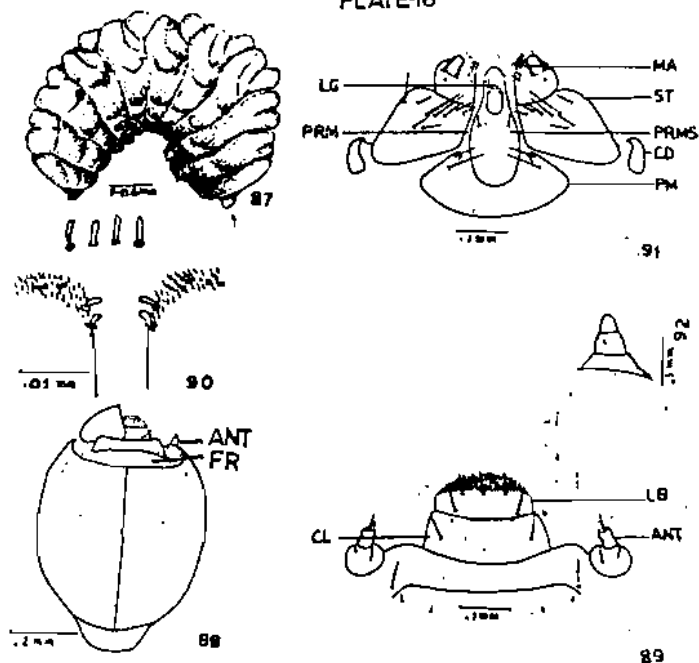
Plate 14. *Bruchidius cassiae* Arora

Figs. 75, Lateral view of the larva; 76, Dorsal view of the head; 77, Aboral view of labrum & antennae; 78, Epipharynx; 79, Aboral view of labium & maxillae; 80, Leg.

## PLATE-15



## PLATE-16

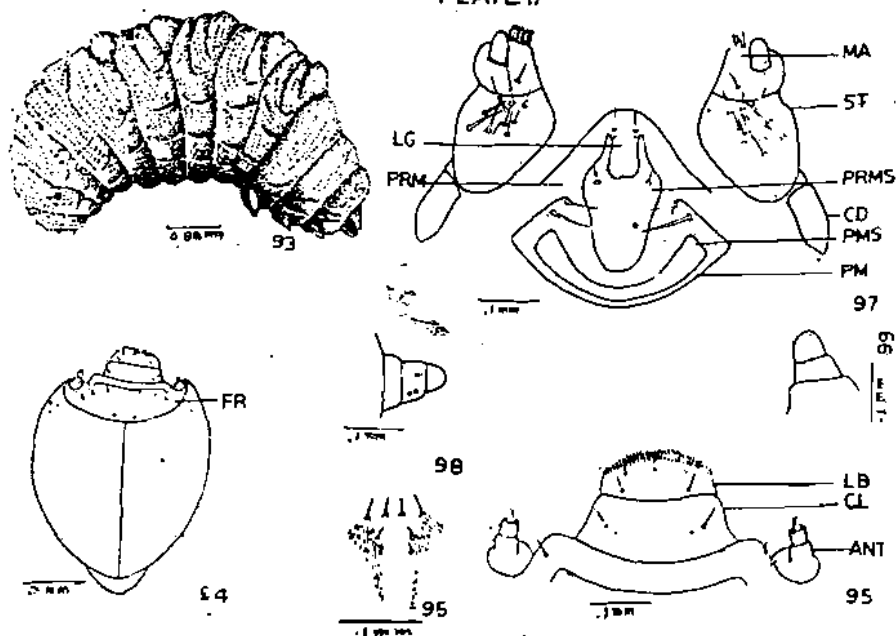
Plate 15. *Bruchidius urbanus* (Sharp)

Figs. 81, Lateral view of the larva; 82, Dorsal view of the head; 83, Aboral view of labrum & antennae; 84, Epipharynx; 85, Aboral view of labium & maxillae; 86, Leg.

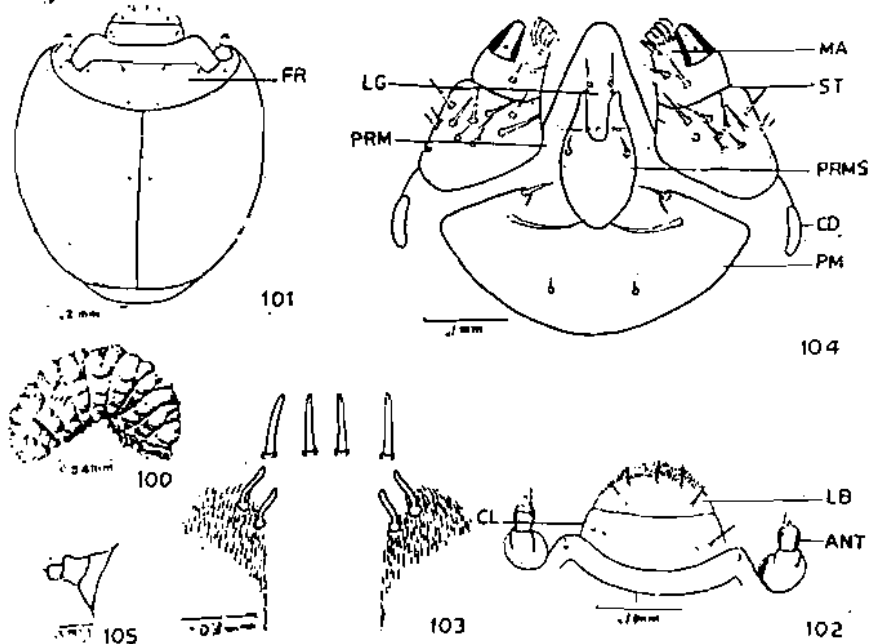
Plate 16. *Bruchidius aureus* Arora

Figs. 87, Lateral view of the larva; 88, Dorsal view of the head; 89, Aboral view of labrum & antennae; 90, Epipharynx; 91, Aboral view of labium & maxillae; 92, Leg.

## PLATE-17



## PLATE-18

Plate 17. *Bruchidius saundersi* (Jek.)

Figs. 93, Lateral view of the larva; 94, Dorsal view of the head; 95, Aboral view of labrum & antennae; 96, Epipharynx; 97, Aboral view of labium & maxillae; 98, post leg; 99, leg.

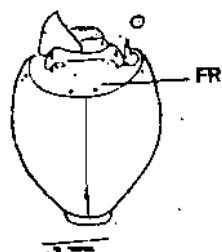
Plate 18. *Bruchidius schilskyi* Arora

Figs. 100, Lateral view of the larva; 101, Dorsal view of the head; 102, Aboral view of labrum & antennae; 103, Epipharynx; 104, Aboral view of labium & maxillae; 105, Leg.

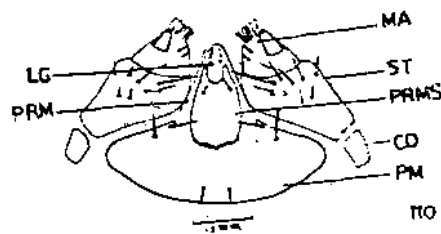
## PLATE 19



106



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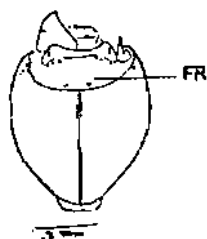


108

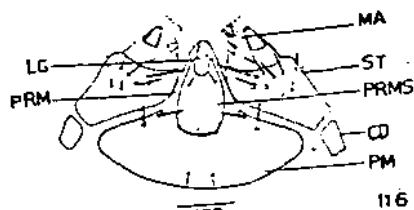
## PLATE 20



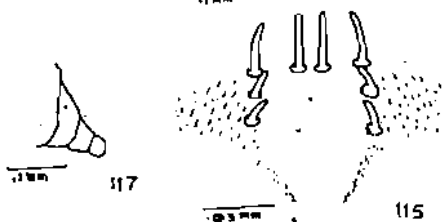
112



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Plate 19. *Bruchidius pygmaculatus* Arora

Figs. 106, Lateral view of the larva; 107, Dorsal view of the head; 108, Aboral view of labrum & antennae; 109, Epipharynx; 110, Aboral view of labium & maxillae; 111, Leg.

Plate 20. *Bruchidius albizziae* Arora

Figs. 112, Lateral view of the larva; 113, Dorsal view of the head; 114, Aboral view of labrum & antennae; 115, Epipharynx; 116, Aboral view of labium & maxillae; 117, Leg.