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Larvae of the Weevil Family Anthribidae of Japan (Coleoptera) *

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Larvae of six genera and eight species of Japanese Anthribidae are described and illustrated. They are *Araecerus fasciculatus*, *A. tarsalis*, *A. varians*, *Euparius oculatus*, *Phloeobius stenus*, *Autotropis distinguenda*, *Exechesops leucopis*, and *Rhaphitropis guttifer*.

INTRODUCTION

In comparison with many other families of beetles, the weevil larvae have only received of minor interest by entomologists. Main reason for this has probably been the difficulty for separating the larvae into species owing to their uniformity. But their study is important because of the potential value of characters of the larvae for the phylogenetic classification and their identification in the larval stage is also necessary for the species of economic importance.

This is first of the series of our studies on the weevil larvae of Japan and dealt with the family Anthribidae on eight species of six genera.

We wish to express our cordial thanks to Prof. Y. Hirashima, of Kyushu University, for his helpful suggestions and encouragement in the course of the present study.

MATERIALS AND METHODS

The identifications of all larvae included in this paper were made from the reared adults by the junior author.

The gross morphological features of entire larvae were examined in alcohol-preserved material. Then, they were macerated in 10 % KOH for several minutes and dissected under a stereoscopic microscope. The head capsule with attached mouth-parts was first removed from the body by a cut made with a fine forceps around the edges of the occipital foramen. The maxillae and labium as a unit were removed from the head capsule and the mandibles were dilated. The head was sketched by this condition from the dorsal and ventral sides. Then the mandibles with attached tendons were removed from the head capsule. The mouth parts and skins were mounted on the microscopic slide for a detailed examination.

The terminology adopted in this paper is in great extent that proposed by

* Contribution from the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka (Ser. 3, No. 216).

Anderson (1947).

LARVAL CHARACTERS OF THE FAMILY ANTHRIBIDAE

Larvae usually subcircular in cross-section. Body setae sparse to abundant, at least moderately abundant ventrally on prothorax.

Head free, sometimes weakly retracted into thorax, light yellow to brownish, about as broad as or slightly broader than long, broadest near the middle, rounded posteriorly, cranium nearly always with moderate to abundant setae. Anterior ocellus present, posterior ocellus absent. Antenna composed of one membranous segment with a few short spines in addition to a sensory appendage (segment). Anterior margin of frons between catapophyses much wider than the base of clypeus. Frontal suture complete anteriorly to mandibular membrane, or at least not terminating at antenna. Epicranial suture present. Endocarina absent (except *Phloeobius stenus*). Hypopharyngeal bracon present, hypopharyngeal sclerite distinct, its anterior margin only slightly extending anteriorly beyond hypopharyngeal bracon. Clypeal setae absent, or with two setae and one sensilla at lateroposterior corner on front-clypeal fold. Labrum with four or more pairs of setae, one pair of basal sensillae, without anterior or median sensilla. Labral rods absent. Labral tormae present. Epipharynx with three anterolateral and four to six anteromedian setae, a pair of sensillae and two pairs of median spines. Mandible usually with two marginal teeth in addition to sharper apical tooth, second marginal tooth often vestigial, mola present, the outer surface of mandible with two setae (except *Euparius oculatus*). Labium usually small. Labial palpi present, one- or two-segmented. Premental sclerite usually present. Prementum with one to several pairs of setae. Submentum broad, with three to twenty pairs of setae. Maxillary palpus with two or three segments, ultimate and penultimate segments each with a short seta. Stipes with several to numerous setae. Mala nearly always with thorn-like lacinia near middle of inner margin, with setae, the dorsal setae when present not arranged in an evident row.

Prothorax usually without pigmented sclerite. Abdomen with eight pairs of spiracles, spiracles all lateral. Typical abdominal segment with two dorsal folds. Sternellum absent.

Thoracic spiracle either in mesothorax or situated between prothorax and mesothorax. Spiracle bicameral, unicameral or with minute air tubes, the orifice oval to subcircular.

Legs usually discernible, often with two segments, but without pointed tarsungulus.

The family characters given by Anderson (1947) are confirmed by the present study for Japanese species as described above. The larvae of the family Anthribidae are easily separable from the other families by the absence of the labral rods on the epipharynx, presence of the labral tormae, well sclerotized hypopharyngeal sclerite and the separation of the labium into the prementum, mentum and submentum.

KEY TO SPECIES EXAMINED

1. Abdominal spiracle unicameral, thoracic spiracle bicameral, their air tubes short

- and without annulations, labial palpus with one segment, maxillary palpus with two segments, legs vestigial *Araecerus*.....2
 Abdominal spiracle bicameral or with several short air tubes, legs often present 3
2. Mandible with apical tooth not produced anteriorly beyond first marginal tooth *Araecerus tarsalis*
 Mandible with apical tooth much produced anteriorly beyond first marginal tooth *Araecerus fasciculatus* and *Araecerus varians*
3. Labrum with about ten pairs of setae, thoracic spiracle three times as large as abdominal spiracle, with seven minute air tubes, abdominal spiracle with five minute air tubes, legs vestigial, maxilla without lacinia, maxillary palpus with three segments *Phloeobius stems*
 Labrum with four pairs of setae, thoracic spiracle bicameral, legs with two segments, each segment with long setae, maxilla with spine-like lacinia 4
4. Labial palpus with one segment, head capsule completely free, broadest at the middle, uniformly pigmented *Euparius oculatus*
 Labial palpus with two segments, head capsule more or less retracted into pronotum, broadest before the middle, not pigmented posteriorly 5
5. Maxillary palpus with three segments, prementum with two pairs of setae, frontal suture indistinct. *Rhaphitropis guttifer*
 Maxillary palpus with two segments, prementum with a pair of setae, frontal suture distinct 6
6. Thoracic spiracle similar to abdominal spiracle in shape and size, prementum narrow, with a pair of setae, not asperate, premental sclerite vestigial, frontal suture complete, hypopharyngeal sclerite normally sclerotized and pigmented *Execkesops leucopsis*
 Thoracic spiracle much larger than abdominal spiracle, prementum broader, with a pair of setae and a pair of pores, premental sclerite traceable, slightly pigmented, frontal suture indistinct anteriorly, hypopharyngeal sclerite not pigmented *Autotropis distinguenda*

Genus *Araecerus* Schoenherr

(Figs. 1-3)

Araecerus: Anderson, 1947, Ann. ent. Soc. Amer., XL: 513 (based on *A. fasciculatus*).

Body moderately slender, not thickened anteriorly. Head light yellow. Body setae numerous, particularly on ventral surface of thoracic segments.

Head as broad as long, broadest near the middle, rounded posteriorly, with numerous short to moderately long setae. Frontal suture reaching the basal membrane of mandible, distinguishable throughout its length, often indistinct anteriorly. Endocarina absent. Anterior ocellus black, located laterad to antenna. Posterior ocellus absent. Antennae vertical or somewhat overhung by extension from frons. Labrum with four pairs of setae, of which the anterior one close to anterior margin near the middle, and a pair of sensillae near the base. Labral tormae reaching posteriorly a little beyond the middle of clypeus. Epipharynx with three anterolateral and four anteromedian setae, one seta of the latter located on the dorsal surface when mounted on slide, and with four median spines and two pairs of sensory pores. Mandible with an apical and two marginal teeth, mola flattened, straight in surface view, with a

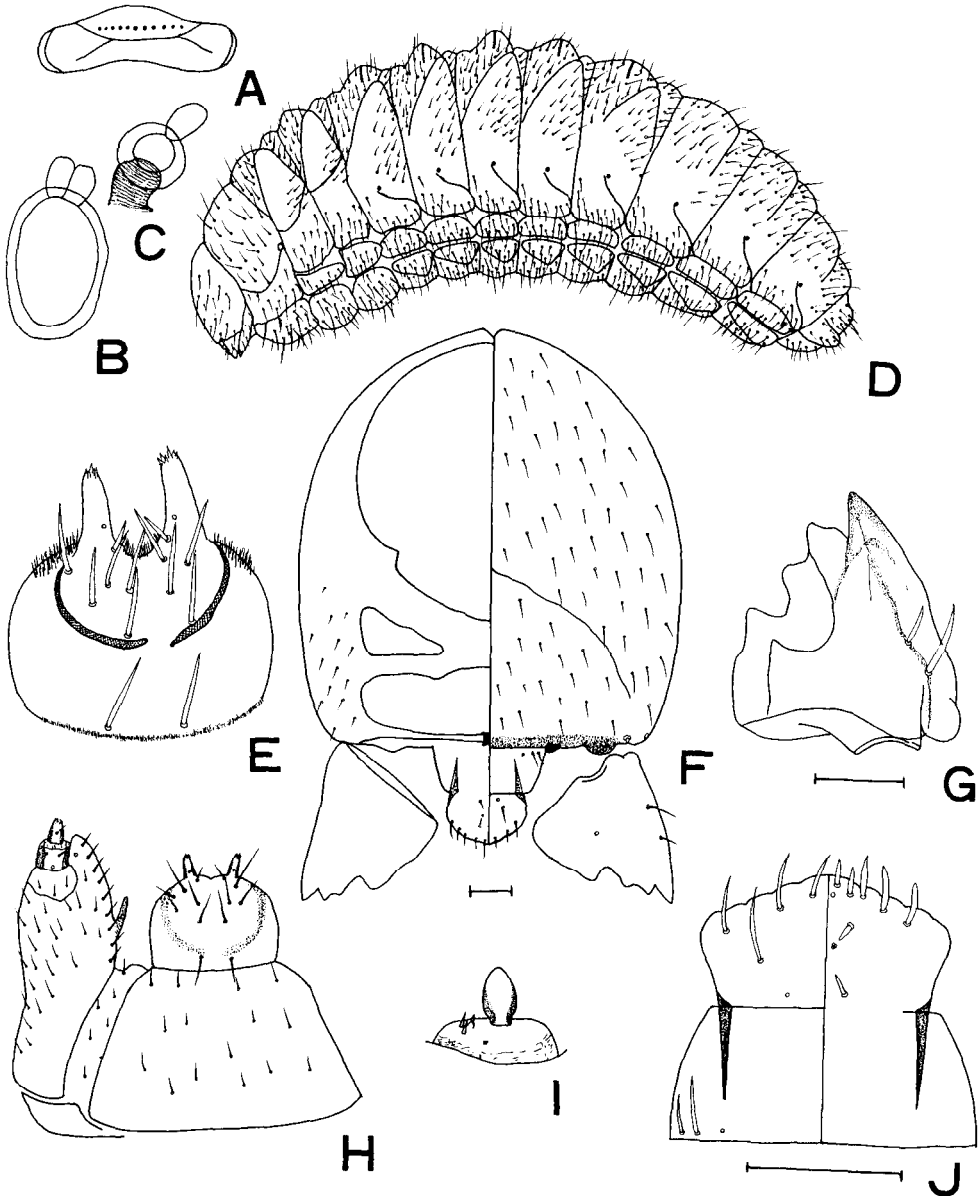


Fig. 1. *Araeceris fasciculatus* (Degeer).

A, Typical abdominal tergite, dorsal, showing tubercles; B, Thoracic spiracle; C, Abdominal spiracle; D, Mature larva; E, Prementum and mentum; F, Head; G, Mandible; H, Maxilla and labium; I, Antenna; J, Labrum and epipharynx. Scale, 0.1 mm.

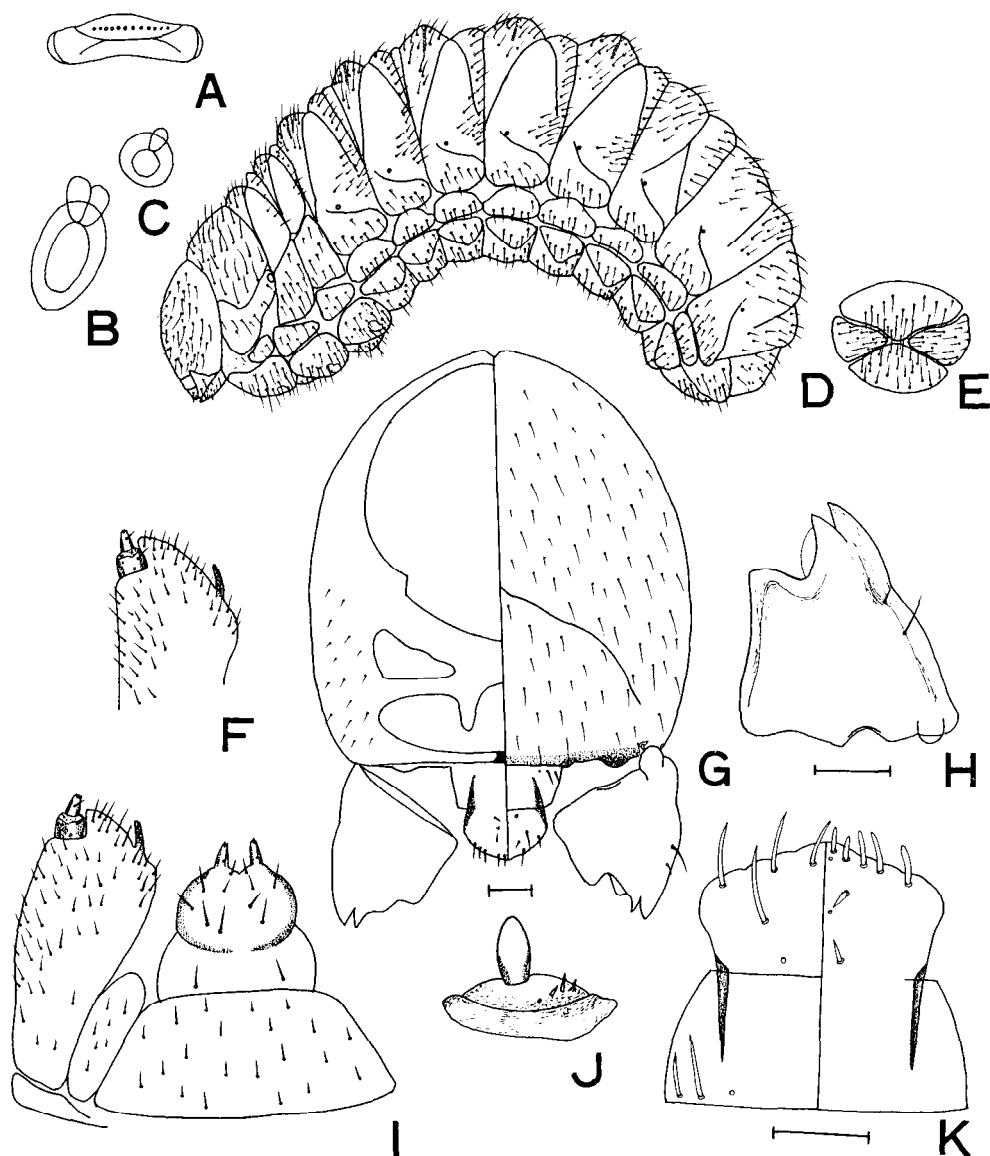


Fig. 2. *Araecerus tarsalis* Sharp.

A, Typical abdominal tergite, dorsal, showing tubercles; B, Thoracic spiracle; C, Abdominal spiracle; D, Mature larva; E, Anus; F, Maxilla, dorsal. G, Head; H, Mandible; I, Maxilla and labium; J, Antenna; K, Labrum and epipharynx. Scale, 0.1 mm.

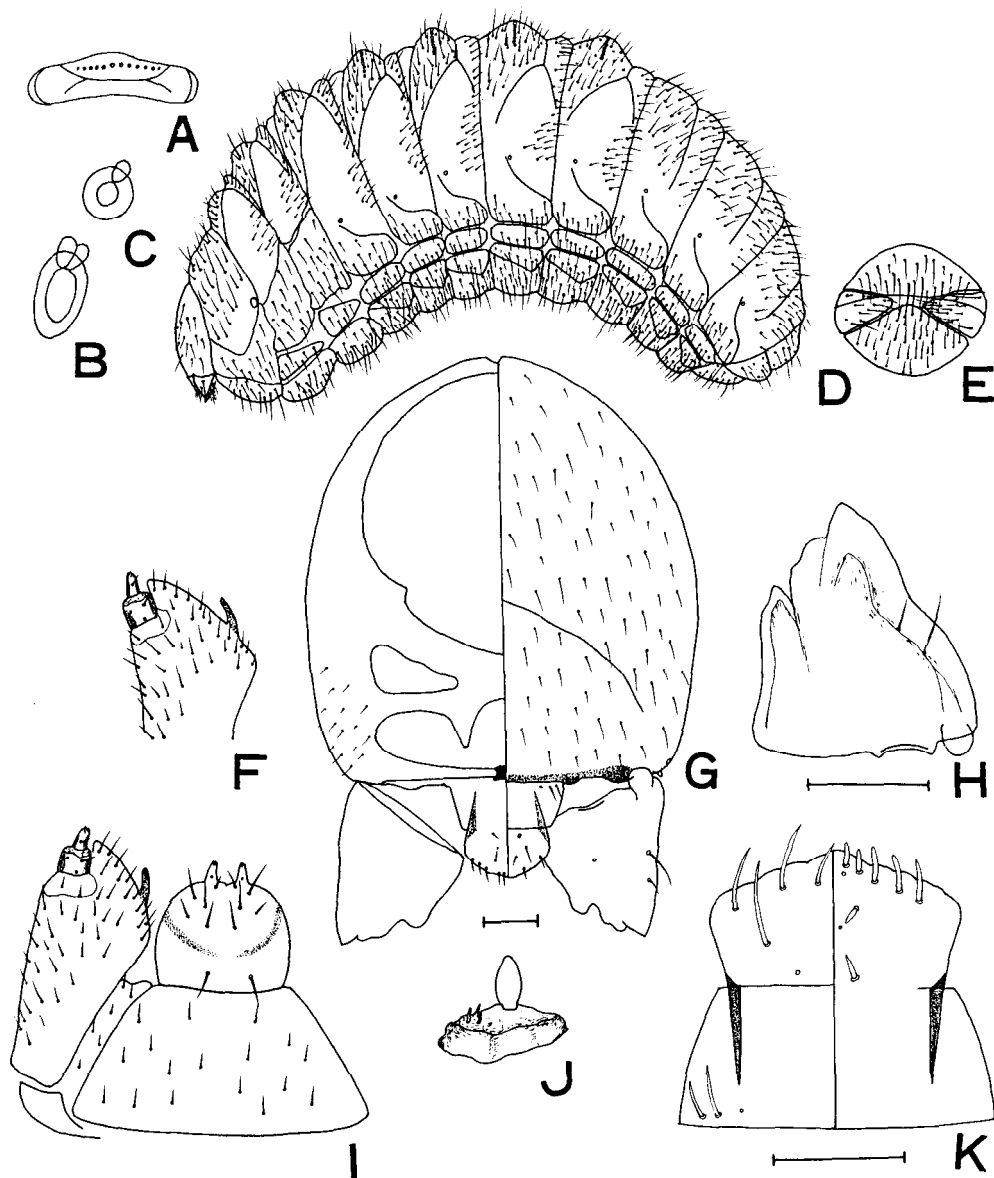


Fig. 3. *Araecerus varians* Jordan.

A, Typical abdominal tergite, dorsal, showing tubercles; B, Thoracic spiracle; C, Abdominal spiracle; D, Mature larva; E, Anus; F, Maxilla, dorsal. G, Head; H, Mandible; I, Maxilla and labium; J, Antenna; K, Labrum and epipharynx. Scale, 0.1 mm.

carina on apical two-thirds near the middle. Labium small, labial palpus one-segmented, with a short seta near base on inner surface and a sensory pore above the seta. Prementum with three to four pairs of setae, often with one additional seta, one of which located laterally near base of palpus. Premental sclerite narrow, often indistinct in the middle. Mentum with a pair of setae, asperate anterolaterally. Submentum indistinctly set off from mentum by a shallow groove, with several pairs of setae. Maxillary stipes and mala with numerous setae dorsally and ventrally, maxillary palpus with two segments.

Pronotum with numerous setae. Legs absent. Thoracic spiracle bicameral, its peritreme broadly oval. Abdominal spiracle unicameral, its peritreme subcircular, about half as long as the maximum diameter of thoracic spiracle. Anterior division of the first five abdominal tergites each with a transverse row of smooth contiguous tubercles. Anus terminal. Asperities short, colorless, pointed.

Species and materials examined :

Araecerus fasciculatus (Degeer). Iki Isl., Sept., 1977, in bulbs of dried garlic.

Araecerus tarsalis Sharp. Kyushu University campus, Dec. 5, 1959, in dead trees of *Fatsia japonica*.

Araecerus varians Jordan. Chichijima Isl., Ogasawara Islands, March 7, 1964. in seeds of *Leucaena leucocephala*.

The description given above agrees well with that of Anderson (1947) except for the following points: Prementum with three to four pairs of setae and premental sclerite not always interrupted in the middle. Identification of three species by the larval characters is very difficult. *A. tarsalis* is only separable from the other two species by the shape of mandible as noted in the key.

Euparius oculatus (Sharp)

(Fig. 4)

Caccorhinus oculatus: Mamaev et al., 1979, In Pravdin (ed.), Stem boring insects and their entomophages, Moscow: 178.

Body moderately large, rather slender, of nearly equal thickness throughout, with numerous setae.

Head uniformly reddish brown, subcircular, with numerous short to moderately long setae arranged in vague rows. Anterior ocellus present, posterior ocellus absent. Antenna scarcely overhung by extension from frons. Frontal suture distinct throughout its length, terminating at side of antenna. Endocarina absent. Labrum with four pairs of setae, anterior pair close to anterior margin near the middle, and with a pair of sensillae near posterior margin. Mandible with a sharp apical and two marginal teeth, the second marginal tooth obtuse, mola straight in surface view, outer surface with five setae. Maxillary palpus with two segments. Stipes and mala with numerous setae dorsally and ventrally. Epipharynx with a small sclerite near apex, with three anterolateral and four anteromedian setae, the innermost anterolateral seta close to the sclerite, the anterior pair of median spines close to the sclerite, posterior pair of median spines arranged longitudinally, with three pairs of sensillae, of which two pairs in the sclerite and the rest a little behind the sclerite. Labial palpus with one segment, almost touching at base, with a sensory pore, premental sclerite broad, interrupted in the middle, prementum deeply incised into two lobes, with a pair of setae. Submentum

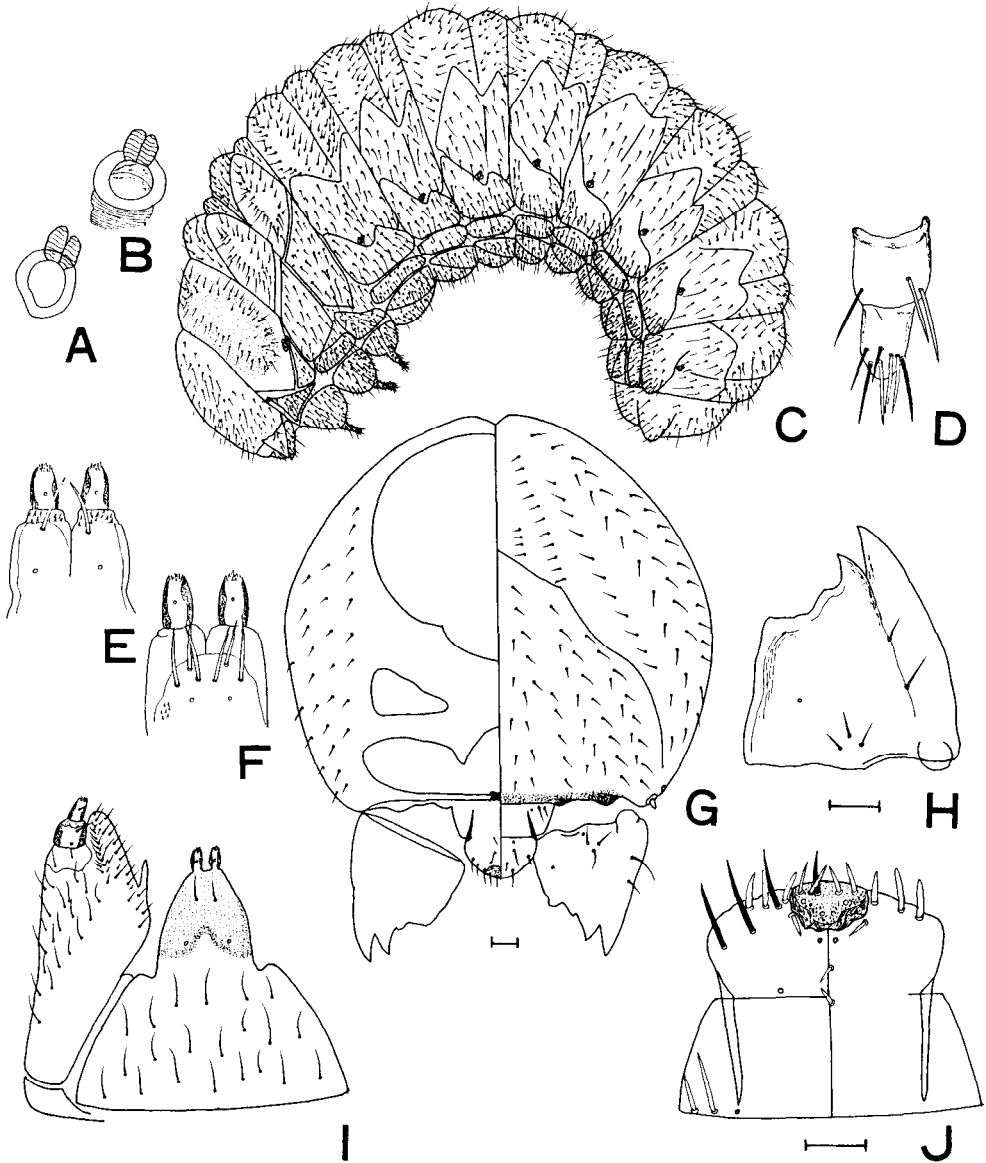


Fig. 4. *Euparius oculatus* (Sharp).

A, Thoracic spiracle; B, Abdominal spiracle; C, Mature larva; D, Leg; E, Premenum, ventral; F, Do, dorsal; G, Head; H, Mandible; I, Maxilla and labium; J, Labrum and epipharynx. Scale, 0.1 mm.

with about seven pairs of setae.

Pronotum with numerous setae. Legs with two segments, basal segment with three or four setae, apical segment with seven setae. Thoracic spiracle bicameral, air tubes short, its peritreme oval. Abdominal spiracle bicameral, its peritreme subcircular, about half as long as the major axis of thoracic spiracle. Anus terminal.

Width of head 1.85 mm.

Materials examined: Minami Park, Fukuoka City, July 10, 1958, in a fungus grown on dead trunk of cherry tree.

Compared with *Euparius marmoreus* described by Anderson (1947), this species is only separable by the larger sclerite of epipharynx, in which two pairs of sensory pores are located. The characteristic prementum is apparently a resultant structure of the adhesion of the prementum and the basal segments of palpi.

Phloeobius stenus Jordan

(Fig. 5)

Body moderately large and robust, with numerous setae.

Head pale brownish, as broad as long, broadest near the middle. Frontal suture discernible throughout its length. Endocarina present, slightly pigmented, about half as long as frons. Anterior half of head thickly set with short setae, the setae sparser posteriorly. Ocellus absent. Antenna in a large oval depression. Labrum with approximately ten pairs of setae. Labral tormae elongate. Epipharynx with numerous setae anterolaterally, with four median spines and four sensory pores. Mandible oblique apically, apical tooth sharper than the marginal teeth, left mandible with second marginal tooth obsolete, right mandible with obtuse second marginal tooth. Labial palpus with two segments, palpi narrowly separated, basal segment with a sensory pore, without seta, apical segment without pore and seta. Prementum with several setae. Premental sclerite interrupted into three parts, median part small trapezoidal, membranous interruptions between the median and lateral sclerites each with a sensory pore. Mentum with a pair of setae behind the middle and with a pair of small sensory pores near the anterior margin. Submentum with more than ten pairs of moderately long setae. Maxillary palpus with three segments. Stipes without lacinia, with abundant setae dorsally and ventrally.

Anterior margin of pronotum deeply emarginate, not sclerotized. Spiracles broadly oval, thoracic spiracle three times as long as abdominal spiracle, air tubes very short, vaguely annulate, thoracic spiracle with seven and abdominal spiracle with five air tubes. Legs small, not pigmented, segments indistinguishable, with many setae. Asperities developed as patches of velvety pubescence. Anus subterminal.

Width of head 2.4 mm.

Materials examined : Omuta City, Fukuoka Pref., Oct. 31, 1965, in stem of *Sasa japonica*.

This species may be separable from *P. pilipes* and *gigas* by the structure of spiracles. The spiracles of *P. pilipes* are annular, and those of *P. gigas* are bicameral on thorax and unicameral on abdomen (Gardner, 1932). The prementum of *P. pilipes* has two pairs of very short setae (Anderson, 1947).

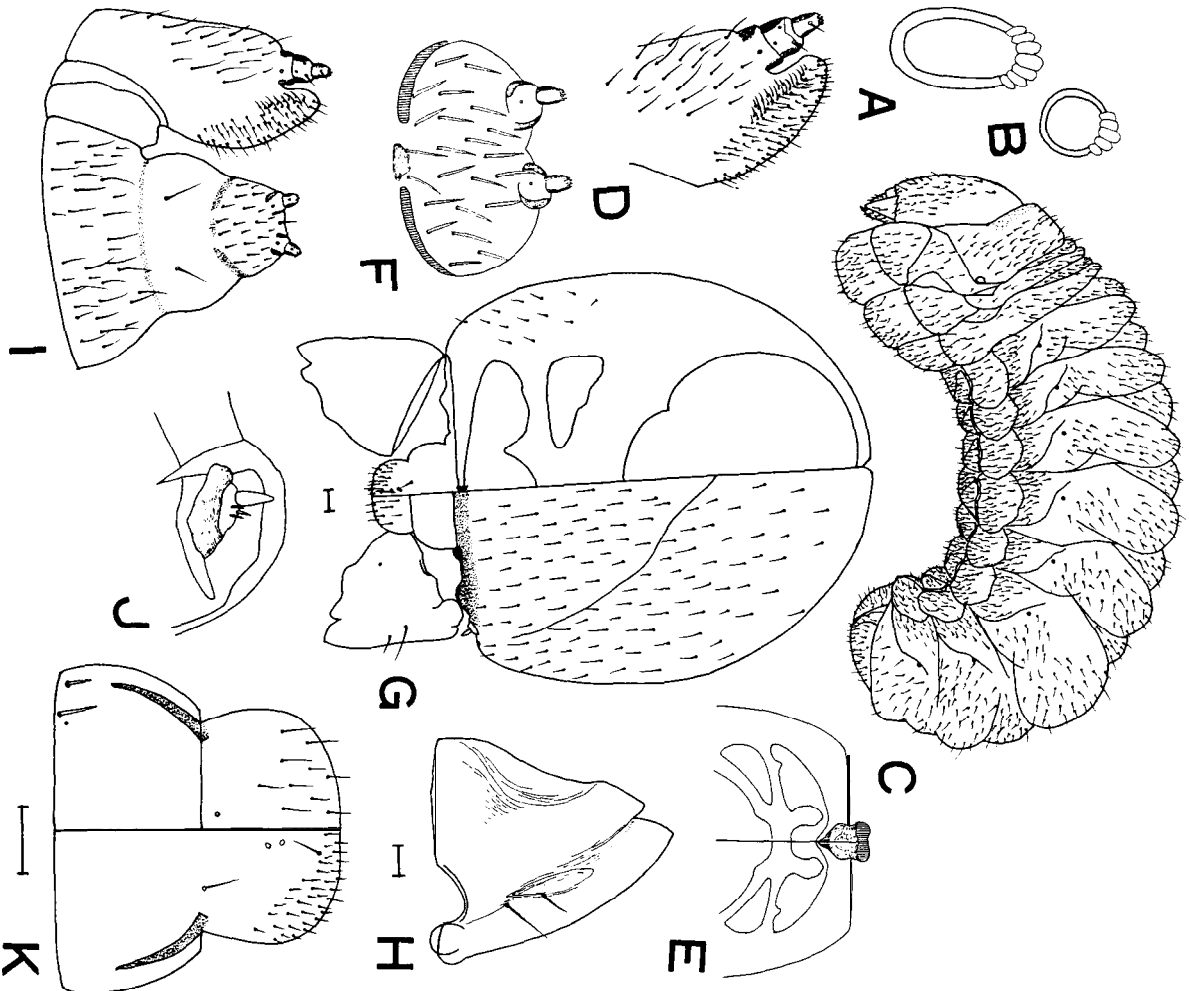


Fig. 5. *Phloeobius stenus* Jordan.

A, Thoracic spiracle; B, Abdominal spiracle; C, Mature larva; D, Maxilla, dorsal; E, Hypopharyngeal sclerite; F, Prementum; G, Head; H, Mandible; I, Maxilla and labium; J, Antenna; K, Labrum and epipharynx. Scale, 0.1 mm.

Autotropis distinguenda (Sharp)

(Fig. 6)

Body moderately curved, markedly thickened on thorax, whitish except for pale brownish anterior margin of frons and brownish mandibles.

Head slightly concealed posteriorly by prothorax, longer than broad, broadest near the middle, rounded posteriorly, with numerous short to moderately long setae. Frontal suture faint, indistinguished anteriorly. Epicranial suture long and distinct. Endocarina absent. Anterior ocellus present, with a small black pigment. Antenna not overhung by extension from frons. Labrum with four pairs of setae and a pair of sensory pores near the basal margin. Labral tormae short. Epipharynx with three anterolateral and six anteromedian setae, of which one pair on dorsal surface, and with four median spines and four sensillae, slightly asperate on admedian areas behind anterior median spines. Hypopharyngeal sclerite not pigmented, but transparent in the manner of hypopharyngeal bracon. Mandible with obtuse apical tooth, first marginal tooth rounded apically, second marginal tooth small, obtuse, molar margin weakly convex in surface view, finely multistriolate. Labial palpus with two segments, basal segment with a sensory pore, sparsely asperate. Prementum with a pair of setae and a pair of sensory pores, asperate laterally. Premental sclerite almost interrupted in the middle. Mentum with a pair of setae. Submentum with three pairs of setae. Maxillary palpus with two segments. Stipes and mala with numerous setae dorsally and ventrally, setae moderately long and strong.

Pronotum with numerous setae. Legs not pigmented, segments only separable by sudden change of the size, each segment with several long setae. Thoracic spiracle broadly oval, 3.5 times as long as abdominal spiracle, the latter subcircular, all spiracles bicameral, air tubes short, annulation indistinct. Anus terminal.

Width of head 0.85 mm.

Materials examined : Mt. Wakasugi, Fukuoka Pref., August 20, 1960, in dead vine of *Wisteria brachybotrys*.

In *Autotropis modesta conspersa* and *A. modesta modesta*, the hypopharyngeal sclerite is absent and a compensatory structure is developed in the stomodeum (Gardner, 1936, and Mathur, 1956), but the sclerite is present in this species. It is not pigmented and transparent in the manner of the hypopharyngeal bracon.

Exechesops leucopis (Jordan)

(Fig. 7)

Body moderately slender, slightly tapering anteriorly, with numerous setae, particularly on ventral surface of thoracic segments, pronotum without pigmented sclerite.

Head free, light brown, lighter in paired dorsal indefinite stripes, as broad as or slightly longer than broad, broadest near the middle, rounded posteriorly. Anterior ocellus present. Frontal suture distinguishable throughout its length. Endocarina absent. Cranium with numerous short to moderately long setae. Labrum with four pairs of setae, and with a pair of sensillae near posterior margin. Epipharynx with three anterolateral and four anteromedian setae, of which one pair on dorsal surface and distant, with four median spines and six sensory pores, the anterior four often indistinct, slightly asperate at sides. Mandible with apical and first marginal teeth of

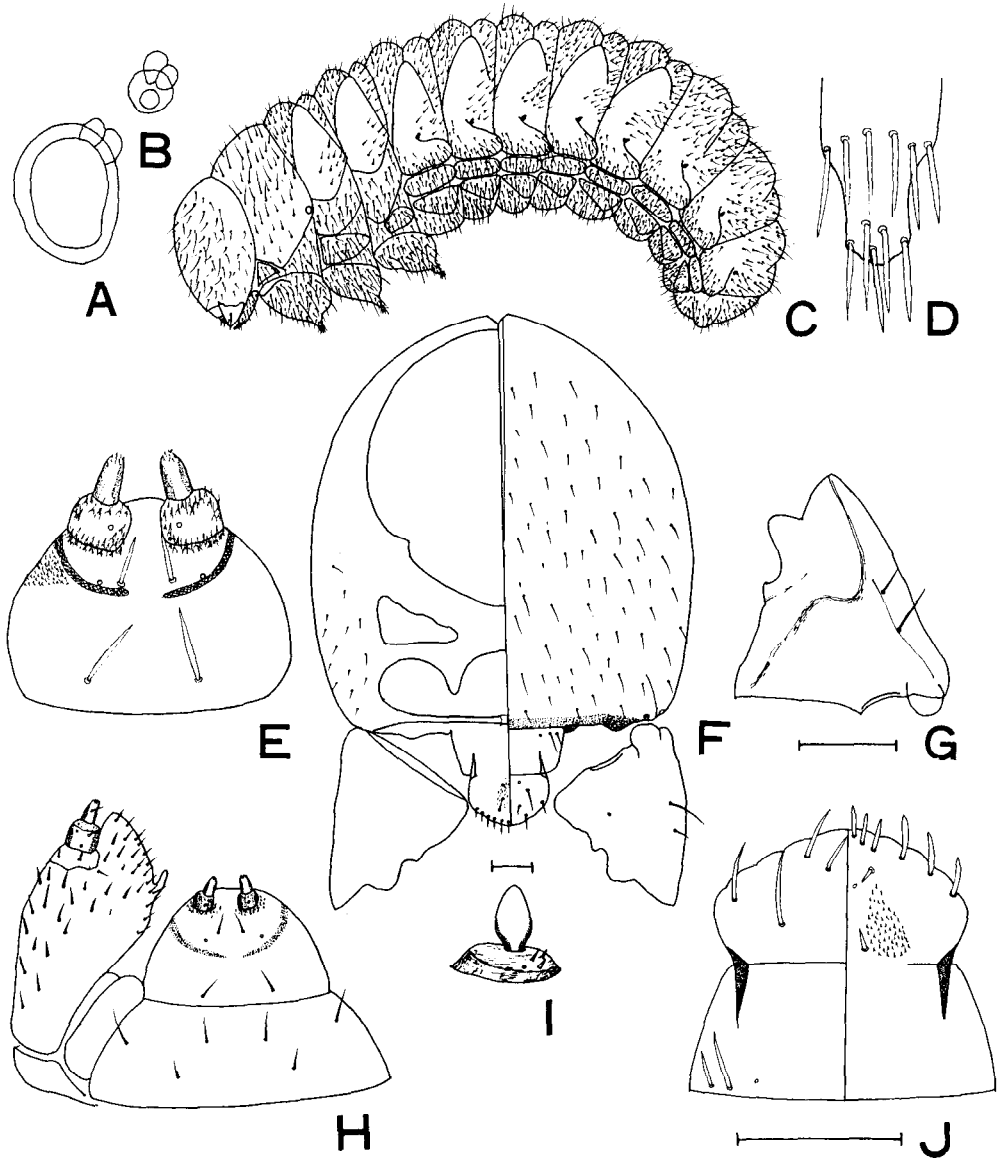


Fig. 6. *Autotropis distingudenda* (Sharp).

A, Thoracic spiracle; B, Abdominal spiracle; C, Mature larva; D, Leg; E, Prementum; F, Head; G, Mandible; H, Maxilla and labium; I, Antenna; J, Labrum and epipharynx. Scale, 0.1 mm.

the same shape, second marginal tooth obtuse, with a deep incision before mola, the latter more than half as long as mandible. Labial palpus with two segments, each segment with a sensory pore. Prementum narrow, sclerite not discernible, with a pair

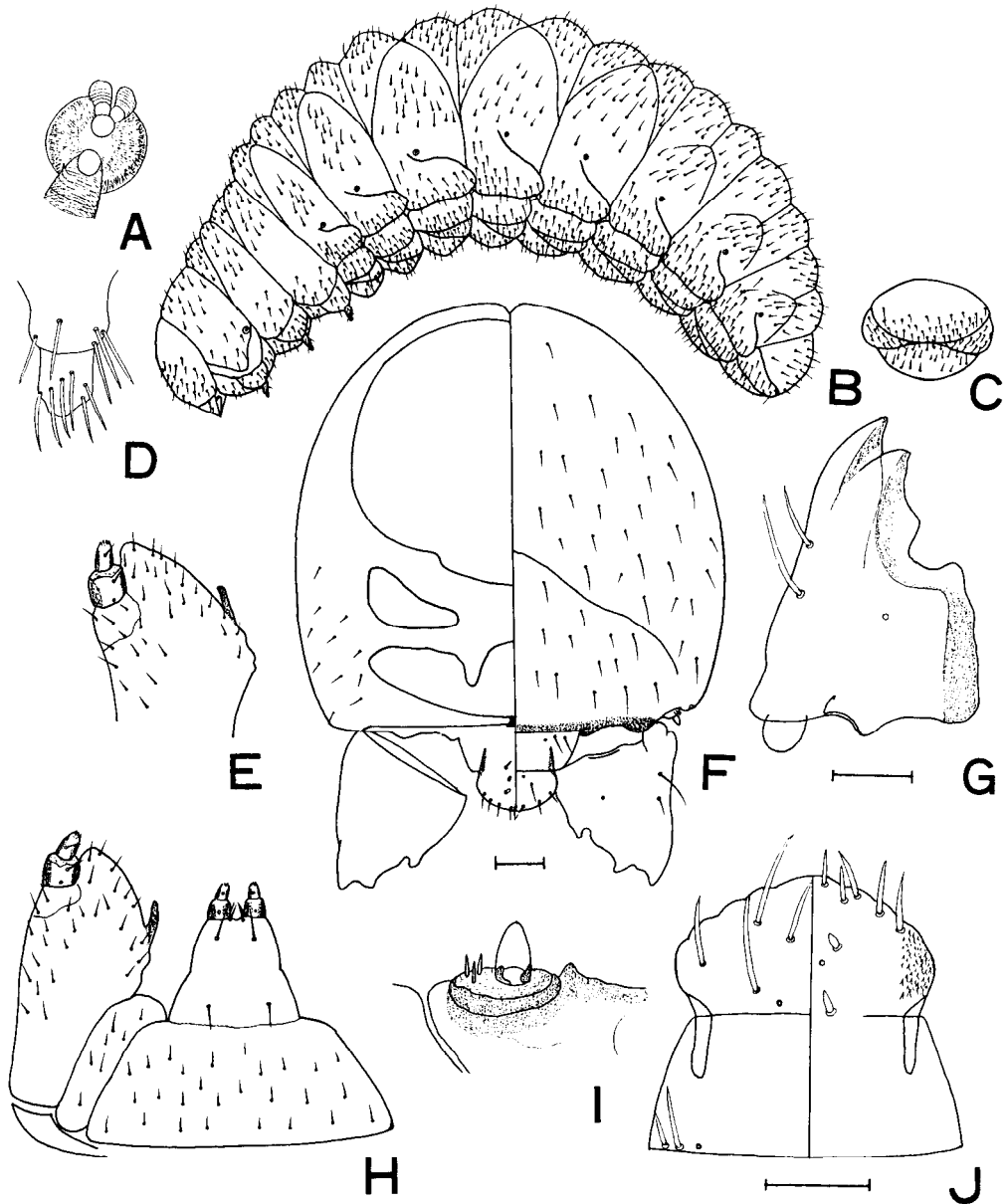


Fig. 7. *Exechesops leucopis* (Jordan).

A, Abdominal spiracle ; B, Mature larva ; C, Anus ; D, Leg ; E, Maxilla, dorsal ; F, Head ; G, Mandible ; H, Maxilla and labium ; I, Antenna ; J, Labrum and epipharynx. Scale, 0.1 mm.

of moderately long setae. Mentum with a pair of moderately long setae. Submentum with more than ten pairs of short to moderately long setae. Maxillary palpus with two segments. Stipes and mala with numerous setae dorsally and ventrally.

Pronotum smoother than abdominal tergites. Thoracic spiracle similar to that of abdomen in shape and size, bicameral, peritreme circular, air tubes weakly annulate. Legs moderately long, with two segments, not sclerotized, each segment with several setae. Anus terminal.

Width of head 0.85 mm.

Materials examined: Mt. Hikosan, Fukuoka Pref., Sept. 5, 1957, in seeds of *Styrax japonica*.

Rhaphitropis guttifer (Sharp)

(Fig. 8)

Tropideres guttifer: Johraku, 1952, Shin-Konchu, 5 (10) : 33.

Body moderately large, rather slender, of nearly equal thickness throughout, with setae numerous, short, slender, inconspicuous.

Head light yellow, very pale, partly embedded in thorax, a little longer than broad, broadest near the middle. Frontal suture indistinct. Endocarina absent. Anterior ocellus present. Antenna scarcely overhung by extension from frons. Mandible with apical tooth sharp, second marginal tooth obsolete, without emargination before mola, mola two-thirds as long as mandible, nearly straight in surface view. Labrum transverse, broadly convex in the median area, with four pairs of setae, of which the anterior pair near apical margin, and with a pair of sensillae near posterior margin. Epipharynx with three anterolateral and four anteromedian setae, and four median spines, of which the posterior pair longer. Epipharyngeal sensory pores two-paired. Labial palpus with two segments. Prementum narrow, with two pairs of setae. Premental sclerite discernible. Submentum with several short to elongatae setae. Maxillary palpus with three segments, two basal segments short, second segment with a seta and two sensillae, third segment with a sensilla. Stipes with lacinia near the middle of inner margin, stipes and mala with numerous setae dorsally and ventrally.

Pronotum with numerous setae. Thoracic spiracle similar to that of abdomen in shape and size, bicameral, air tubes short, annulation indefinite, peritreme circular. Legs moderately long, with two segments, each segment with five to seven setae. Anus terminal.

Width of head 0.65 mm.

Materials examined : Ueki, Kumamoto Pref., May 27, 1970, in dead vine of *Wistaria brachybotrys*.

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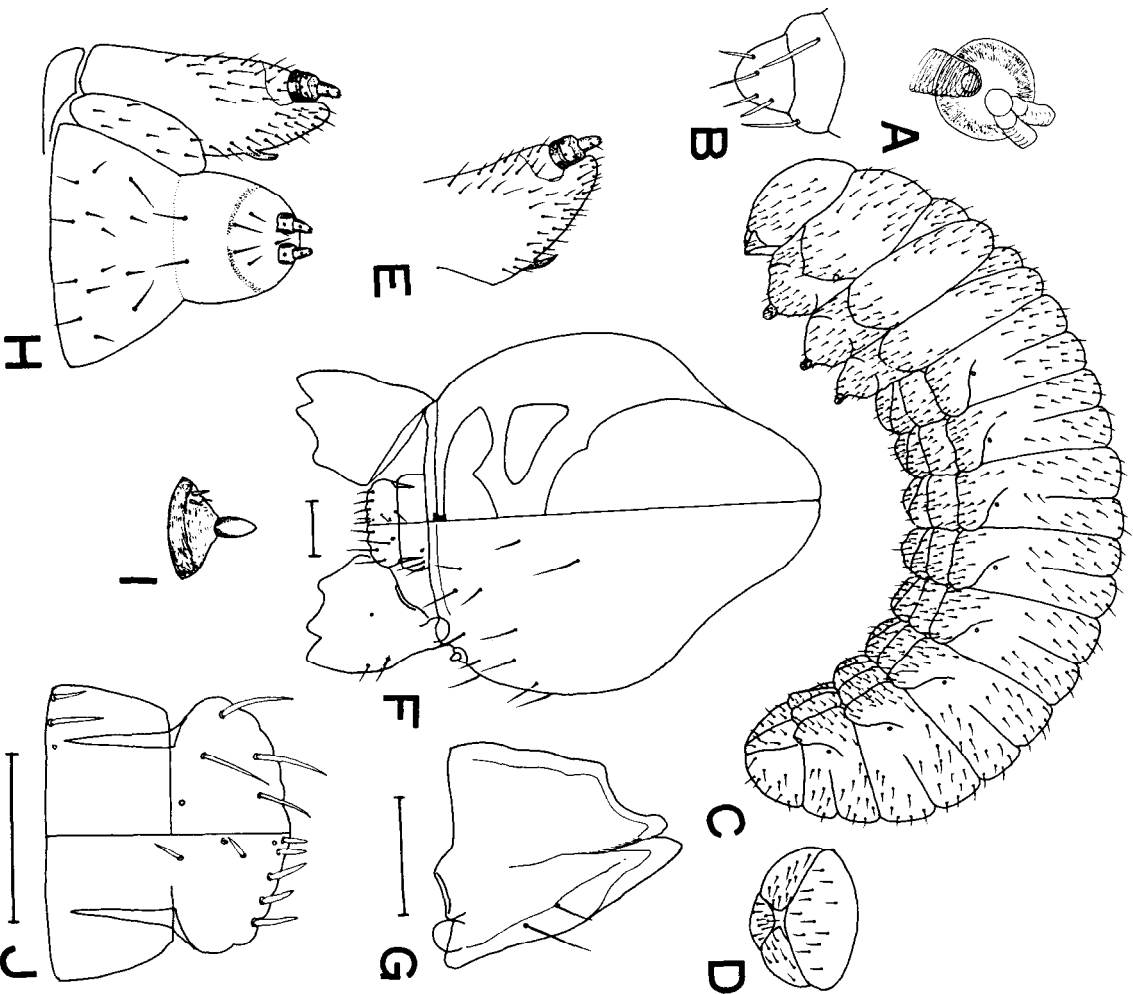


Fig. 8. *Rhabdithropis guttifer* (Sharp).

A, Abdominal spiracle; B, Leg; C, Mature larva; D, Anus; E, Maxilla, dorsal; F, Head; G, Mandible; H, Maxilla and labium; I, Antenna; J, Labrum and epipharynx. Scale, 0.1 mm.

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