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WITH NOTES ON THE SYSTEMATIC POSITION OF
ZEUGOPHORINAE (COLEOPTERA : CHRYSOMELIDAE)

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LARVA OF *ZEUGOPHORA ANNULATA* (BALY) FROM JAPAN,
WITH NOTES ON THE SYSTEMATIC POSITION OF
ZEUGOPHORINAE (COLEOPTERA :CHRYSOMELIDAE)*

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Abstract

The mature larva of *Zeugophora annulata* (Baly) is described and illustrated. Some biological notes and remarks on the systematic position of the subfamily Zeugophorinae are also given.

The genus *Zeugophora* Kunze comprises a small number of leaf beetles, eight species being listed for Japan. The adult classification of Japanese Zeugophorinae has been established by Chûjô and Kimoto (1961). Very little has been known on their bionomics and the larvae except for following two papers. Böving and Craighead (1931) illustrated the larva of *Z. scutellaris*, and Hayashi (1962) described and figured the larva of *Z. annulata*.

The present paper gives a detailed description of the larva of *Z. annulata* with notes on its biology. Larvae were killed in boiling water and stored in 70% ethyl alcohol. Dissected body parts were stored in glycerin and examined in glycerin or alcohol. Drawings were made using an ocular micrometer.

Zeugophora annulata (Baly), mature larva
(Figs. 1,2)

Body creamy yellow, flattened, subparallel-sided. Head pale brown, clypeus and labrum brown, mandibles dark brown.

Head. Prognathous, flattened, slightly sclerotized. Hind corners of epicranium largely produced posteriorly, moderately retractile into prothorax. Frontal suture distinct, singly concavo-convex, but obsolete behind the anterior margin. Frons divided by endocarina, which distinct for full length. Stemmata developed, black pigmented, 2 pairs of stemmata behind antennae. Epicranium with 4 pairs of dorsal setae and 5 pairs of lateral setae, 7 pairs of dorsal sensilla, one pair of lateral sensilla. Frons broad subtriangular, with 6 pairs of setae and 2 pairs of sensilla, anterior margin somewhat sclerotized. Antenna 3-segmented; segment 1 transverse and bearing 3 sensilla, segment 2 transverse, bearing 4 sensilla basiconica, and a large membranous conical sensory papilla, segment 3 with 5 sensilla basiconica at apical disc. Clypeus trapezoid, with one pair of setae and one

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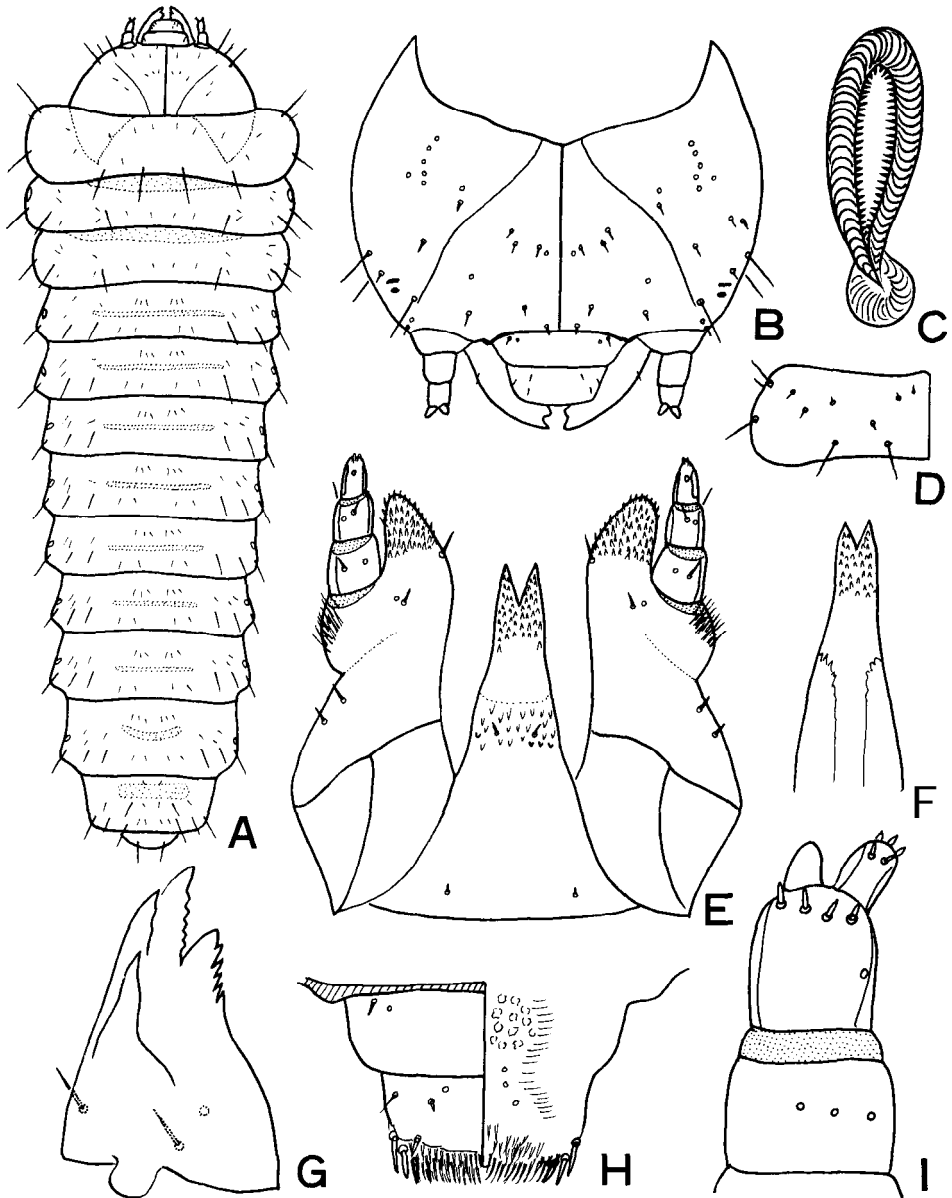


Fig. 1 *Zeugophora annulata* (Baly). A, mature larva ; B, head ; C, spiracle ; D, pronotum ; E, lower mouth parts ; F, labium (dorsal view) ; G, mandible ; H, clypeus, labrum and epipharynx ; I, antenna.

pair of sensilla. Labrum trapezoid, slightly sclerotized, with 3 pairs of labral setae and one pair of sensilla. Epipharynx with 3 pairs of epipharyngeal setae and numerous epipharyngeal spinules; median part of epipharynx with 3 pairs of sensory pores. Mandible palmate, strongly sclerotized, with 4 teeth, third and fourth teeth each with 5 serration, without penicillus. Two mandibular setae

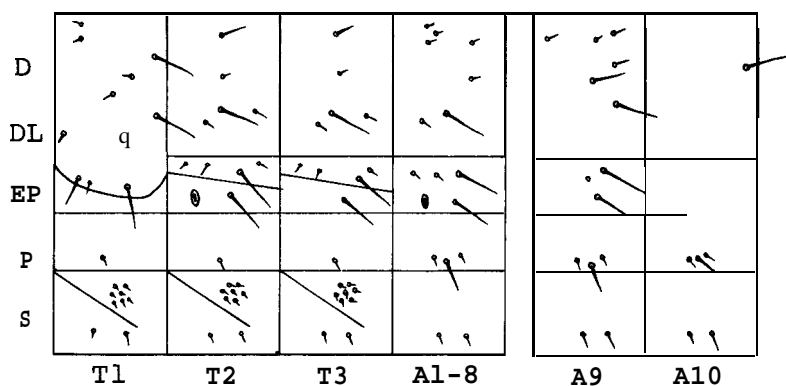


Fig. 2 *Zeugophora annulata* (Baly), chaetotaxy of mature larva. D, dorsal part ; DL, dorso-lateral part ; EP, epipleural part ; P, pleural part ; S, sternal part ; T1, prothorax ; T2, mesothorax ; T3, metathorax ; A1-8, abdominal segments 1-8 ; A9 and A10, abdominal segment 9 and 10.

and one sensillum present on dorsal surface. Prementum nearly fused with postmentum. Ligula with numerous spinules, bifurcate anteriorly ; mentum with 2 pairs of setae, anterior parts with several pairs of spinules. Labial palpus degenerated, a vestigial segment only traceable under high magnification. Maxillary palpus 3-segmented ; segment 1 with one seta and one sensillum, segment 2 with 2 setae and one sensillum, segment 3 with one sensillum. Palpifer with numerous spine-like setae laterally ; stipes with 2 pairs of setae. Galea fused with lacinia, with numerous spinules.

Thorax. Pronotum weakly sclerotized, yellowish, with 11 pairs of setae, of which 7 pairs of setae minute. Meso- and metanota not sclerotized ; prodorsum widely asperate, dorsum with 10 pairs of setae, of which 7 pairs of setae minute. Pleuron with a seta. Pedal area with 7 minute setae. Sternum with 2 pairs of minute setae. Thoracic spiracle uniform, situated on epipleural anterior parts (EPa): spiracular opening oblong-oval, with spinules. Legs absent.

Abdomen. Ten-segmented, 1st to 8th segments each with a wort-like projection postero-laterally. Typical abdominal segment with 11 pairs of setae on tergum, of which 8 pairs of setae minute ; transversely asperate along dorsal groove ; pleuron with a long and two minute setae ; sternum with 2 pairs of short setae. Ninth segment with 9 pairs of setae on tergum, of which 5 pairs of setae minute. Tenth segment with one pair of setae on tergum. Abdominal spiracles present on first 8 segments similar to mesothoracic spiracles but smaller and indistinct.

Body length : 4.6 mm.

Head width : 0.9 mm.

Material examined. Mt. Hikosan, Fukuoka Pref., 9. V. 1989, larvae collected and reared on leaves of *Euonymus sieboldianus* Blume.

Biological notes. The larvae makes a mine in the leaf of *E. sieboldianus*. The adult is found on the host plant from the middle of May. The habit of oviposition has not been observed yet. The mine in broad-liner at first and later blotch-form, whitish green, and of the full-depth type, and feces present here and there. One or two larvae are found in a single leaf.

Remarks. The larva of *Zeugophora* is readily distinguished from those of the other Chrysomelidae by its flat body, flat and partly retracted head, absence of legs, etc. Böving and Craighead (1931) described the larva of *Z. scutellaris* as "Prementum, mentum, and submentum fused ; labial palpi close together ; ligula absent ; mandible with transverse, approximately gouge-shaped,

and slightly scalloped distal edge", and placed it in Orsodacnidae. But in *Z. annulata*, labial palpi are vestigial ; ligula is produced anteriorly as a pair of processes ; and mandible is distinctly dentate. The labium is sandwiched between the maxillae and the anterior part is immersed so as to be seen as a narrow spinulate part. When the labium is mounted and weakly depressed on slide, the observation reveals the facts that the anterior part is nothing but a biforked ligula, and not the palpi as stated by Böving and Craighead, and true palpi are only seen under high magnification as a vestigial segment on anterior margin of the mentum on each side, the mentum is lightly brownish and weakly warped internally. Moreover, the mandibles of *Z. annulata* are distinctly dentate and each tooth in serrate. By this character, the key made by Böving and Craighead is not workable.

The head of this type is common among some larvae of the leaf-mining insects such as Hispinae, Alticinae, Curculionidae, Buprestidae, and Microlepidoptera. But *Zeugophora* is characteristic by the complete absence of the coronal suture and direct contact the frontal sutures with the occipital foramen posteriorly, and complete endocarina. The posterior margin of the cranium on the ventral side is more deeply emarginate than the dorsal side from the posterior comers, and this structure is different from that of leaf-mining Alticinae.

As noted above, the key to subfamilies made by Böving and Craighead (1931) is inadequate and that by Mann and Crowson (1981) is also inappropriate for *Zeugophora*.

The larval characters of *Zeugophora* support the treatment as an independent subfamily Zeugophorinae.

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