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**SUPRA-GENERIC SUBDIVISIONS OF THE SUBFAMILY ALTICINAE BASED  
ON LARVAL CHARACTERS, WITH DESCRIPTIONS OF LARVAE OF  
HISPANIOLAN SPECIES (COLEOPTERA: CHRYSOMELIDAE)**

By HARUO TAKIZAWA

*Abstract*

TAKIZAWA, H. 2005. Supra-generic subdivisions of the subfamily Alticinae based on larval characters, with descriptions of larvae of Hispaniolan species (Coleoptera: Chrysomelidae), *Ins. matsum. n. s.* 62: 187–206, 8 figs., 2 tabs.

Larvae of *Alagoasa cinctus*, *Disonycha comma*, *D. eximia*, *D. spilotrachelata*, *Lysathia occidentalis*, *Macrohaltica jamaicensis*, *Omophoita aequinoctialis* and *Megistops liturata* were described from the Hispaniola Is., West Indies. These Neotropical larvae were successfully incorporated into the author's preliminary groupings of Alticine genera, which was proposed mainly on the basis of Palearctic species. This result stresses particularly the importance of both the larval morphology and biology in discussing the phylogenetic relationships in the subfamily. This system based on larvae may give a good reference for supra-generic classification in the subfamily, where no satisfactory tribe-system based on adults is present.

*Author's address.* Kami 2-7-16, Hasuda, Saitama 349-0122, Japan

## INTRODUCTION

The subfamily Alticinae is one of the largest groups among Chrysomelidae, composed of over 500 genera distributed into 71 genus-groups (Seeno & Wilcox, 1982). However there is no established tribe-system in the subfamily. For this reason, there are many works discussing phylogenetic or systematic aspect of Alticinae and the nearest subfamily Galerucinae. Reid (1995) and Lingfelter & Konstantinov (1999) made cladistic analysis mainly based on adult morphological traits. Furth & Suzuki (1994) studied extensively four characters of adults, viz. the metafemoral spring, hind wing venation and male and female reproductive organs. As a result they recognized 19 genus groups in the subfamily, this grouping being rather different from the traditional one. Farrell (1998) and Kim et al. (2003) made molecular analysis and discussed the relationship between Alticinae and Galerucinae. Duckett & Kjer (2003) also discussed the phylogenetic relationship among the subtribe Oedionychina. Results on these lines of researches are, however, revealed to be more or less contradictory.

On the other hand, Crowson & Crowson (1996) pointed out importance of larval morphology and biology in relation to the ranking of both subfamilies. I proposed a preliminary grouping of alticine genera based on larval characters (Takizawa, 1994, 2000). It was, however, proposed in papers written in Japanese, and the grouping seems poorly known among chrysomelid researchers. It is worth iterating the schema again, with description of some alticine larvae from the Hispaniola. As our knowledge on immature stages of alticine larvae is almost confined to Palearctic or at most Holarctic species, it is of much interest to see whether those Neotropical species fit into my system.

All the specimens used will be deposited in the collection of the Laboratory of Systematic Entomology, Hokkaido University (SEHU), Sapporo.

### PRELIMINARY GROUPINGS OF GENERA BASED ON LARVAL CHARACTERS

#### Genus group *Nonarthra*

Thorax and 1–8th abdominal segments each with a pair of defensive glands opening as a slit between *DLa*\*<sup>1</sup> group and *DLp*, but on prothorax situated antero-laterally to *D-DL-Epa*; tubercles strongly chitinized with long setae; meso- and metathorax with *DL* divided into *DLai*, *DLae* and *DLp*; abdominal segment with *DL* divided into *DLa* and *DLp*, without *Dm*.

Larvae feeding externally on mosses at soil surface; pupating in the soil.

Members—*Nonarthra* Baly.

#### Genus group *Lanka*

Meso- and metathorax with *DL*; 1st to 6th abdominal segments lacking tubercles; 7th and 8th segments wholly chitinized on the dorsum; *Dm* undeveloped.

Larvae possibly living in the soil.

Members—*Lanka* Baly.

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\*1 Details of tubercular terminology are shown later.

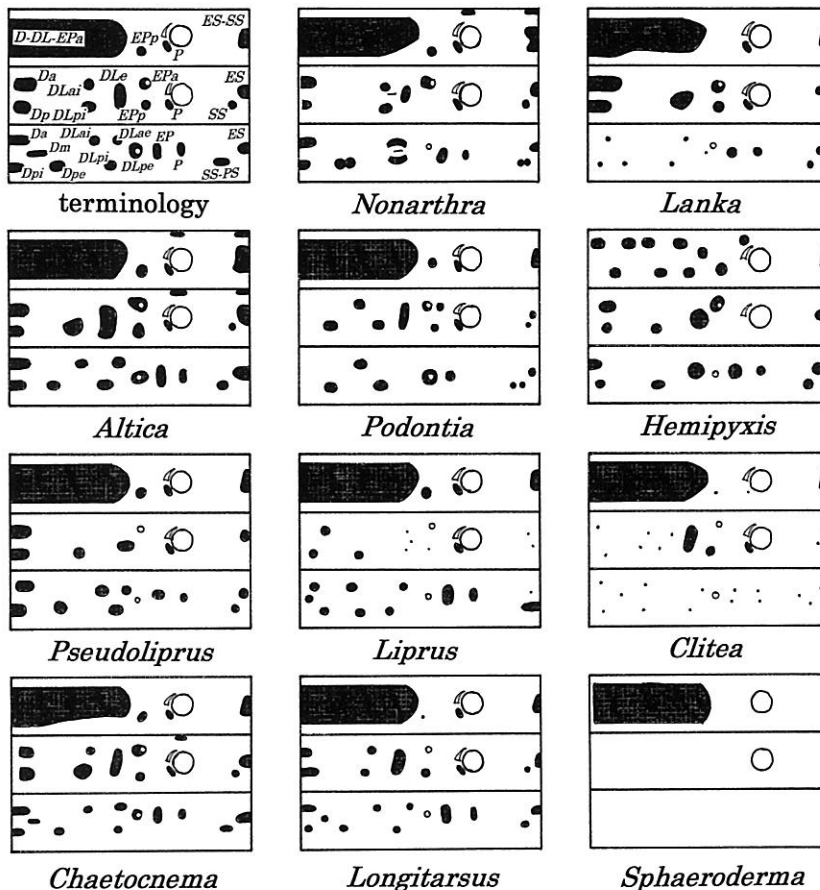


Fig. 1 Schematic presentation of tubercular patterns in Alticinae. Top: prothorax, middle: mesothorax, below: 2nd abdominal segment.

#### Genus group *Altica*

Meso- and metathorax with *DL* divided into *DLai*, *DLae* and *DLp*; abdominal segments with *DL* divided into *DLai*, *DLae* and *DLp*; *Dm* undeveloped; tubercles well chitinized.

Ovipositing on leaf surface in a mass; larvae externally feeding on leaves; 3rd instar larvae pupating in the soil.

Members—*Altica* Geoffroy. *Aphthona* Chevrolat\*<sup>2</sup>, *Neocrepidodera* Heikertinger\*<sup>2</sup> and *Orthocrepis* Weise\*<sup>3</sup> are tentatively grouped here. They are characterized additionally by living in the soil and meso- and metathoracic *Dpi* and *Dpe* united into *Dp*.

#### Genus group *Podontia*

Body robust and cylindrical with round sucking plate on the apex; anus opened dorsally on 9th abdominal segment; tubercles weakly chitinized; meso- and metathorax with small *DL* undivided; abdominal segments with *DL* represented by a few setae; *Dm* undeveloped.

Ovipositing on leaf surface in rows in *Ophrida* and *Podontia*; head with a pair of ocelli; larvae feeding externally on leaves, covered with slimy feces on the dorsum; 4th instar larvae pupating in the soil.

Members—*Blepharida* Chevrolat\*<sup>4</sup>, *Ophrida* Chapuis, *Podontia* Dalman.

#### Genus group *Hemipyxis*

Body somewhat quadrate on lateral side, with *DL* and *EPa* laterally produced into conical processes; dorsal setae spatulate or broadened to apex; meso- and metathorax and abdominal segments with *DL* undivided, without *Dm*; 1st instar larva sometimes with thoracic *Dp* undivided.

Ovipositing on undersurface of leaves; larvae feeding externally on leaves; 3rd instar larvae pupating in the soil.

Members—*Hemipyxis* Dejean, *Philopona* Weise.

#### Genus group *Pseudoliprus*

Meso- and metathorax with *DL* undivided; abdominal segments with *DL* undivided, without *Dm*.

Ovipositing on the soil surface; larvae living in the soil.

Members—*Pseudoliprus* Chûjô et Kimoto. *Mantura* Stephens with leaf-mining larvae is tentatively included here, in which abdominal *DL* is divided into *DLa* and *DLp*.

#### Genus group *Liprus*

Meso- and metathorax with *DL* undivided; abdominal segments with *Dm*; *DL* divided into *DLai*, *DLae* and *DLp*; tubercles usually weakly developed.

Ovipositing on the soil surface or in the soil; larvae living and pupating in the soil; some larvae boring into the roots, or into leaves or stems of the hosts.

Members—*Liprus* Motschulsky, *Phygasia* Baly, *Phyllotreta* Chevrolat, *Pseudodera* Baly, *Psylliodes* Berthold, *Sangriola* Jacobson.

#### Genus group *Clitea*

Meso- and metathorax with *DL* divided into *DLai*, *DLpi* and *DLe*; abdominal segments with *Dm*; *D* divided into *Da*, *Dpi* and *Dpe*; *DL* divided into *DLai*, *DLae*

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\*2 after Medvedev & Zaitsev (1979)

\*3 after Welch (1972)

\*4 after Furth (1982)

and *DLP*.

In *Clitea* ovipositing on the leaf surface; larvae feeding externally on leaves, covered with slimy feces on the dorsum; pupating in the soil.

Members—*Clitea* Baly. *Crepidodera* Chevrolat\*<sup>2</sup>, *Hippuriphila* Foudras\*<sup>2</sup> and *Lythraria* Bedel\*<sup>2</sup> are tentatively included here. These larvae are living in the soil or in the stem of *Equiseta* sp. in the case of *Hippuriphila*.

#### Genus group *Chaetocnema*

Meso- and metathorax with *DL* divided into *DLai*, *DLpi* and *DLe*; abdominal segments with *Dm*; *D* divided into *Da*, *Dpi* and *Dpe*; *DL* divided into *DLai*, *DLae*, *DLpi* and *DLpe*; tubercles weakly developed.

Larvae living in the soil, or sometimes boring into stems; pupating in the soil.

Members—*Chaetocnema* Stephens.

#### Genus group *Longitarsus*

Meso- and metathorax with *DL* divided into *DLi* and *DLe*; abdominal segments with *Dm*; *DL* divided into *DLai*, *DLae* and *DLp*; tubercles weakly developed, or represented by primary setae.

Larvae living and pupating in the soil.

Members—*Longitarsus* Berthold.

#### Genus group *Sphaeroderma*

True leaf miners characterized by strongly flattened body, flattened head with vertex incised in U- or V-shape posteriorly, and by body surface without setae or tubercles.

Members—*Argopistes* Motschulsky, *Argopus* Fischer, *Dibolia* Latreille\*<sup>2</sup>, *Schenklingia* Csiki\*<sup>5</sup>, *Sphaeroderma* Stephens.

#### TUBERCULAR TERMINOLOGY

The tubercular terminology adopted is based on Kimoto (1962) and Takizawa (1972). Tubercles are defined as small chitinized plates around the bases of primary setae on the body surface. Body surface is usually divided into 5 regions, viz. dorsal, dorso-lateral, epipleural, pleural and sternal regions. Dorsal region has a tubercle *D*, which is usually divided into two or three tubercles: *Da* and *Dp*, or *Da*, *Dpi* and *Dpe*, where subscripts 'a', 'p', 'i' and 'e' denote 'anterior', 'posterior', 'interior' and 'exterior', respectively. Dorso-lateral region has a tubercle *DL*, which is divided into two to four tubercles. Epipleural region has a tubercle *EP*, which is sometimes divided into two tubercles. Pleural region has a tubercle *P*. Sternal region has three tubercles, viz. parasternal (*PS*), sternellar (*SS*) and eusternal (*ES*) tubercles. Among these tubercles, *D*, *DL* and *EP* are known to show genus/species specific changes in the subfamily Chrysomelinae, Galerucinae and Alticinae.

In the subfamily Alticinae (Fig. 1), prothorax has dorsal to epipleural tubercles

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\*5 after Kato (1991)

united together (*D-DL-Epa* type). Meso- and metathorax has *D* divided into two or three tubercles (*Da/Dp* or *Da/Dpi/Dpe* type), *DL* sometimes into two to four tubercles (*DL*, *DLi/DLe*, *DLai/DLpi/DLe* or *DLai/DLae/DLpi/DLpe* type). Abdominal segments sometimes have an additional tubercle *Dm* between *Da* and *Dp* group (*Dm* type). Tubercle *D* is divided into two or three tubercles (*Da/Dp*, or *Da/Dpi/Dpe* type). Tubercle *DL* sometimes is divided into two to four tubercles (*DL*, *DLa/DLp*, *DLai/DLae/DLp* or *DLai/DLae/DLpi/DLpe* type).

Combination of these changes together with other morphological and biological traits will define genus groups as shown above.

## RESULTS AND DISCUSSION

This system was first proposed in 6 genus groups (Takizawa, 1994) and later enlarged into 11 groups (Takizawa, 2000) based on larvae known in Japan and its adjacent areas. The groups are principally distinguished by the tubercular patterns on the body surface as shown in Table 1 and Fig.1. So far this is the only supra-generic system proposed on larval characters in the subfamily Alticinae. A few points are worth for considering about its validity. 1. The number of studied species and genera are too small. Moreover, they are so far confined to almost to the species of the Palearctic region. 2. In some species, only the first instar larva was studied, in which case possible changes in the tubercular pattern with successive instars were neglected. 3. As this system was mostly based on the tubercular patterns, true leaf-miners without tubercles may be lumped into one group. It is possible these defects have produced some biases in this system.

I described 9 species belonging to 6 genera of West Indies in the appendix: *Alagoasa cinctus* (Linnaeus), *Disonycha comma* White, *D. eximia* Harold, *D. spilotrachel* Blake, *Lysathia occidentalis* (Suffrian), *Macrohaltica jamaicensis* (Fabricius), *Omophoita aequinoctialis* (Linnaeus), *Megistops liturata* (Olivier) and *Megistops* sp. These larvae were successfully incorporated into my larval groups: *Lysathia occidentalis* and *Macrohaltica jamaicensis* into the genus group *Altica*; *Alagoasa cinctus*, *Disonycha comma*, *D. eximia*, *D. spilotrachel* and *Omophoita aequinoctialis* together with the genus *Walterianella* Bechyne and *Kuschelina* Bechyne after Duckett & Swigonova (2002) and Duckett & Casari (2002) to the genus group *Hemipyxis*; *Megistops liturata* and *Megistops* sp. to the genus group *Sphaeroderma*. This fact may further strengthen the validity of this system.

On the other hand, there is still no comprehensive established tribe-system in the subfamily Alticinae. This makes comparison between larval and adult systems somewhat difficult. Seeno & Wilcox (1982) provided a check-list of genera in the subfamily, in which 71 genus groups are enumerated. The 36 genera mentioned above are listed in Table 2 in reference to Seeno & Wilcox's system. Among the 11 larval groups, 4 groups, viz. *Nonarthra*, *Chaetocnema*, *Longitarsus* and *Podontia*, well correspond to the groups based on adult morphology. While larval group *Sphaeroderma* referring to true leaf-miners contains member of 5 different adult groups. In this group the tubercular pattern has no relevance to further subdivisions as already mentioned. The larval group *Hemipyxis* is characterized by more or less subquadrate body with conically produced tubercles. Among the 7 genera listed, 3 species of *Disonycha* are uniquely characterized by the presence of ocellus and penicillus on the mandibles. These characters are usually found in the subfamily Galerucinae. This may warrant a new group for the

Table 1. Larval group characterized by the tubercular pattern, etc.

Genus group on larvae (this paper)	Morphology					Biology	
	meso- & metathorax		abdomen		others		
	D group	DL group	D group	Dm			DL group
<i>Nonarthra</i>	Da /Dp	DLai /DLae /DLp	Da /Dp	(-)	DLa /DLp	11 pairs of defensive glands	external leaf feeder
<i>Lanka</i>	Da /Dp	DL	Da /Dp	(-)	DLai /DLpi /DLe	1-6th abdominal segments without tubercles	leaf-miner/root feeder?
<i>Altica</i>	Da /Dpi /Dpe	DLai /DLae /DLp	Da /Dpi /Dpe	(-)	DLai /DLae /DLp		external leaf feeder/ root feeder?
<i>Podontia</i>	Da /Dpi /Dpe	DL	Dai /Dae /Dpi /Dpe	(-)	DL	abdominal D and DL not chitinized	external leaf feeder with fecal cover
<i>Hemipyxis</i>	Da /Dpi /Dpe	DL	Da /Dpi /Dpe	(-)	DL	EP and DL produced conically; <i>Disonycha</i> with ocellus	external leaf feeder
<i>Pseudoliprus</i>	Da /Dpi /Dpe	DL	Da /Dpi /Dpe	(-)	DL		root feeder/ leaf-miner
<i>Liprus</i>	Da /Dpi /Dpe	DL	Da /Dpi /Dpe	Dm	DLai /DLae /DLp		root feeder
<i>Longitarsus</i>	Da /Dpi /Dpe	DLi /DLe	Da /Dpi /Dpe	Dm	DLai /DLae /DLp		root feeder
<i>Clitea</i>	Dai /Dae /Dpi /Dpe	DLai /DLpi /DLp	Da /Dpi /Dpe	Dm	DLai /DLae /DLp		external leaf feeder/ root feeder
<i>Chaetocnema</i>	Da /Dpi /Dpe	DLi /DLp or DLi /DLae /DLpe	Da /Dpi /Dpe	Dm	DLai /DLae /DLpi /DLpe		root feeder/stem, leaf-miner
<i>Sphaeroderma</i>	(-)	(-)	(-)	(-)	(-)	tubercles undeveloped; head flattened dorso-ventrally	true leaf-miner

Table 2. Comparison between larval and adult groups in Alticinae

Genus group on larvae (this paper)	Genera included	Genus group on adults* <sup>2</sup> (Seeno & Wilcox, 1982)
<i>Nonarthra</i>	<i>Nonarthra</i> Baly	<i>Nonarthra</i>
<i>Lanka</i>	<i>Lanka</i> Baly	<i>Argopistes</i>
<i>Altica</i>	<i>Altica</i> Geoffroy <i>Lysathia</i> Bechyne <i>Macrohaltica</i> Bechyne <i>Aphthona</i> Chevrolat* <sup>1</sup> <i>Neocrepidodera</i> Heikertinger* <sup>1</sup> <i>Orthocrepis</i> Weise* <sup>1</sup>	<i>Altica</i> <i>Altica</i> <i>Phygasia</i> <i>Aphthona</i> <i>Neocrepidodera</i> <i>Hermaeophaga</i>
<i>Podontia</i>	<i>Blepharida</i> Chevrolat <i>Ophrida</i> Chapuis <i>Podontia</i> Dalman	<i>Blepharida</i> <i>Blepharida</i> <i>Blepharida</i>
<i>Hemipyxis</i>	<i>Alagoasa</i> Bechyne <i>Kuschelina</i> Bechyne <i>Walterianella</i> Bechyne <i>Disonycha</i> Chevrolat* <sup>1</sup> <i>Hemipyxis</i> Dejean <i>Omophoita</i> Chevrolat <i>Philopona</i> Weise	<i>Alagoasa</i> <i>Alagoasa</i> <i>Alagoasa</i> <i>Disonycha</i> <i>Hemipyxis</i> <i>Omophoita</i> <i>Philopona</i>
<i>Pseudoliprus</i>	<i>Pseudoliprus</i> Chûjô et Kimoto <i>Mantura</i> Stephens* <sup>1</sup>	<i>Phygasia</i> <i>Mantura</i>
<i>Liprus</i>	<i>Liprus</i> Motschulsky <i>Phygasia</i> Baly <i>Phyllotreta</i> Chevrolat <i>Pseudodera</i> Baly <i>Psylliodes</i> Berthold <i>Sangariola</i> Jacobson	<i>Phygasia</i> <i>Phygasia</i> <i>Phyllotreta</i> <i>Minota</i> <i>Psylliodes</i> <i>Neocrepidodera</i>
<i>Longitarsus</i>	<i>Longitarsus</i> Berthold	<i>Longitarsus</i>
<i>Clitea</i>	<i>Clitea</i> Baly <i>Crepidodera</i> Chevrolat* <sup>1</sup> <i>Hippuriphila</i> Foudras* <sup>1</sup> <i>Lythraria</i> Bedel* <sup>1</sup>	<i>Mantura</i> <i>Crepidodera</i> <i>Derocrepis</i> <i>Neocrepidodera</i>
<i>Chaetocnema</i>	<i>Chaetocnema</i> Stephens	<i>Chaetocnema</i>
<i>Sphaeroderma</i>	<i>Argopistes</i> Motschulsky <i>Argopus</i> Fischer <i>Dibolia</i> Latreille <i>Megistops</i> Boheman <i>Schenklingia</i> Csiki <i>Sphaeroderma</i> Stephens	<i>Argopistes</i> <i>Argopus</i> <i>Dibolia</i> <i>Dibolia</i> <i>Euphitrea</i> <i>Sphaeroderma</i>

\*1 These genera were included tentatively to the cited group.

\*2 Group names were tentatively selected in relation to those based on larvae.

genus *Disonycha* Chevrolat. Then this *Hemipyxis*-group well corresponds to a group of related genera based on adult characters. Larval group *Altica* as it is now includes 2 different groups, one external leaf-feeder (*Altica*, *Lysathia* and *Macrohaltica*) and the other root-feeders (*Aphthona*, *Neocrepidodera* and *Orthocrepis*). The latter group is partially characterized by meso- and metathorax with *Dp* undivided into *Dpi* and *Dpe*, and living underground. Excluding these genera, this group also becomes fairly homogeneous and in good accordance with the adult system. In the remaining four genus groups: *Clitea*, *Lanka*, *Liprus* and *Pseudoliprus*, relation to the adult system is much complicated. For example the genus group *Liprus* includes six genera corresponding to five different groups in Seeno & Wilcox's adult system. Before giving further taxonomic generalizations on larval characters, we have to accumulate more knowledge on larval

morphology and biology in the subfamily.

*Pseudolampsis guttata* (LeConte) and *P. darwini* (Scherer) described by Casari & Duckett (1997) may exemplify the importance of such new information. These larvae are uniquely characterized by meso- and metathorax with *Da*, *Dpi*, *Dpe* and *DL*; abdomen with *Da*, *Dpi*, *Dpe*, *DLai*, *DLae* and *DLp*; 1st to 8th abdominal segments with a dorso-lateral glandular opening among *DL* group; head with a pair of ocelli posterior to antennae. These external leaf feeders look like those of *Altica*-group in the tubercular pattern but are clearly distinguished by the head with ocelli and by the abdomen with 8 pairs of (defensive) glands among *DL* group. Dorso-lateral (defensive) glands may suggest their close relation to *Nonarthra*-group. But the latter has no ocelli, with additional defensive glands on each thoracic segment, and has *DLai* and *DLae* united into *DLa* on the abdominal segments.

The exact relationship of these peculiar larvae is still unsettled. Yet they clearly show that the tribe Monoplatini including *Pseudolampsis* is distantly related to adult *Disonycha* group, and may shed light to the relationship with the genus *Nonarthra* Baly, which is the only genus characterized by the nine segmented antennae in the adult.

Since similar larval system based on tubercular patterns yielded a harmonious system in the subfamilies Chrysomelinae (Kimoto, 1962; Takizawa, 1976) and Galerucinae (Takizawa, 1972), we have a good reason to believe this larval system will play some crucial roles for establishing a tribe system in the subfamily Alticinae. This primary analysis will hopefully stimulate further research in this time-consuming study area (Crowson & Crowson, 1996).

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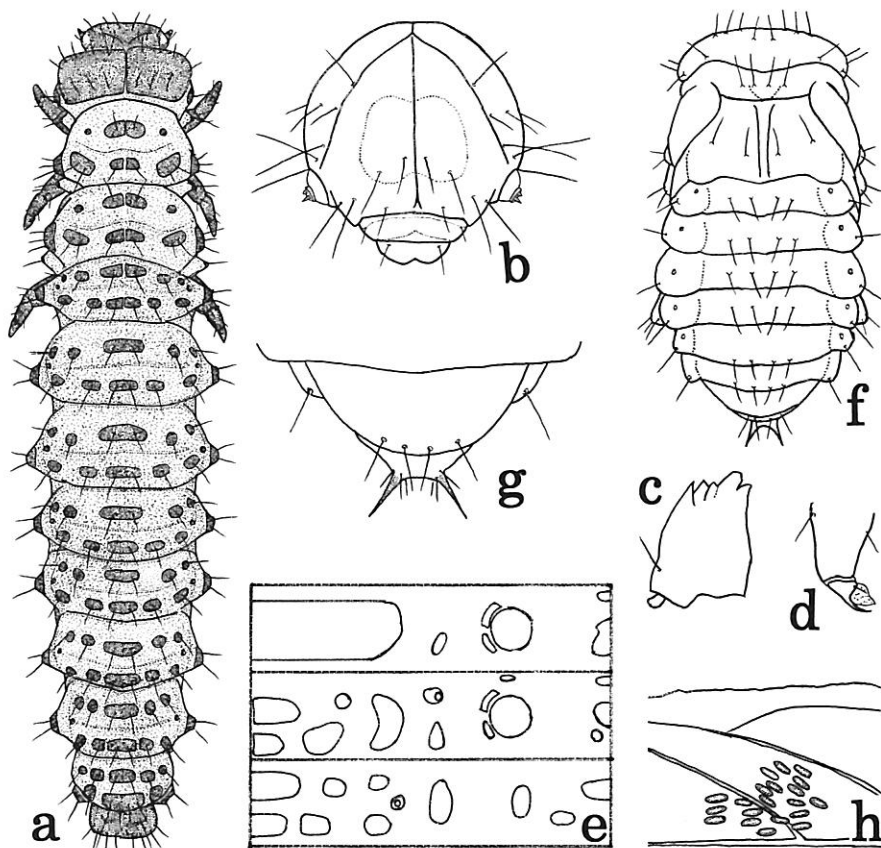


Fig. 2 *Lysathia occidentalis*. a: habitus, b: head, c: mandible, d: tarsal claw, e: tubercular pattern of last instar larva (top: prothorax, middle: mesothorax, below: 2nd abdominal segment), f: pupa, g: apical segments of pupa; h: eggs laid on *Ludwigia*-leaf.

#### APPENDIX

##### *Lysathia occidentalis* (Suffrian) (Fig. 2)

Full grown larva. Body subcylindrical, slightly flattened dorso-ventrally, 7–8 mm in length; light brownish on account of dense chitinous platelets, with head, legs, tubercles and pygidium blackish.

Head light brownish posteriorly to antennae; cordal suture extremely short; vertex with 5 pairs of long setae; frons roundly depressed medially, with 5 pairs of long setae; antenna 2-segmented, with first segment short and large; the 2nd very small and short conical, with small acute accessory process; ocellus absent; mandible 5-dentate, with 3rd and 4th tooth obscure, lacking penicillus.

Prothorax with large *D-DL-EPa* (8L\*<sup>6</sup>) and small *EPp* (1L) on the dorsum, with *P* (1S), *ES-SS* (2S) and a small secondary tubercle anteriorly to *ES-SS* on the venter;

meso- and metathorax with 5 tubercles on the dorsum:  $Da$  (1L) >  $Dpe$  (1L) >  $Dpi$  (1L);  $DLi$  small without seta;  $DLe$  (3L) largest and produced laterally; metathorax with larger  $DLi$  without seta;  $EPa$  (1S) slightly larger than  $EPp$  (1S), and united with mesothoracic peritreme;  $P$  (1S),  $SS$  (1S) and larger  $ES$  (1S) on the venter; a secondary tubercle present each anteriorly to  $ES$  and to trochantin; 2nd abdominal segment with 6 tubercles on the dorsum:  $Da$  (1L) >  $Dpi$  (1L) >  $Dpe$  (1L) =  $DLp$  (1L) >  $DLai$  (1L) >  $DLae$  (1L);  $Da$  and  $Dpi$  on both sides united on the median line; peritreme smaller than  $DLae$ ;  $EP$  (2L1S) produced laterally; venter with 3 tubercles:  $P$  (2S) >  $PS$ - $SS$  (2S) =  $ES$  (1S); 8th abdominal segment with  $Dpi$  and  $Dpe$  united into  $Dp$  (2L); pygidium wholly chitinized with 6 pairs of long setae. Claws simple and slender.

Pupa. Body orange yellow, with small tubercles and setae blackish brown, 6.0 mm in size; head with 3 pairs of setae, 2 along inner margin of eyes and one near the base of antenna; prothorax dorsally with 8 pairs of long setae; meso- and metathorax and abdominal segments each with 2 pairs of setae on the dorsum; abdominal segment with a pair of long setae on lateral-most; 8th abdominal segment with a pair of short, straight, chitinized processes apically.

Specimens examined. Seven larvae, Ebano Verde Sci. Res., La Vega, 2.VI.2001, H. Takizawa leg.

Hosts. *Ludwigia octovalvis* (Onagraceae), *Ammannia latifolia* (Lythraceae).

Notes. Adults, larvae and eggs are usually found simultaneously on the hosts at somewhat damp areas near the water. Eggs are laid without fecal cover in an irregular mass of 10 to 20 on the under surface of leaves. Full grown larvae enter into the soil and pupate.

At Parque Nacional Mirador del Norte near Santo Domingo, this species is found together with *Lysathia ludoviciana* (Fall), but the latter are less common than this species. Cardo and DeLoach (1982) worked on the biology of *Lysathia flavipes* and reported *Ludwigia* and *Myriophyllum* as its hosts in Argentina. The habit and morphological characters of this species are very similar to that of the genus *Altica* Geoffroy. There seem no clear morphological characters to distinguish them in the larval stage, but in *Lysathia* eggs are laid without fecal covers.

#### *Macrohaltica jamaicensis* (Fabricius) (Fig. 3)

Full grown larva. Body subparallel-sided, slightly flattened dorso-ventrally, 11–13 mm in length; yellowish white, with head, legs, pronotum, tubercles and pygidium blackish; dorsal surface covered with chitinous platelets; some of dorsal and dorso-lateral tubercles conically produced.

Head with cordal suture short; vertex with 5 pairs of long setae; frons roundly depressed medially, with 3 pairs of long setae; antenna 2-segmented with the 2nd short and conical; ocellus absent; mandible 4-dentate, lacking penicillus.

Prothorax with large  $D$ - $DL$ - $EPa$  (8L) and small  $EPp$  (1L) on the dorsum; on the venter with  $P$  (1S),  $ES$ - $SS$  (1S) and small secondary tubercle each anteriorly to trochantin and to  $ES$ - $SS$ ; meso- and metathorax with 5 tubercles on dorsal side:  $DLe$  (3L2S) >  $Da$  (1L) >  $Dpe$  (1S) >  $Dpi$  (1L), all of which are conically produced;  $DLai$  smallest without seta; mesothoracic spiracle situated on  $EPa$ ;  $EPp$  (1L) conically produced and smaller than

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\*6 Numeral in parenthesis shows number of setae occurring on the tubercle; L, S and M refer long, short and micro setae, respectively.

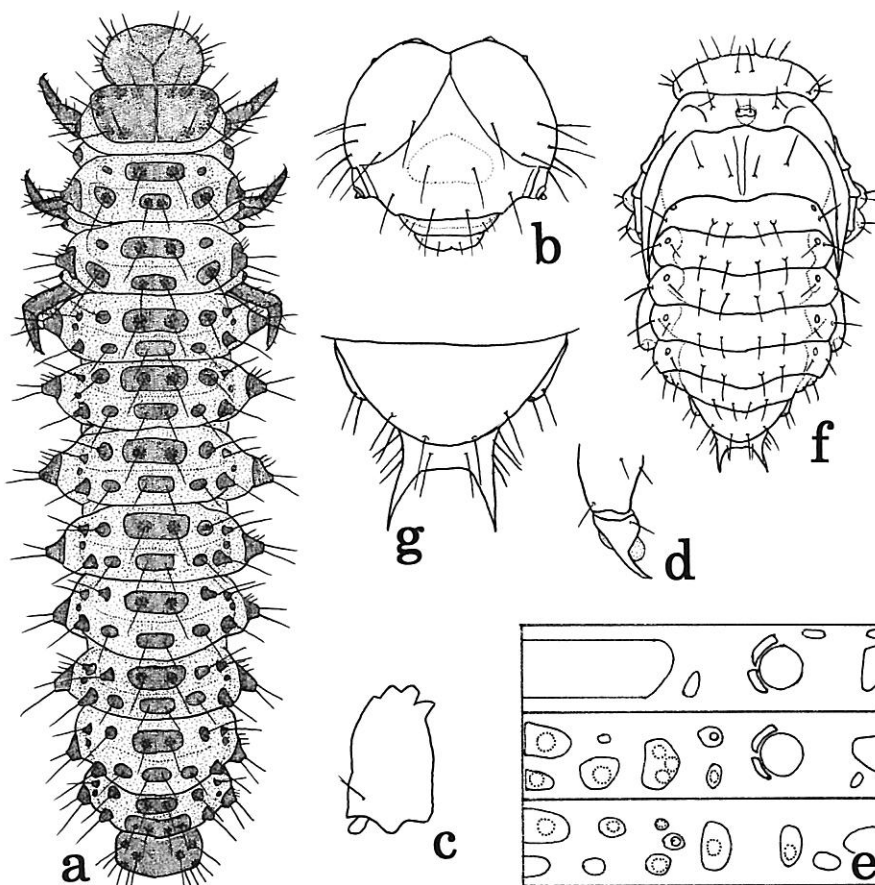


Fig. 3 *Macrohaltica jamaicensis*. a: habitus, b: head, c: mandible, d: tarsal claw, e: tubercular pattern of last instar larva, f: pupa, g: apical segments of pupa.

*EPa*; *P* (1S); *ES-SS* (1S) weakly developed; 2nd abdominal segment with 6 tubercles on the dorsum, of which *Da*, *DLai*, *DLae* and *DLp* conically produced;  $Da$  (1L) >  $Dpi$  (1L) >  $DLai$  (1L) >  $DLp$  (1L) >  $Dpe$  (1L) >  $DLae$  (1L); peritreme larger than  $DLae$ ; *EP* (2L2-3S) and *P* (2L) conically produced; venter with *PS-SS* (2S) smaller than *ES* (3S); 8th abdominal segment with *Dpi* and *Dpe* united into *Dp*; 9th segment dorsally covered with pygidium (12L), with a single large tubercle (4L) on the venter. Legs stout; claws slender and simple.

**Pupa.** Body pale orange yellow with small tubercles and setae blackish, 6–7mm in length; head with 3 pairs of setae, two along inner margin of eyes, and another near the base of antenna; prothorax dorsally with 8 pairs of long setae; meso- and metathorax, and each abdominal segment with 2 pairs of setae on the dorsum; abdominal segment with a short seta posteriorly to spiracle and another on the lateral-most; 8th abdominal segment with a pair of short, stout and straight processes apically.

Hosts. *Althenanthera* sp. (Amaranthaceae), *Ludwigia octovalvis* (Onagraceae).

Specimens examined. A lot of larvae, Ebano Verde Sci. Res., La Vega, 2.VI.2001, H.

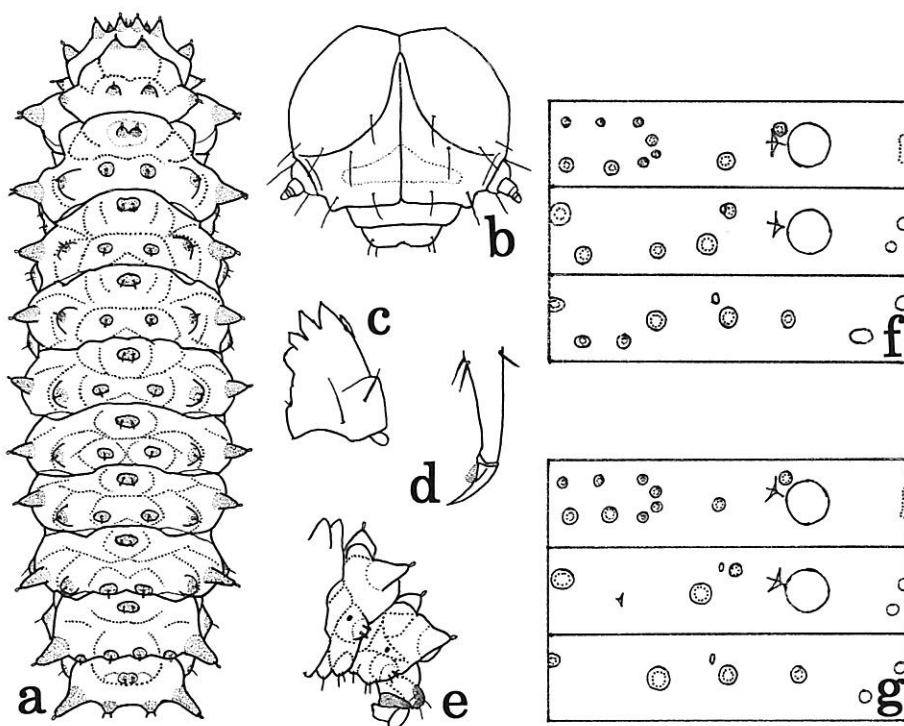


Fig. 4 *Alagoasa cinctus*. a: habitus, b: head, c: mandible, d: tarsal claw, e: lateral view of apical segments, f: tubercular pattern of last instar larva, g: ibid. (1st instar larva).

Takizawa leg.

Notes. Adults and larvae were found feeding gregariously on leaves of *Ludwigia* sp. and *Althernanthera* sp. near water-side. Eggs are laid on the leaf-surface in an irregular mass of 7 to 10 without fecal cover, which are yellowish white and long. The full grown larvae enter and pupate in the soil. Adults actively fly about the hosts, but jump few centimeters, and feign death when disturbed. This species is also similar to those of the genus *Altica* in habits and morphological characters. The larger body and conically elevated tubercles easily distinguish this species from *Lysathia occidentalis* on the similar habitat.

*Alagoasa cinctus* (Linnaeus) (Fig. 4)

Full grown larva. Body stout with *DL* and *EP* strongly projected laterally, 10 mm in length; yellowish white to reddish orange, with 5 anterior abdominal segments dark reddish violet; meso- and metathorax with median dorsal portion dark; head, legs and pygidium dark brown; dorsal setae short and stout, situated on tubercles; ventral setae longer; head and pygidium curved downwardly, so that they are invisible from above.

Head without ocellus; vertex and frons each with 3 pairs of long setae; clypeus and labrum trapezoid in shape, the latter slightly notched medially at anterior margin;

mandible 5-dentate, slightly raised on dorso-basal portion, with inner cutting edge not smooth, with a minute seta corresponding to penicillus.

Prothorax dorsally with 8 setae corresponding to *D-DL-Epa*, each situated on small raised tubercles; *EP* (2S) strongly produced; *P* undeveloped; a weakly raised tubercle present contiguous to trochantin; *ES-SS* dechitinized, without seta; meso- and metathorax with *Da*, *Dpi*, *Dpe* and *EP* more or less raised; *DL* strongly and conically produced laterally; *Epa* united with mesothoracic peritreme; *P* undeveloped; *ES* and *SS* small, each with a seta; 2nd abdominal segment with *Da*, *Dpi*, *Dpe* and *DL* raised, each with a micro seta; *EP* (1S) gently raised; *P* (2S), *PS-SS* (2S) and *ES* (1S) on the venter weakly raised; 8th abdominal segment with *Da* (1M), *Dp-DLi* (2M), *DLe*, *EP* and *P* (1M); 9th segment situated below 8th and invisible from above; dorsal surface narrowly chitinized with 4 pairs of setae. Tibiae slender; claws slender and gently curved, with small pulvillus.

First instar larva. Body 4 mm in length, pale orange with head and legs dark brown; setae much longer and those on dorsal side broadened apically; prothorax similar to full grown larva; meso- and metathorax with acute triangular egg-burster between *D* and *DL*; 2nd abdominal segment with *D* and *DL*; *D* not divided into *Da*, *Dpi* and *Dpe* in contrast to full grown larva.

Hosts. *Lantana* sp. (Verbenaceae).

Specimens examined. Two full grown larvae, Parque Nacional Mirador del Norte, Santo Domingo, Distrito Nacional, 10.XI.2002, H. Takizawa leg.; 8 larvae, Rio Isabela nr. Villa Altigracia, San Cristobal, 30.VII.2001, H. Takizawa leg.; 5 larvae, ditto, 20.IX.2002, H. Takizawa leg.; 3 larvae, El Recodo, nr. Bani, Peravia, 2.XII.2002, H. Takizawa leg.

Notes. Adults and larvae are found feeding on leaves of *Lantana* sp. on sunny field almost all year round. Larvae are easy to find on account of its reddish to violet dorsal color.

#### *Disonycha spilotrachel* Blake (Fig. 5)

Full grown larva. Body rather wide and slightly depressed dorso-ventrally, 7–8 mm in length; yellowish white with head and legs brownish to dark brownish; head with darker stripes on frons and vertex; body with 3 longitudinal dorsal stripes, which are composed of dense chitinous platelets and are sometimes irregularly interrupted; dorsum with long conical projections corresponding to primary tubercles, of which tips are chitinized with a seta; head almost invisible from above; dorsal setae slightly broadened to apex and yellowish white.

Head with setae broadened to apex; vertex with a pair of ocelli and 4 pairs of setae; frons medially depressed with 3 pairs of setae; antenna 2-segmented with a conical sensilla; mandible 4-dentate, with a seta corresponding to penicillus.

Prothorax with 8 conical projections corresponding to *D-DL-Epa* and laterally with 3 small ones corresponding to *Epp*; *P* and a tubercle contiguous to trochantin conically produced; *ES* represented by a minute seta; meso- and metathorax dorsally with a transverse elevation across median line, on which *Da* is situated; *Dp* situated on another elevation; *DLi* situated on a lateral elevation; *DLi*, *DLe*, *Epa*, *Epp* and *P* each conically produced; *ES-SS* represented by a micro seta; 2nd abdominal segment with *DLi*, *DLe* and *EP* broadly produced laterally; *D* situated on transverse elevation; *PS-SS* represented by two micro setae, and *ES* by a micro seta; pygidium with 4 pairs of setae. Tibiae rather stout, with strongly curved claw.

First instar larva. Body 2 mm in length; yellowish white with head, legs and

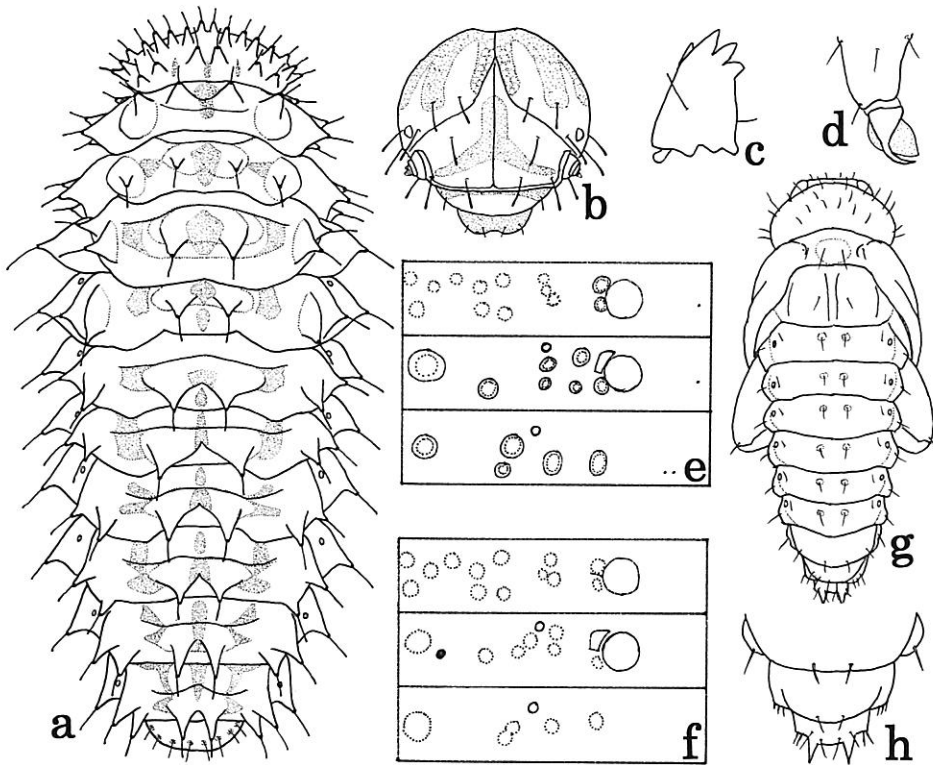


Fig. 5 *Disonycha spilotrachela*. a: habitus, b: head, c: mandible, d: tarsal claw, e: tubercular pattern of last instar larva, f: *ibid.* (1st instar larva), g: pupa, h: apical segments of pupa.

pygidium light brownish; prothorax with 8 setae of *D-DL-EPa* and 3 setae of *EPp* situated on different elevations; *P* and a small tubercle contiguous to trochantin conically produced; meso- and metathorax with egg-bursters between *Da* and *Dp*; *SS-PS* and *ES* undeveloped; 2nd abdominal segment with large *D*, *DLi* and *DLe*, which are nearly contiguous to each other; *EP* and *P* conically produced; *SS-PS* and *ES* undeveloped.

Pupa. Body yellowish white and slender, 6.0 mm in length; setae sparse and dark brown; head with 3 pairs of setae; prothorax with about 12 pairs of setae; meso- and metathorax with a pair of setae; each abdominal segment with 3 pairs of setae, one median, the 2nd near spiracle, and the 3rd on lateral-most; 9th abdominal segment with a pair of short, robust processes apically.

Specimens examined. Three full grown larvae, Plaza Cultura, Santo Domingo, Distrito Nacional, 13.VIII.2001, H. Takizawa leg.; 10 younger larvae, ditto, 19.IX.2001, H. Takizawa leg.; 1 larva, ditto, 2.V.2001, H. Takizawa leg.; 3 full grown larvae, Parque Nacional Mirador del Norte, Santo Domingo, Distrito Nacional, 7.IV.2001, H. Takizawa leg.; 5 larvae, ditto, 24.VII.2001, H. Takizawa leg.

Hosts. Isabela II (scientific name untraceable).

Notes. Adults are found feeding on leaves of Isabela II all year round. Larvae are mostly found from May to August feeding on the hosts.

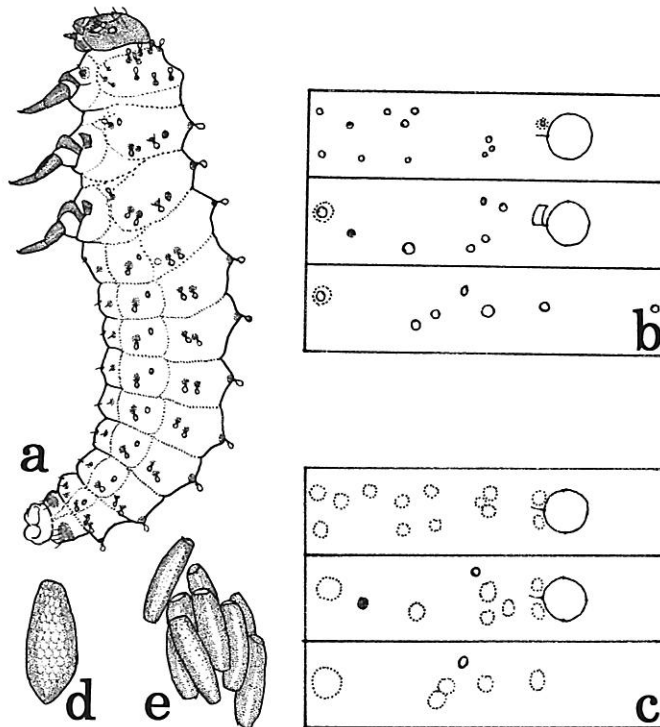


Fig. 6 *Disonycha eximia* (a, b & d) and *D. comma* (c & e). a: habitus of 1st instar larva, b & c: tubercular pattern of 1st instar larva, d & e: egg.

*Disonycha comma* White (Fig. 6)

First instar larva. Body 1.5 mm in length, yellowish white with head, legs and pygidium light brown; head with a pair of ocelli; meso- and metathorax each with a small egg-burster between *Da* and *Dp*; dorsal to epipleural tubercles and abdominal *P* conically produced, each with a long seta which is slightly broadened to apex; ventral tubercles undeveloped.

Prothorax dorsally with 8 small raised tubercles, corresponding to *D-DL-EPa*; *EPp* represented by 3 small raised tubercles; both *P* and a small tubercle contiguous to trochantin conically produced; meso- and metathorax with 4 tubercles on the dorsum:  $Da > Dp = DLi = DLe$ ; another tubercle contiguous to trochantin raised; 2nd abdominal segment with large *D*, *DLi* and *DLe*.

Specimens examined. Twelve first instar larvae, Parque Nacional Mirador del Norte, Santo Domingo, Distrito Nacional, 9.X.2001, H. Takizawa leg.

Notes. Larvae are very similar to the first instar larvae of *D. spilotrachelata*, except for the prothoracic tubercle contiguous to trochantin much weakly developed. Adults are found rather commonly on herbaceous plants on lowland, but their host plant is unknown. Though White (1990) reported this species from imported melons, neither adults nor hatched larvae feed on wild or cultivated Cucurbitaceae. Eggs are long cylindrical and almost 1.5 mm in length, and pale brownish in color. They were irregularly piled up on

the wall of plastic vial in the laboratory. After 5 days they hatched, but soon died out without appropriate foods.

*Disonycha eximia* Harold (Fig. 6)

First instar larva. Body 2.5 mm in length; yellowish white, covered with fine chitinous platelets; head, legs and pygidium dark brown; dorsal to dorso-lateral tubercles weakly raised, each with a spatulate seta; head with a pair of ocelli.

Prothorax with 8 small tubercles corresponding to undeveloped *D-DL-EPa*; *EPp* represented by 3 minute tubercles; a small tubercle contiguous to trochantin weakly raised; *P* and *ES-SS* undeveloped; meso- and metathorax dorsally with produced *Da* and small *Dp*; a small egg-burster present postero-laterally to *Da*; *DL* represented by two minute tubercles, each with a spatulate seta; *EPa* situated near spiracle; *EPp*, *P* and *ES-SS* undeveloped; 2nd abdominal segment with produced *D*, small *DLi* and *DLe*; *EP* weakly raised; *P* and *ES* each with a short seta; 8th segment with *P-PS-SS* (2S) and *ES* (1S) on ventral side; pygidium with 4 pairs of short setae; legs slender.

Specimens examined. Four first instar larvae, hatched from eggs, Parque Nacional Mirador del Norte, Santo Domingo, Distrito Nacional, 23.IX.2001, H. Takizawa leg.

Hosts. *Alternanthera sessilis* (Amaranthaceae).

Notes. Adults are found feeding on host leaves in shaded humid areas all year round, but no larvae were observed on the hosts. The eggs are somewhat longitudinal and finely microreticulate.

*Omophoita aequinoctialis* (Linnaeus) (Fig. 7)

Full grown larva. Body dirty yellowish white, with head dark brown, 11–12 mm in length; dorsum almost glabrous, with a minute seta on each tubercle, and around the bases of setae very narrowly chitinized; thoracic segments with *DL* developed into a slender digit-like process; prothorax with a tubercle contiguous to trochantin weakly produced; abdominal segments with *DL*, *EP* and *P* produced into short conical processes.

Head without ocellus; vertex with 4 pairs of long setae; frons with 3 pairs of long setae; mandible 5-dentate, with penicillus represented by 4 stout setae.

Prothorax with weakly developed *D-DL-EPa*, on which 8 minute setae are situated; *EPp* short and conically produced; *P* and *ES-SS* undeveloped; meso- and metathorax with weakly chitinized *Da*, *Dpi* and *Dpe*; *EPa* united with mesothoracic peritreme; *EPp* undeveloped; a small tubercle contiguous to trochantin, *P*, *ES* and *SS* weakly chitinized; 2nd abdominal segment with *Da*, *Dpi* and *Dpe* weakly developed; *EP* (2S) and *P* slightly raised; *P* with a long slender seta; *PS-SS* and *ES* weakly chitinized; 7th abdominal segment with *Dpi* and *Dpe* conically produced; 8th abdominal segment with *Dp* and *DL* conically produced and located closely to each other; 8th segment with *EP*, *P-PS-SS* and *ES*; pygidium weakly chitinized, with 4 pairs of short setae. Legs slender and weakly chitinized, with slender and long claw.

First instar larva. Body yellowish white, 4 mm in length; head and pronotum dark brown; setae on tubercles long and slender; prothorax with a weakly produced tubercle (1S) contiguous to trochantin; meso- and metathorax dorsally with *D*; *DL* (2L) strongly produced into a subquadrate projection; egg-burster small but distinct between *D* and *DL*; *EPa* (1L) produced; *P* and *ES-SS* undeveloped; 2nd abdominal segment with *Da* (1L), *Dp* (1L); *DL* (1L), *EP* (2L) and *P* (1L) produced into short conical processes; *PS-SS* (2L)

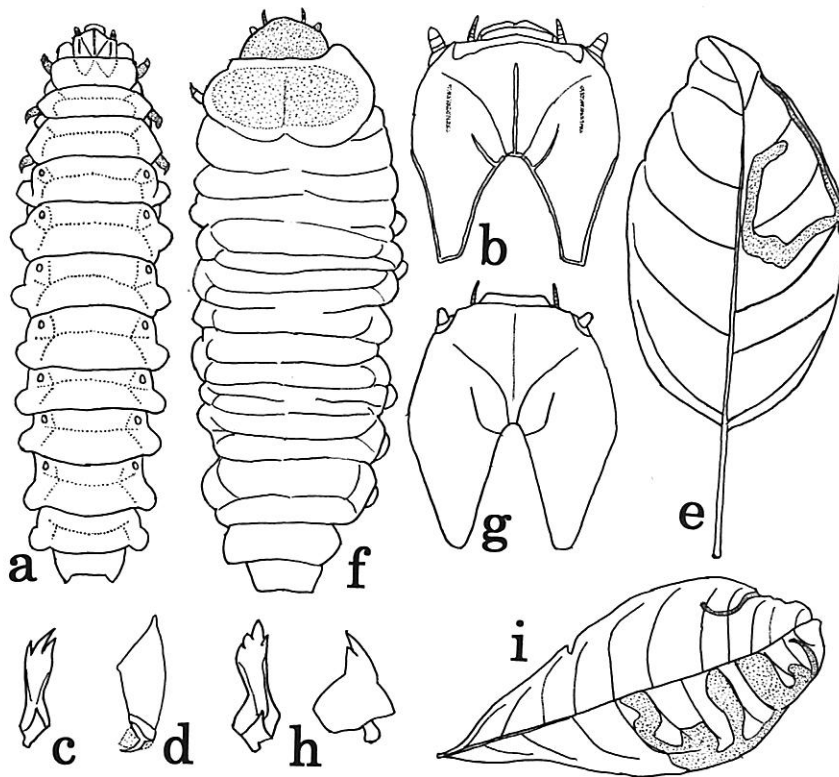


Fig. 8 *Megistops liturata* (a-e) & *Megistops* sp. (f-i). a & f: habitus, b & g: head, c & h: mandible, d: tarsal claw, e: larval mine on *Catalpa*-leaf, i: ditto on *Crecentia*-leaf.

Specimens examined. Four full grown larvae, Parque Nacional Mirador del Norte, Santo Domingo, Distrito Nacional, 12.VIII.2001, H. Takizawa leg.

Hosts. *Catalpa longissima* (Bignoniaceae).

Notes. Adults are found feeding on young leaves of *Catalpa* sp. all year round. Larvae make linear mine on the leaves of host.

*Megistops* sp. (Fig. 8)

Specimens examined. One dead larva, Las Penas, San Francisco de Macoris, Duarte, 21. VII. 2001, H. Takizawa leg.

Hosts. *Crecentia kujete* (Bignoniaceae).

Notes. Only one dead larva was recovered from a linear mine on a host leaf. The body shape and size are similar to the preceding species, but its head is dark brown without dark brownish stripes on the vertex; prothorax dorsally covered with dark brown chitinized plate; mandible distinctly 4-dentate. Owing to bad condition of the specimen, details of morphology are unavailable. This species seems undescribed, adult of which is characterized by a small and convex body of 2–2.5 mm; metallic cupreous in color.

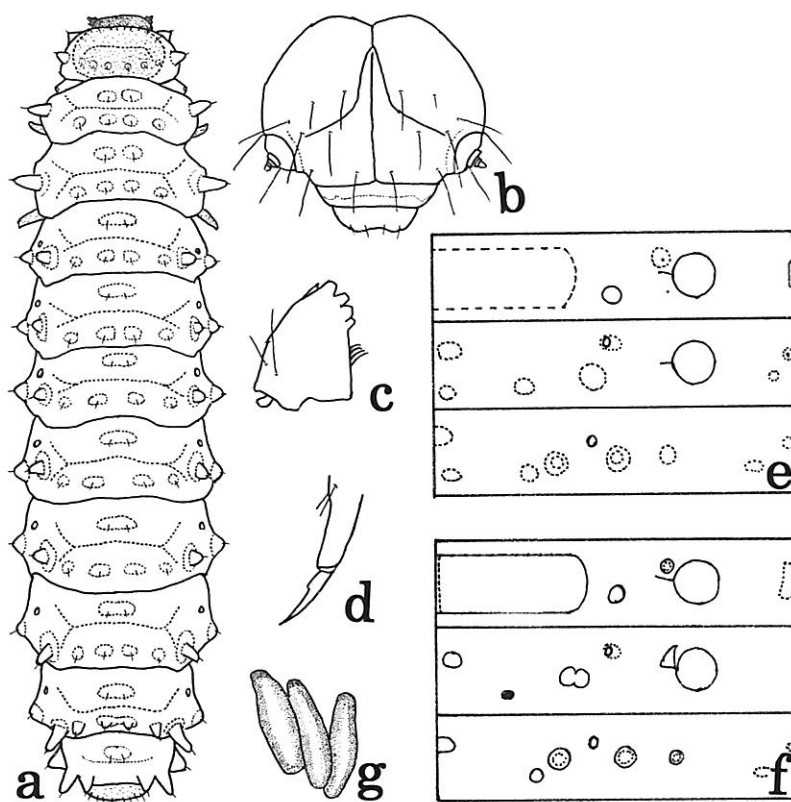


Fig. 7 *Omophoita aequinoctialis*. a: habitus, b: head, c: mandible, d: tarsal claw, e: tubercular pattern of last instar larva, f: ibid. (1st instar larva), g: egg.

and *ES* (1S) slightly raised.

Specimens examined. A lot of larvae reared from oviposition to full grown larva, Parque Nacional Mirador del Norte, Santo Domingo, Distrito Nacional, 5.IX.2001, H. Takizawa leg.

Hosts. *Stachytarpheta jamaicensis* (Verbenaceae).

Notes. Adults are found feeding on host leaves on sunny herbaceous field. Eggs are long cylindrical and reddish brown in color, of which period last for about 5 days. Larvae feed on host leaves in laboratory and became full grown in about 2 weeks.

#### *Megistops liturata* (Olivier) (Fig. 8)

Last instar larva. Body flattened dorso-ventrally, and subparallel-sided, 4–5 mm in length; yellowish orange, with head, pronotum and legs light brownish; meso- and metathorax triangularly produced at lateral-most; each abdominal segment produced laterally into round projection; glabrous, without setae or tubercles; pygidium not chitinized, with a pair of short triangular processes apically.

Head dorso-ventrally flattened, without ocellus; vertex produced into a pair of long plate-like projections apically, with a pair of short dark brownish stripes; mandible 3-dentate; claws slender and strongly curved.