

## Larvae of Australian Buprestidae (Coleoptera) Part 2. Genus *Metaxymorpha*

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**Abstract.** The larva of *Metaxymorpha gloriosa* Blackburn, 1894 is fully described, illustrated and compared with other known Australian Stigmoderini larvae. Short notes on the bionomy of the larva as well as illustrations of its tunnels are given.

**Taxonomy, larval morphology, bionomy, Coleoptera, Buprestidae, Stigmoderini, *Metaxymorpha*, Australia**

### Introduction

This paper follows the previous study on larvae of Australian Buprestid larvae (Bílý & Volkovitsh 2003) and it is a part of the long-term project dealing with the larval taxonomy and morphology of the family Buprestidae. The study was partly realized with the financial support of Ministry of Culture of the Czech republic VZ F02/98: NMP M 00001 and Grant project No. 01-04-49641 from the Russian Foundation for Basic Research.

No larvae of Australian Stigmoderini have ever been described. Moore (1986) briefly described larvae of two *Dactylozodes* Chevrolat, 1838 species from Chile but these descriptions lack sufficient detail to establish the main diagnostic characters for either *Dactylozodes* or Stigmoderini as a whole.

In this paper, larva of *Metaxymorpha gloriosa* Blackburn, 1894 is described and compared with the larvae of the genera *Castiarina* Laporte de Castelnau et Gory, 1838, *Stigmodera* Eschscholtz, 1829 and *Temognatha* Solier, 1833. The morphological terminology follows that used in the papers of Volkovitsh (1979), Volkovitsh & Bílý (1997), Bílý (1999), Volkovitsh & Bílý (2001) and Bílý & Volkovitsh (2003). Larval images are also available on:

<http://www.zin.ru/Animalia/Coleoptera/rus/buplarau.htm>.

## Description of larva of *Metaxymorpha gloriosa* Blackburn, 1894

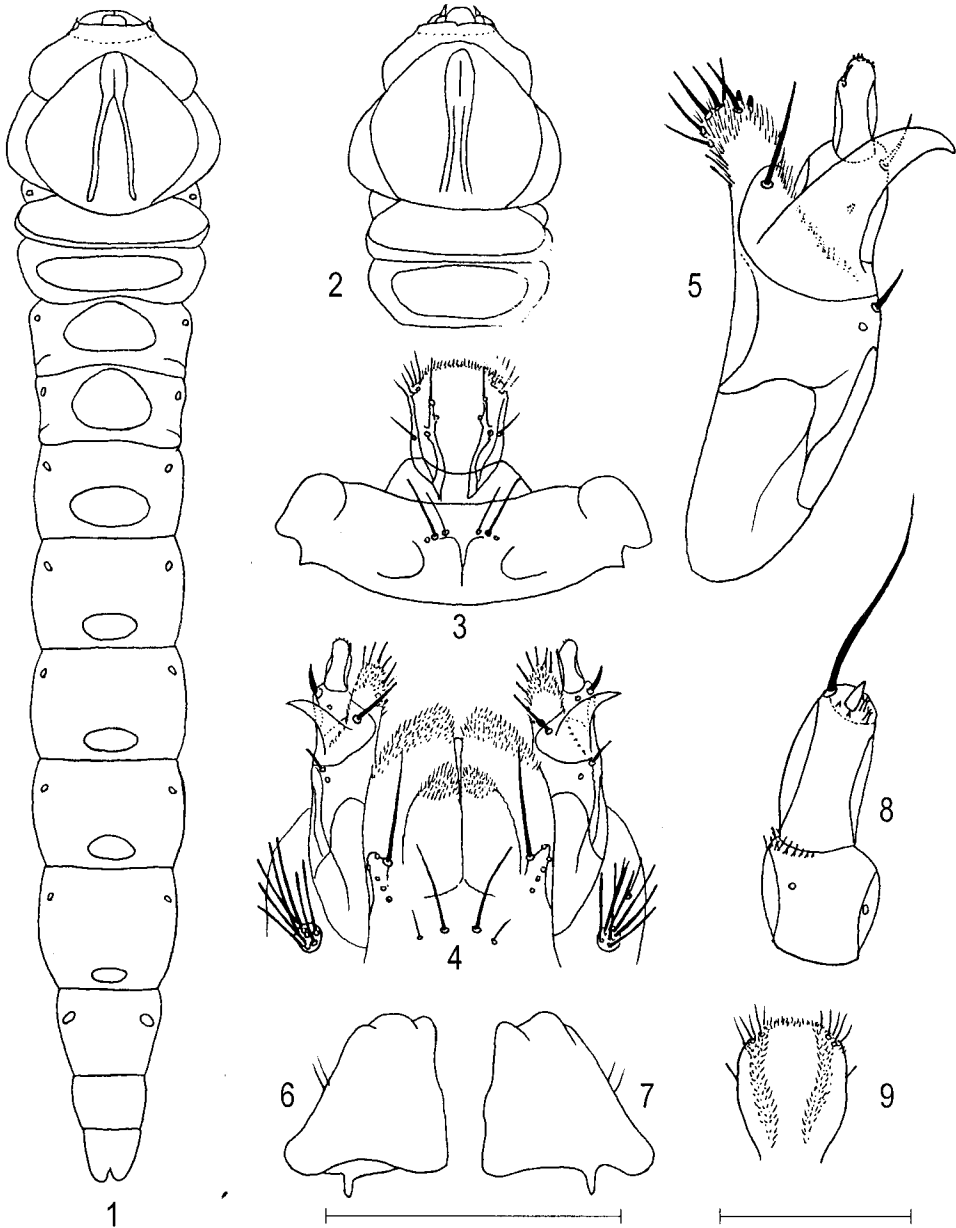
(Figs 1-16)

**Specimens studied.** One adult and two middle-aged larvae: N Queensland, Polly Creek, Garradunga, 17°28'S 146°00'E, 23.vii.1995, J. & P. Hasenpush leg. Host plant: *Guioa lasioneura* (Sapindaceae). Specimens deposited in the National Museum, Prague and in the Zoological Institute of the Russian Academy of Sciences, St. Petersburg.

**Measurements.** Body length 35.0, 47.0 and 66.0 mm; width of prothorax 5.8, 7.0 and 10.6 mm.

Larva is of typical buprestoid type (Figs 1-2), morpho-ecological subtype 2, intermediate to 3 (Volkovitsh 1979), thoracic segments weakly expanded, metathorax nearly as wide as abdominal segments 1-2, terminal part of abdomen acuminate (Fig.1); body reddish-yellow, last 4 abdominal segments whitish, thoracic plates and abdominal ambulatory pads brownish-yellow; whole body (except for thoracic plates and ambulatory pads) covered with brownish setae which are longer and more dense on lateral sides of thoracic segments and shorter and sparser on last abdominal segments. For armament of body-surface see Fig. 11.

**Head.** Epicranium completely invaginated into prothorax, tentorium with reduced lateral arms. Epistome (Fig. 3) relatively narrow, strongly transverse, 3.60 times as wide as long; anterior margin feebly emarginate, nearly straight between mandibular condyles which are regularly semiglobular; posterior margin widely and arcuately projecting posteriorly, slightly emarginated inward latero-posterior corners which are very small, sharpened apically and weakly projecting outwards; lateral margins of epistome slightly curved, poorly separated from antennal incisions; those are shallow, less than  $\frac{1}{2}$  of epistomal length; arrangement and composition of epistomal sensillae: two very long setae extending to about posterior  $\frac{1}{3}$  of labrum and one campaniform sensilla in each group arranged nearly linearly at anterior  $\frac{1}{3}$  of epistomal length closely to medial line. Clypeus (Fig. 3) membranous, transverse and glabrous. Labrum (Fig. 3) elongate, 1.30 times as long as wide, trapezoidally projecting anteriorly, middle part truncate, lateral lobes not developed; lateral sides of labrum almost straight, slightly emarginate, nearly parallel; palatine sclerites well-developed with very narrow, long and distinctly inwards curved medial branches; lateral branches narrow and straight apically, widened and incurved posteriorly; medial sensillae of labrum (t- trichoid, c- campaniform): 1c-2t-3c, distance between 3c and 2t almost half of that between 1c and 2t; 2t long, far extending anterior margin of labrum; antero-lateral sensillae of labrum (t- trichoid, c- campaniform): external group: (1t, 2c)+3t-4t, internal group: 1t+2c+3t+4t, 2c situated beneath and between 1t and 3t, basis of all sensillae arranged very closely to each other, almost fused; armament of labrum: dorsal side with long, dense microsetae along medial truncate part of anterior margin, lateral border of microsetal area extending to external 1t antero-lateral sensilla, posterior border of area nearly straight; ventral side (epipharynx – Fig. 9) with two nearly parallel-sided, slightly incurved stripes of dense microsetae extending lateral borders of dorsal microsetal area.



Figs 1-9. Larva of *Metaxymorpha gloriosa* Blackburn. 1 – body shape, dorsal side, 35.0 mm; 2 – thorax, ventral side; 3 – epistome, clypeus and labrum; 4 – labiomaxillary complex; 5 – right maxilla; 6 – left mandible, dorsal side; 7 – left mandible, ventral side; 8 – antenna; 9 – epipharynx.

Antennae (Fig. 8) two-segmented, situated in rather shallow latero-basal incision of epistome, distal segment being 1.87 times as long as proximal one; articular membrane glabrous, without any armament; proximal antennomere short, 1.07 times as wide as long, distinctly expanded apically, bearing one external campaniform sensilla near the middle, one internal campaniform sensilla near to outer margin and row of long microsetae along anterior margin; inner sclerite well-developed; distal antennomere glabrous, very long, 2.54 times as long as wide, subcylindrical and parallel-sided, inner sclerite well-developed; apical cavity of distal antennomere glabrous, very shallow with only dorsal lobe covering sensillae, containing 2 basiconic sensillae, 2 palmate sensillae, one trichosensilla which is 1.50 times as long as segment itselfs and conical sensory appendage which is 2.30 times as long as wide and which extends beyond the cavity.

Mandibles (Figs 6-7) triangular, nearly as long as wide, strongly sclerotized except for narrow, basal part; anterior margin obtuse, basal margin with long, and sclerotized process ventrally which is getting changed posteriorly into tendon; mandibular setal brush absent, inner glands invisible, outer margin with 2 rather long setae; cutting edge with 2 lateral teeth (one small, obtuse, dorsal tooth and one small, sharp, slightly curved ventral tooth); apical mandibular tooth absent, anterior margin between lateral teeth widely and irregularly rounded.

Laterostome yellow-brown, moderately sclerotized with 3 short and one long setae next to ocellus; ocelli well-developed, large.

Maxillae (Figs 4-5). Cardo elongate, isolated sclerite of cardo well-defined and sclerotized, nearly circular, bearing 1 campaniform sensilla and 7-9 long, thick setae, sometimes with additional seta which is situated on the membrane near to sclerite. Stipes (Fig. 5) rather long with very long anterior projection bearing externally and apically long, dense microsetae completely covering mala; inner part of stipes with wide, long and strongly sclerotized but transparent, claw-like projection directed towards labrum and situated anteriorly of mandibles; inner sclerite of stipes well-developed and sclerotized, its proximal part strongly expanded, elongate-ovoid and transparent, distal part internally extending and fusing with inner sclerite of mala; apical seta of stipes about 1.50 times as long as palpomere 2, very thick and situated on apical projection of stipes just posteriorly of apical microsetal area; lateral seta situated on external margin posteriorly to base of palpomere 1, one campaniform sensilla at external margin posteriorly to base of lateral seta; internal margin of stipes glabrous, external armament composed of long, dense microsetae externally and apically on apical projection, internal armament composed of small groups of microsetae on each side of base of claw-like projection. Palpus maxillaris two-segmented, both segments of the same length (Fig. 5); basal palpomere glabrous, subcylindrical, 1.20 times as long as wide with distinctly curved external margin; apical seta very thick, relatively short, nearly as long as palpomere 2, campaniform sensilla situated posteriorly the middle, closer to external margin; distal palpomere elongate, 2.30 times as long as wide, subcylindrical and slightly curved, with approximately 10, short, peg-like and equal in length apical conical sensillae; curved sensilla very short ( $\frac{1}{4}$  of the palpomere

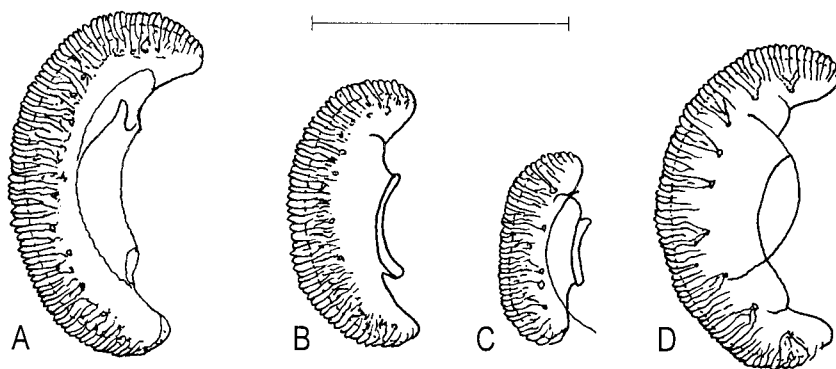


Fig. 10. Larva of *Metaxymorpha gloriosa* Blackburn. Spiracles: A – mesothoracic; B – 1<sup>st</sup> abdominal; C – 7<sup>th</sup> abdominal; D – 8<sup>th</sup> abdominal.

length) situated along internal margin subapically, campaniform sensilla subapical, next to curved sensilla. Mala (Fig. 5) nearly parallel-sided, 1.80 times as long as wide; inner sclerite of mala well-defined, inner part of internal sclerite of stipes prolonged and fused with inner part of internal sclerite of mala; external armament of mala composed of two peg-like sensillae and one short and two long (as long as mala) thick setae, internal armament composed of 5 long (as long as mala) thick setae situated apically (2) and on inner margin (3) of mala.

Labium (Fig. 4). Prementum irregularly rounded, elongate, 1.33 times as long as wide, its central part swollen, separated and divided in the middle; anterior margin narrowly rounded, very deeply emarginate, apically, emargination extending postmentum; lateral sides arcuate, more converging to apex than to the base; dorsal part of prementum (hypopharynx) glabrous with narrow lateral fields of microsetae along the sides and with wavy, longitudinal cuticular sculpture in central part; ventral part: posterior border of anterior microsetal area widely and arcuately emarginate; apical portion of central swollen area of prementum with large posterior microsetal areas; corner sclerites of labium elongate, almost parallel-sided, its apical setae long, thin, far extending posterior border of anterior microsetal area; 3 campaniform sensillae situated at external margin of apical part of sclerite, 2 campaniform sensillae at its base. Postmentum bearing 4 setae: 2 long, curved, thick setae extending bases of apical setae of corner sclerites and 2 short (about  $\frac{1}{4}$  of medial setae), thin and straight lateral setae; distance between lateral and medial setae equal to that between medial setae.

Thorax (Figs 1-2). Slightly expanded, all segments almost of the same width; rudiments of legs poorly visible, situated ventrally on glabrous areas in postero-lateral corners.

Prothorax slightly transverse, 1.45 times as wide as long, hardly wider than other thoracic segments, only 1.10 times as wide as mesothorax; lateral sides not projecting outwards, widely rounded, anterior membrane covered with long, dense, brownish setae; lateral sides of prothorax with very long, dense, brownish setae; both dorsal and ventral plates well-defined, sharply, angularly projecting anteriorly, brownish due to dense, small and well-sclerotized asperities. Pronotal plate covered with asperi-

ties forming nearly regular ovoid area with two glabrous areas along anterior part of groove and numerous, small evenly dispersed glabrous spots forming reticulate pattern; asperities larger and more sclerotized along the groove than those on the rest of plate; lateral parts of the plate with fine, oblique secondary folds. Pronotal groove inverted Y-shaped (Fig. 1), moderately sclerotized, clearly distinct due to surrounding asperities; common part of groove relatively long, situated on glabrous area, surrounded with sclerotized area bearing asperities and forming arrow-like zone nearly reaching epistome anteriorly; posterior arms of groove slightly arched, extending posterior border of asperate area, surrounded with more sclerotized asperities, their posterior ends closely disposed; angle between arms about 14°; branches 2.60 times as long as common part.

Prosternum (Fig. 2). Prosternal plate covered with asperities forming transverse, irregular area with 2 glabrous fields containing rudiments of legs in postero-lateral corners, anterior border of the field reaching nearly  $\frac{1}{4}$  of pronotal plate; whole prosternal plate with numerous, small glabrous spots forming reticulate pattern and indistinct oblique stripes near basal half of groove; lateral parts of plate with fine, oblique, secondary folds. Prosternal groove moderately sclerotized in its basal half, well-visible only due to surrounding, sclerotized asperities, enlarged posteriorly; anterior part of groove situated on glabrous area surrounded with sclerotization bearing sparse asperities and forming elongately ovoid pattern nearly reaching hypostome anteriorly; medial part of groove more strongly sclerotized anteriorly and diverging posteriorly.

Mesothorax (Figs 1-2) strongly transverse, 4.00 times as wide as long, nearly as wide as prothorax and 1.20 times as wide as metathorax; lateral sides with long and dense, brownish setae and with secondary folds; both dorsal and ventral sides with distinct transverse plates covered with microteeth, ambulatory pads absent.

Metathorax (Figs 1-2) less transverse and hardly narrower than mesothorax, 2.70 times as wide as long and 1.20 times as wide as the 1<sup>st</sup> abdominal segment; lateral sides with long and dense, brownish setae and with secondary folds; both dorsal and ventral sides of metathorax with distinct, transverse plates covered with microteeth, ambulatory pads absent.

Abdomen (Fig. 1) subcylindrical, glabrous (except for ambulatory pads) with dense, brownish setae which are shorter and sparser than those on thorax; abdominal segments subparallel-sided without transverse, secondary folds; lateral keels and lateral depressions well-developed on segments 3-9, depressions strongly elongate, narrow, parallel-sided; segments 1-2 similar in the shape, segments 1-5 hardly narrower than metathorax, transverse (1-3) or nearly as wide as long (4-8), narrowing posteriorly (8-10); ambulatory pads well-developed, sclerotized, strongly swollen, covered with microteeth, transversely ovoid, situated on segments 1-7 dorsally and 1-6 ventrally; dorsally they are situated in the middle (segments 1-2) or near posterior margin (3-7), ventrally in the middle (1-2) or near posterior margin (3-6); sternum of the 7<sup>th</sup> segment without pad. Abdominal segment 1 strongly transverse, 2.3 times as wide as long, parallel-sided, slightly narrower than metathorax and nearly as wide as segment 2; ambulatory pads large, reniform (dorsally) or transversely ovoid (ven-

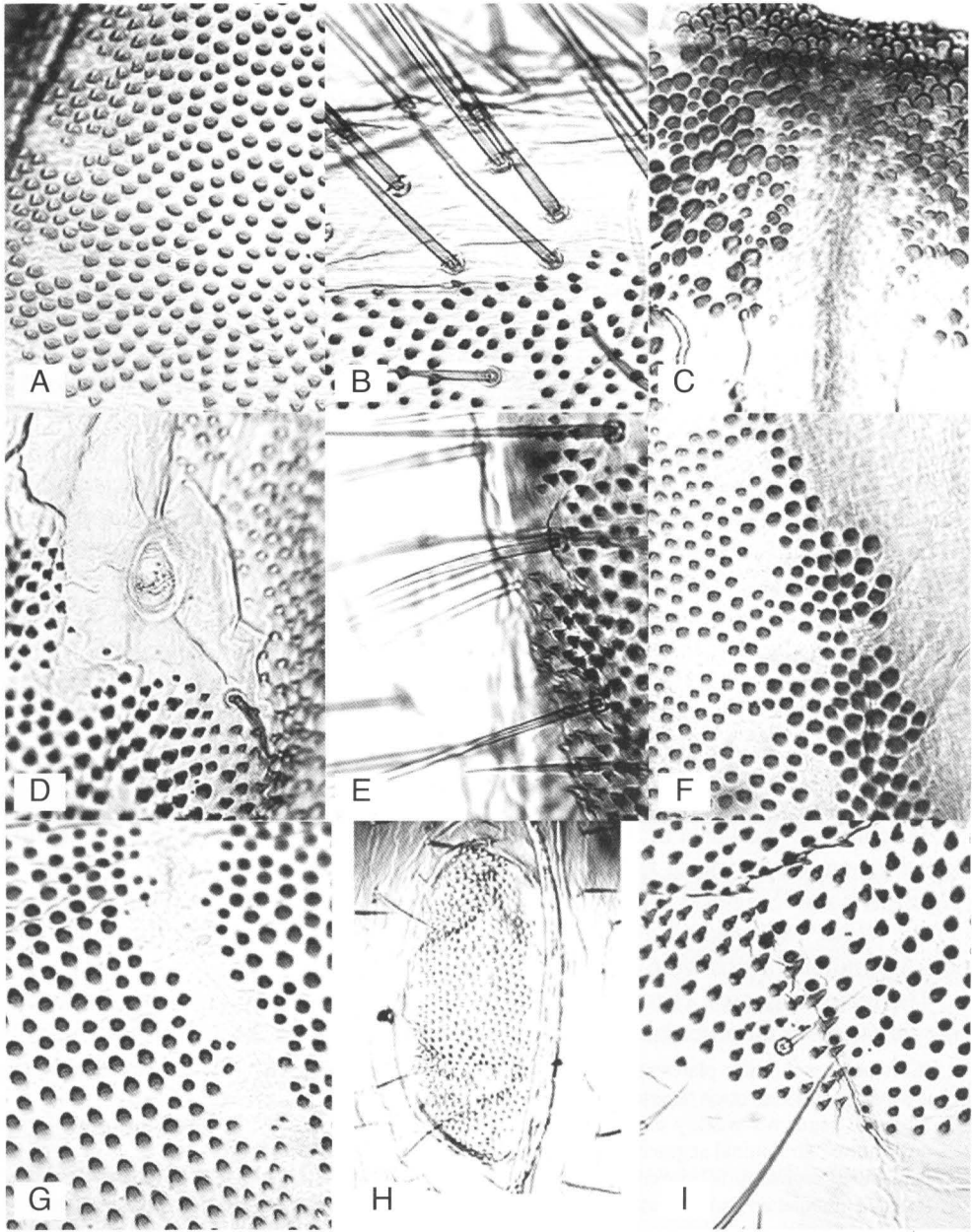


Fig. 11. Larva of *Metaxymorpha gloriosa* Blackburn. Armament of the body-surface: A – pronotal plate, antero-lateral area; B – the same, border between plate and anterior membrane; C – the same, anterior portion of common part of pronotal grooves; D – prosternal plate, postero-lateral area with rudiment of prothoracic leg; E – pronotal plate, lateral area; F – the same, central area near the groove; G – sculpture of mesosternal plate; H – dorsal ambulatory pad on 7<sup>th</sup> segment; I – the same, detail of sculpture.

trally). Abdominal segments 2-8 subcylindrical, 2<sup>nd</sup> segment about twice as wide as long, segments 3-7 slightly transverse or as wide as long, 8<sup>th</sup> segment distinctly narrowed posteriorly. Abdominal segment 9 slightly narrowing posteriorly, 1.50 times as wide as long, 10<sup>th</sup> segment nearly as wide as long, subcylindrical, truncate apically.

Spiracles (Fig. 10). Thoracic spiracles (Fig. 10A) of the buprestoid transitory to agriloid type, reniform, about 3 times as wide as long, situated laterally at anterior part of mesothorax; perithrema rimate with numerous, regular, short and narrow slots (rimae) which are compressed laterally and situated along posterior margin of perithreme and shifted to posterior wall of spiracle; their anterior ends extending nearly to  $\frac{1}{2}$  of trabecular length; trabeculae numerous, dense and branched, arising from posterior wall and reaching half of spiracle length; atrium well-sclerotized, transverse and large, closing apparatus well-sclerotized; ostium covered with poorly visible swelling without sclerotized structures, adjacent cuticle glabrous, distally covered with long and dense setae. Abdominal spiracle 1 (Fig. 10B) of the same type, reniform, about 2.80 times as wide as long, situated dorsally; structures of the spiracle corresponds to those of the thoracic spiracle except for poorly sclerotized closing apparatus. Abdominal spiracles 2-7 (Fig. 10C) similar to 1<sup>st</sup> abdominal spiracle, spiracle 8 (Fig. 10D) very large, nearly as big as mesothoracic spiracle.

Proventriculus absent; foregut connected with midgut between coeca gastrica, its distal part slightly enlarged, walls unsclerotized, transparent with very feeble, obtuse microteeth sitting in rows by 3-5 on hardly sclerotized common bases (Fig. 12).

## Discussion

To compare the larva of *Metaxymorpha gloriosa* with other Australian stigmoderine genera the larvae of following species were studied and contrasted in Table 1: *Stigmodera roei* Saunders, 1869, *S. cancellata* (Donovan, 1805), *Temognatha conspiciellata* White, 1843 and *Castiarina* sp. A number of larvae from other Australian and non-Australian groups were examined as well.

The main diagnostic characters distinguishing *Metaxymorpha* and other stigmoderine larvae from all other known Australian buprestid larvae are as follows:

1. Body besides thoracic plates and abdominal pads covered with long, dense light or dark setae, which are longer and denser on the sides and anterior part of thorax.
2. Thoracic segments weakly expanded, prothorax widest but only slightly wider than meso- and metathorax; abdominal segment 1 nearly as wide as meso- and metathorax.
3. Abdominal segments 1-7 dorsally and 1-6 ventrally bearing transversally ovoid or reniform, strongly swelling ambulatory pads covered with microteeth and asperities forming sclerotized plates similarly to those on thoracic segments.
4. Epicranium with anterior lateral tentorial arms missing, tentorial bridge strongly reduced, if compared with normal buprestine tentorial structure.
5. Epistomal setae very long, far extending anterior margin of epistome.
6. Antennomere 2 strongly elongated with very shallow apical cavity.
7. Mandibles without apical teeth, anterior margin rounded with small lateral teeth dorsally and ventrally; base with long sclerotized projection changing to tendon distally.



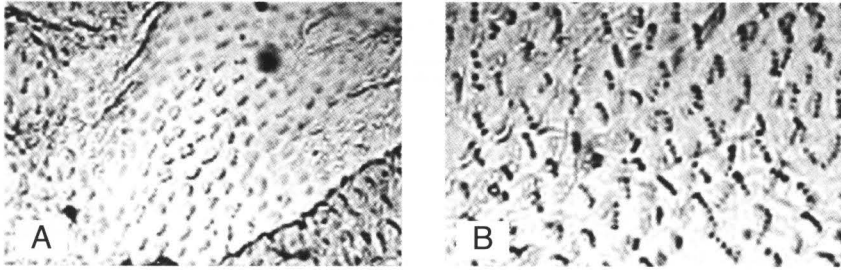


Fig. 12. Larva of *Metaxymorpha gloriosa* Blackburn. Inner armament of foregut: A – dorsally; B – ventrally.

8. Isolated sclerites of maxillary cardo bearing tuft of several long setae.
9. Maxillary stipes internally with wide, long, incurved, strongly sclerotized but transparent claw-like projection, directed upward towards labrum and situated anteriorly to mandibles.
10. Anterior part of stipes dorsally extending into very long anterior projection partly or completely covering mala and bearing long, dense microsetae externally and apically.
11. 2<sup>nd</sup> palpomere of maxillary palpus strongly elongated, sucyndrical, with very short subapical curved sensilla internally and campaniform sensilla located next to it.
12. Labium nearly as wide as long, divided medially; anterior margin of prementum arcuated, deeply emarginated in the middle, sides arcuated.
13. Postmentum usually with 4 medial setae.
14. Spiracles of buprestoid transitory to agriloid type, reniform, with rimate peritreme that is characterized by numerous regular, short, parallel, narrow slots (rimae) located along posterior margin of peritreme, and numerous, dense, branched trabeculae arising from posterior wall and extending to half of spiracle length.
15. Last abdominal spiracle usually distinctly larger than 7<sup>th</sup>, sometimes as large as thoracic one.
16. Proventriculus absent. Foregut connected to midgut between coeca gastrica, its distal part slightly expanded, walls unsclerotized, transparent with very feeble, obtuse microteeth sitting in rows on hardly sclerotized common bases.

The most important larval diagnostic characters of Australian Stigmoderini genera we have studied are as follows:

- (1) presence of well-developed abdominal ambulatory pads bearing microteeth and asperities; (2) strongly reduced tentorial bridge of epicranium; (3) presence of well-sclerotized projection at mandible base; (4) wide, long, incurved, strongly sclerotized claw-like projection on internal part of maxillary stipes; (5) poorly developed apical cavity of 2<sup>nd</sup> antennomere; (6) spiracles of buprestoid transitory to agriloid type; (7) and lack of proventriculus.

These states characterize Stigmoderini as one of the most specialized and isolated buprestid taxa.

The most important distinguishing characters of *Metaxymorpha* larvae compared to the other studied Australian stigmoderine genera (Table 1) are:

- (1) slightly elongated terminal abdominal segments; (2) last abdominal spiracles very large, nearly as big as thoracic ones and much bigger than other abdominal spiracles; (3) shape of prothoracic plates and grooves; (4) armament of labrum and labium and some other minor features.

It is important to note that only a few larvae from a great diversity of Australian stigmoderine species were studied and further investigations are vital to find reliable generic and tribal diagnostic larval characters.

Table 1. Comparison of the main taxonomic characters of larvae of Australian stigmoderine genera.

Character	<i>Metaxymorpha</i>	<i>Stigmodera</i>	<i>Temognatha</i>	<i>Castiarina</i>
<b>Prothorax,</b> pilosity on the sides	With long, dense setae	With relatively short and sparse setae	With long, dense setae	With long, fine, hairs and shorter and sparser setae
<b>Prothoracic plates,</b> armament	Nearly completely covered with large, strongly sclerotized asperities, on major part with reduced teeth and expanded basal tubercles	Nearly completely covered with large, strongly sclerotized asperities, on major part with reduced teeth and expanded basal tubercles	Nearly completely covered with large, strongly sclerotized asperities, on major part with reduced teeth and expanded basal tubercles	Only basal ¼-½ covered with sclerotized microteeth changing to asperities with reduced teeth and expanded basal tubercles along the grooves
<b>Prothoracic plates,</b> glabrous areas	Numerous, small evenly dispersed glabrous spots forming reticulate pattern	Numerous, small evenly dispersed glabrous spots forming reticulate pattern	Numerous, small evenly dispersed glabrous spots forming reticulate pattern	Without reticulate pattern of glabrous spots
<b>Pronotal plate,</b> anterior glabrous areas	Along common part of groove	Without marked glabrous areas along common part of groove	Along common part of groove	Anterior half of pronotum completely glabrous
<b>Pronotal groove,</b> ratio of branch to common part lengths	Branches more than 2 times longer than common part	Branches more than 2 times longer than common part	Branches more than 2 times longer than common part	Branches nearly as long as common part
<b>Prosternal plate,</b> disposition of large glabrous areas	Along common part of groove, around rudiments of legs, and 2 narrow, oblique stripes of sparse asperities along central part of groove	Along anterior part of groove, around rudi- ments of legs, and 2 narrow, oblique poorly visible stripes of sparser asperities along central part of groove	Along anterior part of groove, around rudiments of legs, and 2 narrow, oblique stripes of sparser asperities along central part of groove	Anterior ⅔ of pronotum completely glabrous besides triangular strip along base of groove
<b>Abdominal segments,</b> width / length	Slightly transverse, at least segments 4-8 nearly as long as wide	Strongly transverse, all segments nearly 2 times wider than long	Strongly transverse, all segments 1.5-2.0 times wider than long	At least segments 4-8 nearly as long as wide or longer than wide
<b>Labrum,</b> shape	Elongated, 1.3-1.4 times as long as wide	Elongated, 1.3-1.4 times as long as wide	Elongated, 1.3-1.4 times as long as wide	Subquadrate, nearly as long as wide
<b>Labrum,</b> anterior microsetal area	Along anterior margin; posterior border of microsetal area straight	Posterior border of area about ⅓ of distance between anterior margin and bases of medial setae, zig-zag-shaped	Along anterior margin; posterior border of area zig-zag-shaped	Posterior border of area about ⅓ of distance between anterior margin and bases of medial setae, zig-zag-shaped
<b>Antennae,</b> 1 <sup>st</sup> antennomere, anterior margin, armament	With line of long microsetae externally	Glabrous	Glabrous	With line of long microsetae externally
<b>Mandibles,</b> apical margin	Rounded with lateral teeth dorsally and ventrally	Evenly rounded, without lateral teeth	Obliquely truncate, without lateral teeth	Evenly rounded, without lateral teeth
<b>Maxillary palpus,</b> 1 <sup>st</sup> palpomere apically	Glabrous	Glabrous	Glabrous	With long, dense microsetae

Character	<i>Metaxymorpha</i>	<i>Stigmodera</i>	<i>Temognatha</i>	<i>Castiarina</i>
<b>Labium,</b> externally	Divided medially, central part separated; both microsetal areas well developed	Divided medially, central part poorly separated; only anterior microsetal area well developed	Divided medially, central part not separated; only anterior microsetal area developed	Divided medially, central part not sepa- rated; both microsetal areas well developed, fusing anteriorly
<b>Prementum, sides</b>	Feebly arcuate, nearly parallel	Evenly arcuate in the middle, slightly emarginated posteriorly	Sharply arcuate in the middle, evenly arcuated anteriorly and slightly emarginated posteriorly	Widely arcuate
<b>Prementum,</b> anterior microsetal area	Wide, about 1/3 of pre- mentum length; deeply divided in the middle; with arcuately emargin- ated posterior border	Wide, about 1/3 of pre- mentum length; deeply divided in the middle; with arcuately emargin- ated posterior border	Narrow, about 1/3 of prementum length; deeply divided in the middle; with zig-zag- shaped posterior border	Wide, about 1/3 of prementum length; deeply divided in the middle; with zig-zag- shaped posterior border
<b>Prementum,</b> posterior microsetal area	Large, divided in the middle, anteriorly nearly extending posterior border of anterior area	Nearly absent, repre- sented only by a few microsetae on each side of medial line	Absent	Large, divided in the middle, anteriorly overlapping posterior border of anterior area
<b>Prementum,</b> corner sclerites, shape	Narrow, nearly parallel-sided; with campaniform sensillae arranged almost linearly	Narrow, nearly parallel-sided; with campaniform sensillae arranged almost linearly	Widest anteriorly, narrowing posteriorly; with campaniform sen- sillae arranged arcuately	Wide, nearly parallel- sided; with campani- form sensillae arranged arcuately
<b>Prementum,</b> corner sclerites, apical seta	Long, far extending posterior border of anterior microsetal area	Long, far extending posterior border of anterior microsetal area	Rather short, not extend- ing posterior border of anterior microsetal area	Very long, extending anterior margin of prementum
<b>Postmentum,</b> sensillae	2 long, curved medial setae and 2 short, straight, fine lateral setae	2 short, straight setae; with or without lateral campaniform sensillae	1(? 2) medial long seta and 2 short, straight, fine lateral setae	4 long straight setae, located on the same distance of each other; medial longer and thicker, extending the middle of posterior microsetal area
<b>Spiracles,</b> anterior adjacent area	Only thoracic and 1 <sup>st</sup> abdominal spiracles with poorly visible swelling without sclerotized rugae	Only thoracic spiracles with distinct swelling bearing several parallel, sclerotized rugae	All spiracles with distinct sclerotized swelling bearing several parallel, stronger sclerotized rugae	Without visible swelling
<b>Spiracles,</b> perithremal rimae	Shifted to posterior wall of spiracle, their anterior ends extending to about 1/3 of trabecular length	Shifted to posterior wall of spiracle, their anterior ends extending to about 1/3 of trabecular length	Shifted to posterior wall of spiracle, their anterior ends extending to about 1/3 of trabecular length	Do not shifted to posterior margin of perithreme, as long as trabecular length
<b>Abdominal spiracle 8, size</b>	Very large, nearly as big as thoracic one and much bigger than 7 <sup>th</sup>	Much smaller than thoracic one, nearly as big as 1 <sup>st</sup> and 7 <sup>th</sup>	Smaller than thoracic one, nearly as big as 1 <sup>st</sup> abdo- minal and bigger than 7 <sup>th</sup>	Very large, nearly as big as thoracic one and much bigger than 7 <sup>th</sup>

## Bionomy

All larvae studied were taken from the trunks of *Guioa lasioneura* (Sapindaceae) of the diameters from 2-20 cm (Figs 13-16), but two other host plants are noted here: *Cyclophyllum multiflorum* (Rubiaceae) and *Sarcopteryx reticulata* (Sapindaceae). Eggs are deposited on the upper part of the trunk and the larva bores its nearly straight tunnel in the heartwood down to the basal part and roots of the tree packing its frass in the tunnel. In the base of the host plant the mature larva grazes back and forth in vertical open galleries (Fig. 13) it has constructed and pupates at the base of the tree. During grazing in the open galleries, the larva constructs several perpendicular side branches (ventilation tunnels) which are terminated by small holes in the bark (Fig. 14). Through those holes the larval frass is expelled outside of the trunk and these holes are very recognizable on the trunk due to a fine saw-dust falling from them (Fig. 15). Similar types of galleries with the ventilation holes were observed in some European *Agrilus*-species (Bílý 2002) and they are rather frequent in longhorn beetles (Cerambycidae). The length of larval development is uncertain but it likely extends over several years. Heavily infested trees usually die but very often trees survive, the galleries and ventilation holes heal, so that all evidence including emergence holes are only seldom seen.

Adult beetles are rather important pollinators of rainforest trees and they were observed on flowers of *Melicope elleryana* (Rutaceae), *Canthium odoratum* (Rubiaceae), *Buckinghamia celcissima*, *Grevillea baileyana*, *Macadamia whelanii* (all Proteaceae), *Eleocarpus angustifolius*, *Syzygium tierneyanum*, *S. kuranda*, *Eucalyptus* spp. and *Leptospermum* spp. (all Myrtaceae). Beetles crawl in the flowers and they are very often completely covered in pollen. Most of the host plants of *Metaxymorpha gloriosa* grow as an understorey in the forest, so the female must fly under the canopy to locate her host plants to oviposit.

Larvae of *M. gloriosa* have also a very special predator: the stripped possum (*Dactylopsila trivirgata* Grey, 1858). This marsupial strips the bark from the infested trees with its teeth (Fig. 16) and hooks the larvae from their galleries with its elongate fourth finger; larvae of *M. gloriosa* are a favourite food of this possum.

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Figs 13-16. *Metaxymorpha gloriosa* Blackburn. 13 – feeding galleries and frass trails with side-holes for expressing frass; 14 – middle-aged larva in its grazing gallery at the hole for expressing frass; 15 – trunk of *Guioa lasioneura* attacked by striped possum (*Dactylopsila trivirgata* Grey) feeding on *Metaxymorpha* larvae; 16 – frass expelled from feeding/grazing galleries.

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