

**DESCRIPTIONS OF LARVA AND PUPA OF *TOMOXIA LINEELLA* LeCONTE
WITH NOTES ON LARVAL HABITAT (COLEOPTERA: MORDELLIDAE)**

ANNEKE LISBERG AND DANIEL K. YOUNG
Department of Entomology
University of Wisconsin-Madison
445 Russell Labs 1630 Linden Dr.
Madison, WI 53706, U.S.A.
young@entomology.wisc.edu

Abstract

The mature larva and pupa of *Tomoxia lineella* LeConte are described and illustrated based on specimens collected and reared from a standing large-toothed aspen (*Populus grandidentata* Michaux) in a northern-mixed forest element in south-central Wisconsin. Larvae were collected on 30 March 2001 and 23 April 2001 from tunnels approximately two cm under the bark in the wood of the south-facing side of the tree. *Tomoxia lineella* was previously unrecorded from Wisconsin.

Mordellidae is a commonly encountered and speciose group with more than 1,500 species worldwide. In North America north of Mexico three tribes, 17 genera, and 203 species are known (Jackman and Lu 2002). Despite the relative abundance of the family, very few larvae have been described and keys to larvae are scarce. Keys to larvae of eight genera including *Tomoxia* have been published for the Palearctic Region (Odnosum 1992), however these descriptions are based on relatively few species (three *Tomoxia*) and do not include North American species. Larvae of seven species in *Mordellistena* were described from the Ukraine (Odnosum 1985, 1989) but none of these occur in North America north of Mexico (Bright 1986). Other species descriptions of mordellid larvae are generally brief or incomplete, often not illustrated and inadequate for comparison. Only one other species of *Tomoxia*, *T. biguttata* Gyllenhal has been formally described (Perris 1875). Descriptions of mordellid pupae are limited in both number and depth and none may be considered complete or adequate for comparison.

Due to the paucity and adequacy of descriptions in the literature, especially concerning North American Mordellidae, there is a tremendous gap in our knowledge of the immature stages of mordellid species. Additionally, the correct association of many North American mordellid species into appropriate genera is still in considerable question (Jackman and Lu 2002), and knowledge from immature stages may eventually aid in developing a better understanding of the relationships within this family.

Ecological data for Mordellidae are also sparse. Mordellid larvae are stem-borers, apparently feeding largely on herbaceous plant stems, shrub stems, and dead wood (Lawrence 1991). Plant associations for mordellid larvae have only recently begun to be recorded, records are few, and larvae have rarely been determined to species (Ford and Jackman 1996).

Specimens and Methods

Specimen Collection and Habitat. Five larvae used for the larval description and reared for identification were collected by D. K. Young on 30 March 2001 from a standing dead large-toothed aspen (*Populus grandidentata* Michaux) located on a west-facing slope in a northern mixed forest element in south-central Wisconsin

(Sauk County: Hemlock Draw: 43°21'50"N; 89°56'51"W) **NEW STATE RECORD.** All larvae were located in tunnels within the wood of the south-facing side of the tree, approximately two cm under the bark. The wood was still fairly solid, requiring a hatchet to expose the larvae. The larva reared for pupal description was collected by A. E. Lisberg from the same tree on 23 April 2001. Adults were determined by A. E. Lisberg; all specimens are housed in the University of Wisconsin-Madison Insect Research Collection.

Rearing. Three of the initial five larvae were placed in a covered petri dish along with woody substrate from the tree. The substrate was packed fairly tightly and a jar was placed on the lid to maintain a light pressure. The substrate was periodically moistened and the dish was kept at room temperature. Two larvae tunneled into the substrate but the third larva remained near the surface and died within two days. The first adult emerged 33 days later and the second was found fully developed but still in a tunnel within the substrate on the same day. The larva collected on 23 April 2001 was placed in a plastic, nine dram vial along with substrate from the tree. The larva tunneled into the substrate and back out, pupating on the floor of the container after one week. The pupa responded to touch by twisting its abdomen in a circular motion.

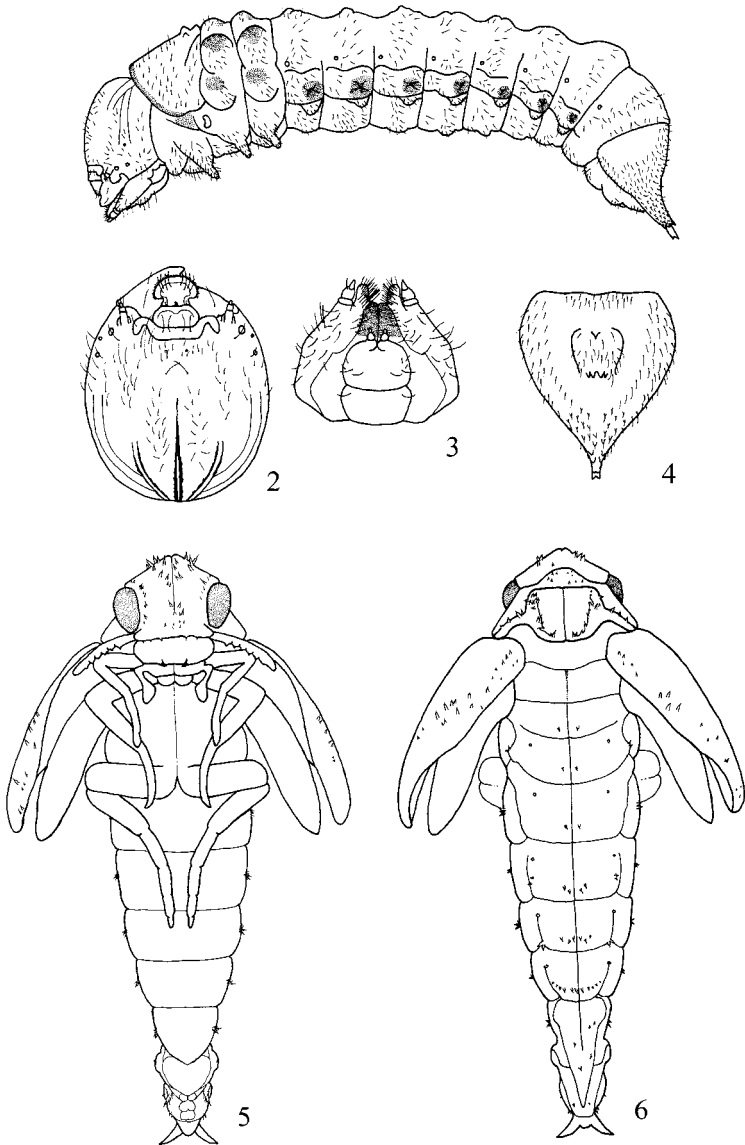
Preparation. Two of the initial five larvae as well as the pupa were killed in near-boiling water and preserved in 80% EtOH.

Mature Larva of *T. lineella* LeConte (Figs. 1–4)

Description. Body cylindrical, length ($n = 2$) 9.0–10.5 mm, very slightly C-shaped (Fig. 1). Color creamy white, asperites and median process on A9 piceous, mandibles piceous, apices black, labrum testaceous.

Head (Figs. 2–3) ovate, bearing scattered, erect, short to moderately elongate setae, hypognathous. Endocarina (Fig. 2) coincidental with epicranial stem, running anteriorly from posterior rim of cranium along almost two-thirds length of cranium. Bilaterally bifurcated melanized areas beginning at posterior rim of cranium and diverging anteriorly. One pair of apparent sensory pores located mesally, posterad frontoclypeal suture. Each side of cranium bearing three pairs of indistinct stemmata; anterior stemma posterad antennal insertions, larger than posterior stemmata. Antennae three-segmented; segment one slightly longer and wider than segment two, segment three strongly reduced. Labrum strongly convex, wider than long, margin densely fringed with short setae; epipharynx with three pairs of long setae along lateral margins, mesally raised and with short setae. Mandibles slightly asymmetrical, heavily sclerotized, broadly conical and pointed apically with a blunt, subapical tooth, adoral surface with some microsculpturing, two setae on dorsal side. Maxillae (Fig. 3) with mala long, reaching almost to apex of third maxillary palpomere, adoral margin slightly excurved and densely covered with long, stout setae; maxillary articulating area well-developed, covered with minute asperities; maxillary palpi three-segmented: first segment smallest, second segment 4× length of first, third segment cone-shaped and 2–3× length of first. Labium with submentum lightly sclerotized; labial palpi two-segmented, arising laterad mid-ventral line, palpiger short, 2× width of second labial palpomere, first palpomere equal in length to palpiger and 1.5× width of second palpomere, second palpomere 1.5× length of palpiger.

Prothorax slightly longer and wider than mesothorax and metathorax, slightly wider than abdomen. Pronotum produced anterolaterally into a shield; its anterior edge covered with asperities; dorsum bearing a lightly pigmented transverse ridge of 4–6 asperate callosities near meson and a pair of smaller, raised, asperate callosities along meson, posteriorly. Prothoracic sternum 3× length of mesothoracic sternum and 2× length of metathoracic sternum, subdivided by a transverse sulcus between anterior margins of the prothoracic coxae; cervicosternum incompletely divided into three plates; sternum posterad sulcus marked by a mesal patch of erect, moderately elongate, moderately dense setation. Mesothorax and metathorax with poorly defined dorsal ampullae and paired, poorly developed dorsolateral ampullae, tipped with minute asperities; sterna with patch of moderate setation mesally. Legs short, setose, indistinctly 4-segmented, mesothoracic legs slightly more widely spaced than those of prothorax, metathoracic



Figs. 1–6. *Tomoxia lineella* LeConte. **Figs. 1–4.** Larva. **1)** Habitus, lateral view; **2)** head with maxillae and labium removed, dorsal view; **3)** maxillae and labium, ventral view; **4)** abdominal apex, ventral view. **Figs. 5–6.** Pupa. **5)** Habitus, ventral view; **6)** habitus, dorsal view.

legs slightly more widely spaced than those of mesothorax. Mesothoracic spiracles well developed, elongate oval.

Abdomen gradually increasing in diameter from anterior to posterior, A1–A7 each bearing distinct, fleshy laterotergites tipped with minute asperities; A9 (Fig. 4) setiferous, bearing pigmented asperities, tapering caudally to form a long, median, spine-like process, spine 4× longer

than wide, dorsomesally indistinctly grooved along its entire length; tip of spine produced into four lobes, two dorsolateral and two ventrolateral, with the division between the dorsolateral lobes deeply pronounced, V-shaped. A10 ventral, encircled by sternum of A9; A10 slightly raised from sternum of A9, divided by a weakly developed mesal sulcus into two, setaceous, longitudinally ovate surfaces, each of which is further divided into two lobes posteriorly. Abdominal spiracles ovate, present anteriorly on A1–A8, dorsad laterotergites.

Pupa of *T. lineella* LeConte

(Figs. 5–6)

Description. Body cylindrical, 8.8 mm in length. Color creamy white, tips of mandibles and setiferous tubercles yellow-brown, compound eyes with reddish-purple facets.

Head (Fig. 5) ventrally reflexed, vertex coming to a distinct point. Frontal region of head with deep, mesal sulcus bifurcating bilaterally and becoming confluent with inflated antennal insertion ridges; labro-clypeal area thus pursed inwardly. Elongate, setiferous tubercles distributed on cranium asymmetrically: in a large patch at vertex, bordering orbits along mesal edge, a patch on lower frontal region, and several smaller tubercles along frontoclypeal suture. Antennae free, arising frontally between lower margins of compound eyes and mandibular bases; antennal segments 4–9 subserrate, segments 10–11 conjoined. Pigmented mandibular apices visible laterad labrum. Maxillary palpi flattened, indistinctly three-segmented; third palpomere widened apically.

Thorax subequal in width to head. Disk of pronotum (Fig. 6) transversely divided by broad, shallow sulcus; anterior portion with transverse, ovoid setal ring on slightly raised mesal surface; posterior portion with flattened, U-shaped region mesally, bordered by raised lip and subequally spaced setiferous tubercles similar to those of head. Lateral portions of pronotum also bearing several scattered setiferous tubercles. Elytra articulated at base, reaching anterior margin of A5, rounded apically and sparsely covered on dorsal surface with setiferous tubercles; mesothoracic scutellum visible, its posterior margin slightly bilobed. Metathoracic wings free, similar to elytra but without tubercles; metathoracic notum with small dark concentric markings mesally. Prothoracic and mesothoracic legs obscured proximally by mouthparts, lying folded along sides of thorax. Metathoracic sternum conspicuous, larger than combined lengths of prothoracic and mesothoracic sterna; metathoracic legs folded horizontally at femoro-tibial articulations, extending beyond width of thorax.

Abdomen gradually tapering from base to apex, A1 one-fourth as long as wide; terga increasing in length from A1 to A3, then decreasing again in length to A5, terga A5 and A6 subequal in length. Terga of A1–A6 each bearing a group of setiferous tubercles on either side of mid-dorsal line, tubercles gradually increasing in number from one on each side (A1) to two transverse lines of about five tubercles each, bilaterally along posterior margin of A6; lateral margins of terga sparsely setose. Spiracles visible laterad raised terga, near anterior margins of ill-defined, fleshy, raised, laterotergal areas. Tergum A7 elongate-conical, visible posterad A6, generally resembling adult pygidium; anterolateral margins somewhat rounded, swollen, with setiferous tubercles posterad swellings. Genital segments extend laterally and posteriorly from A7, bearing paired setiferous tubercles posterolaterad swollen basal angle of A7; lateral margins incised posterad tubercles thence excised to previous width; posteriorly tapering gradually to apex which bears two excurved, pointed urogomphi; an additional pair of setiferous tubercles arises laterad posterior portion of A7. Abdominal sterna each with group of large, setiferous tubercles laterad spiracles. Ventrally, anterior genital segment nearly heart-shaped, slightly pigmented on lateral margins; three ill-defined, fleshy bilobed swellings posterad apex of anterior genital segment; posterolateral margins near apex of genital segments bearing three setiferous tubercles, anterad urogomphi.

Discussion

In a key to larvae of the genera *Yakuhananomia*, *Hoshihananomia*, *Tomoxia*, *Mordella*, *Variimorda*, *Conalia*, *Tolidopalpus*, and *Mordellistena* for Palearctic Mordellidae, Odnosum (1992) noted several characters that could perhaps be diagnostic at the generic and specific levels. The shape of median spine-like process at apex of abdomen and the shape of the prothoracic spiracles of *T. lineella* agree with Odnosum's generic description and taxonomic key (including his Fig. 7). A brief key to

the genera *Glipostena*, *Glipa*, *Falsomordellistena*, *Mordella*, and *Hoshihananomia* also exists for larvae of Japanese Mordellidae (Hayashi 1980). Both works base the keys on relatively few specimens and species, and represent but a starting point. Other works discussing or illustrating larvae of *Tomoxia* include Borowiec (1996) which illustrates an unidentified larva of Mordellidae fitting the general descriptions for *Tomoxia*, the larva of *T. biguttata* described by Perris (1875) along with an extremely brief and incomplete description of the pupa, and Odnosum (1992) which includes partial illustrations of *T. biguttata* larvae. Frost (1913) and Bøving and Craighead (1931) briefly described and incompletely illustrated the larva of *Yakuhananomia bidentata* (Say), under the generic name *Tomoxia*. Frost (1913) also mentioned the pupa. Interestingly, Frost also mentioned *T. lineella* but only to clarify the separation of the species from *T. bidentata*. Other immature Mordellidae that have been partially described include the larva and pupa of *Mordella marginata* Melsheimer (Weiss 1920), the larva of *Mordellistena perrisii* Mulsant (Perris 1875), the larva and pupa of *Mordellistena nigricans* Melsheimer (French 1933), the larva and pupa of *Mordella maculosa* Naezen (Saalas 1923), and the larva and pupa of *Mordellistena episternalis* Mulsant (Falcoz 1920).

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SCIENTIFIC NOTE

Pterolophia granulata (Motschulsky) (Coleoptera: Cerambycidae) as a Pod Borer

Larvae of most longicorn beetles (Cerambycidae) feed on living, dying, dead and rotten tree wood and stems of herbs, grasses and bamboo (Linsley 1959), but only a small number of cerambycid species are known to attack the reproductive organs of plants, such as seeds (Linsley 1959; Kato 2001). We recently found a cerambycid species boring into leguminous pods in Japan, and the feeding habits observed are reported in this note.

We collected ca. 100 seedpods of the Japanese honey locust *Gleditsia japonica* Miquel at the riverbank of the Hozu River, Kameoka City, Kyoto Prefecture, central Japan in late May 2002 (for detailed site description see Takakura 2002). At the site, two trees of *G. japonica* grew. The collected pods were anntinous and scattered on the ground. They were brought to our laboratory and dissected in mid-June, when individual cerambycid larvae were found in four pods. Among those, two larvae were introduced with pieces of pod into a petri dish, which was kept under laboratory conditions. In late July, a male adult of *Pterolophia granulata* (Motschulsky) emerged.

Both the larva and the adult fed on the pod wall but not on seeds. We speculated that due to the large size of *G. japonica* pods (ca. 20 cm length), *P. granulata* could complete their growth on the pod wall only. *Pterolophia granulata* is known to attack dead wood of various trees and shrubs such as cedar, aspen, oak, fig and elm (Kojima and Hayashi 1969). Therefore, *P. granulata* seemed to utilize the pods facultatively. At the study site, *G. japonica* bears mature pods in October and sheds them gradually from winter to early summer. The collected pods were produced in the previous year and fell to the ground by early summer of the current year. Oviposition thus seemed to occur in autumn or spring, and the larvae developed to adults within a year.

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Kazuo Yamazaki and Koh-ichi Takakura, Osaka City Institute of Public Health and Environmental Sciences, 8-34 Tojo-cho, Tennoji, Osaka, 543-0026 Japan.

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