



***Anarsioses*, a new generic name for *Phyllonorycter aberrans* (Braun) (Lepidoptera: Gracillariidae)**

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INTRODUCTION

Annette Braun (1930) described the leafmining moth *Phyllonorycter aberrans* in the genus *Lithocolletis* Hübner, 1825. The species was later transferred to *Phyllonorycter* by Davis (1983). Recent morphological studies on North American Gracillariidae by the author have shown that *P. aberrans* requires a new generic placement. Generic distinction was also recognized by the molecular studies of Kawahara *et al.* (2017: fig. 2). *Anarsioses* is very similar to *Phyllonorycter* in general head morphology and wing venation, but differs in the unusual asymmetry of the male genitalia and in larval biology.

The following abbreviations are used in the text: CSE = collection of Charles S. Eiseman, Northfield, Massachusetts; em = emerged; and USNM = collection of the United States National Museum of Natural History, Washington, DC.

SYSTEMATICS

***Anarsioses*, new genus**

Type species: *Lithocolletis aberrans* Braun, 1930, by original designation and monotypy.

Description. Adult. *Head* (Fig. 3). Vertex covered with long, erect, dense tuft of piliform scales; frons with broad, smoothly appressed scales extending down to bases of labial palpi; eyes enlarged, interocular index (= maximum vertical eye diameter/interocular distance at tentorial pits) ca. 1.45. Antenna ca. equal to length of forewing, smooth scaled, with a single row of slender scales per segment; scape with relatively short, dense pecten ventrally. Proboscis well developed, naked, ca. 2.9x length of labial palpus. Maxillary palpus very reduced, ca. 0.5x length of labial palpomere II, and directed laterally, consisting of 2 articulated segments. Labial palpus drooping, with 3 slender segments of almost equal length.

Thorax (Fig. 4). Forewing slender, maximum length/width ratio ca. 5.2, extremely narrow at apex, reduced to an elongate lobe. Venation consisting of 7 veins extending to wing margin and a very rudimentary CuP vein ending short of wing margin near CuA; Sc extending to slightly less than basal third of costal margin; R and Rs 1 absent; Rs 2–4 present with Rs 4 arising from terminal end of cell; 1A fused with 2A and extending to distal 0.7 of hindmargin. Hindwing lanceolate, maximum width ca. 0.14 that of length; venation reduced, similar to *Phyllonorycter*.

Abdomen. Male genitalia (Figs. 5–6). Tegumen relatively short, triangular in ventral view. Vinculum a broadly rounded, slender, U-shaped, ventral ring. Transtilla slender. Valvae strongly asymmetrical, with right valva relatively broad and terminating in a mostly rounded, slightly clefted apex; left valva very slender, terminating in a prominently divided apex with two slender, digitate lobes. Gnathos terminating in a relatively elongate, slender lobe. Phallus (Fig. 6) slender, strongly curved, with a small triangular, ventral process arising near base. Female genitalia (Figs. 8–9). Papillae anales laterally flattened, densely setose. Posterior apophyses slender, elongate. Ostium bursae opening along caudal margin of abdominal segment 7, slightly left of median. Ductus bursae elongate, strongly curved. Accessory bursae membranous, nearly the size of corpus bursae and arising about midlength of

ductus bursae. Corpus bursae with a small, U-shaped, sclerotized signum with a minutely serrated anterior margin; interior wall of corpus bursae densely covered with numerous rows of minute spines encircling signum.

Diagnosis. Morphologically, *Anarsioses* differs from *Phyllonorycter* and other Lithocolletine genera in the asymmetry of the male genitalia and eighth abdominal sternite. The right valva in *Anarsioses* (Fig. 5) is broad with a rounded apex, and the left valva is extremely narrow with a bifurcated apex (Fig. 5). The phallus is strongly curved (Fig. 6), and the male eighth sternum terminates in a slender, curved lobe (Fig. 7). The males of several species of *Phyllonorycter* also have asymmetrical valvae, but in most of these species the left valva is broad and the right slenderer. The phallus in *Phyllonorycter* is typically straight. The male eighth sternum also is typically symmetrical in *Phyllonorycter*, although in at least one North American species (i.e., *P. occitanica* (Frey & Boll)) the caudal apex of sternum eight is attenuated and slightly curved. In the Japanese species “*Lithocolletis*” *issikii* Kumata, the valvae are also asymmetrical with the left valva slenderer (Kumata 1963). However, in this species the phallus is straight and the eighth sternum is symmetrical.

The larvae of *A. aberrans* differ from those of all *Phyllonorycter* in exiting the leaf mine to pupate (Fig. 10), and from most *Phyllonorycter* in creating a flat, upper-surface mine. In a recent molecular phylogeny utilizing 22 genes for 96 species of Gracillariidae and representing all previously recognized subfamilies and genus groups, *Anarsioses aberrans* was found to comprise a clade distinct from the other members of *Phyllonorycter* and the other genera sampled (Kawahara *et al.* 2017: fig. 2).

Etymology. The generic name is derived from the Greek *anarsios* (strange) and *ses* (moth), in reference to the strongly asymmetrical male genitalia and eighth abdominal sternite.

***Anarsioses aberrans* (Braun), new combination**

Figs. 1–7

Lithocolletis aberrans Braun 1930: 12; Braun 1939: 283; McDunnough 1939: 996 (No. 9230).

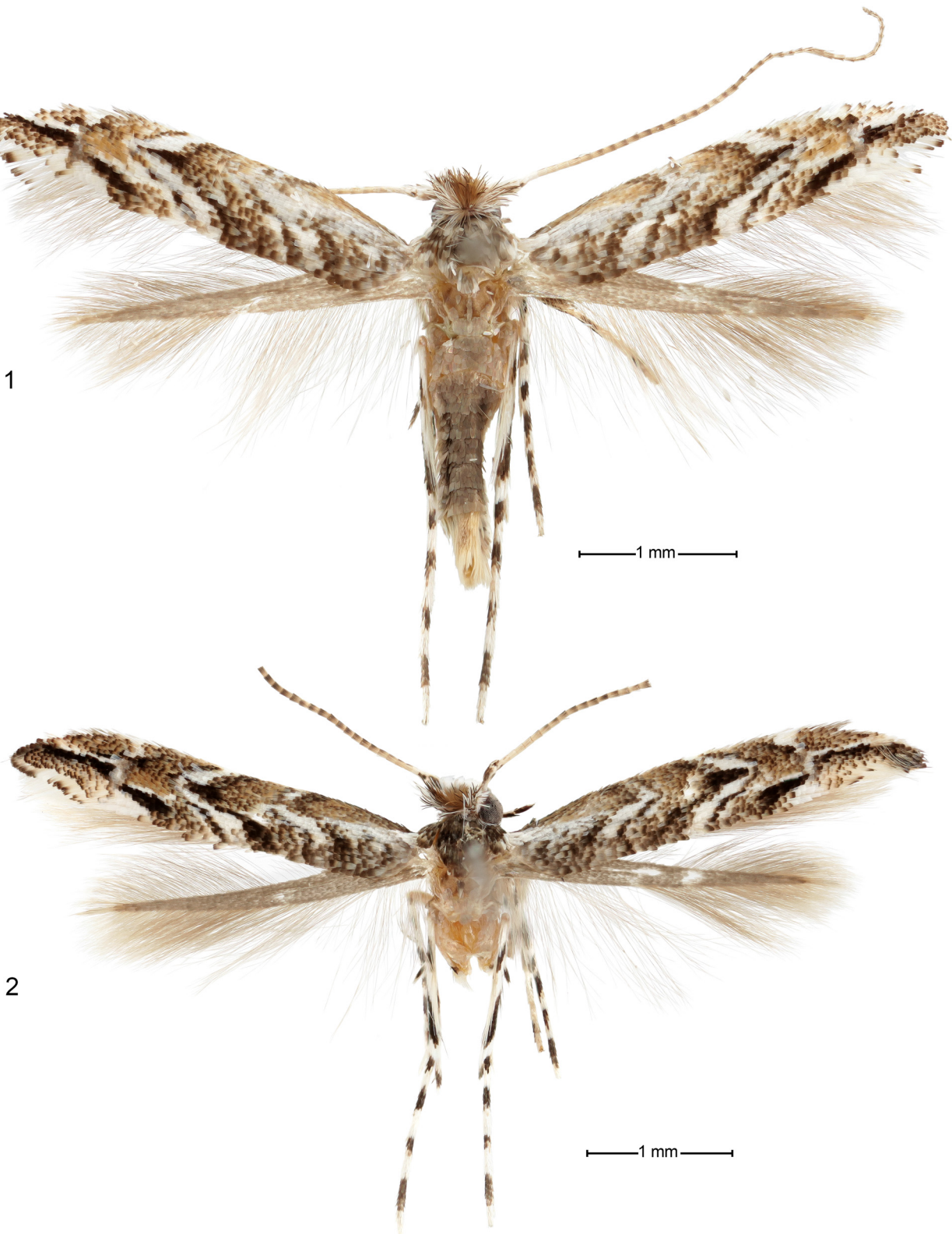
Phyllonorycter aberrans: Davis 1983: 19; De Prins & De Prins 2005: 264; Heppner 2003: 243; Kawahara *et al.* 2017: 70; Eise-man 2019: 220, 306, 423, 758, 769, 783, 814.

Description. Adult (Figs 1–2). *Head*: Frons white; dorsal scale tuft with mixture of white and dark brown, piliform scales. Antenna mostly brown with whitish annuli; scape and a few succeeding flagellomeres white on anterior surface. *Thorax*: White with brown and brownish ochreous scales intermixed. Forewing length 2.7–3.0 mm. Forewing pattern complex, partially brownish ochreous with black tipped scales, and with 2 strongly angulate white fasciae near basal third and distal two thirds; costal arms of fasciae shorter than dorsal arms; a pair of white spots on costal and dorsal wing margin near distal third of wing; a pair of much smaller, more slender white spots terminating near forewing apex; basal margins of fasciae and spots bordered with patches of black scales. Cilia predominantly white, tipped with a few black scales below wing apex. Hindwing pale silvery gray with cilia slightly ochreous. Legs white, apices of segments dark brown; posterior tibiae with diagonal, dark brown bands. *Abdomen*: Gray to brown dorsally, silvery white ventrally. Sternum 8 (Fig. 7) in male broad and elongate, equaling length of male genitalia; caudal margin strongly asymmetrical, terminating in a small, strongly curved, caudal lobe. Male genitalia (Figs. 5–6) as described for genus. Female genitalia (Figs. 8–9) as described for genus.

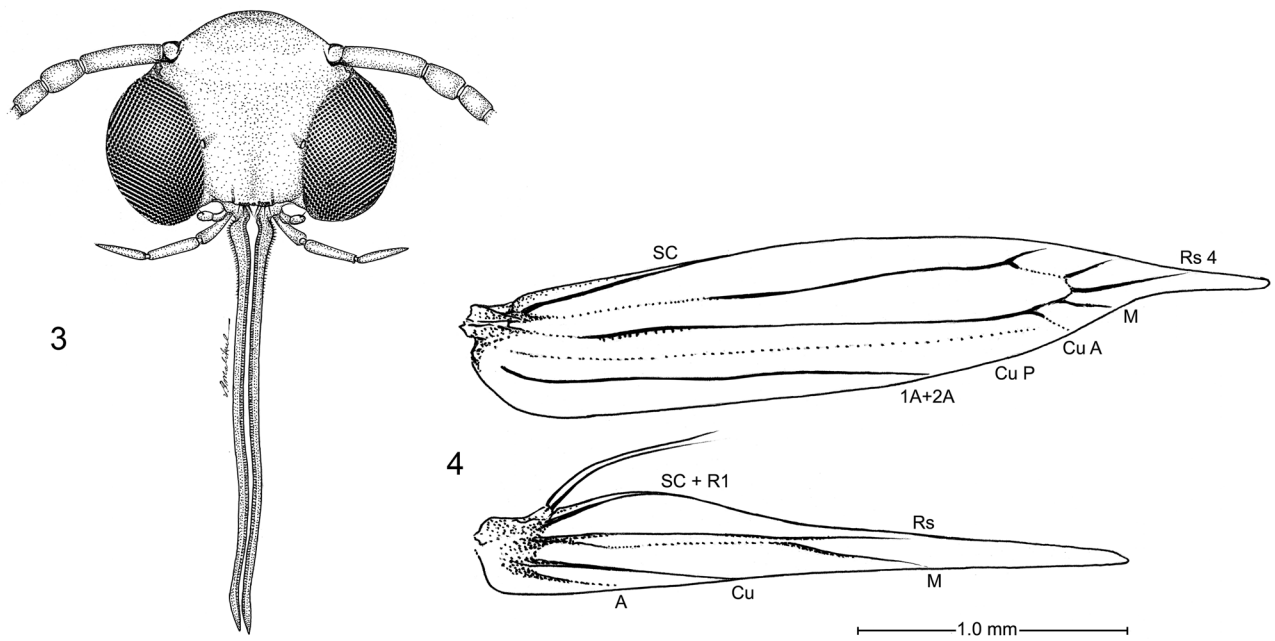
Larva. Last instar spinning larva (Figs. 11–17): *Head*: Approximately round with mouthparts fully developed; frons elongate, ca. 0.75x the distance to epicranial notch; ecdysial line terminating at epicranial notch. Chaetotaxy (Figs. 12–13, 15) relatively complete; all three MD setae present, arising caudad to P1. P1 arising adjacent to ecdysial line. P2 reduced, arising caudad to A2. A2 long, slightly exceeding length of A1. Five stemmata present. Antenna 3-segmented, with segments approximately equal in length and third segment reduced in diameter. Labrum (Fig. 16) strongly bilobed; M2 and La1 reduced in length. Mandible (Fig. 17) with four relatively large median cusps and one reduced lateral cusp. *Thorax*: Pronotum and dorsal plates sclerotized on T1–3. Prothorax with setae XD1 and XD2 extremely short and of equal length; SD1 elongate, immediately ventral to XD2. L and SV groups bisetose on T1–3. Legs relatively short but fully developed; coxae widely separated, with 4 coxal setae. *Abdomen*: Dorsal plate sclerotized on A1–10; D and SD groups bisetose on A1–8, 10; unisetose on A9. Prolegs present on A3–5, 10; anal plate broad, with 4 pairs of setae.

The early instar larvae are sap-feeding with relatively flattened bodies and specialized mouthparts (Davis 1987). The final instar transforms to a tissue-feeding larva possessing a typical cylindrical body form and chewing

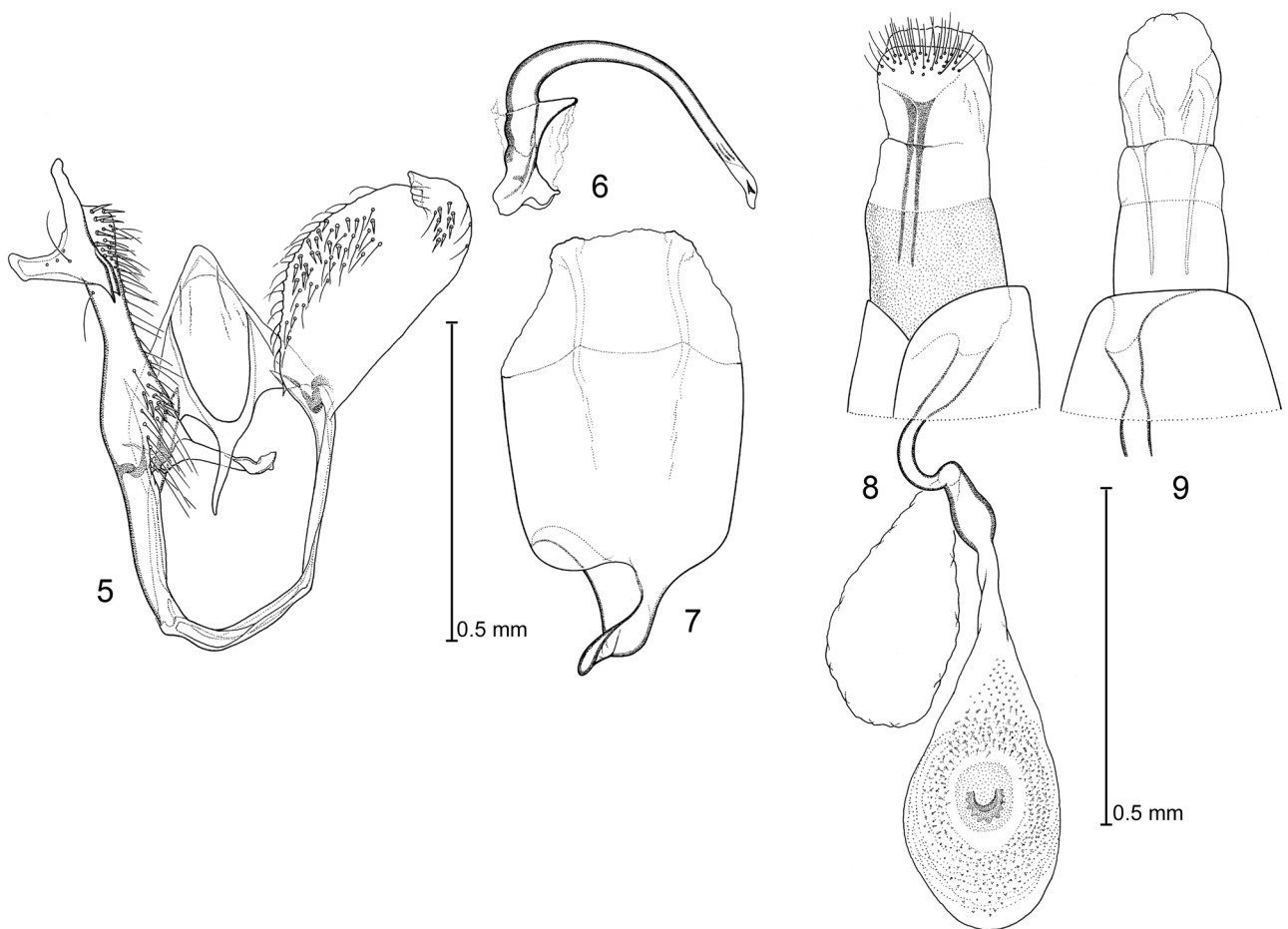
mouthparts. After feeding on parenchymal leaf tissue for two or three days, the final instar exits the mine and spins a smooth, flat, whitish cocoon. Braun (1930) estimated that the mining period was about three weeks in duration, with early instar larvae collected in Ohio around mid-August forming cocoons ca. September 4–5 and the adult moths emerging September 18–23.



FIGURES 1–2. Adults. 1. Female. 2. Male



FIGURES 3–4. Adult. 3. Head. 4. Wing venation.



FIGURES 5–9. Genitalia. 5. Male genitalia, ventral view. 6. Phallus, lateral view. 7. Male sternum 8. Female genitalia, lateral view. 9. Female genitalia, ventral view.

Larval mine (Fig. 10). The leaf mine begins as a short irregular line that quickly begins to enlarge to form a smooth, slightly irregular blotch on the dorsal leaf surface. As feeding continues, the blotch increases in size, thereby obliterating the early serpentine mine, and finally enlarges to ca. 1.5–2.0 cm in diameter. Adjacent mines sometimes coalesce resulting in more than one larva within a single large blotch. The larva pupates in a small cocoon spun outside the mine, sometimes in a folded over edge of the leaf (see Fig. 10)

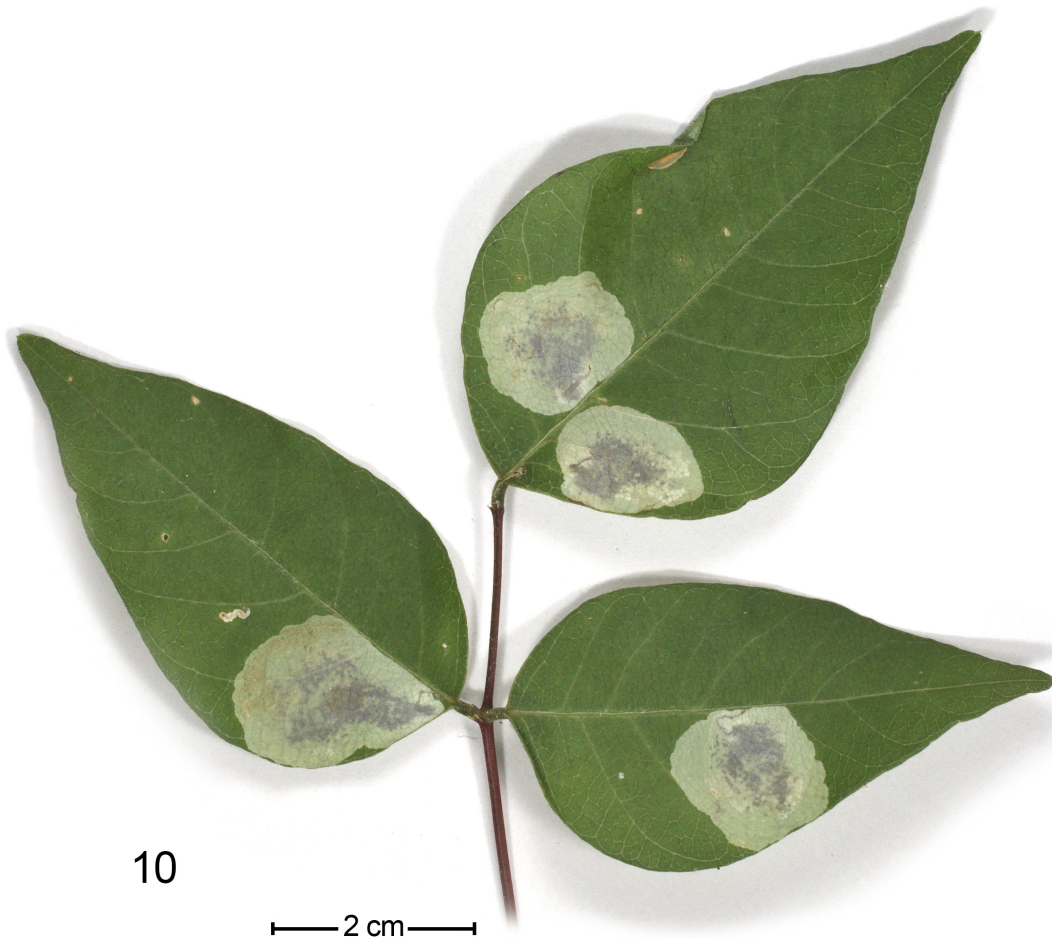


FIGURE 10. Larval blotch mines on *Apios americana* Medikus; note pupal hibernaculum in folded edge of upper middle leaf.

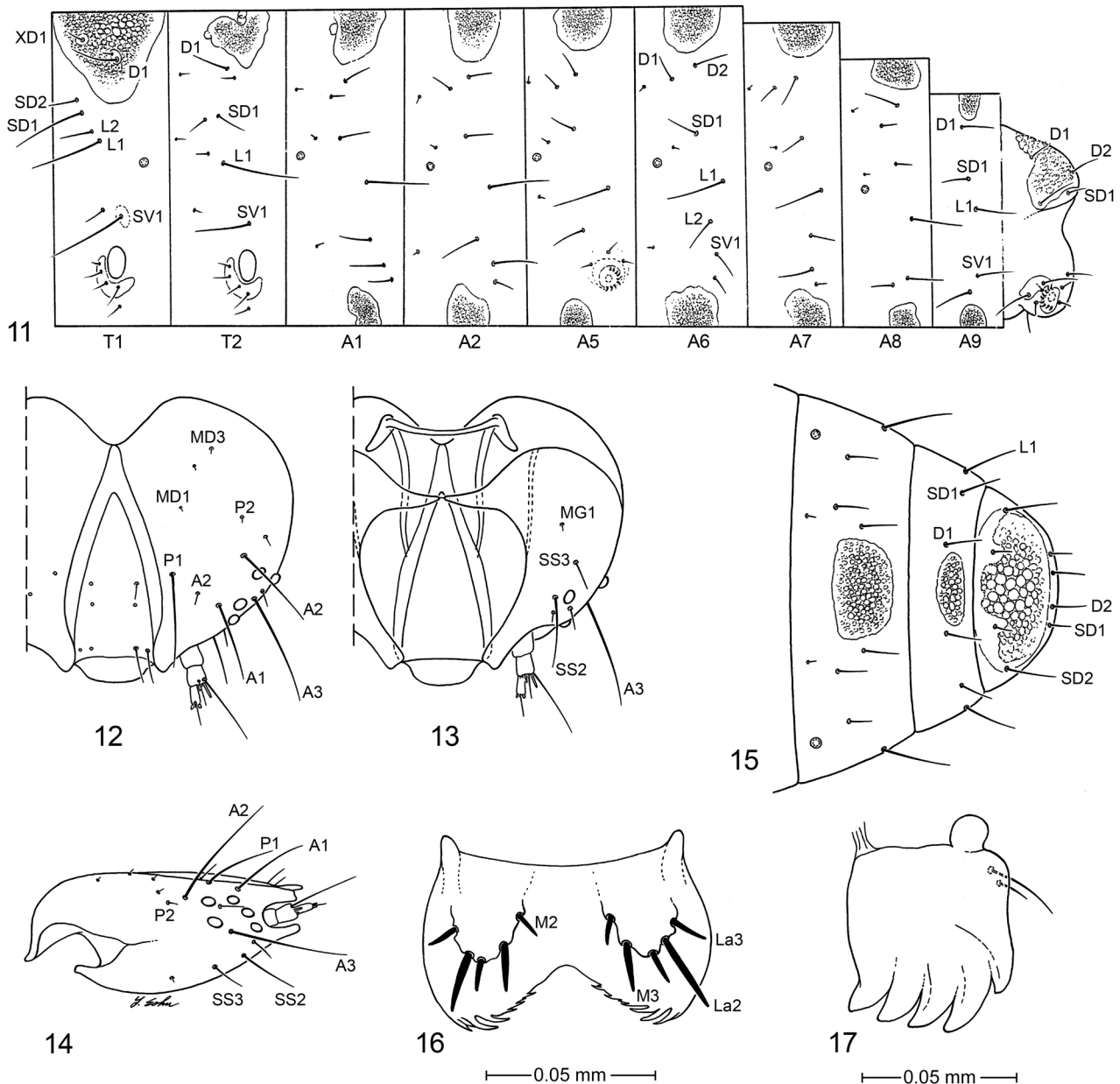
Holotype. *Anarsioses aberrans* (Braun), ♂, Beaver Pond, Adams County, Ohio (ANSP).

Hosts. Fabaceae: *Apios americana* Medikus (Eiseman & Davis, in prep.); *Desmodium canescens* (L.), *Desmodium paniculatum* (L.) DC. (Braun 1930); *Desmodium glabellum* (Michaux) A.P. de Candolle (new record); *Desmodium marilandicum* (L.) DC.; *Desmodium perplexum* B.G. Schub.; *Lespedeza hirta* (L.) Hornem. (Eiseman & Davis in prep.); *Vigna luteola* (Jacq.) Benth. (D. H. Habeck, reported in current reference) [misspelled as “*Vigna lutens*” by Heppner (2003)].

Distribution. Since the original collection of this species by Annette Braun in Adams County, Ohio, *Anarsioses aberrans* has been found to occur widely over the eastern United States from Maryland south through several states to possibly Texas. Braun (1939) reported rearing this species from Arkansas, Kentucky, Missouri, and South Carolina, and found empty mines in Tennessee. Warren Steiner, Jil Swearingen, and the author have reared *A. aberrans* from *Apios americana* in marshy habitats in southern Maryland. Charley S. Eiseman and T. S. Feldman have reared the species from other hosts in Missouri and North Carolina.

Material Examined. Florida: Colombia Co: Ichetucknee Springs State Park: 2♂, 1♀, 27 Jun 1975, em: 14 Jul 1973, D. H. Habeck, host: *Vigna luteola* (Jacq.) Benth. (USNM). **Kentucky:** McCreary Co: 1♂, 9 Apr 1942, A. F. Braun, host: *Desmodium*, USNM 17156 ♂ (USNM), Cumberland Falls: 1♀, 12 Aug 1937, B 1324, A.F. Braun

(USNM); Monroe Co: Mud Lick: 1♀, 9 Apr 1942, host: *Desmodium*, USNM 17959 ♀ (USNM). **Maryland:** Prince Georges Co: Fort Washington, Henson Creek: 1♂, DRD 2706, 8 Sep 1996, em: 15 Dec, 1996, host: *Desmodium glabellum*, D.R. Davis, USNM. Piscataway Park: 3♂, 1♀, 13 Aug 2010, em: 25 Aug 2010, host: *Apios americana*, W.E. Steniner and J.W. Swearingen; 1♂, 2♀, 13 Aug 2011, em: 6 Sep 2011, host: *Apios americana*, DRD 2706, D.R. & M.M. Davis (USNM). **Missouri:** Franklin Co: Gray Summit, Shaw Nature Preserve: 1♂, 1 Jul 2015, em: 21 Jul 2015, host: *Desmodium perplexum*, host: *Desmodium marilandicum*, CSE 1763, C.S. Eiseman (USNM). Shaw Co.: 1♀, 26 Jul 1939, A.F. Braun, B1623 (USNM). **North Carolina:** Scotland Co: Laurinburg, St. Andrews University: 1♂, 2 May 2016, em: 24 May 2016, CSE 2499; 1♀, 7 Jun 2016, em.: 23 Jun 2016, CES 2621; 1♂, 1♀, 26 Aug 2015, em: 18 Sep 2015, host *Apios americana*, CSE 2061; 1♂, Sep 2016, em: 20 Mar 2016, CSE 2386, host: *Apios americana*, T.S. Feldman & C.S. Eiseman (CSE, USNM).



FIGURES 11–17. Last instar larva. **11.** Lateral schematic of prothorax, mesothorax, and abdominal segments 1, 2, 5–10. **12.** Head, dorsal view. **13.** Head, ventral view. **14.** Head, lateral view. **15.** Dorsal view of abdominal segments 8–10. **16.** Labrum, dorsal view. **17.** Mandible, ventral view.

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