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THE LARVA OF *AGROTIS VOLUBILIS* HARVEY (LEPIDOPTERA: NOCTUIDAE)[1]

Timothy L. McCabe

Abstract.—The mature larva of *Agrotis volubilis* Harvey (Lepidoptera: Noctuidae) is described and illustrated. *Achillea millefolium* L. was found to be an acceptable host. Late instar larvae became more general, accepting *Vaccinium vacillans Torr. and Oenothera biennis* L. Larvae were full-grown by the 20th of July (52 days), but would not pupate. They remained healthy through October, when they were placed in out-of-door cages; the larvae failed to overwinter.

Despite the economic significance of the genus *Agrotis*, many species' biologies are unknown and identification of the adults of several species is hampered by the paucity of species-specific genitalic characters and the variability shown in adult habitus. *Agrotis volubilis* Harvey (1874) can not presently be satisfactorily separated from *A. stigmosa* Morrison (1874) or even *Feltia* [*Agrotis*] *musa* Smith (1910) on the basis of adult morphology (Ahmadi, 1977).

The genitalia of the *A. volubilis* parental female, whose progeny form the basis of this paper, has posterior apophyses which extend to the base of the anterior apophysis, as in Ahmadi's (1977) illustration of *A. stigmosa*; his specimen was from North Dakota. I have seen paratypes of *A. stigmosa*, described from Massachusetts, and these may represent a very pale form of *A. volubilis*, but it seems likely that it is a valid coastal species. The parental female, from the Pine Bush, Albany County, New York, resembles the inland and not the coastal species in habitus and I have called it *A. volubilis*. It compares well with Holland's (1903) figure of *Feltia* [*Agrotis*] *volubilis*.

The only biological information on *A. volubilis* is a paper by Hawkins (1930). This is a table of ratios of the tarsal claw of various noctuids. No information is available on the larva of *A. musa* or *A. stigmosa*.

A female *A. volubilis* was collected on May 28th, 1978, and ova were obtained by the 30th. The first instar larvae were confined with *Taraxacum officinale* L., *Prunus virginiana* L., *Achillea millefolium* L., and *Populus tremuloides* Michx., but fed only upon the *Achillea*. Later instar larvae would feed on *Vaccinium vacillans* Torr., and *Oenothera biennis* L., but

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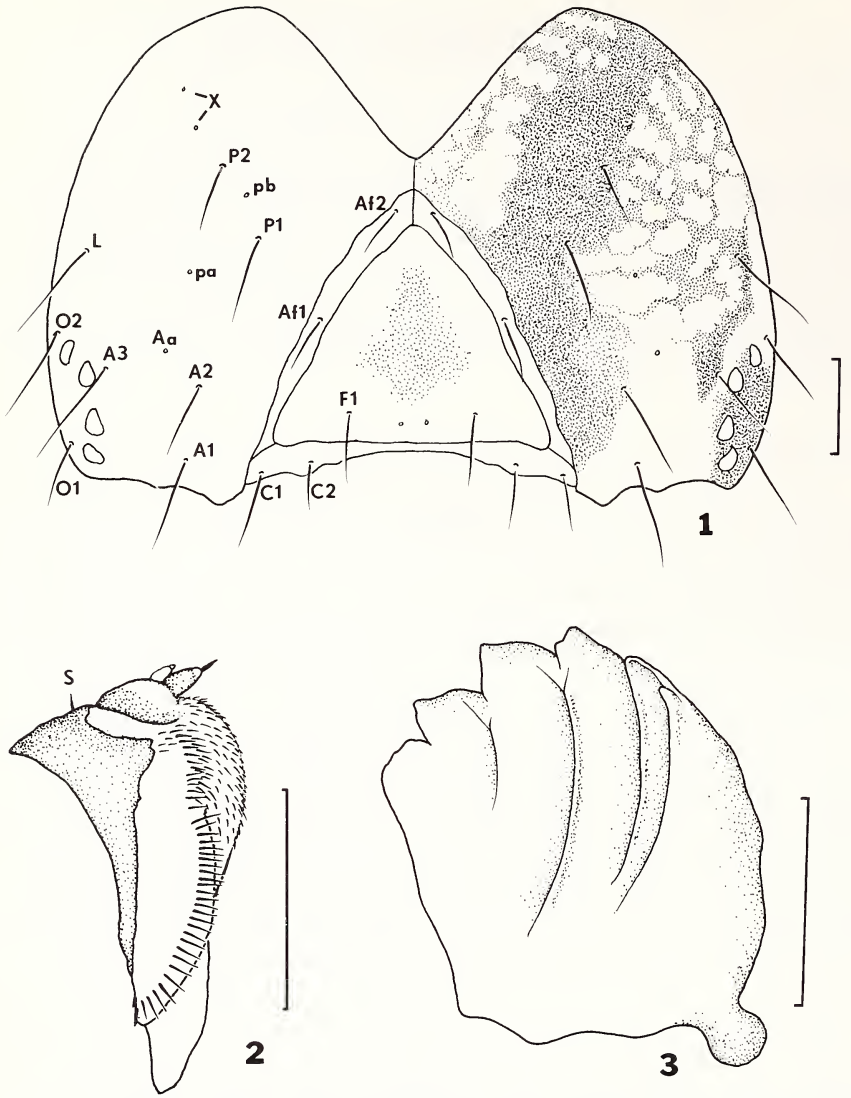


Figs. 1–3. *Agrotis volubilis,* Pine Bush, Albany Co., New York: 1, frontal aspect of head; 2, hypopharyngeal complex; 3, oval aspect of left mandible. Scale lines equal 0.5 mm.

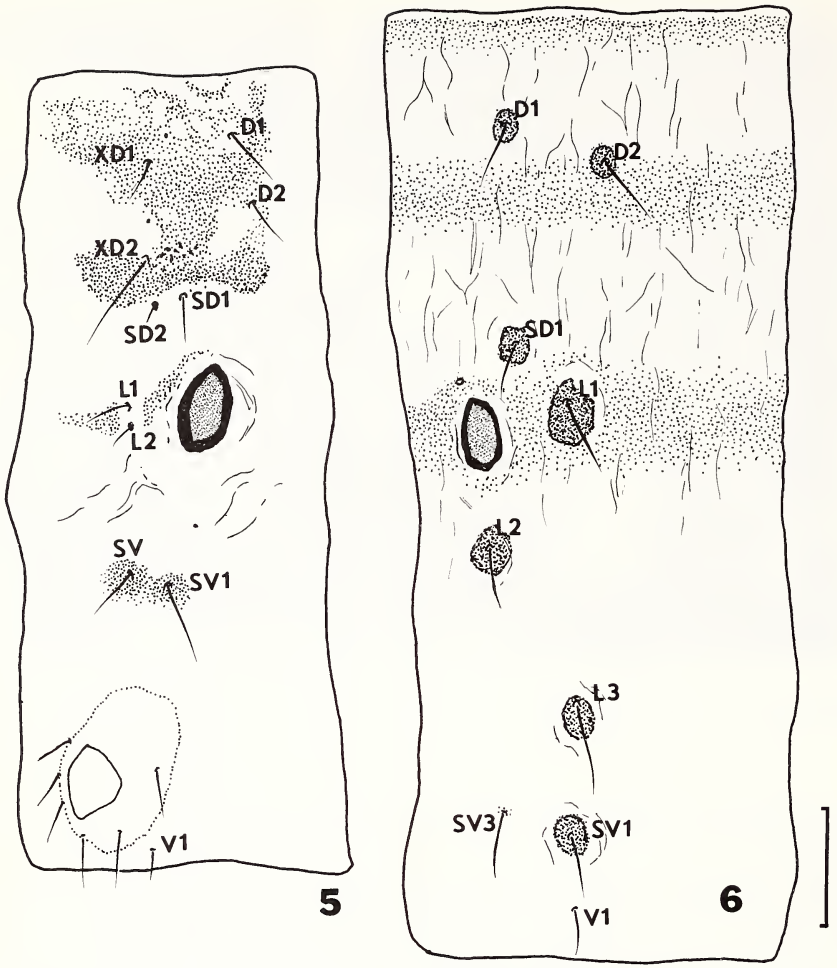
only sparingly on the latter. All larvae were ultimate instars by 20 July. At this point there was a marked decrease in feeding and the larvae crawled beneath the litter at the bottom of the rearing tray and fed only enough to maintain fluids and weight. This torpid state lasted through the remainder of the summer and fall and on 20 October 100 larvae that had not been

Fig. 4. *Agrotis volubilis,* Pine Bush, Albany Co., New York: photograph of living, sixth instar larva.

preserved were left in out-of-door cages. The larvae did not survive the winter.

Larvae were reared in continuous darkness, interrupted by addition of fresh leaves every two days. This procedure usually causes larvae to bypass a diapause, and, with night feeding larvae, accelerates development. Apparently this species has a summer aestivation followed by an obligatory larval diapause to overwinter. This is supported by the spring appearance of adults and univoltinism in nature throughout its range. Crumb (1929) reported similar adaptive strategies in species of *Feltia* and in another *Agrotis* species.

Agrotis venerabilis Walker (1856) and *A. volubilis* larvae are extremely similar and no consistent larval mouthparts or head capsule differences were found. The size and relation of the Abl Ll pinaculum to the Abl spiracle seem to offer reliable differentiating characters: the pinaculum and the spiracle are the same size in *A. volubilis,* that of *A. venerabilis* have the pinaculum 50% larger than the spiracle; the spiracle of *A. volubilis* is 0.52 mm high, that of *A. venerabilis* is 0.36 mm high on average (the full grown length is comparable in the larvae). Considering the above similarity in two



Figs. 5–6. *Agrotis volubilis*, Pine Bush, Albany Co., New York: 5, prothorax; 6, first abdominal segment. Scale line equals 1.0 mm.

"distant" *Agrotis* species, it may not be possible to distinguish *A. musa*, *A. stigmosa*, and *A. volubilis* larvae.

Larval setal nomenclature follows Hinton (1946) with the exception of the ultraposterior coronal punctures which are labelled with an X.

First Instar Larva.—First instar larva with primary body setae tipped with a knob; proleg Ab3 rudimentary, Ab4 one-half the size of Ab5; proleg Ab5, Ab6, and Ab10 all well developed.

Sixth Instar Larva.—General (Fig. 4): Average head width 3.20 mm; average total length (fully extended) 42.0 mm; abdominal prolegs present on

3rd through 6th and 10th segments; setae simple; crochets a uniordinal mesoseries; spiracle A8 0.50 mm high on average (N = 18).

Coloration (living material): Head (Fig. 1) with a brown, oblique band from vertex and then expanding ventrally to encompass entire adfrontal line; reticulate pattern present dorsal to band and between band and stemmata. Body gray-brown with conspicuous lateral series of black spots, two on each segment comprising the spiracle and the 1st lateral (L1) pinaculum.

Head (Fig. 1): Epicranial suture 0.50 mm long; height of frons 1.03 mm. Second adfrontal (Af2) anterior and 1st adfrontal (Af1) posterior to apex of frons. Coronal punctures Aa, pa, pb, and 3 ultraposterior (2 visible in frontal aspect) present as illustrated.

Mouthparts: Hypopharyngeal complex (Fig. 2): spinneret shorter than labial palpus, apex lacking setae; stipular seta (S) at anterodorsal region of prementum; distal region of hypopharynx bears numerous fine spines, followed by a single row of 25–30 spines which extends to the posterior apex of the prementum. Mandible (Fig. 3) with inner ridges distinct, lacking basal tooth. Sixth outer tooth low, divided into smaller subteeth.

Thoracic segments: Prothorax (Fig. 5): cervical shield weakly sclerotized. Subdorsal setae (SD1 & SD2) lacking pinaculi; prespiracular setae (L1 & L2) also lacking pinaculi. Subventral setae share common pinaculum. Meso- and metathorax with dorsal and subdorsal setae (D1, D2, SD2, and SD1) all in a vertical line through center of segment and each on its own pinaculum; SD1 peculiarly modified, surrounded by an inverted horseshoe-shaped pinaculum and with a very large, black setal base which is twice the diameter of other setal bases although the seta itself is less than half the size of other primary setae. Angle of L3-L1-L2 120°.

Abdominal segments: Ab1 (Fig. 6): two subventral setae (SV1 & SV3); L1 posterior to spiracle; SD2 seta reduced or absent, but setal base always present anterodorsal to spiracle, rarely contiguous with upper margin of spiracle; spiracle 0.52 mm high. Ab2–6 with 3 subventral setae; SD2 setal base anterior to spiracle. Ab7&8 with only 1 seta in subventral group.

Crochets a uniordinal mesoseries: 9–15 on Ab3 (mode = 12), 12–19 (15) on Ab4, 13–20 (16) on Ab5, 14–18 (17) on Ab6, and 17–23 (20) on Ab10. Material examined. Eighteen specimens, Pine Bush, lat. 42°34′07″, long. 73°52′53″, Albany County, New York, elev. 91 meters, 30 July 1978, from ova of female collected and determined by T. L. McCabe. Pl♀ and all larvae are coded tlm 78–65.

Acknowledgments

I thank Linnea Johnson for the illustrations. Voucher specimens of the larvae will be deposited in the New York State Museum and the United States National Museum.

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New York State Museum, The State Education Department, Cultural Education Center, Albany, New York 12230.

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