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Source: Florida Entomologist, 93(2) : 321-322

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.093.0230

FIRST RECORD OF *ALCATHOE CAROLINENSIS* (LEPIDOPTERA: SESIIDAE) COLLECTED IN TENNESSEE

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Known mostly from male specimens, *Alcathoe carolinensis* Engelhardt (Fig. 1) has been reported as rare, but is more likely to be infrequently collected (Thomas D. Eichlin, Senior Insect Biosystematist, retired, California Department of Food and Agriculture, personal communication), thus the full extent of its native range is poorly documented. Though most captures have been incidental and typically consist of 1 to 3 specimens, only 2 studies have reported captures of 10 or more males through use of *E*,*Z*-3,13–ODDA and *Z*,*Z*-3,13–ODDA blends (Reed et al. 1981; Snow et al. 1985). Based on other *Alcathoe* species host plant preferences, larval host plants are assumed to be *Clematis* spp., though *A. carolinensis* remains the only North American member of its genus not reared from any species or cultivar of *Clematis* (Engelhardt 1925; Eichlin & Duckworth 1988). *Alcathoe carolinensis* was once listed as a synonym of *A. autumnalis* Engelhardt, but later the two were recognized as distinct species (Eichlin & Duckworth 1977; Eichlin & Duckworth 1988). When questioned about the lack of label data on the type specimen, Beutenmüller recalled collecting it on *Clematis* flowers somewhere in "the Black Mountains of North Carolina" (Engelhardt 1946). Engelhardt (1946) reported that subsequent visits to the collecting site showed Beutenmüller's plant identification to be inaccurate, though he did not clarify what the mistakenly identified plant was. Morphological similarities between *A. carolinensis* and 2 species in the western U.S., *A. pepsioides* Engelhardt and *A. autumnalis,* also cast some doubt on the capture of *A. carolinensis* in a state so disjunct from other similar *Alcathoe* populations (Engelhardt 1946, Eichlin & Duckworth 1977, 1988). Currently, *A. carolinensis* specimens have been collected as far north as Indiana and south to Florida (Sharp et al. 1978; Reed et al. 1981). A lone male captured in Missouri extended the western boundary of its known range and is the most recent reported capture of this species (Brown 1986).

Fig. 1. Adult male *Alcathoe carolinenis* Engelhardt, illustrating the hyaline area at base of hind wing (h) and caudal appendage (ca), which are characteristic of *Alcathoe* males.

In 2007, as part of an on-going survey of clearwing moth presence in eastern Tennessee, a Multipher-1 moth trap (Les Services BioContrôle, Ste.-Foy, Quebec) was baited with a commercial yellow-legged clearwing moth (*Synanthedon vespiformis* (L.)) lure (Great Lakes IPM, Vestaburg, MI). This modified trap was placed just outside the boundaries of the Great Smoky Mountains National Park in Sevier Co., Tennessee. The trap was retrofitted with an ethanol collection chamber, thus preserving DNA for analyses and preventing damage to important morphological characters. Specimens were captured about 70 meters from a mountain stream in a wooded area on a western-facing slope approximately 600 meters above sea level. Several hemlock, pine, oak trees, and rhododendron shrubs had recently been removed from the site. The lure-baited trap was placed on the edge of this canopy opening, where a single male was collected between 29-VI and 5-VII-2007.

In 2009, the same modified trap style was deployed with 2 viburnum borer (*S. viburni* Engelhardt) lures (Scentry Biologicals, Inc., Billings, Montana) along the wooded edge of a roadside park in Oak Ridge, Tennessee approximately 100 kilometers west of the original Norton Creek site and at

about 260 meters in elevation. Canopy mid- and overstory consisted predominantly of oaks (*Quercus* sp.), loblolly pine (*Pinus taeda*), bush honeysuckle (*Lonicera maackii*), privet (*Ligustrum sinense*), tulip poplar (*Liriodendron tulipfera*), sweetgum (*Liquidambar styraciflua*), and rusty blackhaw viburnum (*V. rufidulum*). The trap yielded 8 *A. carolinensis* males between 10 and 20-VIII-2009. Identification of the sesiid was verified by Thomas D. Eichlin. Although *Clematis* species were not found within about 160 meters of deployed traps, several other vining forbs were found within 33 meters, including honeysuckle (*Lonicera* sp.), trumpet creeper (*Campsis radicans*), greenbriar (*Smilax* sp.), grape (*Vitis* sp.), and Carolina moonseed (*Cocculus carolina*).

In Tennessee, *A. carolinensis* responded to lures which attract *S. viburni* and *S. vespiformis*, both known to be drawn to *Z,Z*-3,13-octadecadienyl acetate (ODDA)/*E,Z*-3,13-octadecadienyl acetate at a ratio of 9:1 (Greenfield & Karandinos 1979; Voerman et al. 1983). The commercial lures used were confirmed by vendors as containing the same ratio of isomers reported in the literature. With the exception of a solitary account in which *E,Z*-3,13–ODDA alone was used, previous *A. carolinensis* captures were accomplished with a 50:50 or 75:25 blend of the 2 previously mentioned isomers (Reed et al. 1981; Snow et al. 1985; Sharp et al. 1978; Brown 1985, 1986). Regardless of the exact isomer blend used, we expect *A. carolinensis* will continue to be infrequently collected until larval host plant resources are identified and trapping is focused around habitats containing key plant species.

Although larvae of other *Alcathoe* species rely on *Clematis* plants for development, no specimens of the plant genus were found at the Oak Ridge, Tennessee location. A less common species, *C. glaucophylla*, is listed on Tennessee's rare plant list as endangered (Crabtree 2008) and is reported from North Carolina, Florida, Georgia, and eastern Tennessee. However, older reports of this clematis species may have confused it with closely-related *C. viorna,* thus the range of *C. glaucophylla* may be more restricted than is reported (Estes 2006).

Because many ornamental *Clematis* species are economically important and popular landscape specimens, further efforts to find larvae and rear adults from *Clematis* species are warranted. Engelhardt (1925) noted use of horticultural *Clematis* varieties by *A. caudata* (Harris), but mentioned no specific varieties. We caution that at least 1 native *Clematis* species, *C. glaucophylla* is endangered in Tennessee, thus care should be taken to assess any protected status this plant may have when sampling plants to confirm *A. carolinensis* presence from other localities in the state.

Summary

The first captures of *Alcathoe carolinensis* Engelhardt in Tennessee are reported from pheromone-baited trap yields taken in 2007 and 2009 from eastern Tennessee locations 100 kilometers apart and at different elevations. Traps were baited with a different pheromone combination than reported in other published accounts. Its capture at 600 meters elevation in the Great Smoky Mountains adjacent to GSM National Park boundaries marks the highest elevation at which *A. carolinensis* has been recorded and is similar to the original type locality described by Beutenmüller for North Carolina.

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