The Great Lakes Entomologist

Volume 16
Number 4 - Winter 1983 *Number 4 - Winter 1983*

Article 5

December 1983

Establishment of the Alfalfa Weevil Parasite *Microctonus Aethiopoides (Hymenoptera: Braconidae)* in Michigan

Edward B. Radcliffe
University of Minnesota

Gerrit W. Cuperus
Oklahoma State University

John K. Flessel
Ohio State University

ESTABLISHMENT OF THE ALFALFA WEEVIL PARASITE *MICROCTONUS AETHIOPOIDES (HYMENOPTERA: BRACONIDAE) IN MINNESOTA*[1]

Edward B. Radcliffe,[2] Gerrit W. Cuperus,[3] and John K. Flessel [4]

ABSTRACT

Microctonus aethiopoides, a braconid parasite of adult alfalfa weevil, *Hypera postica*, is now established in southeastern Minnesota. Releases were made near Caledonia in Houston County, in 1978 and 1979, and near Rosemount in Dakota County, in 1979 and 1980. *M. aethiopoides* was recovered in Houston County in 1979, a new state record, and since has expanded its range more than 40 km from the release site. Establishment in Dakota County was unexpected because of low host densities, but parasites were recovered there in 1983. Other workers have recovered *M. aethiopoides* in Olmstead County.

Microctonus aethiopoides Loan (=*M. aethiops* (Nees), the name misapplied by North American authors before 1975 [Loan 1975]) is a recently established braconid parasite of adult alfalfa weevil, *Hypera postica* (Gyllenhal). *M. aethiopoides* is now one of the most important biological control agents of this pest in the eastern United States and southern Canada.

First attempts to establish this parasite in North America were a series of apparently unsuccessful introductions in Canada and the United States, made between 1948 and 1957, against sweetclover weevil, *Sitona cylindricollis* (Fåhr) (Day et al. 1971). Releases were made in Minnesota in 1953 (Loan and Holdaway 1961). In 1957, the parasite was reintroduced from France and released in New Jersey against alfalfa weevil (Dysart and Day 1976). Parasites were recovered in New Jersey for the first time in 1961, and the following year in Pennsylvania. Since then extensive recolonization and natural spread have resulted in widespread establishment of *M. aethiopoides* throughout the northeastern and north central United States.

Alfalfa weevil was first reported in Minnesota from Houston County in the southeast corner of the state in 1970 (Radcliffe and Chiang 1972). The following year, personnel from the USDA Beneficial Insects Research Laboratory released *M. aethiopoides* near Freeburg, in Houston County, but apparently the parasite did not become established at that time[5]. From 1978 to 1980, we undertook further attempts to colonize *M. aethiopoides* in Minnesota, and the results of those introductions are reported here.

MATERIALS AND METHODS

Four thousand adult weevils, ca. 85% parasitized, were shipped from Ohio and released 31 May 1978, on the farm of Roland Deters (NW Sec. 18, Winnebago Twp.[6]) near

[1]Contribution of the University of Minnesota Agricultural Experiment Station. Paper no. 13,662, Scientific Journal Series.

[2]Department of Entomology, University of Minnesota, St. Paul, MN 55108.

[3]Department of Entomology, Oklahoma State University, Stillwater, OK 74078. Formerly with Department of Entomology, University of Minnesota.

[4]Department of Entomology, Ohio State University, Ohio Agricultural Research and Development Center, Wooster, OH 44691.

[5]Information on 1971 release of *M. aethiopoides* in Minnesota provided by R. J. Dysart (pers. comm.), USDA Beneficial Insects Research Laboratory, Newark, DE 19713.

[6]Site designations given to nearest ¼ section (Sec.) of Township (Twp.); 1 section = 259 ha.

Caledonia, in Houston County. A second lot of 4000 weevils, ca. 10% parasitized, was released at the same site 9 June 1979. Three releases, of 1500–2400 weevils each, 20–25% parasitized, were made at a site (SE Sec. 3, Empire Twp.) on the University of Minnesota Agricultural Experiment Station, near Rosemount in Dakota County; on 24 October 1979, 2 April 1980, and 30 May 1980.

The fields used for these releases were small, ca. 1.5 ha at the Houston County site and less than 0.5 ha at the Dakota County site. Both sites were bordered by undisturbed wooded areas that appeared suitable for weevil aestivation. Following release of the parasitized weevils, the alfalfa was cut only once a season for the next two years, and that only after the summer adult weevils had left the field. No insecticides were sprayed on these or nearby fields.

Surveys to determine parasite presence and levels of weevil parasitism were made in Houston County each year beginning in 1979, but in Dakota County only in 1983. The release site on the Deter farm and a site in NW Sec. 11, Wilmington Twp., 3.4 km distant were sampled each year. A third site, in NW Sec. 9, Sheldon Twp., 22.2 km distant, was sampled in 1980 and each year following. A site in SE Sec. 14, Wilmington County, 2.6 km distant, was sampled only in 1981. Five additional sites were sampled in 1983: two in Houston County , NE Sec. 11, Spring Grove Twp., 10.1 km distant, and SW Sec. 16, Blackhammer Twp., 18.0 km distant; two in Winona County, SW Sec. 8, Pleasant Hill Twp., 41.1 km distant, and SW Sec. 24, Hart Twp., 42.0 km distant; and in Dakota County, SE Sec. 4, Empire Twp., 0.6 km from the release in that county.

Sampling was done at 275 CDD above a 9°C base in 1979 and at the Dakota County site in 1983, but otherwise at 175–200 CDD. We attempted to collect 100–200 weevils/site each sampling date, however, this was not always possible because weevil densities never exceeded 3 adults/100 sweeps and in some fields averaged less than 1 adult/200 sweeps. The smallest samples were those collected in Spring Grove and Hart townships in 1983. These samples had only 87 and 23 weevils, respectively. The weevils were held at room temperature in screen-bottomed cages that permitted emerging parasites to drop through to a container below where they could spin their cocoons on strips of felt (Loan and Holdaway 1961). Cocoons were transferred to individual 3-dram vials and held for adult emergence.

RESULTS AND DISCUSSION

Recoveries are summarized in Table 1. In 1979, 24 adult *M. aethiopoides* were reared from ca. 300 adult weevils collected 9 June at the release site. This was a new state record for the parasite. Parasites were not recovered from weevils collected at the second site, 3.4 km distant.

In 1980, parasitism was 9% on the Deter farm and 4% at 3.4 km. Parasites were not recovered at the third site, 22.2 km distant. While parasitism at the release site was slightly lower than in 1979, recovery of *M. aethiopoides* at the second site suggested that establishment and dispersal in southeastern Minnesota was assured. Similar results were obtained in 1981, when parasitism levels at these same sites were 13%, 2%, and 0%, respectively.

In 1982, greater levels of parasitism and an appreciable expansion of the range of distribution were found. Percentages of adult weevils parasitized by *M. aethiopoides* were 23% on the Deter farm, 9% at 2.6 km, 15% at 3.4 km, and 10% at 22.2 km.

In 1983, *M. aethiopoides* were reared from weevils collected at all sites. In Houston County, parasitism was 38% on the Deter farm, 27% at 3.4 km, 12% at 10.1 km, 29% at 18.0 km and 48% at 22.2 km. In Winona County, parasitism was 22% at the 41.1 km site and 44% at the 42.0 km site. At the Dakota County site, parasitism was 7%, but the first parasite emerged from that sample within 24 h of host collection indicating some prior emergence probably had occurred.

In 1980, APHIS personnel recovered *M. aethiopoides* from seven counties in Wisconsin: Fond du Lac, Iowa, Jefferson, Juneau, Marathon, Shawano, and Trempealeau and

https://scholar.valpo.edu/tgle/vol16/iss4/5
DOI: 10.22543/0090-0222.1474

Table 1. Parasitism of overwintered, adult alfalfa weevil by *Microctonus aethiopoides* in southeastern Minnesota, 1979-1983.

Location, distance from release site	Percentage of weevils parasitized				
	1979	1980	1981	1982	1983
Houston County					
NW Sec. 18, Winnebago Twp., release site	14	9	13	23	38
SE Sec. 14, Wilmington Twp., 2.5 km W., 0.8 km S.	—	—	—	9	—
NW Sec. 11, Wilmington Twp. 2.8 km W., 2.0 km N.	0	4	2	15	27
NE Sec. 11, Spring Grove Twp., 9.9 km W., 1.8 km N.	—	—	—	—	12
SW Sec. 16, Blackhammer Twp. 15.4 km W., 9.4 km N.	—	—	—	—	29
NW Sec. 9, Sheldon Twp., 5.9 km W, 21.4 km N.	—	0	0	10	48
Winona County					
SW Sec. 8, Pleasant Hill Twp., 10.3 km W., 39.8 km N.	—	—	—	—	22
SW Sec. 24, Hart Twp., 21.2 km W., 36.2 km N.	—	—	—	—	44
Dakota County					
SE Sec. 4, Empire Twp., 0.6 km W.	—	—	—	—	7

from five in Iowa: Clayton, Davis, Jones, Louisa, and Mahaska[7]. These were all new county records and the recoveries in Trempealeau and Louisa were new state records. In 1981, APHIS personnel recovered *M. aethiopoides* from three additional counties in Wisconsin: Chippewa, Florence, and Sawyer; and three more in Iowa: Cass, Madison, and Pottawattomie. In 1983, the parasite was detected from three additional counties in Iowa: Montgomery, Story, and Tama.

The known distribution of *M. aethiopoides* in Wisconsin was extended by Wisconsin Department of Agriculture surveys[8] to include the following counties: in 1980, Dane, Richland and Sauk; in 1981, Columbia, Portage and Rock; in 1982, Green, La Crosse, Lafayette, Marquette, Monroe, Vernon, Washington, Waukesha, Waupaca, Waushara, and Wood; and in 1983, Crawford, Dodge, Green Lake, Kenosha, Milwaukee, and Walworth.

[7]Information on recoveries of *M. aethiopoides* by APHIS personnel provided by V. E. Montgomery (pers. comm.). USDA, APHIS, Biological Control Satellite Facility, Niles, MI 49120.

[8]Information on recoveries of *M. aethiopoides* in Wisconsin by state personnel provided by J. M. Nara (pers. comm.). Wisconsin Department of Agriculture, Trade and Consumer Protection, Agricultural Resource Management Division, Madison, WI 53708.

Since the completion of our survey, it has come to our attention that APHIS personnel recovered two *M. aethiopoides* eggs, by dissection of summer adult weevils collected in NW Sec. 25, Eyota Twp., Olmstead County, 19 August 1981. This recovery was a new county record and greatly extended the known range of *M. aethiopoides* in Minnesota. Based on the information presented here, and from the rapid spread of *M. aethiopoides* in Wisconsin and Iowa, it appears probable that this parasite is now of general occurrence in southeastern Minnesota. Our observations are consistent with those of Stehr (1974) in Michigan, that *M. aethiopoides*, once established, is capable of rapid expansion of its range.

LITERATURE CITED

Day, W. H., L. W. Coles, J. A. Stewart, and R. W. Fuester. 1971. Distribution of *Microctonus aethiops* and *M. colesi*, parasites of the alfalfa weevil, in the eastern United States. J. Econ. Entomol. 64:190–193.

Dysart, R. J. and W. H. Day. 1976. Release and recovery of introduced parasites of the alfalfa weevil in eastern North America. USDA Prod. Res. Rep. No. 167. 61 p.

Loan, C. C. 1975. A review of Haliday species of *Microctonus* (Hym.: Braconidae, Euphorinae). Entomophaga 20:31–41.

Loan C. C. and F. G. Holdaway. 1961. *Microctonus aethiops* (Nees) auctt. and *Perilitus rutilus* (Nees) (Hymenoptera: Braconidae), European parasites of *Sitona* weevils (Coleoptera: Curculionidae). Canadian Entomol. 93:1057–1079.

Radcliffe, E. B. and H. C. Chiang. 1972. State invaded by alfalfa pest. Minnesota Sci. 28(2):8–9.

Stehr, F. R. 1974. Dispersal following establishment in Michigan of *Microctonus aethiops*, a parasite of adult alfalfa weevils. Environ. Entomol. 3:575–576.