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Thomas L. Clark  
*University of Nebraska-Lincoln*

John E. Foster  
*University of Nebraska-Lincoln, john.foster@unl.edu*

John F. Witkowski  
*University of Nebraska-Lincoln, jwitkowski1@unl.edu*

Blair D. Siegfried  
*University of Nebraska-Lincoln, bsiegfried1@unl.edu*

Terence A. Spencer  
*University of Nebraska-Lincoln, tspencer1@unl.edu*

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**Parasitoids Recovered from European Corn Borer, *Ostrinia nubilalis*  
Hübner, (Lepidoptera: Pyralidae) Larvae in Nebraska**THOMAS L. CLARK, JOHN E. FOSTER, JOHN F. WITKOWSKI, BLAIR D. SIEGFRIED, AND  
TERENCE A. SPENCERDepartment of Entomology, University of Nebraska-Lincoln,  
Lincoln, Nebraska 68583-0816

**ABSTRACT:** Information about the current status of parasitoids attacking European corn borer, *Ostrinia nubilalis* (Hübner), larvae is lacking in Nebraska. This study was conducted at multiple sites in 5 counties during 1995 and 1996 to determine the presence and prevalence of European corn borer parasitoids in Eastern Nebraska. The braconid, *Macrocentrus grandii* Goidanich, was recovered from 8.9 and 10.2% of collected 5th instar European corn borer larvae during 1995 and 1996, respectively. Recovery of this parasitoid had not been previously reported in Nebraska. Meanwhile, the ichneumonid, *Eriborus terebrans* (Gravenhorst), was recovered from 7.6 and 7.5% of collected larvae during the same period. A small number of the native tachinid parasitoid, *Lixophaga* spp., were recovered in three collections. Combined parasitoid recovery rates for all species was 16.6 and 17.7% during 1995 and 1996.

**INTRODUCTION:** The European corn borer (ECB), *Ostrinia nubilalis* (Hübner), is one of the most destructive pests of corn (*Zea mays* L.) in the United States. Damage by *O. nubilalis* may exceed one billion dollars annually (Mason et al., 1996). ECB is a native of Europe and is thought to have been introduced in dry broom corn stalks, *Sorghum bicolor* L., from Italy or Hungary in the early 1900's (Smith, 1920; Caffrey and Worthley, 1927). Since it was first discovered near Boston, Massachusetts in 1917 (Caffrey and Worthley, 1927), ECB has spread to 40 other states, including Nebraska in 1944 (Sooter and Muma, 1949), and into Canada (Showers et al., 1989).

Because ECB is an introduced pest, it has been considered a likely candidate for biological control. An extensive search and release program for ECB natural enemies was implemented in the 1920's, 1930's, and 1940's (Baker et al., 1949). As a result, 23 species of parasitoids were imported from Europe and Asia of which only six became established in the United States. Only three species, *Eriborus terebrans* (Gravenhorst) (Hymenoptera: Ichneumonidae), *Macrocentrus grandii* Goidanich (Hymenoptera: Braconidae), and *Lydella thompsoni* (Diptera: Tachinidae), became widely distributed in the north central states (Baker et al., 1949; Brindley and Dicke, 1963). In Nebraska, *E. terebrans*, *M. grandii*, *L. thompsoni*, *Sympiesis viridula* (Hymenoptera: Eulophidae), and *Chelonus annulipes* (Hymenoptera: Braconidae) were released between 1948-1950 (Sooter and Muma, 1949; Lomax and Walstrom, 1950; Bewick et al., 1951). Despite the release of these parasitoid species, only *E. terebrans* had been reported in Nebraska since 1966 (Carpino, 1977; Hill et al., 1978; Godfrey et al., 1991). Meanwhile, recovery of *M. grandii* had not been reported since the final year of its release in 1949. The purpose of this short communication is to report the presence and prevalence of ECB larval parasitoids at selected sites in Nebraska during 1995-1996.

**MATERIALS AND METHODS:** During 1995 and 1996, 1st and 2nd generation ECB larvae (5th instar) were collected from maize stalks in Dixon, Hamilton, Lancaster, Saunders, and York Counties, Nebraska. Collection sites were not treated with insecticides prior to collection of ECB larvae.

Collected insects were dipped in a phenylmercuric nitrate solution (0.1 g/liter H<sub>2</sub>O) and immediately blotted dry in an attempt to surface sterilize the larvae and prevent secondary pathogen growth. Larvae were then placed into individually labeled 4 dram vials containing a wheat germ meridic diet (CIMMYT, 1987) and plugged with nonabsorbent cotton. Vials were held at 25.0°C, 16:8 [L:D] (1st generation) or 24:0 [L:D] (2nd generation) photoperiod, and 75.0% relative humidity in environmental chambers until emergence of moths or parasitoids. The 2nd generation larvae were placed in 24:0 [L:D] photoperiod to terminate diapause. A fresh meridic diet plug was placed into the vial when the diet plug began to dessi-

Table 1. Location and percentage parasitism of European corn borer larvae by three parasitoids in Nebraska during 1995 and 1996.

County of collection	Generation	Number of larvae*	Percentage parasitism by species			Total % parasitism
			<i>Macrocentrus grandii</i>	<i>Eriborus terebrans</i>	<i>Lixophaga</i> spp.	
1995						
Dixon	1st	446	6.5	13.9	0.0	20.5
Dixon	2nd	319	0.6	3.5	0.0	4.1
Dixon	2nd	116	7.8	17.2	0.0	25.0
Lancaster	1st	564	15.8	5.9	1.8	23.4
Lancaster	2nd	191	7.3	1.6	1.1	10.0
Saunders	2nd	23	13.0	4.3	0.0	17.3
York	2nd	69	8.7	1.4	0.0	10.1
Totals		1728	8.9	7.6	0.1	16.6
1996						
Dixon	1st	464	2.2	10.6	0.0	12.7
Dixon	1st	588	18.7	11.1	0.0	29.8
Dixon	2nd	481	20.6	7.9	0.0	28.5
Hamilton	1st	381	1.3	8.1	0.0	9.4
Lancaster	1st	440	1.4	3.4	0.0	4.8
Lancaster	2nd	134	6.0	4.5	0.8	11.3
Saunders	1st	515	13.2	3.9	0.0	17.3
Totals		3003	10.2	7.5	0.0	17.7

\* Number of insects that survived the collection and rearing procedures.

cate prior to parasitoid or adult ECB emergence. Vials were checked daily and emerged ECB adults or parasitoids were identified and recorded. Dead or injured individuals and cause of death (if known) were also recorded. Observations continued until all insects had emerged or died. Individuals that died during the collection process or as a result of secondary pathogens were eliminated from parasitism rate analysis.

RESULTS AND DISCUSSION: Three parasitoid species, *M. grandii*, *E. terebrans*, and *Lixophaga* spp., were recovered during this study. The number of 5th instar ECB larvae collected and percentage that contained parasitoids are shown by location and ECB generation in Table 1.

The percentage parasitism by *M. grandii* of collected ECB larvae ranged from 0.6–15.8% at the different locations with a mean of 8.9% during 1995. The following year these rates ranged from 1.3–20.6% with a mean of 10.2%. *M. grandii* was recovered from ECB larvae collected at each site during this study. These results are interesting as recovery of *M. grandii* had not been reported in ECB parasitoid surveys in Nebraska since the release of 17,551 adult *M. grandii* in Cass and Lancaster Counties during 1949 and 1950 (Carpino, 1977; Hill et al., 1978; Godfrey et al., 1991). It is most likely that the current population is the result of dispersion from nearby states like Iowa and Minnesota where extensive parasitism of ECB larvae by this species has been reported (Lewis, 1982; Winnie and Chiang, 1982). The recovery and relative abundance of *M. grandii* in this study is contrary to reports in other states that indicate *M. grandii* is declining as an important parasitoid of ECB (Hill et al., 1978; Lewis, 1982; Siegel et al., 1987; Landis and Haas, 1992).

*E. terebrans* recovery rates from ECB larvae ranged between 1.4–17.2% with a mean of 7.6% during 1995. The following year the range was 3.4–11.1% with a mean of 7.5%. The recovery of this parasitoid was expected as it had been reported at several locations in previous Nebraska parasitoid surveys (Carpino, 1977; Hill et al., 1978; Godfrey et al., 1991). Like *M. grandii*, the presence of *E. terebrans* in Nebraska is most likely the result of dispersion from Iowa and Missouri where more extensive releases occurred (Hill et al., 1978). The initial and only release of *E. terebrans* in Nebraska was comprised of 462 individuals in 1950 near Lincoln, Nebraska.

A native parasitoid, *Lixophaga* spp. (Diptera: Tachinidae), was recovered in low numbers (0.0–1.8%) from ECB larvae collected in Lancaster County. However, little is known about the biology of this larval parasitoid which may not be well synchronized with ECB.

It is evident that both *M. grandii* and *E. terebrans* are currently well established in Nebraska. The combined percentage parasitism for all species ranged from 4.1–25.0% with a mean of 16.6% during 1995 and 4.8–29.8% with a mean of 17.7% during 1996. While the recovery of *E. terebrans* alone was not much higher than the long range averages (7.5%) reported by Hill et al. (1978) for this species, the combined parasitoid recovery results are significantly higher than the long range averages. However, the long term impact and significance of these parasitoids on ECB population dynamics in Nebraska remains poorly understood.

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