

FIRST RECORD OF *LARRA BICOLOR* (HYMENOPTERA: CRABRONIDAE) IN NORTH CAROLINA

PETER T. HERTL* AND RICK L. BRANDENBURG

Department of Entomology, Box 7613, North Carolina State University, Raleigh, NC, 27695-7613, USA

*Corresponding author; E-mail: peter_hertl@ncsu.edu

ABSTRACT

Here we report on the first record of the mole cricket parasitoid *Larra bicolor* F. (Hymenoptera: Crabronidae) in North Carolina. The presence of larvae and adults was documented at a mole-cricket-infested golf course near the South Carolina border. The means of arrival is not known, and may have occurred at the same time the hosts arrived or as the result of natural dispersal and range expansion. Evidence suggests that the parasitoids were able to survive through at least one severe winter.

Key Words: *Scapteriscus*, mole crickets, biological control, turfgrass

RESUMEN

Aquí reportamos la primera anotación del parasitoide de grillos topo, *Larra bicolor* F. (Hymenoptera: Crabronidae), en Carolina del Norte. La presencia de larvas y adultos fue documentada en un campo de golf infestado con grillos topo cerca de la frontera de Carolina del Sur. El origen de la introducción es desconocido y puede haber ocurrido al mismo tiempo que se introdujeron los hospederos ó como resultado de dispersión y expansión geográfica natural. Evidentemente, los parasitoides fueron capaces de sobrevivir al menos un invierno severo.

Palabras Clave: *Scapteriscus*, grillos topo, control biológico, césped

Mole crickets are serious pests of warm-season turf and pasture grasses throughout the southeastern United States. *Larra bicolor* F. (Hymenoptera: Crabronidae) is an introduced ectoparasitoid of *Scapteriscus* mole crickets. Brazilian stock of *L. bicolor* (from Puerto Rico) was first released into the United States in southern Florida 1981-1983, and Bolivian stock was released in northern Florida in 1988 for the biological control of mole crickets (Frank et al. 1995). The species has since spread throughout the state (Frank et al. 2009) and has also been reported from southern counties in Georgia and Mississippi (Held 2005) and southern Alabama (Abraham et al. 2008). Additional releases were made near Tifton, Georgia and Baton Rouge, Louisiana (Frank et al. 2009). Although systematic monitoring has not been performed in South Carolina, *L. bicolor* was reported from Hilton Head in Oct 2009 (David Shetlar, Dept. Entomology, Ohio State University, personal communication) and as far north as Goose Creek in 2012 (Juang-Horng 'JC' Chong, Dept. Entomology, Clemson University, personal communication). Here we report on the first documented occurrence of *L. bicolor* in North Carolina.

Details of the life cycle of *L. bicolor* have been reported by several authors (Castner 1988; Frank et al. 1995; Frank & Sourakov 2009). Adult wasps

fly over infested turf and locate large mole cricket nymphs and adults in their burrows. The host is temporarily paralyzed with a sting and an egg is laid on the underside of the thorax. The larva feeds externally on the side of the insect near the rear of the thoracic area, develops through 5 instars and pupates in the soil. Parasitism results in the death of the host. Approximately 50 d are required from egg to adult; however, development time is extended if the pupal stage enters diapause to pass the winter (Cabrera-Mireles 2002).

MATERIALS AND METHODS

Larra bicolor adults were first observed in North Carolina flying over fresh *S. vicinus* Scudder damage at Scotch Meadows Golf Course in Laurinburg (N 34.6914° W 79.5123°) during the summer of 2009. The course is located approximately 2 km from the North Carolina-South Carolina border. No adults were collected, and the first specimens obtained were larvae. *Scapteriscus vicinus* nymphs and adults were collected on the course by soapy water flush on 7 Oct 2009. Eighty-four specimens were randomly selected for use in an insecticide efficacy trial which concluded with 9.5% mortality unrelated to treatment effect (unpublished data). Two of the 8 mole

crickets that died were parasitized by what appeared to be *L. bicolor* larvae. No additional larvae were found.

The first adult specimens were collected by net while they were flying over fresh mole cricket damage at the same site in Jun 2010. The wasps were submitted to the North Carolina State University Plant Disease and Insect Clinic for identification. Further monitoring at the site was precluded by wide-scale application of insecticides to control the mole cricket infestation.

RESULTS

Species-specific identification could not be made from the juvenile specimens collected in 2009. The level of parasitism among the field-collected mole crickets used in the experiment was 2.38%. The adult specimens were confirmed as *L. bicolor* based on comparison with specimens in the collection at Cornell University. Although it is likely the population is derived from the Bolivian stock releases, this could not be confirmed using the morphological characters presented in Menke (1992).

DISCUSSION

The origins of the mole crickets and *Larra* wasps at the site are unknown. The first mole crickets were not noted at the golf course until 2007 and did not represent a substantial infestation until 2009. It is possible that a small number of wasps may have also been present and escaped notice before 2009. It should be noted that mole cricket research has been conducted at numerous turf sites throughout southeastern North Carolina over the last 20 yr and included the collection of thousands of mole crickets. *Larra* wasps or larvae had not been previously detected at the sites or in these samples.

The documentation of this species from North Carolina represents a major northward expansion in the known range. The population of *L. bicolor* may have arrived at the site at the same time as the mole cricket hosts or as the result of natural dispersal and range expansion from points south. The capture of the adults in 2010 is significant in that it documents that *L. bicolor* was able to withstand one of the coldest winters in recent times. According to the North Carolina Office of Climate (2010), Feb 2010 was the coldest Feb in NC in more than 30 yr. Average monthly statewide temperature was more than 3.3 °C (6 °F) below normal, conditions not seen since 1979. Although Frank & Walker (2006) speculated that the range of this tropical wasp would not extend much north of 32 °N, this suggests that the species is able to tolerate winter temperatures at this

latitude. Most of the golf courses where adventive species of mole crickets have been a problem in North Carolina are to the South and East of the Laurinburg site, and experience similar or milder weather conditions than Laurinburg. Therefore, it is likely that *L. bicolor* could be more widely distributed. However, widespread treatment with insecticides in recent years has significantly reduced both the number of hosts and sites available for colonization or study.

ACKNOWLEDGMENTS

We would like to thank David L. Stephan (Plant Disease and Insect Clinic, North Carolina State University) for the identification of the specimens and Howard Frank (University of Florida), David Held (Auburn University), David Shetlar (Ohio State University), Will Hudson (University of Georgia, Athens) and JC Chong (Clemson University) for assistance in the preparation of the manuscript. Voucher specimens have been placed in the Insect Museum at NC State University.

REFERENCES CITED

- ABRAHAMS, C. M., HELD, D. W., AND WHEELER, C. 2008. First record of *Larra bicolor* (Hymenoptera: Sphecidae) in Alabama. *Midsouth Entomol.* 1: 81-84
- CABRERA-MIRELES, H. 2002. Relationship between temperature and development of the ectoparasitoid *Larra bicolor* (Hymenoptera: Sphecidae) and the endoparasitoid *Ormia depleta* (Diptera: Tachinidae). Ph.D. Dissertation, Univ. Florida, Gainesville, FL.
- CASTNER, J. L. 1988. Biology of the mole cricket parasitoid *Larra bicolor* (Hymenoptera: Sphecidae), pp. 423-432. In V. K. Gupta [ed.], *Advances in Parasitic Hymenoptera Research*. Brill, Leiden.
- FRANK, J. H., AND WALKER, T. J. 2006. Permanent control of pest mole crickets (Orthoptera: Gryllotalpidae: *Scapteriscus*) in Florida. *American Entomol.* 52: 138-144.
- FRANK, J. H., AND SOURAKOV, A. 2009. *Larra* wasps, *Larra analis* Fabricius; Mole cricket hunters, *Larra bicolor* Fabricius (Insecta: Hymenoptera: Sphecidae). Florida Coop. Ext. Ser. Publ. EENY-268.
- FRANK, J. H., PARKMAN, J. P., AND BENNETT, F. D. 1995. *Larra bicolor* (Hymenoptera: Sphecidae), a biological control agent of *Scapteriscus* mole crickets (Orthoptera: Gryllotalpidae), established in northern Florida. *Florida Entomol.* 78: 619-623.
- FRANK, J. H., LEPPLA, N. C., SPRENKEL, R. K., BLOUNT, A. C., AND MIZELL, R. F. 2009. *Larra bicolor* Fabricius (Hymenoptera: Crabronidae): its distribution throughout Florida. *Insecta Mundi* 0063: 1-5.
- HELD, D. W. 2005. Occurrence of *Larra bicolor* (Hymenoptera: Sphecidae), ectoparasite of mole crickets (*Scapteriscus* spp.), in coastal Mississippi. *Florida Entomol.* 88: 327-328.
- MENKE, A. S. 1992. Mole cricket hunters of the genus *Larra* in the New World (Hymenoptera: Sphecidae, Larrinae). *J. Hymenoptera Res.* 1: 175-234.
- STATE CLIMATE OFFICE OF NORTH CAROLINA. 2010. <http://www.nc-climate.ncsu.edu/office/newsletters/2010Mar>