Larra bicolor Fabricius (Hymenoptera: Crabronidae): its distribution throughout Florida

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Abstract. We document the presence of Larra bicolor Fabricius (Hymenoptera: Crabronidae) in 46 of Florida’s 67 counties. The species is represented by two stocks. The first (released in 1981) originated in Pará, Brazil, but was obtained from Puerto Rico, and became established in Broward County in southern Florida. The second (released in 1988) originated in Santa Cruz de la Sierra, Bolivia, and became established in Alachua County in northern Florida. The Bolivian stock, aided by additional satellite releases from Alachua County, is now widely distributed. The species probably occupies all counties in central and northern Florida, but may yet be absent from some southern counties. Introduction was made for classical biological control of invasive mole crickets.

Introduction

Larra spp. have traditionally been called wasps although they are bee-relatives (Hymenoptera: Apoidea). As explained in Portman et al. (2009) we follow the taxonomic lead of W. J. Pulawski (unpublished) in transferring Larra from Sphecidae to Crabronidae. All are parasitoids of mole crickets (Orthoptera: Gryllotalpidae) (Menke 1992).

Larra bicolor F. is a widely-distributed South American species using various Scapteriscus spp. mole crickets as hosts (Menke 1992). Stock from Amazonian Brazil (via Puerto Rico) was introduced in 1981 into southern Florida, and stock from Bolivia was introduced in 1988 into northern Florida (Frank et al. 1995, Frank and Sourakov 2002). By 2005, the Brazilian stock still seemed confined to a small area (Frank and Walker 2006); no releases have been made of it since the early 1980s.

At evidence of establishment of the Bolivian stock in 1993, one question was: will this stock spread from Gainesville throughout Florida, and how long will such spread take? We could not envisage enlisting a network of dedicated observers representing every county for the duration of such a project. But, evidence of dispersal accumulated from the efforts of volunteer observers until by mid-2005 the stock had been reported from 25 counties (Frank and Walker 2006). Then for 12 months we received funding to try to document its establishment in the remaining 42 counties.

The wasp was introduced as one of three biological control agents to suppress invasive mole crickets (Frank and Walker 2006). Although earmarked funding for the biological control program ended in 1991, there still was pressure from the ranching and turf industries to achieve suppression throughout Florida. This pressure prompted satellite releases of stock from the Gainesville area. Releases were made only on a small scale for lack of financial support, but they hinder interpretation of the natural spread of the Bolivian stock. This paper documents the spread of L. bicolor.

Materials and Methods

Releases of the Bolivian stock. Initial releases in Alachua Co. (Gainesville area) were made in 1988 and 1989 (Frank et al. 1995). No more were made until 1998, and these are listed below under names of counties (in bold). All releases in Florida were made at plants of Spermacoce verticillata F. (Rubiaceae), almost all planted deliberately, which serves as a nectar source (Arévalo and Frank 2005). Releases were generally of 30 adult wasps, mainly female, at or after sundown. Orange: Orlando, Winter Pines Golf

Two releases, not listed above, were made in spite of earlier presence in the county (St. Johns 2001, Sarasota 2003). One hundred and eighty adult *L. bicolor* were supplied from Gainesville to the University of Georgia Agricultural Extension Service in 2001, and allowed establishment of populations at three sites in and near Tifton, Georgia. Adults were supplied to the Louisiana Agricultural Extension Service in September 2002 for release at a patch of *Chamaecrista fasciculata* (Michx.) Greene (Fabaceae), partridge pea, near Baton Rouge, but are not known to have established.

Detection. Until 2005, attempts to detect the presence of *L. bicolor* in each county followed no statewide strategy. They were mainly responses to requests from collaborators in counties distant from Gainesville, and these collaborators were interested in improved control of pest mole crickets. Responses generally took the form of supply to the collaborator of *S. verticillata* plants with request that the plants be installed in a suitable habitat, maintained, and examined occasionally for the presence of adult wasps (examples are Baker, Bradford, Flagler, and Santa Rosa counties). Or, someone had reported to Howard Frank the presence of the wasp in some distant county (examples are Levy, Liberty, Putnam, and Sarasota counties). By mid-2005, all forms of detection had shown the presence of the Bolivian stock in 25 counties (Fig. 4 in Frank and Walker 2006).

In Spring 2005, a plan was devised (and funded) to seek collaborators in the remaining 42 counties, to provide each of them with at least 15 *S. verticillata* plants, and to encourage them to maintain the plants and collect or photograph wasps as evidence. The plants were grown, distributed, and were in place in most of those counties by Spring or Summer 2006. Most of these collaborators were county-based Extension Service employees, and were typically horticulturists or livestock agents. Some of them, in turn, encouraged participation by Master Gardeners. One was an FDACS-DPI employee. Meanwhile, reports continued to Howard Frank of sightings by people uninvolved in the project, who were curious about the possible presence of *L. bicolor* in their county. Outstanding examples are Collier and Escambia counties, among the most distant from Gainesville, both of them occupied by Spring 2006.

All reports by non-entomologists were confirmed by examination of specimens or photographs, or by a soon-subsequent confirmed record from a nearby place.

Results

Brazilian stock. A population of the Brazilian stock, from the original release in 1981, still exists at Davie, Broward County. A specimen of it was collected in Palm Beach County: West Palm Beach, Possum Pass, November 2004, by Alejandro Arévalo. The voucher specimen is now in the Florida State Collection of Arthropods. Wasps of the Bolivian stock can be distinguished from those of the Brazilian by microsculpture of the head (Menke 1992, Frank et al. 1995).

First reported sightings of *L. bicolor* in the 44 counties now believed to be occupied by the Bolivian stock. Alachua: Gainesville, attacking a mole cricket, October 1993—Judy Gillmore (Entomology and Nematology Dept, UF); Baker: Macclenny, November 2003—Mike Sweat (Baker Co. Extension); Bay: Panama City, at *S. verticillata* flower, August 2006—Ken Rudisill (Bay Co. Extension); Bradford: Starke, trapped in the window of a pickup truck, June 2004—Paulette Tomlinson (Bradford Co. Extension); Brevard: Cocoa, at *S. verticillata* flower on a golf course, 2002—Lowell Loadholtz (Brevard Co. Extension, retired)

**Conclusion and Discussion**

Collaborators in 11 northwestern counties who did not detect *L. bicolor* in 2006 made no reports since then. However, the scattered (rather then clumped) distribution of detection in the counties northwest of Gainesville suggests that the wasp is present in all of them. Detection in Hamilton County in 2001 and
Liberty County in 2002, before releases had been made north of Gainesville, imply a natural spread from Alachua County, suggesting that all the intervening counties should be occupied. Some of the collaborators in eastern and southern counties who did not detect *L. bicolor* in 2006 persevered with the task and reported it in 2007 or 2008.

*Larra bicolor* uses nectar from several plants, but *S. verticillata* is outstanding among them (Arévalo and Frank 2005). In northern Florida, plantings of *S. verticillata* are attractive to wasps, and make detection of *L. bicolor* easy. In southern Florida, *S. verticillata* grows in disturbed areas from the Florida Keys north to Indian River Co. on the east coast, north to Sarasota Co. on the west coast, and north to Highlands and Okeechobee counties in the center. The widespread presence of this plant in the south may conceivably make plantings of *S. verticillata* less useful as attractors in southern counties. This may perhaps be the explanation of why *L. bicolor* has seemingly been harder to detect in seven counties north from the Florida Keys to Indian River Co. on the east coast (and perhaps also in other southern counties).

**Figure 1.** Map showing confirmed distribution of *L. bicolor* among Florida counties. Green (dark gray) indicates counties without records, orange (medium gray) counties where the Bolivian stock has been recorded, and pale magenta (very pale gray) ovals the localities where the Brazilian stock has been detected in southeastern counties. As of October 2008.
The wasp may be present in all those counties (although we do not know whether it is represented by the Brazilian or Bolivian stock).

The approach of the widespread Bolivian stock to the restricted Brazilian stock in Broward and Palm Beach counties offers an opportunity for a study in population genetics. It would be useful to confirm the continued genetic differentiation between the two stocks, and to learn whether they interbreed freely. We believe that *L. bicolor* populations now occupy all regions of Florida even if not yet all counties.

**Endnotes**

County extension faculty (named above) in Baker, Bay, Bradford, Brevard, Flagler, Gilchrist, Gulf, Hillsborough, Holmes, Jackson, Lake, Leon, Madison, Manatee, Nassau, Okaloosa, Okeechobee, Orange, Osceola, Pasco, Polk, Santa Rosa, Sarasota, Seminole and Wakulla counties were the backbone of this effort. FDACS-DPI personnel stationed in or visiting Clay, Liberty, Pinellas, and Volusia counties played an important role, as did Lionel Stange and Jim Wiley in providing taxonomic help. Alejandro Arévalo, Katie Barbara, Mark Deyrup, Judy Gillmore, Melita Hoffman, David Hoggard, Dave Knesky, Randy Lundgren, Rob Meagher, Andrei Sourakov, and Brian Womble, provided information for other counties. Several people deserve special mention. Retired Extension Director Lowell Loadholtz in Brevard County, took *S. verticillata* plants from Gainesville to a golf course in his county and then, once they were established, took *L. bicolor* there, and succeeded in establishing a population. Fred Santana (Sarasota County) launched a program to publicize use of *L. bicolor* and give away *S. verticillata* plants to residents of his county. Audrey Durr, Florida Yards and Neighborhoods Agent, Citrus County, promoted use of nectar sources (*S. verticillata* and a native plant, partridge pea, to encourage populations of the wasp. Lance Osborne (Mid-Florida Research and Education Center) became interested in the potential of *S. verticillata* as a banker plant for various beneficial insects. *Spermacoce verticillata* plants in 4-L (1-gal.) pots are now available from a commercial grower. This contribution is dedicated to the late Reece Sailer who, 30 years ago, had the vision that *L. bicolor* would solve Florida’s pest mole cricket problems, and to Fred Bennett who, in 1988, imported the appropriate (Bolivian) stock of that species.

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**Literature Cited**


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