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Research

Distribution of *Xenomyrmex floridanus* (Hymenoptera: Formicidae) in Florida and the West Indies

*James K. Wetterer**

Abstract

Xenomyrmex floridanus Emery (Hymenoptera: Formicidae) is a small arboreal ant known only from peninsular Florida and the West Indies. *Xenomyrmex floridanus* colonies nest in plant cavities, particularly in hollow twigs and dead branches. I compiled and mapped >100 site records for *X. floridanus*, documenting the earliest known records for the 4 geographic areas where it occurs: peninsular Florida, the Bahamas, Cuba, and Jamaica. Records of *X. floridanus* range from Gainesville, Florida (29.7°N) in the north to Pedro Cross, Jamaica (18.9°N) in the south. *Xenomyrmex floridanus* shows striking evolutionary convergences in morphology and behavior with *Monomorium floricola* (Jerdon) (Hymenoptera: Formicidae), an Old World tramp ant species that has spread worldwide through human commerce. Both species are tiny, thin, and short-legged, a morphology that allows them to nest in very narrow plant cavities. In addition, both are slow moving and have an exceptional ability to cling to surfaces, a capacity that probably allows them to avoid being blown out of trees, even in high winds. *Monomorium floricola* has invaded Florida and the West Indies, where it may negatively impact *X. floridanus* populations. In red mangrove (*Rhizophora mangle* L.; Rhizophoraceae) in southeastern Florida, I found that *X. floridanus* is the most common native ant and *M. floricola* is the most common exotic ant.

Key Words: distribution; geographic range; native range; red mangrove; *Rhizophora*

Resumen

Xenomyrmex floridanus Emery (Hymenoptera: Formicidae) es una pequeña hormiga arbórea conocida sólo en la península de la Florida y las Indias Occidentales. Las colonias de *Xenomyrmex floridanus* anidan en las cavidades de las plantas, particularmente en las ramas huecas y muertas. Se hizo una compilación y un mapa de >100 sitios donde se ha registrado *X. floridanus*, documentando los primeros registros conocidos para las 4 áreas geográficas donde ocurre: la peninsula de la Florida, las Bahamas, Cuba y Jamaica. Los registros de *X. floridanus* van desde Gainesville, Florida (29.7°N) en el norte a Pedro Cross, Jamaica (18.9°N) en el sur. *Xenomyrmex floridanus* muestra convergencias evolutivas sorprendentes en la morfología y el comportamiento con *Monomorium floricola* (Jerdon) (Hymenoptera: Formicidae), una especie de hormiga que se ha esparcido por todo el mundo a través del comercio humano. Ambas especies son minúsculas, delgadas y de piernas cortas, una morfología que les permite anidar en las cavidades mas estrechas de las plantas. Además, ambas son de movimiento lento y tienen una capacidad excepcional para aferrarse a las superficies, una capacidad que probablemente les permite evitar ser sopladas de los árboles, incluso en fuertes vientos. *Monomorium floricola* ha invadido la Florida y las Antillas, donde puede afectar negativamente a las poblaciones de *X. floridanus*. En el manglar rojo (*Rhizophora mangle* L .; Rhizophoraceae) en el sureste de la Florida, encontré que *X. floridanus* es la hormiga nativa más común y *M. floricola* es la hormiga exótica más común.

Palabras Clave: distribución; rango geográfico; rango nativo; mangle rojo; *Rhizophora*

Xenomyrmex floridanus Emery (Hymenoptera: Formicidae: Myrmicinae) is a small arboreal ant known only from peninsular Florida and the West Indies. *Xenomyrmex floridanus* colonies commonly nest in plant cavities, particularly in hollow twigs and dead branches (Creighton 1957). In the Florida Keys, *X. floridanus* colonies are common on red mangrove (*Rhizophora mangle* L.; Rhizophoraceae) tree islands (Simberloff & Wilson 1969; Cole 1983). In the Gainesville, Florida, area, *X. floridanus* colonies nest in sweetgum (*Liquidambar styraciflua* L.; Altingiaceae) trees (Van Pelt 1947). Here, I examine the biogeography of *X. floridanus*.

Forel (1884) established the genus *Xenomyrmex*, based on specimens of *Xenomyrmex stolli* Forel that Otto Stoll collected in Guatemala, co-inhabiting an oak gall with a carpenter ant (*Camponotus abscicus* Roger) colony. Forel (1884) assumed that *X. stolli* was probably a parasitic species, and named the genus *Xenomyrmex,* meaning "foreign ant." Forel (1884: 55) wrote (in French): "This genus is nearest to *Monomorium*, which it closely resembles in habitus. Its petiole, however, is entirely different and is similar to the genus *Pristomyrmex*, which it otherwise does not at all resemble."

Emery (1895) described *Xenomyrmex stolli floridanus* (= *X. floridanus*) based on specimens that Theodore Pergande collected from a twig of a yellow mastic tree (*Sideroxylon foetidissimum* Lam; Sapotaceae) in Lake Worth, Palm Beach Co., Florida. Junior synonyms include *Xenomyrmex stolli cubanus* Wheeler (from Cuba), *Xenomyrmex stolli lucayanus* Wheeler (from the Bahamas), and *Xenomyrmex stolli rufescens* Wheeler (from Florida).

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The genus *Xenomyrmex* currently includes 4 other described species, all known only from Central America and/or Mexico: *Xenomyrmex panamanus* (Wheeler) (known from Panama), *Xenomyrmex picquarti* (Forel) (known from Costa Rica), *Xenomyrmex skwarrae* Wheeler (known from Guatemala and Mexico), and *X. stolli* (known from Guatemala and Mexico) (Kempf 1972; Bestelmeyer et al. 2000; Campbell et al. 2006; Pacheco & Mackay 2013). In addition, unidentified *Xenomyrmex* specimens have been recorded from South America: Brazil (Delabie & Nascimento 1998; Vasconcelos 2007), Colombia (SIB 2016), Paraguay (Wild 2007), and Peru (Wilson 1987). Because *Xenomyrmex* workers resemble small *Monomorium* and *Solenopsis* workers, they often may be misidentified (Wheeler 1931). It is therefore possible that unrecognized populations of *Xenomyrmex* are actually fairly widespread in South America.

Materials and Methods

Using published and unpublished records, I documented the known range of *Xenomyrmex floridanus.* I obtained unpublished site records from museum specimens in the collections of Archbold Biological Station (ABS), the Museum of Comparative Zoology (MCZ), and the Smithsonian Institution (SI). In addition, I used online databases with collection information on specimens by Antweb (www.antweb.org). I obtained geo-coordinates for collection sites from published references, specimen labels, maps, or geography web sites (e.g., earth.google.com and www.tageo.com).

In part to define better the geographic range of *X. floridanus*, I collected ants nesting inside dead twigs of red mangrove at sites along the east coast of Florida, north of the Florida Keys (in St. Johns, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade counties) and on islands of the Bahamas (Grand Bahama, North Bimini, New Providence, and Half Moon Cay) and the Turks and Caicos Islands (Providenciales, North Caicos, Middle Caicos, and Grand Turk).

Results

I collected *Xenomyrmex floridanus* nesting in the dead twigs and branches of red mangrove at 5 sites on 3 Bahamian islands (from north to south, geo-coordinates and collection date in parentheses):

Grand Bahama
- Crabbing Beach (26.656°N, 77.980°W; 2-Jun-2015)
- McLean's Town (26.644°N, 77.936°W; 2-Jun-2015)

North Bimini
- North end of road (25.774°N, 79.263°W; 8-Jun-2015)
- North end of lagoon (25.773°N, 79.261°W; 8-Jun-2015)

Half Moon Cay
- Bonefish Lagoon (24.579°N, 75.950°W; 10-Aug-2015)

I also collected *X. floridanus* in red mangrove at 43 sites in 8 counties along the east coast of peninsular Florida (from north to south):

Volusia Co.
- Daytona Beach, Manatee Island Park (29.219°N, 81.021°W; 31-Mar-2016)
- Port Orange, Daniels Port Orange (29.147°N, 80.987°W; 19-Jun-2015)
- Rose Bay, by fish camp (29.103°N, 80.972°W; 31-Mar-2016)
- Spruce Creek, by boat ramp (29.083°N, 80.963°W; 31-Mar-2016)
- New Smyrna Beach, South Causeway (29.027°N, 80.902°W; 31-Mar-2016)

Brevard Co.
- Cape Canaveral, Manatee Sanctuary Park, (28.395°N, 80.619°W; 19-Jun-2015)
- Melbourne Beach, Sebastian Inlet State Park (27.859°N, 80.452°W; 27-Feb-2016)

Indian River Co.
- Wabasso Island, Environmental Learning Center (27.758°N, 80.415°W; 14-Mar-2015)
- Vero Beach, Round Island Park (27.562°N, 80.329°W; 14-Mar-2015)

St. Lucie Co.
- Indrio, Harbor Branch Oceanographic Institute (27.531°N, 80.349°W; 19-Feb-2015)
- Fort Pierce, Jim Island (27.478°N, 80.314°W; 14-Mar-2015)
- Fort Pierce, Bear Point Park (27.429°N, 80.281°W; 28 Nov-2014)
- Fort Pierce, Blind Creek Park (27.378°N, 80.256°W; 14-Mar-2015)

Martin Co.
- Joe's Point, Joe's Point Park (27.246°N, 80.194°W; 13-Nov-2015)
- Jensen Beach, Indian Riverside Park (27.225°N, 80.212°W; 28-Mar-2015)
- Stuart, Florida Oceanographic Coastal Center (27.216°N, 80.180°W; 21-Nov-2014)
- Stuart, east end of A1A bridge (27.212°N, 80.184°W; 29-Nov-2015)
- Stuart, Negro Cove (27.206°N, 80.170°W; 13-Nov-2015)
- Seminole Shores, Bessie Cove (27.190°N, 80.162°W; 6-Dec-2015)
- St. Lucie Inlet State Park, north end of Long Island (27.162°N, 80.167°W; 9-Apr-2015)
- St. Lucie Inlet State Park, west side of Long Island (27.152°N, 80.162°W; 15-Nov-2014)
- Port Salerno, Manatee Park (27.148°N, 80.196°W; 8-Dec-2015)

Palm Beach Co.
- Tequesta, Coral Cove (26.963°N, 80.080°W; 3-Oct-2015)
- Tequesta, south of Coral Cove (26.961°N, 80.079°W; 31-Dec-2015)
- Jupiter, Jupiter Beach Park (26.940°N, 80.072°W; 12-Mar-2015)
- Palm Beach Gardens, Village Square (26.837°N, 80.073°W; 19-Jun-2015, 25-Jan-2016)
- Riviera Beach, Singer Island (26.816°N, 80.038°W; 12-Mar-2015)
- Palm Beach, Bingham Island (26.674°N, 80.044°W; 29-Dec-2015)
- Boca Raton, Gumbo Limbo Nature Center (26.367°N, 80.071°W; 26-Feb-2015)

Broward Co.
- Pompano Beach, Bay Drive (26.254°N, 80.084°W; 1-Nov-2015)
- Fort Lauderdale, English Park (26.139°N, 80.116°W; 27-Feb-2015)
- Dania, by fishing charter (26.048°N, 80.115°W; 14-Nov-2015)
- Hollywood, West Lake Park (26.040°N, 80.118°W; 14-Nov-2015)
- Hollywood, Ann Kolb Center, Observation Trail (26.040°N, 80.122°W; 24-Apr-2016)
- Hollywood, Ann Kolb Center, Mudflat Trail (26.036°N, 80.121°W; 24-Apr-2016)

Hollywood, Lake Forest Park (26.035°N, 80.117°W; 14-Nov-2015)
Hollywood, Holland Park (26.019°N, 80.118°W; 14-Nov-2015)

Miami-Dade Co.
Aventura, NE 207th St. (25.968°N, 80.132°W; 21-Feb-2016)
North Miami Beach, SW Maule Lake (25.929°N, 80.150°W; 24-Apr-2016)
North Miami Beach, Oleta River State Park (25.916°N, 80.128°W; 20-Feb-2016)
Virginia Key, Miami Seaquarium (25.733°N, 80.167°W; 21-Feb-2016)
Key Biscayne, No Name Harbor (25.676°N, 80.161°W; 21-Feb-2016)
Homestead, Bayfront Park (25.463°N, 80.346°W; 20-Feb-2016)

I also collected *X. floridanus* nesting in black mangrove, *Avicennia germinans* (L.) (Acanthaceae), at 1 site where red mangrove was absent:

Martin Co.
Port Salerno, Cove Road Park (27.149°N, 80.168°W; 7-Nov-2015)

In total, I compiled and mapped >100 *X. floridanus* site records (Fig. 1), documenting the earliest known record for 4 geographic areas (Table 1): Bahamas (Wheeler 1905, 1931; Deyrup 1994; Deyrup et al. 1998), Cuba (Wheeler 1931; Fontenla Rizo 1993a,b; Fontenla 1999; Portuondo Ferrer & Fernández Triana 2004; Portuondo & Fontenla Rizo 2005; Reyes 2005; antweb.org), Florida (Wheeler 1931; Creighton 1957; Van Pelt 1947, 1958; Simberloff & Wilson 1969; Simberloff 1976; Deyrup et al. 1988; Ferster & Prusak 1994; Valles et al. 2007; Moreau & al 2014; antweb.org; ABS), and Jamaica (antweb.org; Table 1). Known records of *X. floridanus* ranged from Gainesville, Florida (29.7°N; Valles et al. 2007), in the north to Pedro Cross, Jamaica (18.9°N; Table 1), in the south.

Whereas Deyrup et al. (1989) listed *X. floridanus* from 10 counties in Florida, I found published and unpublished records of *X. floridanus* from 18 counties in Florida: Alachua, Brevard, Charlotte, Collier, Desoto, Highlands, Hillsborough, Lake, Lee, Marion, Miami-Dade, Monroe, Orange, Palm Beach, Pinellas, Polk, Sarasota, and Volusia. In addition, I collected the first records of *X. floridanus* from 4 additional counties: Broward, Indian River, Martin, and St. Lucie (see list above), bringing the total to 22 counties in Florida.

Fig. 1. Known site records of *Xenomyrmex floridanus*.

Table 1. Earliest known records for *Xenomyrmex floridanus*.

Location	Earliest record
Florida	1887 (Emery 1895)
Bahamas	1904 (Wheeler 1905; as *Xenomyrmex lucayanus*)
Cuba	1927 (Wheeler 1931; as *Xenomyrmex cubanus*)
Jamaica[a]	1984 (J. T. Longino, antweb.org): Pedro Cross

[a] No previously published records.

North of Volusia County, red mangroves are rare. I did not find *X. floridanus* at the only red mangrove site I surveyed in St. Johns County (St. Augustine, Fish Island Marina, 29.8705°N, 81.3025°W; 24-Jul-2016), where I only found *M. floricola*. I did not find any red mangroves at 2 sites in Flagler County dominated by black mangrove: Betty Steflik Memorial Preserve and Gamble Rogers Memorial State Recreational Area.

Discussion

Xenomyrmex floridanus has widespread records from peninsular Florida, the Bahamas, and Cuba, plus 1 record from Jamaica (Fig. 1). The high concentration of *X. floridanus* records along the east coast of peninsular Florida (Fig. 1) is primarily due to my collecting ants nesting in red mangrove, a tree species restricted to brackish habitats. Although *X. floridanus* colonies nest in many tree species, it appears that red mangrove provides an important habitat for this species. In my surveys of red mangrove in southeastern Florida and the Bahamas, *X. floridanus* was the native ant species that I most commonly collected.

Concerning *X. floridanus*, Wheeler (1905) wrote that "the habits of the workers resemble those of *Monomorium floricola*, so far as could be ascertained by hasty observation in the field." *Monomorium floricola* (Jerdon) is native to the Old World, but has been transported around the world through human commerce (Wetterer 2010) and is the most common exotic ant I collected in red mangrove in Florida. My own observations confirm Wheeler's (1905) supposition that *X. floridanus* and *M. floricola* show evolutionary convergence in morphology and behavior. Both species are tiny, thin, and short-legged, a morphology that allows them to nest in very narrow plant cavities, such as inside the hollow dead twigs of red mangrove. Both *X. floridanus* and *M. floricol*a are slow moving and have an exceptional ability to cling tenaciously to surfaces. As a result, both species can be difficult to collect off twigs and branches using an aspirator and are hard to dislodge through vegetation beating. The ability to grip onto surfaces probably allows these arboreal ants to avoid being blown out of trees, even in high winds. This trait should be particularly important for ants living in red mangrove growing in brackish water, where falling out of the tree would mean almost certain death.

Whereas *X. floridanus* is extremely common in red mangroves of southeast Florida, additional research is needed to determine whether the same is true in the Bahamas, Cuba, and Jamaica. It is not known whether *X. floridanus* possesses any special adaptations for living in red mangroves, such as high salt tolerance, or whether the prevalence of hollow spaces in dead twigs of red mangroves may be indicative of a myrmecophyte that benefits from the presence of ants. The close similarity in the behavior and ecology of *X. floridanus* and *M. floricola* suggests that these 2 species may be important competitors in areas where *M. floricola* invades. *Monomorium floricola* colonies can grow to an enormous size with thousands of

workers and dozens of queens (personal observation), giving them a numerical advantage over *X. floridanus.* Evaluating whether *M. floricola* has a significant impact on *X. floridanus* populations in Florida, the Bahamas, or elsewhere would require further research.

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