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Source: Florida Entomologist, 100(1) : 145-148

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.100.0120>

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Geographic distribution of *Tapinoma litorale* (Hymenoptera: Formicidae)

James K. Wetterer^{1,*} and Roberto J. Guerrero²

Abstract

Tapinoma litorale Wheeler (Hymenoptera: Formicidae) is a small, inconspicuous New World ant that nests in plant cavities, particularly in epiphytes and hollow grass stems and twigs. Recently, *T. litorale* was included on a list of exotic ant species established in North America, introduced through human commerce. We compiled and mapped >240 site records for *T. litorale*, documenting the earliest known records for 19 geographic areas, including many with no previously published records: Belize, Colombia, Costa Rica, Guatemala, Haiti, Honduras, Jamaica, San Andrés Island, Trinidad, the Turks & Caicos Islands, and Venezuela. Records for *T. litorale* ranged from 8.5°N to 29.1°N, spread broadly around the circum-Caribbean region: peninsular Florida, the West Indies, Mexico, Central America, and northern South America. The earliest records of *T. litorale* come from Florida, the Bahamas, Puerto Rico, and Cuba, and there is no notable distributional gap between Florida and the West Indies. This pattern does not support the proposition that *T. litorale* populations in North America are exotic. *Tapinoma litorale* workers resemble ghost ants, *Tapinoma melanocephalum* (F.), an Old World tramp species that has been spread around the world through human commerce. *Tapinoma melanocephalum* also nests in plant cavities and potentially may compete with *T. litorale* in areas where it invades.

Key Words: biogeography; exotic species; geographic range; native range

Resumen

Tapinoma litorale Wheeler (Hymenoptera: Formicidae) es una hormiga muy pequeña, propia del Nuevo Mundo, que habita dentro de las cavidades de plantas, particularmente en epífitas, ramas y tallos huecos de algunas herbáceas. Recientemente, *T. litorale* fue incluida en una lista de especies de hormigas exóticas establecidas en Norte América, introducida a través del comercio humano. Se compilaron y mapearon >250 registros para *T. litorale*, documentando los primeros registros conocidos para 19 áreas geográficas, incluyendo a muchas sin registros previamente publicados: Belice, Colombia, Costa Rica, Guatemala, Haití, Honduras, Jamaica, La isla de San Andrés, Trinidad, Las Islas Turcas y Caicos, y Venezuela. Los registros para *T. litorale* van desde los 8.5°N a los 29.1°N, extendiéndose ampliamente alrededor de la región circum-caribeña: La Florida peninsular, Las Indias Occidentales, México, América Central y el norte de América del Sur. Los registros más antiguos de *T. litorale* provienen de la Florida, las Bahamas, Puerto Rico y Cuba, sin una brecha notable en la distribución entre La Florida y las Indias Occidentales. Este patrón no apoya la proposición de que las poblaciones de *T. litorale* en Norteamérica son exóticas. Las obreras de *Tapinoma litorale* se parecen a las de la hormiga fantasma, *Tapinoma melanocephalum* (F.), una especie invasora del Viejo Mundo que se ha dispersado alrededor del mundo a través del comercio humano. *Tapinoma melanocephalum* también anida en las cavidades de plantas y potencialmente puede competir con *T. litorale*, en aquellas zonas donde confluyen.

Palabras Clave: biogeografía; área de distribución geográfica; área de distribución nativa; especies introducidas

Tapinoma litorale Wheeler (Hymenoptera: Formicidae: Dolichoderinae) (sometimes misspelled as *littorale*) is a small, inconspicuous New World ant that commonly nests in plant cavities, particularly in epiphytes and hollow grass stems and twigs. For example, in the Florida Keys, *T. litorale* colonies are common in dead saw grass stems (*Cladium jamaicense* Crantz; Cyperaceae) and red mangrove twigs (*Rhizophora mangle* L.; Rhizophoraceae) (Simberloff & Wilson 1969; Cole 1982). Recently, Wittenborn & Jeschke (2011) included *T. litorale* on their list of 93 exotic ant species established in North America, i.e., introduced through human commerce.

Here, we examine the geographic distribution of *T. litorale* site records and consider evidence of whether or not *T. litorale* may be exotic to parts of North America. When evaluating the native and exotic ranges of a species, researchers consider a spectrum of distributional, historical, evolutionary, ecological, and genetic information (see Wetterer 2008). For example, evidence considered indicative of a species'

native range includes older records largely confined to a single continuous region and occurrence in intact native communities. In contrast, evidence indicative of a species' exotic range includes sudden appearance and spread of the species through an area discontinuous with other known populations, and occurrence exclusively in highly disturbed environments.

Wheeler (1905) described *T. litorale* from Florida and the Bahamas nesting in epiphytes, hollow grass stems, and twigs of trees and bushes. Putative junior synonyms of *T. litorale* include *Tapinoma litorale cubaense* Wheeler, *Tapinoma panamense* Wheeler, and *Tapinoma canalis* Wheeler (Longino 2006). Wheeler (1913) described *T. litorale cubaense* from Cuba, nesting in hollow twigs and epiphytes. Wheeler (1934) described *T. panamense* from Barro Colorado Island, Panama. Wheeler (1942) subsequently described *Tapinoma canalis* from Barro Colorado Island, Panama. Shattuck (1992), however, determined that Wheeler's (1942) description was based on the same specimens as

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T. panamense, and designated *T. canalis* a junior synonym. Although Bolton (2015) recognized *T. panamense* as a separate species, Longino (2006) wrote: "I take a broad view of *litorale*, to include *panamense* Wheeler 1934 (and its synonym *canalis* Wheeler 1942). There is considerable variation and there could well be multiple cryptic species." R. J. G. (unpublished data) made a detailed taxonomic analysis of *T. litorale* confirming the synonymy of *T. litorale cubaense*, *T. panamense*, and *T. canalis*.

Tapinoma litorale workers are small (~1.5 mm) and monomorphic, and resemble ghost ants, *Tapinoma melanocephalum* (F.), in size, general appearance, and behavior. The 2 species, however, differ in coloration: *T. litorale* workers are uniformly yellow or tan, whereas *T. melanocephalum* workers have a dark brown head and thorax and light tan abdomen.

Materials and Methods

Using published and unpublished records, we documented the range of *T. litorale*. We obtained unpublished site records from museum specimens in the collections of the Museum of Comparative Zoology (Cambridge, Massachusetts), the Smithsonian Institution (Washington, District of Columbia), Universidad de Guadalajara (Mexico), Instituto Alexander von Humboldt (Colombia), Museo del Instituto de Zoología Agrícola (Venezuela), and Universidad de São Paulo (Brazil). We also obtained specimens from the personal collections of Phil S. Ward (Davis, California), William P. Mackay (El Paso, USA), and John T. Longino (Salt Lake City, Utah). In addition, we used online databases with collection information on specimens by AntWeb (www.antweb.org). We obtained geographic coordinates for collection sites from published references, specimen labels, maps, or geography web sites (e.g., earth.google.com and www.tageo.com). In addition, J. K. W. sur-

veyed dead twigs and branches of red mangroves and hollow grass stems at sites in peninsular Florida and around the Caribbean region.

Results

In total, we compiled and mapped >240 *T. litorale* site records (Fig. 1), documenting the earliest known records for 19 geographic areas, including many with no previously published records: Belize, Colombia, Costa Rica, Guatemala, Haiti, Honduras, Jamaica, San Andrés Island, Trinidad, the Turks & Caicos Islands, and Venezuela (Table 1).

J. K. W. recorded *T. litorale* at 108 sites: in the Bahamas (12 sites); Cozumel, Mexico (2 sites); Florida (69 sites); Roatán, Honduras (2 sites); San Andrés Island, Colombia (1 site); and the Turks and Caicos Islands (22 sites). *Tapinoma litorale* was the third most common ant that J. K. W. found nesting in red mangrove in peninsular Florida, after *Xenomyrmex floridanus* Emery and *Monomorium floricola* (Jerdon) (Hymenoptera: Formicidae). We found earlier published and unpublished records of *T. litorale* from 13 counties in Florida, namely, Brevard, Broward, Charlotte, Collier, Highlands, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Pinellas, and Sarasota counties, and collected the first records of *T. litorale* from St. Lucie and Volusia counties.

Records of *T. litorale* ranged in latitude from Corcovado National Park, Costa Rica (8.5°N; 1982; J. T. Longino; AntWeb JTL000009192) in the south, to Daniels Port Orange, Volusia County, Florida (29.1°N; 2015; J. K. W.) in the north.

The color of *T. litorale* workers varied among different sites. Workers we examined from most sites were pale yellow in color, but tan in some Central American and Greater Antillean populations. R. J. G. (unpublished data) found no consistent morphological differences associated with this color difference.

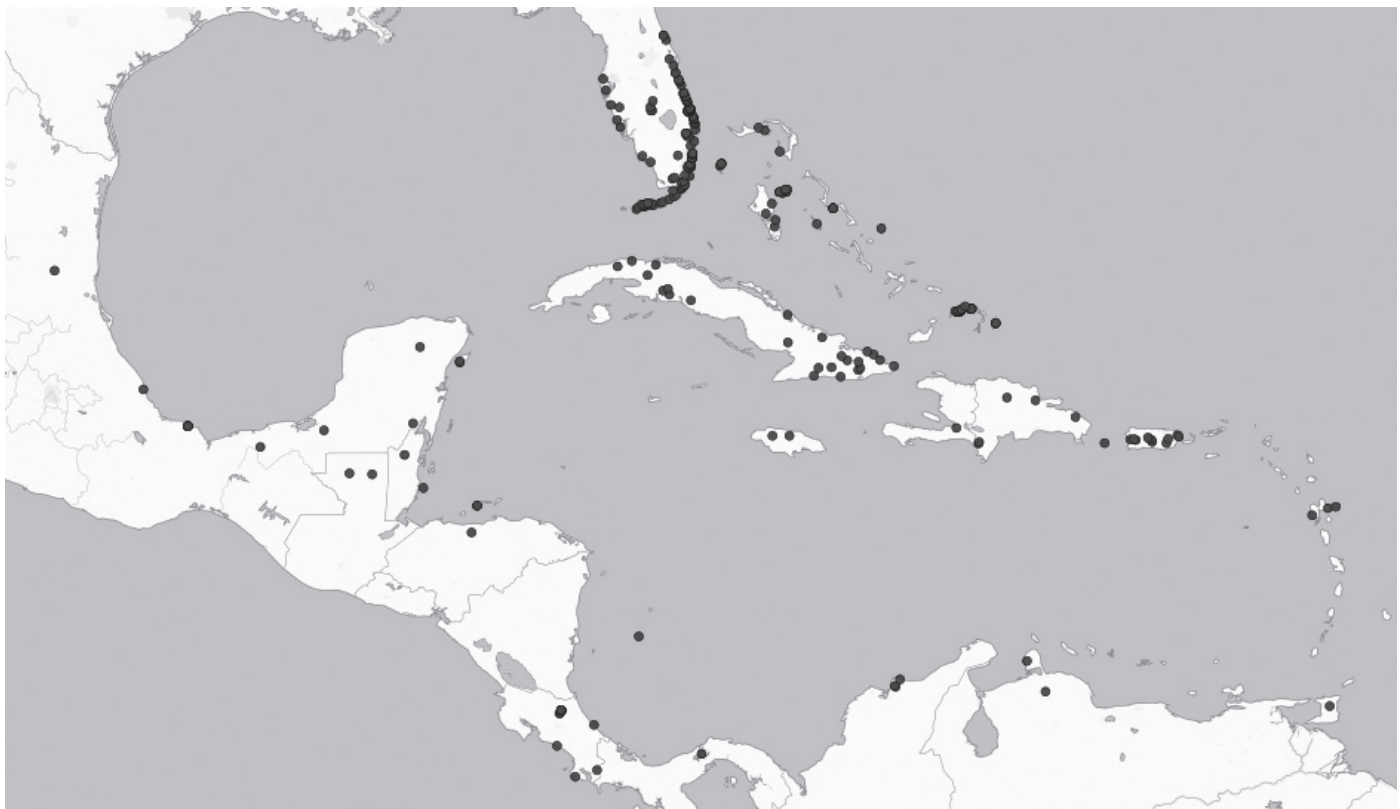


Fig. 1. Site records of *Tapinoma litorale*.

Table 1. Earliest known records for *Tapinoma litorale* from Florida and the West Indies.

Location	Earliest record
Florida	1904 (Wheeler 1905)
Bahamas	1904 (Wheeler 1905)
Puerto Rico	1906 (Wheeler 1908)
Cuba	1913 (Wheeler 1913, as <i>T. litorale cubaense</i>)
Dominican Republic	1928 (Menozi & Russo 1930)
Haiti ^a	1972 (R. E. Gregg, AntWeb): Petionville
Jamaica ^a	1984 (J. T. Longino, AntWeb): Cedar Valley
Guadeloupe	1986–1987 (Jaffe et al. 1990)
Turks & Caicos Islands ^a	2015 (J. K. W.): south of Grand Turk airport
San Andrés Island ^a	2015 (J. K. W.): Old Point Reserve
Trinidad ^a	date unknown (C. K. Starr, MIZA ^b): Arena Forest

^aNo previously published records.

^bMIZA = Museo del Instituto de Zoología Agrícola.

We found very few site records for putative junior synonyms *T. litorale cubaense*, *T. panamense*, and *T. canalis*. Some records from Cuba listed *T. litorale cubaense* (Wheeler 1913; Mann 1920; Reyes 2005), whereas others listed *T. litorale* (Fontenla Rizo 1993; Fontanela 1999; Portuondo & Fernández 2004). The only published site record for *T. panamense* and *T. canalis* is their type locale: Barro Colorado Island, Panama (9.2°N; Wheeler 1934, 1942; Shattuck 1992). In addition, we found 1 specimen record listed as *T. panamense* on AntWeb (CASENTO280678) from Corcovado National Park, Costa Rica, with the same collection information as other specimens identified as *T. litorale*.

Discussion

Tapinoma litorale is widespread in the circum-Caribbean region with records from peninsular Florida, the Bahamas, the Turks and Caicos Islands, the Greater and Lesser Antilles, Mexico, Central America, and northern South America. The earliest records of *T. litorale* come from Florida, the Bahamas, Puerto Rico, and Cuba, and there is no notable distributional gap between Florida and the West Indies. This pattern does not support the proposition that *T. litorale* populations in North America are exotic. In fact, we know of no reference other than Wittenborn & Jeschke (2011) that considers *T. litorale* to have exotic populations in North America.

Except 1 site record from Panama, the earliest record we found of *T. litorale* from Mexico, Central America, or South America was from 1976 (see Results and Table 2). Although it is possible that *T. litorale*

Table 2. Earliest known records for *Tapinoma litorale* from Mexico, Central America, and South America.

Location	Earliest record ^a
Panama	1923 (J. Zetek, USNM): Canal Zone, Cooper's Place by Aejeta River
Colombia ^b	1976 (E. Martínez, IAVH): Parque Nacional Natural Tayrona
Costa Rica	1982 (J. T. Longino, AntWeb): Parque Nacional Corcovado
Mexico	1987 (W. P. Mackay, personal collection): Gómez Farías
Belize ^b	1987 (C. Feller & W. Mathis, USNM): Twin Cays
Guatemala ^b	2004 (W. P. & E. Mackay, personal collection): Flores
Honduras ^b	2008 (P. S. Ward, personal collection): 7 km south of Yaruca
Venezuela ^b	2009 (A. Pérez; MIZA): Las Guarabitas de Arauca

^aUSNM = US National Museum, IAVH = Instituto Alexander von Humboldt, MIZA = Museo del Instituto de Zoología Agrícola.

^bNo previously published records.

is a recent arrival in Mexico, Central America, and South America, the fact that most records of *T. litorale* from this region come from intact natural areas suggests that *T. litorale* is native there as well. Researchers may easily overlook *T. litorale*, even in habitats where they are common. For example, when we collected ants from red mangrove twigs, *T. litorale* workers usually remained packed tightly inside the twigs until we sliced their nest twig open. Thus, simple vegetation beating may often miss *T. litorale*. When removed from the twig, *T. litorale* workers move with short bursts of frenetic activity, but then usually freeze, making the ants difficult to capture when they are moving and difficult to see when they freeze.

We found no reports of *T. litorale* as a pest. *Tapinoma litorale* workers resemble those of *T. melanocephalum*, an Old World tramp species that has been spread around the world through human commerce and is a common household pest (Wetterer 2009). *Tapinoma melanocephalum* also nests in plant cavities, including hollow grass stems and red mangrove twigs, and in areas where it invades, it could compete with *T. litorale* and other native species.

Acknowledgments

We thank M. Wetterer for comments on this manuscript; A. Schaffner, A. Inamoto, A. Ardelean, A. Ridgeway, B. Liddell, C. Danley, C. Olbrych, D. Arrieta, D. Brothers, G. Kramer, J. Herr, K. Kelly, L. Feliciano, M. Merritt, S. Crary, S. Groth, T. Holmes, and T. Bertolami for field assistance; Fernando Fernández (MHN-ICN), J. T. Longino (JTL), M. Vásquez (CZUG), S. Cover (MCZ), P. S. Ward (UC at Davis), T. Schultz (SI), and W. P. Mackay (UT at El Paso) for help with their respective ant collections; D. P. Wojcik and S. D. Porter for compiling their valuable FORMIS bibliography; L. Lesperance of the FAU library for processing so many interlibrary loans; Florida Atlantic University for financial support. R. J. G. was partially supported with funds from The Ernst Mayr in Animal Systematics Travel Grants, and the research project "Systematics and Evolution of the Ant Genus *Tapinoma* Förster (Formicidae: Dolichoderinae) in the Neotropical Region" supported by Colciencias-Universidad del Magdalena through agreement #008-2015.

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