

Geographic distribution of *Trachymyrmex jamaicensis* (Hymenoptera: Formicidae)

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Abstract

Trachymyrmex jamaicensis (André) (Hymenoptera, Formicidae) is a rarely encountered fungus-growing ant known only from the West Indies and South Florida. I compiled and mapped >100 site records for *T. jamaicensis*, documenting the earliest known records for 15 geographic areas (countries, U.S. states, and major West Indian islands). Populations of *T. jamaicensis* have an essentially continuous range from the island of St. Vincent in the south (13.1°N) to Florida and the Bahamas in the north (up to 27.0°N). Almost all records from Florida come from the Florida Keys, south of 25.5°N; there are only 2 records of *T. jamaicensis* from mainland Florida. Based on the scarcity of records of *T. jamaicensis* in Florida, the Florida Committee on Rare Endangered Plants and Animals (FCREPA) officially designated *T. jamaicensis* as rare species.

Key Words: biogeography; fungus-growing ant; geographic range; native range

Resumen

Trachymyrmex jamaicensis (André) (Hymenoptera, Formicidae) es una hormiga raramente encontrada que cultiva hongos y es conocida solamente de las Indias Occidentales y del Sur de la Florida. He compilado y cartografiado >100 registros de sitios para *T. jamaicensis*, una documentación de los registros más antiguos conocidos para 15 áreas geográficas (países, estados de Estados Unidos, y las principales islas de las Indias Occidentales). Las poblaciones de *T. jamaicensis* tienen esencialmente un rango geográfico continuo desde la isla de San Vicente en el sur (13.1°N) a la Florida y las Bahamas en el norte (hasta 27.0°N). Casi todos los registros de la Florida provienen de los Cayos de Florida, al sur de 25.5°N; sólo hay 2 registros de *T. jamaicensis* de la parte continental de la Florida. En base a la escasez de registros de *T. jamaicensis* en la Florida, el Comité de la Florida de Plantas y Animales Raras en Peligro de Extinción (FCREPA) designó oficialmente *T. jamaicensis* como una especie rara.

Palabras Clave: biogeografía; hormigas que cultivan hongos; distribución geográfica; área de distribución natural

Fungus-growing ants (Hymenoptera, Formicidae) include >250 recognized species, divided into 16 genera (Bolton 2014). All are dependent on gardens of mutualist fungus that they grow for food. However, different species of fungus-growers vary greatly in their ecologies. Two genera of fungus-growing ants (*Atta* and *Acromyrmex*) have conspicuous colonies of up to 10 million workers. Ants of these 2 genera generally depend on cutting fresh leaves and vegetation for their fungal gardens and are commonly called leaf-cutting ants. Leaf-cutting ants are the most important agricultural pests of the New World tropics (Wilson 1986). In contrast, ants of the other, “lesser” fungus-growing ant genera tend to have small, inconspicuous colonies with fewer than 3,000 workers, and generally collect insect excrement or small pieces of dead plant material to use as substrate for their fungal gardens. Here, I examine the geographic distribution of *Trachymyrmex jamaicensis* André, a rarely encountered “lesser” fungus-growing ant.

Trachymyrmex jamaicensis is known only from the West Indies and South Florida. This species was already known from several West Indian islands when William F. Buren found the first known *T. jamaicensis* in Florida in 1945 “in the littoral zone of the beach at Dania” (Smith 1954). Smith (1954) concluded that *T. jamaicensis* “may have been introduced, as no individuals have been found elsewhere in the state.” However, Smith (1954) was apparently unaware that in 1946, Buren also collected *T. jamaicensis* on Vaca Key, in the Florida Keys (specimens in the Smithsonian Institution, Wash-

ington, District of Columbia, USA). With the accumulation of many additional records of *T. jamaicensis* from the Florida Keys, Deyrup (1994) concluded that the distinctive *T. jamaicensis* populations in Florida appeared to be endemic to Florida, writing: “Florida specimens show significant differences from all West Indian populations studied, and it is possible that the Florida population is a distinct species or subspecies.”

Deyrup et al. (1998) wrote that *T. jamaicensis* was “presumed native” to the Bahamas. Nonetheless, Deyrup et al. (2000) revisited the question as to whether *T. jamaicensis* was native to Florida, writing: “On the one hand, this is a large conspicuous ant that one might expect to have been found earlier [than 1945] if it had been present. On the other hand, it is only common in a few places in tropical Florida, and it does not seem to occur in heavily disturbed or cultivated areas, either in the Keys or in the Bahamas, so it may have been displaced by the early attempts at agriculture. There is a hypothesis that it may have been affected by spraying for mosquitoes (Deyrup et al. 1988). The nests are deep and it is unlikely that they would be in containers of plants.” Perhaps based on Deyrup et al.’s (2000) apparent uncertainty, Wittenborn & Jeschke (2011) included *T. jamaicensis* on their list of 93 exotic ant species established in North America. The present analysis is aimed primarily at documenting the known range of *T. jamaicensis* and assessing where this species is native and where it may have been introduced through human commerce.

TAXONOMY

André (1893) described *Atta jamaicensis* (= *T. jamaicensis*) from Jamaica. Junior synonyms include *Atta sharpii* Forel (from St. Vincent), *Atta maritima* Wheeler (from the Bahamas), *Trachymyrmex jamaicensis frontalis* Santschi (from Haiti), and *Trachymyrmex jamaicensis cubaensis* Wheeler (from Cuba) (Mayhé-Nunes & Brandão 2007; Rabeling et al. 2007; Snelling & Torres, unpublished manuscript).

Mayhé-Nunes & Brandão (2007) noted much geographic variation in *T. jamaicensis* and confirmed the distinctiveness of the Florida populations, e.g., writing: "All Florida specimens present mesosomal projections stouter than in other samples and more expanded frontal lobes in relation to specimens from other localities, but agree in all other details with the description we provide above" (for *T. jamaicensis*).

Mayhé-Nunes & Brandão (2007) raised *Atta jamaicensis haytiana* Wheeler & Mann to full species, writing: "Jack Longino kindly sent us additional samples of this species, from Jamaica, so *T. haytianus* and *T. jamaicensis* are sympatric, strengthening our argument for the recognition of this form as a good species." Mayhé-Nunes & Brandão (2007) did not synonymize the subspecies *T. jamaicensis antiguensis*, writing: "We examined two *T. jamaicensis antiguensis* 'cotypes' (syntypes) deposited in the MZSP and noticed that both workers lack the main diagnostic feature of *Trachymyrmex* of the *Jamaicensis* group, the posteriorly opened antennal scrobe. We believe that these specimens actually belong to a species of the *Trachymyrmex* *Urichi* group, to be dealt with in a forthcoming paper."

However, Snelling & Torres (unpublished manuscript) synonymized *T. jamaicensis haytiana* and *T. jamaicensis antiguensis* (as well as the other infraspecific taxa above) with *T. jamaicensis*, writing: "We have examined syntypes of the various infraspecific taxa listed above. All are trivial variants of an ant that is widely variable even within a single locality. We can find no justification for any of these forms ever having been described in the first place." Mayhé-Nunes & Brandão (2007) examined 3 specimens that Jack Longino collected at Malvern, Jamaica, on 12 Mar 1984, and identified 1 as *T. haytiana* (collected as a solitary forager) and 2 as *T. jamaicensis* (collected as part of a nest series) (J. T. Longino, pers. comm.). In light of the expert taxonomic judgment of Snelling & Torres (unpublished manuscript), I consider the taxonomic status of *T. jamaicensis antiguensis* and *T. jamaicensis haytiana* as unsettled and deserving further attention. In fact, the genus *Trachymyrmex* is not monophyletic, and its status is unsettled. For example, *T. jamaicensis* is more closely related to species classified in the genus *Sericomyrmex* than it is to most other species currently placed in the genus *Trachymyrmex* (Mehdiabadi & Schultz 2010).

Materials and Methods

Using published and unpublished records, I documented the known range of *T. jamaicensis*. I obtained unpublished site records from museum specimens in the collections of the Museum of Comparative Zoology (MCZ, Harvard University, Cambridge, Massachusetts, USA) and the Smithsonian Institution (SI). I obtained unpublished site records of *T. jamaicensis* from L. W. Morrison (Bahamas) and C. S. Moreau (Florida Keys). 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 a number of cases, publications did not include the collection dates for specimens, but we were able to determine the approximate date based on information on the collector's travel dates. For example, André (1893) described *T. jamaicensis* based on specimens collected

by William J. Fox, who collected in Jamaica in Apr 1891. Forel (1893) reported the ants collected by Herbert H. Smith, who worked in St. Vincent in 1889 and 1890.

Results

I collected *T. jamaicensis* at 11 sites on 7 West Indian islands, from north to south (geo-coordinates and collection date in parentheses):

Tortola:	Balsam Ghut, near peak, forest (18.455°N, 64.566°W; 17-XI-2005)
Tortola:	Smuggler's Cove, beach sea grape (18.393°N, 64.704°W; 16-XI-2005)
St. John:	Windberg, 1 km SE Francis Bay, forest slope (18.361°N, 64.731°W; 11-XI-2005)
Mona:	near Antenna, scrub forest (18.091°N, 67.936°W; 2-VI-2006)
Mona:	Los Cerezos, forest (18.089°N, 67.900°W; 3-VI-2006)
Mona:	near Cueva Carita, scrub forest (18.084°N, 67.939°W; 2-VI-2006)
Barbuda:	Two-Foot Bay, below cliffs, beach manchineel (17.669°N, 61.770°W; 10-VII-2007)
Barbuda:	Gut Road, 2 km E of town, scrub forest (17.634°N, 61.803°W; 11-VII-2007)
St Kitts:	Key Beach, beach manchineel (17.343°N, 62.712°W; 20-V-2007)
Nevis:	White Bay, beach manchineel (17.119°N, 62.548°W; 16-V-2007)
Guadeloupe:	Kahousanne, 3 km W of point, beach scrub (16.251°N, 61.208°W; 26-V-2008)

Trachymyrmex jamaicensis specimens from the 2 sites on Tortola were noticeably lighter-colored than those from the other islands. In total, I compiled and mapped >100 *T. jamaicensis* site records (Fig. 1), documenting the earliest known record for 15 geographic areas (countries, U.S. states, and major West Indian island and island groups; Table 1). The northernmost records came from Jonathan Dickinson State Park, Martin County, Florida (27.0°N; 1992; Lloyd R. Davis; MCZ) and an islet near Snake Cay, Bahamas (26.4°N; 2003; L. W. Morrison, pers. comm.). The southernmost record came from near Brighton Estate, St. Vincent (13.1°N; Forel 1893). Wheeler (1937) recorded *T. jamaicensis* from the Virgin Islands but did not indicate which island.

Discussion

For such a large, distinctive ant, there are surprisingly few records of *T. jamaicensis*. One reason for this scarcity of records is that *T. jamaicensis* nests fairly deep underground, so colonies will not be encountered when researchers sample leaf litter or when they search under rocks and logs, 2 primary methods for general ant collecting. In addition, fungus-growing ants in general are not attracted to sugar or protein-based baits. Finally, *T. jamaicensis* workers are cryptically colored and become motionless when disturbed (pers. obs.). On the island of St. John, U.S. Virgin Islands, I accidentally slid down a forest slope and, on the newly exposed soil left in my wake, I encountered a single *T. jamaicensis* forager. Despite extensive effort searching the surrounding area, I could not find the nest or any additional *T. jamaicensis* foragers.



Fig. 1. Known site records of *Trachymyrmex jamaicensis*.

Trachymyrmex jamaicensis has been recorded primarily in tropical dry forests and scrub forests (Torres 1989). A large proportion of *T. jamaicensis* records have come from beach sites. For example, 5 of 11 sites where I found *T. jamaicensis* in the West Indies were beach forests; 3 of these were forests of poisonous manchineel trees (*Hippomane mancinella* L.; Malpighiales: Euphorbiaceae), a habitat that more cautious ant collectors wisely avoid. Wheeler (1905) wrote: "At first I was inclined to believe that the species must be restricted to sea beaches, but on walking inland about two miles from All Saints' Rectory at Mangrove Key, I found it nesting also in the clearings."

Trachymyrmex jamaicensis has been found most commonly on smaller islands, notably cays of Bahamas and the Florida Keys and uninhabited islets surrounding Cuba and Puerto Rico. Wheeler (1905) wrote that on the cays around Andros Island, Bahamas, *T. jamaicensis* "was seen wherever I landed and searched for it." Lloyd W. Morrison (pers. comm.) collected *T. jamaicensis* on 8 uninhabited cays in the Bahamas. *Trachymyrmex jamaicensis* has been recorded from 11 different islands in the Florida Keys (from north to south: Elliot Key, Key Largo, Indian Key, Long Pine Key, Fat Deer Key, Vaca Key, Big Pine Key, Bahia Honda Key, Long Key, Grassy Key, and Shark Key). Yet, this species can be elusive, such as when Wilson (1964) surveyed 4 of the Florida Keys (Key Largo, Plantation Key, Big Pine Key, and Key West) in 1958 and did not find any *T. jamaicensis*. Deyrup (1994) wrote that in Florida, *T. jamaicensis* "is abundant only on Elliott Key in Biscayne Bay National

Monument. It is rare on several keys from Big Pine to Key Largo and has been seen once in Broward County and once in Martin County. It is possible that this species is susceptible to spraying for mosquitoes, which could affect the ants directly or indirectly through the caterpillars that are important in providing pre-digested compost material for the fungus gardens. Its habitat is also disappearing over much of its range." In 2 d of general collecting, I found *T. jamaicensis* at 3 sites on Mona, a relatively small island west of Puerto Rico that is entirely a nature preserve. In contrast, I never encountered *T. jamaicensis* on the main island of Puerto Rico in several weeks of general collecting. Populations of *T. jamaicensis* apparently can fluctuate greatly. Torres (1989) did not find *T. jamaicensis* in the tropical dry forest of Guánica, Puerto Rico, during visits in 1980 and 1982, but found it was common there in 1983. In 1996, Torres et al. (1999) found 219 *T. jamaicensis* nests in one 1.4 ha plot at Guánica.

The most substantial gap in the known distribution of *T. jamaicensis* occurs at the southern end of its range, between Guadeloupe (16.3°N) and St. Vincent (13.1°N). Populations of *T. jamaicensis* in Florida and the Bahamas are at the northern end of an essentially continuous native range of *T. jamaicensis* through the West Indies (Fig. 1). The sole evidence that has been used to suggest that *T. jamaicensis* may not be native to Florida is the late date (1945) of its first record from Florida, from Dania (now called Dania Beach) in Broward County. However, besides this record, there is only 1 additional record of *T. jamaicensis*

Table 1. Earliest known records for *Trachymyrmex jamaicensis*.

Location	Earliest record
St. Vincent	1889–90 (Forel 1893 as <i>Trachymyrmex sharpii</i>)
Jamaica	1891 (André 1893)
Bahamas	1904 (Wheeler 1905 as <i>Atta maritima</i>)
Puerto Rico	1906 (Wheeler 1907)
Haiti	1912–13 (Wheeler & Mann 1914)
Cuba	1927 (Mayhé-Nunes & Brandão 2007)
Antigua	1936 (Weber 1938 as <i>T. jamaicensis antiguensis</i> *)
Dominican Republic	1938 (P. J. Darlington, MCZ): Barahona
Florida	1945 (Smith 1954)
U.S. Virgin Islands	1982 (Torres 1989)
British Virgin Islands	1991 (Snelling 1993)
Guadeloupe	≤1994 (Jaffe & Lattke 1994)
+Barbuda	2007 (J. K. Wetterer, MCZ): Two Foot Bay
+Nevis	2007 (J. K. Wetterer, MCZ): Key Beach
+St. Kitts	2007 (J. K. Wetterer, MCZ): White Bay

+ = No previously published records. MCZ = Museum of Comparative Zoology. * = Considered a separate species by Mayhé-Nunes & Brandão (2007).

from mainland Florida (see Results). Given the enormous amount of ant collecting that has been conducted on mainland Florida, it is clear that *T. jamaicensis* must be very uncommon here. I believe that the late first record of *T. jamaicensis* in Florida simply reflects this rarity.

I believe that Wittenborn & Jeschke (2011) were wrong in classifying *T. jamaicensis* as exotic to North America. In addition, Wittenborn & Jeschke (2011) appear to have misclassified as exotics a number of other ant species that are actually native to North America. For example, Wittenborn & Jeschke (2011) classified *Gnamp-togenys hartmani* (Wheeler), a rarely encountered predator of fungus-growing ants, as exotic in North America. Yet this species has an apparently continuous native range from South America, through Central America, and into Mexico, Texas, and Louisiana and gives no indication of being exotic to North America (Wetterer 2014). Wittenborn & Jeschke (2011) even classified *Leptogenys manni* Wheeler, a species endemic to Florida (Trager & Johnson 1988), as an exotic species in North America. Incorrectly categorizing native as exotic species certainly weakens Wittenborn & Jeschke's (2011) analyses. Unfortunately, there is also some danger that if unique native species, such as *T. jamaicensis*, *G. hartmani*, and *L. manni*, are erroneously considered to be exotic, they may be treated as such and exterminated, rather than valued and protected. Based on the scarcity of records of *T. jamaicensis* in Florida, the Florida Committee on Rare Endangered Plants and Animals (FCREPA) officially designated *T. jamaicensis* as rare species (Deyrup 1994; Mazzotti & Hudson Kelley 2001; Rabeling et al. 2007).

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