

Geographic distribution of *Labidus coecus* (Latr.) (Hymenoptera, Formicidae), a subterranean army ant

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Abstract

Labidus coecus (Latreille) (Hymenoptera, Formicidae) is a New World subterranean army ant with an extensive geographic range. We compiled and mapped >650 site records for *L. coecus*, documenting the earliest known report for 27 geographic areas (countries, US states, and major West Indian islands), including three for which there are no previously published records: Margarita, Tobago, and Trinidad. With the new records, *L. coecus* has now been reported from 20 countries in Central and South America (all except Chile), three West Indian islands (Margarita, Trinidad, and Tobago), and four US states (Arkansas, Louisiana, Oklahoma, and Texas). The range of *L. coecus* appears to be essentially continuous, from Buenos Aires, Argentina in the south (~34.6°S) to Delaware County, Oklahoma in the north (~36.6°N). The three West Indian islands with *L. coecus* populations are all continental shelf islands that were connected to South America during periods of lower sea levels a few thousand years ago, so *L. coecus* populations on these islands have only recently become isolated. *Labidus coecus* commonly nests in caves, a microhabitat that may allow it to live in regions with otherwise inhospitable climates. Although recent papers listed *L. coecus* as an exotic species in North America, we found no evidence that *L. coecus* is exotic to any part of its known range.

Keywords

Biogeography, Ecitoninae, exotic species, geographic range, native range

Introduction

Labidus coecus (Latreille) (Hymenoptera, Formicidae) is a widespread New World subterranean army ant. Longino (2007) wrote that *L. coecus*: “is one of the most remarkable of all army ant species. It has an extremely broad ecological tolerance. It occurs across a great latitudinal range, from the equator to the subtropics of both North and South America. It occurs in dry forest and wet forest, in primary forest and in second growth, in coffee farms and pastures, and in suburban yards. It occurs from sea level to high montane regions. The highest ant record I have for Costa Rica, a collection at 3000 m near Villa Mills, is *Labidus coecus*. The species is almost entirely subterranean, sometimes at considerable depth... In the study of army ants, most of the attention has focused on the large epigaeus species in the genus *Eciton*. But the highest density and most ecologically important army ants may turn out to be *L. coecus*.” Crawley (1916) noted this underappreciation, writing that *L. coecus* in Guyana is “a common species, but owing to its habit of burrowing beneath the surface of the soil it is not frequently observed.”

Smith (1965) wrote that *L. coecus*: “is a native and widely distributed species, ranging from Oklahoma and Arkansas to Texas and Louisiana, and south to Argentina.” Recently, however, Wittenborn and Jeschke (2011) included *L. coecus* on their list of exotic ant species established in North America. Here, we examine the biogeography of *L. coecus*. We were particularly interested in evaluating evidence concerning whether or not *L. coecus* has established any exotic populations in North America or elsewhere.

Taxonomy

Latreille (1802) described *Formica coeca* (= *L. coecus*) from Central America. Junior synonyms of *L. coecus* include *Formica omnivora* Olivier, *Labidus latreillii* Jurine, *Labidus latreillii jurine* Shuckard, *Labidus servillei* Westwood, *Mutilla fulvescens* Blanchard, *Labidus saji* Haldeman, *Labidus panzeri* Smith, *Labidus atriceps* Smith, *Labidus pilosus* Smith, *Eciton vastator* Smith, *Eciton erratica* Smith, *Myrmica rubra* Buckley, *Pseudodichthadia incerta* André, *Eciton smithi* Dalla Torre, *Eciton coecum kulowi* Forel, *Eciton coecum biloba* Emery, *Eciton nigrita* Emery, *Eciton selysi* Forel, *Eciton grassator* Forel, *Eciton coecum servillei hostilis* Santschi, *Eciton coecum opacifrons* Wheeler, *Eciton coecum elsbethae* Forel, and *Eciton serpentis* Weber.

Material and methods

Using published and unpublished records, we documented the known range of *L. coecus*. We obtained unpublished site records from museum specimens in the collections of Louisiana State Arthropod Museum (LSAM); the Museum of Comparative Zoology (MCZ), and the Smithsonian Institution (SI). We obtained unpublished site

records of *L. coecus* from C. Sanabria (Colombia), A.J. Pérez-Sánchez (Margarita), and E. Mendoza (El Salvador). In addition, we used on-line databases with collection information on specimens by the Field Museum, Antweb (www.antweb.org), and the Global Biodiversity Information Facility (www.gbif.org). JKW collected *L. coecus* in Tobago and El Salvador.

We obtained geo-coordinates for collection sites from published references, specimen labels, maps, or geography web sites (e.g., earth.google.com, www.tageo.com, and www.fallingrain.com). Published records usually included collection dates. 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, Forel (1899a) reported *L. coecus* from Colombia collected by Princess Theresa of Bavaria, who took part in a scientific expedition to South America in 1898.

Results

We compiled and mapped >650 site records (Fig. 1), documenting the earliest known record for 27 geographic areas (countries, US states, and major West Indian islands), including three for which there are no previously published records: Margarita, Tobago, and Trinidad (Table 1).

In the US, the vast majority of *L. coecus* records came from Texas. O'Keefe et al. (2000) listed records of *L. coecus* from 67 counties in Texas. We found records from six additional counties in Texas, primarily from caves: Burnet, Coryell, Medina, Menard, Montague, and Val Verde (Reddell and Cokendolpher 2001, Calixto 2008, Cokendolpher et al. 2009, antweb).

Watkins (1976) included a distribution map for *L. coecus* showing continuous range from Buenos Aires, Argentina to Oklahoma, Arkansas, and Louisiana with gaps around Uruguay and (inexplicably) Nicaragua.

We found no published site records for *L. coecus* in Oklahoma. Smith (1935) wrote that in Oklahoma, *L. coecus* "may range into the extreme southern part of the state." Later, Smith (1947) listed *L. coecus* as occurring in Louisiana, Oklahoma, and Texas, but gave no site information. Smith (1965, 1979) then listed *L. coecus* from Arkansas, Louisiana, Oklahoma, and Texas. We found only one *L. coecus* specimen from Oklahoma, collected at a black light in Delaware County (1971; C. M. Smith; LSAM).

We found no specific site records for *L. coecus* in Uruguay. Fernández and Sendoya (2004) listed *L. coecus* in Uruguay citing Borgmeier (1955), Watkins (1976), and Palacio (1999) as their source of information on this species, but none of these references recorded *L. coecus* in Uruguay. Zolessi et al. (1989) did not include *L. coecus* in their summary of the ants of Uruguay. Nonetheless, we mapped the Uruguay record to Artigas in northern Uruguay, near records in southern Brazil. It seems almost certain that *L. coecus* does occur in Uruguay, given its presence in surrounding parts of Brazil and Argentina.

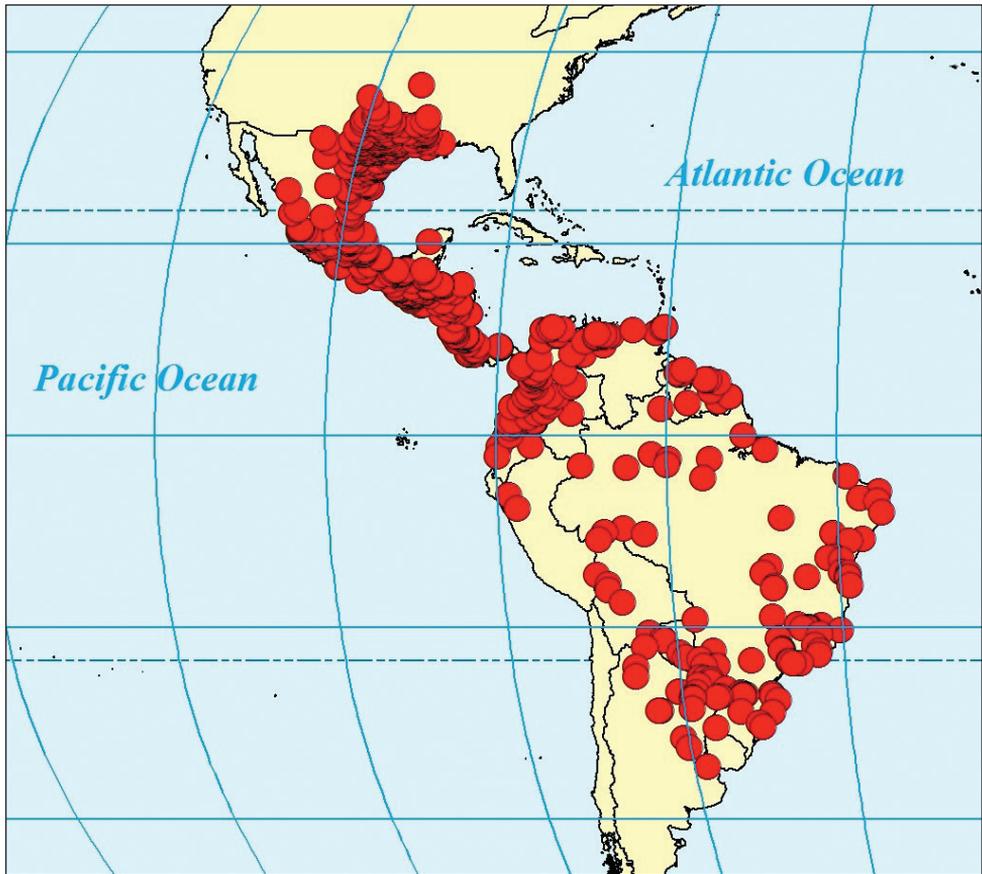


Figure 1. Site records of *Labidus coecus*.

Problematic records

Antbase coded one *L. coecus* record as from Espiritu Santo, Vanuatu, but the specimen was actually from Espiritu Santo, Brazil. Antbase previously listed a record of *L. coecus* from New Mexico, but this turned out to be a misidentification (C. Moreau, pers. comm.).

Discussion

Labidus coecus has now been reported from 27 geographic areas, including 20 countries in Central and South America (all except Chile), three West Indian islands (Margarita, Tobago, and Trinidad), and four US states (Arkansas, Louisiana, Oklahoma, and Texas). The range of *L. coecus* appears to be essentially continuous, from Buenos Aires, Argentina ($\sim 34.6^{\circ}\text{S}$; Borgmeier 1955) in the south to Delaware County, Oklahoma ($\sim 36.6^{\circ}\text{N}$; see Results) in the north. The three West Indian islands with *L. coecus* populations are all continental shelf islands that were connected to South America during

Table 1. Earliest known records for *Labidus coecus*. + = no previously published records. FM = Field Museum; UWI = University of the West Indies (Trinidad); MCZ = Museum of Comparative Zoology.

	Earliest record
French Guiana	≤1791 (Olivier 1791 as <i>Formica omnivora</i>)
Central America	≤1802 (Latreille 1802)
Surinam	≤1807 (Jurine 1807 as <i>Labidus latreillii</i>)
Brazil	1830 (Westwood 1842 as <i>Labidus servillei</i>)
Guyana	≤1840 (Shuckard 1840 as <i>Labidus jurinii</i>)
Texas	≤1852 (Haldeman 1852 as <i>Labidus saji</i>)
Colombia	≤1859 (Smith 1859 as <i>Labidus panzeri</i>)
Guatemala	1878–1883 (Forel 1899b)
Mexico	≤1885 (André 1885 as <i>Pseudodichthadia incerta</i>)
Costa Rica	1889 (Emery 1890)
Venezuela	≤1890 (Emery 1890)
Belize	1870-1890 (Forel 1899b)
Paraguay	≤1894 (Emery 1894)
Nicaragua	≤1899 (Forel 1899b)
Panama	≤1899 (Forel 1899b)
Argentina	1898–1900 (Emery 1906)
Ecuador	≤1901 (Emery 1901 as <i>Eciton coecum biloba</i>)
Bolivia	1911 (Mann 1916)
Honduras	1920 (Mann 1922)
+Trinidad	1924 (AE Emerson, FM): Blue Basin
Louisiana	≤1947 (Smith 1947)
Oklahoma	≤1947 (Smith 1947)
Peru	≤1955 (Borgmeier 1955)
El Salvador	≤1957 (Berry and Salazar 1957)
Arkansas	≤1965 (Smith 1965)
+Tobago	1993 (SK Starr, UWI): Charlotteville
Uruguay	≤2004 (Fernández and Sendoya 2004)
+Margarita	2008 (AJ Pérez-Sánchez, pers. comm.): Cerro Macanao

periods of lower sea levels a few thousand years ago, so *L. coecus* populations on these islands have only recently become isolated. *Labidus coecus* has been recorded from numerous caves in Texas (53), Mexico (4), Venezuela (1), and Peru (1) (Kempf 1961, Reddell and Cokendolpher 2001, Cokendolpher et al. 2009). The more stable microclimate of caves may allow *L. coecus* to extend its range into regions with otherwise inhospitable climates. Given its extremely broad ecological tolerance, it is unclear why *L. coecus* populations in the southeast US are not known east of Louisiana, when there would appear to be suitable habitat for this species below 31°N all along the Gulf coast of Alabama and Mississippi and into Florida.

Wittenborn and Jeschke (2011) included *L. coecus* in a list of 93 exotic ant species established in North America. The populations of *L. coecus*, however, appear to be continuously distributed from Argentina to the southern US. We know of no evidence

that even suggests that *L. coecus* has any exotic populations. In addition to *L. coecus*, Wittenborn and Jeschke (2011) appear to have misclassified as exotics numerous other ant species that are actually native to North America. For example, *Gnamptogenys hartmani* (Wheeler), *Leptogenys elongata* (Buckley), and *Pachycondyla harpax* (Fabricius) all have distributions in the southern US that appear to be the northern end of continuous native ranges and give no indication that these species are exotic to North America. Other species that Wittenborn and Jeschke (2011) most likely misclassified as exotics include *Cephalotes varians* (Smith), a widespread arboreal species known from Cuba, the Bahamas, and Florida (de Andrade and Baroni Urbani 1999) and *Leptogenys manni* (Wheeler), a species endemic to Florida (Trager and Johnson 1988). For more than 20 additional ant species, Wittenborn and Jeschke's (2011) classification as exotic in North America is questionable. It seems hazardous research protocol to list species as exotic without documenting the source of this classification. In addition, there is some danger that if native species are erroneously considered to be exotics, they may be treated as such and exterminated, rather than valued and protected.

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