



## RESEARCH ARTICLE - ANTS

## Geographic range of *Pachycondyla harpax* (Fabricius) (Hymenoptera: Formicidae)

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### Abstract

*Pachycondyla harpax* (Fabricius) is a widespread and conspicuous New World ponerine ant (subfamily Ponerinae). To examine the geographic distribution of *P. harpax*, I compiled and mapped published and unpublished specimen records from >1600 sites. I documented the earliest known *P. harpax* records for 28 geographic areas (countries, West Indian islands, and US states), including four for which I found no previously published records: the islands of Guadeloupe, Margarita, and Tobago and the US state of Georgia. *Pachycondyla harpax* has been recorded from every country in South and Central America except Chile and Uruguay. *Pachycondyla harpax* is also now known from six West Indian islands: Grenada, Guadeloupe, Jamaica, Margarita, Trinidad, and Tobago. The known continental range of *P. harpax* appears to be essentially continuous, extending from Rio Grande do Sul, Brazil in the south (31.8°S) to Wood County, Texas in the north (32.8°N), including the continental islands of Margarita, Tobago, and Trinidad. Isolated island populations of *P. harpax* on Grenada, Guadeloupe, and Jamaica may be exotic, introduced through human commerce. In the US, it is unclear why *P. harpax* populations are only known from Texas, Louisiana, and Georgia, when there would appear to be suitable habitat for this species all along the Gulf coast of Alabama, Mississippi, and Florida.

### Introduction

Ponerine ants (subfamily Ponerinae) include >1000 species (Bolton 2015), many of which are well known for their potent sting. For example, *Brachyponera sennaarensis* (Mayr) (formerly *Pachycondyla sennaarensis*) is a widespread species of sub-Saharan Africa and the Middle East that is well known for its powerful sting, which sometimes leads to anaphylactic shock in humans and even death (Wetterer, 2013). *Brachyponera chinensis* (Emery) (formerly *Pachycondyla chinensis*) is an East Asian species now spreading through the eastern US that has a painful sting that can also induce severe allergic reaction (Guénard & Dunn, 2010). Here, I examine the geographic range of the ponerine ant *Pachycondyla harpax* (Fabricius). Wittenborn and Jeschke (2011) included *P. harpax* on a list of exotic ant species established in North America. Based on Wittenborn and Jeschke (2011), Miravete et al. (2013; now retracted) listed *P. harpax* as Neotropical species from South

America that is an introduced and established exotic species in the US.

*Pachycondyla harpax* is a large (up to 10 mm in length), conspicuous New World ponerine ant (Fig 1). *Pachycondyla harpax* has an exceptionally broad geographic range in South, Central, and North America (Wheeler, 1900) and occupies a great diversity of natural and disturbed environments. Mackay and Mackay (2010) wrote that *P. harpax* is “found in a wide variety of habitats, ranging from dry forest, late dry season gap forest, urban environments, parks, grassy areas, coffee, cacao and banana plantations, cypress swamps, to oak forests, oak riparian forests, rocky wet quebradas, arid scrub, palm thorn forests, tropical deciduous forests, tropical evergreen forests, second growth tropical forests, transitional bamboo/cloud forest, old growth dry tropical forest, steep rocky forest slopes, ridge forest, wet mountain forests, riparian rain forest, montane evergreen forest, lowland forests, cloud forest and riparian tropical rain forests.” Longino (2001) wrote: “I have



never found a nest of this common species. The nest must be subterranean. If they nested in the leaf litter or in dead wood, nests would be more frequently encountered.”

#### *Taxonomy and identification*



**Fig 1.** *Pachycondyla harpax*. a) head and b) lateral view of worker from Costa Rica (CASENTO249149; P.S. Ward leg.; photos by R. Perry from antweb.org).

Fabricius (1804) described *Formica harpax* (= *P. harpax*) from South America. Junior synonym include *Pachycondyla harpax concinna* Wheeler (from Bolivia, Brazil, and Peru), *Pachycondyla harpax dibullana* Forel (from Colombia), *Pachycondyla harpax irina* Wheeler (from Colombia, Costa Rica, Guatemala, Guyana, and Peru), *Pachycondyla montezumia* Smith (from Mexico), *Pomera amplinoda* Buckley (from Texas), and *Pachycondyla orizabana* Norton (from Mexico) (see Brown, 1950). Mackay and Mackay (2010) wrote that the *P. harpax*: “worker can be separated from most other species in the genus, as it lacks the malar carina, the eye is small but is located less than one maximum diameter from the anterior edge of the head. The pronotal carina is poorly developed but forms a shiny raised line (usually), the metanotal suture

is absent on the dorsum of the meso soma and the petiole is rectangular shaped with a distinct dorsal face and the posterior lateral margin forms a sharp carina, which is barely evident as it passes to the anterior edge of the petiole.” Brown (1950) suggested that *P. harpax* may actually be a species complex rather than a single species.

Schmidt (2013) determined that the genus *Pachycondyla*, as formerly constituted, was polyphyletic. In Schmidt and Shattuck’s (2014) revision, however, *P. harpax* remained in the genus *Pachycondyla* along with ten other species.

#### **Methods**

Using published and unpublished records, I documented the worldwide range of *P. harpax*. I obtained unpublished site records from museum specimens in the collections of the Museum of Comparative Zoology (MCZ) and the Smithsonian Institution (SI). In addition, I used on-line databases with collection information on specimens by Antweb ([www.antweb.org](http://www.antweb.org)), and the Global Biodiversity Information Facility ([www.gbif.org](http://www.gbif.org)). I received unpublished collection information of *P. harpax* records from C. Alatorre-Bracamontes (Mexico) and E. Mendoza (El Salvador). Finally, I collected *P. harpax* specimens from Costa Rica, El Salvador, Guadeloupe, Margarita, Trinidad, and Tobago.

I obtained geo-coordinates for collection sites from published references, specimen labels, maps, or geography web sites (e.g., [earth.google.com](http://earth.google.com), [www.tageo.com](http://www.tageo.com), and [www.fallingrain.com](http://www.fallingrain.com)). If a site record listed a geographic region rather than a “point locale,” and I had no other record for this region, I used the coordinates of the capital or largest town within the region or, in the case of small islands and natural areas, the center of the region. Published records usually included collection dates, but when this was not the case, I was sometimes able to determine the approximate date based on information on the collector’s travel dates or limit the date by the collector’s date of death. For example, Nils Holmgren visited in Peru and Bolivia in 1904-1905, thus bracketing the date he collected *P. harpax* specimens examined by Wheeler (1925). Henry T. Vanderford (1901-1990), who collected the only known *P. harpax* specimen from Georgia (identification confirmed by S.P. Cover), worked for the Georgia Department of Agriculture until at least 1967 (Williams, 1986).

#### **Results**

I compiled and mapped published and unpublished specimen records from >1600 sites. I documented the earliest known *P. harpax* records for 28 geographic areas (countries, West Indian islands, and US states), including four for which I found no previously published records: the islands of Guadeloupe, Margarita, and Tobago and the state of Georgia.

*Pachycondyla harpax* has been recorded from every

country in South and Central America except Chile and Uruguay (Table 1). *Pachycondyla harpax* is also now known from six West Indian islands: Grenada, Guadeloupe, Jamaica, Margarita, Trinidad, and Tobago (Table 2).

Most records of *P. harpax* come from intact forest

**Table 1.** Earliest known records for *Pachycondyla harpax* in South, Central, and North America. += no previously published records. MCZ = Museum of Comparative Zoology. SI = Smithsonian Institution.

South America	≤1804 (Fabricius, 1804)
Mexico	≤1858 (Smith, 1858 as <i>P. montezumia</i> )
Texas	≤1866 (Buckley, 1866 as <i>Pomera amplinoda</i> )
Colombia	≤1870 (Mayr, 1870)
Guatemala	≤1883 (Forel, 1899)
Venezuela	1887-1888 (Emery, 1890a)
Costa Rica	1889 (Emery, 1890b)
Bolivia	1885-1893 (Emery, 1894)
Brazil	≤1895 (Forel, 1895)
Guyana	≤1895 (Forel, 1895)
Paraguay	≤1895 (Forel, 1895)
Nicaragua	≤1899 (Forel, 1899)
Peru	1904-1905 (Wheeler, 1925 as <i>P. harpax irina</i> & <i>P. harpax concinna</i> )
Belize	1905-1906 (Wheeler, 1907)
Panama	1911 (W.M. Wheeler, MCZ): Ancón
Louisiana	1913 (J.R. Horton, SI): Nairn
Honduras	1920 (Mann, 1922)
Ecuador	1922 (F.X. Williams, SI): Baños
El Salvador	1959 (N. Krauss, SI): Santa Ana
Surinam	1959 (Kempf, 1961)
Argentina	≤1978 (Kusnezov, 1978)
+Georgia	≤1990 (H.T. Vanderford, SI): Eastman
French Guiana	1996 (G.D. Alpert & M. Moffett, MCZ): Paracou Forest

**Table 2.** Earliest known records for *Pachycondyla harpax* on West Indian islands.

Jamaica	1909 (Wheeler, 1911)
Grenada	1912-1913 (R. Thaxter, MCZ): Grand Etang
Trinidad	1913 (Wheeler, 1916)
+Tobago	2003 (J.K. Wetterer, MCZ): Gilpin Trace
+Guadeloupe	2008 (J.K. Wetterer, MCZ): Carbet Falls Road
+Margarita	2010 (J.K. Wetterer, MCZ): SE of San Sebastian

habitats. In 2015, antweb.org recorded that *P. harpax* was “found most commonly in these habitats: 382 times found in mature wet forest, 169 times found in tropical moist forest, 152 times found in tropical rainforest, 120 times found in tropical wet forest, 106 times found in secondary lowland rainforest, 106 times found in lowland wet forest, 104 times found in montane wet forest, 77 times found in secondary wet forest, 51 times found in lowland rainforest, 50 times found in mesophil forest.”

I have collected *P. harpax* at 42 sites, 39 of which came from inland forest sites on West Indian islands: Guadeloupe (4), Margarita (1), Tobago (10), and Trinidad (24). The three others came from Central America: Costa Rica (beach vegetation in Tortuguero National Park) and El Salvador (two gardens in urban San Salvador).

## Discussion

Wheeler (1900) wrote that *P. harpax* ranged from “Texas through Mexico, Central America and Brazil to Bolivia and Paraguay.” More recent records extend that range to include Louisiana and Georgia in the north, Argentina in the south, plus several West Indian islands (Table 1). The native continental range of *P. harpax* appears to be essentially continuous from Rio Grande do Sul, Brazil (31.8°S) in the south to Wood County, Texas (32.8°N) in the north (Fig 2). Although there are numerous apparent gaps in this continental range (e.g., in central Brazil), it is likely that much of this is an artifact of insufficient sampling. It is unclear why *P. harpax* populations in the US are only known from Texas, Louisiana, and Georgia 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.

Populations of *P. harpax* on the West Indian islands of Margarita, Trinidad, and Tobago represent part of the continuous continental range because these are continental islands that were connected to South America when sea levels were >100 m lower 15,000-30,000 years ago (Lambeck et al., 2014). The West Indian islands of Grenada, Guadeloupe, and Jamaica, however, have never been connected to the adjacent continent. It is unclear how *P. harpax* population came to colonize Grenada, Guadeloupe, and Jamaica. It is possible that the populations of *P. harpax* on these islands are exotic, introduced through human commerce. On all three islands, however, *P. harpax* was collected almost exclusively in intact native forest, an atypical locale for an exotic species. Genetic analyses could be useful in determining whether *P. harpax* is native or exotic on Grenada, Guadeloupe, and Jamaica.

I found no evidence indicating that *P. harpax* is exotic to continental North America. In addition to *P. harpax*, Wittenborn and Jeschke (2011) appear to have misclassified numerous other ant species as exotics to North America that are actually natives. For example, *Gnamptogenys hartmani* (Wheeler), *Labidus coecus* (Latreille), and *Leptogenys elongata* (Buckley), all have distributions in the southern US that appear



Fig 2. Geographic distribution of *Pachycondyla harpax* records.

to be the northern end of continuous native ranges and give no indication of being exotic to North America. Other species that Wittenborn and Jeschke (2011) most likely misclassified as exotics include *Cephalotes varians* (Smith), a widespread arboreal species in Cuba, the Bahamas, and Florida (Andrade & Baroni Urbani, 1999) and *Leptogenys manni* (Wheeler), a species endemic to Florida (Trager & Johnson, 1988). Mark Deyrup (pers. comm.), who has encyclopedic knowledge of the ants of Florida, confirmed that he knows of no reason why these two species would be that considered exotic in Florida (the only US state where they occur). Regrettably, Wittenborn and Jeschke (2011) did not provide evidence to support their classification. There is some danger that if native US species, such as *P. harpax*, are erroneously considered to be invasive exotic species, they may be treated as such and exterminated, rather than valued and protected.

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