

# Geographic distribution of *Leptogenys elongata* (Buckley) and *Leptogenys manni* Wheeler (Hymenoptera, Formicidae, Ponerinae)

James K. Wetterer<sup>1</sup>

<sup>1</sup> Wilkes Honors College, Florida Atlantic University, 5353 Parkside Drive, Jupiter, Florida 33458 USA

Corresponding author: James K. Wetterer ([wetterer@fau.edu](mailto:wetterer@fau.edu))

---

Academic editor: J. Neff | Received 13 September 2015 | Accepted 22 September 2015 | Published 30 November 2015

<http://zoobank.org/F14DCA4B-322D-4CDF-A0DD-33F8CFD03076>

---

**Citation:** Wetterer JK (2015) Geographic distribution of *Leptogenys elongata* (Buckley) and *Leptogenys manni* Wheeler (Hymenoptera, Formicidae, Ponerinae). Journal of Hymenoptera Research 46: 127–136. doi: 10.3897/JHR.46.6555

---

## Abstract

*Leptogenys elongata* and *Leptogenys manni* (Hymenoptera, Formicidae, Ponerinae), the only described *Lep-togenys* known from the continental US, were recently included on a list of exotic ants established in North America. To evaluate this possibility, I compiled and mapped published and unpublished specimen records of *L. elongata* and *L. manni*. *Leptogenys elongata* records have an essentially continuous distribution through central and eastern Texas (65 counties), southern Oklahoma (one county), and western Louisiana (eight parishes), south through much of Mexico (nine states), plus one questionable record from Colorado and one almost certainly erroneous record from the District of Columbia. *Leptogenys manni* records are known from much of Florida (22 counties), plus one isolated record from Georgia that needs corroboration. I found no credible evidence that *L. elongata* or *L. manni* have established populations anywhere beyond their native ranges.

## Keywords

Biogeography, exotic species, geographic range, native range

## Introduction

More than forty ant species have well-established populations in multiple areas of both the Old World and the New World, spread through human commerce (Wetterer 2015). In earlier papers, I have reviewed the worldwide spread of many of these cosmopolitan ant species, including some that have become major global pests, incurring great ecological and economic damage, e.g., *Anoplolepis gracilipes* (Smith), *Linepithema humile* (Mayr), *Pheidole megacephala* (Fabricius), *Solenopsis geminata* (Fabricius), *Solenopsis invicta* Buren, and *Wasmannia auropunctata* (Roger) (Wetterer 2005, 2011, 2012, 2013a, b, Wetterer et al. 2009).

Recently, Wittenborn and Jeschke (2011) investigated characteristics of exotic ant species by comparing species that they classified as native to North America with those they classified as exotic. Two species that Wittenborn and Jeschke (2011; supplementary material) considered exotic in North America were *Leptogenys elongata* (Buckley) and *Leptogenys manni* Wheeler. Of the 307 described *Leptogenys* species (Bolton 2015), *L. elongata* and *L. manni* are the only ones known from the continental US. Both *L. elongata* and *L. manni* appear to be specialist predators of terrestrial isopods (Wheeler 1904, Trager and Johnson 1988). Here, I examine the geographic ranges of *L. elongata* and *L. manni* and evaluate evidence concerning whether these species have any exotic populations in North America or elsewhere.

When a cosmopolitan ant species occurs in both the Old World and the New World, it is almost always clear that one of these ranges is entirely exotic. Within a species' native hemisphere, however, it can be difficult to determine what geographic area constitutes the native range and what area, if any, constitutes the exotic range. 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 1) older records largely confined to a single continuous region, 2) occurrence in inland native communities, and 3) proximity to the ranges of closely related species. In contrast, evidence indicative of a species' exotic range includes 1) sudden appearance and spread of the species through an area discontinuous with other known populations, 2) occurrence exclusively in coastal and highly disturbed environments, and 3) geographic isolation from closely related species.

## Taxonomy

Buckley (1866) described *Ponera elongata* (= *L. elongata*) from near Austin, Texas. Wheeler (1902) designated *Ponera texana* Buckley (described from Archer County, Texas) and *Lobopelta septentrionalis* Mayr (described from "Districte Columbia") as junior synonyms of *L. elongata*. Latke (2011) designated *Leptogenys mexicana* Mayr (described from Mexico) as a junior synonym of *L. elongata*.

Wheeler (1923) described *Leptogenys elongata manni* (= *Leptogenys manni*) from Florida. Trager and Johnson (1988) raised *L. manni* to full species status.

Lattke (2011) placed *Leptogenys elongata* and *Leptogenys manni* in the *elongata* species group, along with nine other species (including seven new species), all known from Central America, and two with ranges extending into Colombia: *Leptogenys bifida* Lattke (known from Honduras), *Leptogenys chamela* Lattke (known from Jalisco, Mexico), *Leptogenys foraminosa* Lattke (known from Costa Rica, Panama, and Colombia), *Leptogenys honduriana* Mann (known from Honduras), *Leptogenys oaxaca* Lattke (known from Oaxaca, Mexico), *Leptogenys peninsularis* Mann (known from Baja California, Mexico), *Leptogenys sianka* Lattke (known from Veracruz, Chiapas, and Quintana Roo, Mexico), *Leptogenys sonora* Lattke (known from Sonora, Mexico), and *Leptogenys volcanica* Lattke (known from Costa Rica, Panama, and Colombia).

## Materials and methods

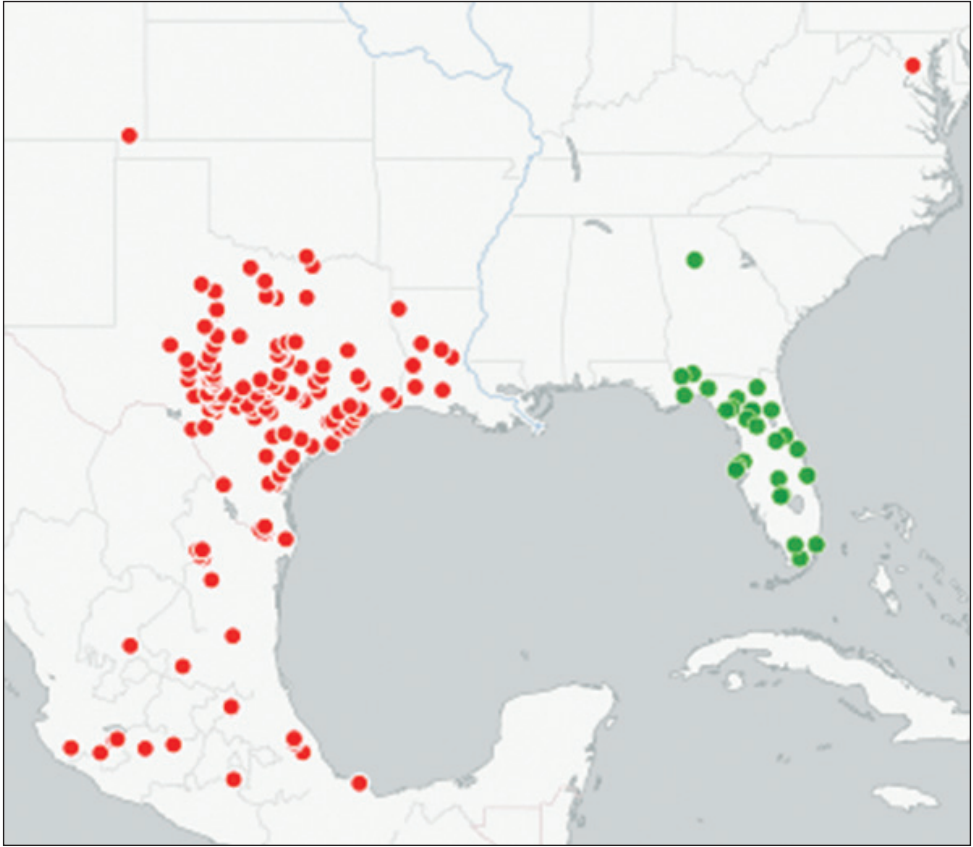
Using published and unpublished records, I documented the known ranges of *Leptogenys elongata* and *Leptogenys manni*. I obtained unpublished site records from museum specimens in the collections of the Archbold Biological Station (ABS), the Museum of Comparative Zoology (MCZ), and the Smithsonian Institution (SI). In addition, I used on-line databases with collection information on specimens by Antweb ([www.antweb.org](http://www.antweb.org)). 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) and [www.tageo.com](http://www.tageo.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 largest town within the region or, in the case of small islands and natural areas, the center of the region. In the only exception, I mapped Deyrup et al.’s (1989) record of *L. manni* from Monroe County, Florida to a site in northeastern part of the mainland part of the county rather than the largest town (Key West) because Trager and Johnson (1988) and others wrote that *L. manni* is not known from the Florida Keys.

I was unable to map individually many records of *L. elongata* from caves because the site locations are kept secret to avoid vandalism. For example, Reddell and Cokendolpher (2001) and Cokendolpher et al. (2009) listed records of *L. elongata* from seven caves in Bexar County, Texas, including two caves on Camp Bullis Military Training Reservation; I included all these records as just a single site record, mapped near the center of Camp Bullis.

## Results

In total, I mapped 139 site records of *Leptogenys elongata* (including 106 from Texas) and 27 site records of *Leptogenys manni* (all but one from Florida) (Fig. 1; Table 1).



**Figure 1.** Site records of *Leptogenys elongata* (red) and *Leptogenys manni* (green).

Sites records of *L. elongata* in Texas came from 65 counties: Archer, Bandera, Bastrop, Bell, Bexar, Blanco, Brazoria, Brazos, Brown, Burleson, Burnet, Calhoun, Cameron, Comal, Concho, Coryell, Dallas, DeWitt, Edwards, Fayette, Fort Bend, Galveston, Gillespie, Grayson, Guadalupe, Harris, Hays, Hidalgo, Houston, Irion, Jack, Jefferson, Jones, Karnes, Kendall, Kerr, Kimble, Kinney, Kleberg, Liberty, Live Oak, Matagorda, McLennan, Menard, Milam, Nueces, Palo Pinto, Parker, Real, Refugio, Robertson, Runnels, San Jacinto, San Patricio, Schleicher, Stonewall, Sutton, Taylor, Travis, Uvalde, Victoria, Washington, Webb, Wharton, and Williamson (Buckley 1866, O’Keefe et al. 2000, Reddell and Cokendolpher 2001, Calixto Sanchez 2008, Cokendolpher et al. 2009, Lattke 2011, antweb). The northernmost Texas records came from Archer County and Grayson County (both  $\sim 33.6^{\circ}\text{N}$ ; Buckley 1866, O’Keefe et al. 2000). The westernmost Texas record came from Irion County ( $\sim 101.2^{\circ}\text{W}$ ; Cokendolpher and Francke 1990).

The eight site records of *L. elongata* in Louisiana came from eight different parishes: Acadia, Avoyelles, Beauregard, Caddo, Calcasieu, Natchitoches, Rapides, and

**Table 1.** Earliest known records for *Leptogenys elongata* and *Leptogenys manni* in the US and Mexican states. \* = probably erroneous. Site information given for unpublished records.

<i>Leptogenys elongata</i>	Earliest record
Texas	≤1866 (Buckley 1866)
Mexico	≤1870 (Mayr 1870 as <i>Lobopelta mexicana</i> )
Washington DC*	≤1886 (Mayr 1886 as <i>Lobopelta septentrionalis</i> )
Colorado*	≤1894 (Emery 1894 as <i>Leptogenys septentrionalis</i> )
Louisiana	1908 (collector unknown, Smithsonian Institution): Marksville
Veracruz	1941 (Lattke 2011)
Michoacán	1952 (Lattke 2011)
Tamaulipas	1964 (Lattke 2011)
Hidalgo	1965 (Lattke 2011)
Jalisco	1966 (Lattke 2011)
Nuevo León	1972 (R.E. Gregg, antweb): Horsetail Falls
San Luis Potosí	≤2005 (Vásquez-Bolaños 2005)
Morelos	≤2007 (Quiroz-Robledo and Valenzuela-González 2007 as <i>L. mexicana</i> )
Zacatecas	≤2007 (Navarrete-Heredia et al. 2007)
Oklahoma	2014 (K. Roeder, J. Trager, pers. comm.): Kingston
<i>Leptogenys manni</i>	Earliest record
Florida	≤1908 (Wheeler 1908 as <i>Leptogenys elongata</i> )
Georgia	≤1947 (Smith 1947 as <i>Leptogenys elongata</i> )

Vernon (Dash 2004, Lattke 2011, antweb). The northernmost Louisiana record came from Shreveport in Caddo Parish (32.5°N; Lattke 2011). The easternmost Louisiana record came from Marksville in Avoyelles Parish (92.1°W; Lattke 2011).

James Trager (pers. comm.) provided one unpublished record of *L. elongata* from Marshall County in southernmost Oklahoma (33.9°N; Table 1).

The 22 site records of *L. elongata* in Mexico came from nine states (Table 1). The two southernmost Mexico record came from Los Tuxtlas, Veracruz (18.6°N; Quiroz Robledo and Valenzuela González 2003 as *L. mexicana*) and Ticuman, Morelos (18.7°N; Quiroz Robledo and Valenzuela González 2007 as *L. mexicana*). The westernmost Mexico record came from Atenquiqui in Jalisco state (103.5°W; Lattke 2011).

Two of the new species in the *elongata* group that Lattke (2011) described have distributions in Mexico that overlap with that of *L. elongata* (*L. sianka* in Veracruz and *L. chamela* in Jalisco). Lattke (2011) re-identified specimens reported as *L. mexicana* from Quintana Roo on the Yucatan Peninsula (Dejean et al. 1995; Dejean and Olmsted 1997) as *L. sianka*. Lattke (2011) confirmed species identification for 12 of the 22 Mexican *L. elongata* site records. It is possible that some Mexican specimens not examined by Lattke (2011) that are currently considered *L. elongata* are actually a different species in the *elongata* group.

The 26 site records of *L. manni* in Florida came from 22 counties: Alachua, Baker, Brevard, Columbia, Dixie, Gadsden, Gilchrist, Highlands, Indian River, Leon, Levy, Marion, Miami-Dade, Monroe, Orange, Pasco, Pinellas, Polk, Putnam, Taylor,

Volusia, and Wakulla (Deyrup et al. 1989, Lattke 2011, antweb, ABS collection). The northernmost Florida record came from Tall Timbers Research Station in Leon County (30.7°N; ABS). There is a single, isolated record of *L. manni* from Georgia (33.8°N; see below).

### Problematic records

There are three problematic reports of *L. elongata* (from Colorado, the District of Columbia, and Maryland). Creighton (1950) wrote: “Records for *elongata* have been reported from Colorado, the District of Columbia and Maryland. It is unlikely, but not impossible, that *elongata* occurs in southeastern Colorado. But records from the District of Columbia and Maryland seem plainly impossible.”

Wheeler (1908) reported *L. elongata* from Texas, Florida, Colorado, and Maryland, though Wheeler (1908) cited Pergande and Mayr for the Maryland record and therefore this must refer to Mayr’s (1886) record of Pergande’s specimens reportedly from the District of Columbia. Wheeler (1923) wrote that *L. elongata* “occurs in the Gulf States from Texas to Florida and north to Colorado and the District of Columbia.” Records of *L. elongata* from Florida were actually *L. manni* (see above), and it seems likely that published records of *L. elongata* from Colorado and the District of Columbia did not come from outdoor populations in these areas. Both southernmost Colorado (37.0°N) and the District of Columbia (38.9°N), have considerably higher latitudes (and much cooler climate) than the next highest latitude records for *L. elongata* (33.9°N, see above).

The single record of *L. elongata* from Colorado was based on specimens that Ezra T. Cresson collected (Emery 1894 as *L. septentrionalis*). Cresson made substantial collections of Hymenoptera in the Western US for the Academy of Natural Sciences of Philadelphia. Cresson collected in Colorado, but he also worked extensively in Texas (see Cresson 1872). Even though the validity of this record is questionable, I mapped it to Campo in southeastern Colorado.

The single record of *L. elongata* from the District of Columbia was based on specimens that Theodore Pergande collected (Mayr 1886 as *L. septentrionalis*). Pergande worked for the Federal Bureau of Entomology in Washington DC. All other ant specimen records I have found for Pergande from Washington DC were from inside houses and greenhouses (e.g., *Monomorium pharaonis*, *Paratrechina longicornis*, and *Tapinoma melanocephalum* in the Smithsonian collection). It is possible that the specimens Mayr (1886) reported came from a greenhouse. It seems more likely, however, that the specimens were mislabeled or their provenance was misunderstood. Pergande (1893, 1894, 1896) collected ants extensively in Mexico and Texas, which are more likely sources of his specimens. Lattke (2011) similarly concluded that this record was “an obvious error as the District of Columbia lies far beyond the range of *L. elongata*.”

Smith (1947) wrote that he saw specimens of *elongata* labeled “Stone Mt., Decatur, Georgia.” These specimens are at the Smithsonian and Lattke (2011) identified them

as *L. manni*. Lattke (2011) wrote: “The specimens labeled as from Georgia constitute a single series and lack a date, though the state of the label suggests the early 1900’s. *L. manni* is now known to range into northern Florida, but over 300 kilometers separate Decatur from the nearest *L. manni* collection sites in Florida. The Georgia locality is a possibility but needs corroboration.”

## Discussion

Trager and Johnson (1988) wrote that *Leptogenys elongata* occurs in “western Louisiana, Texas, and northeastern Mexico.” However Lattke’s (2011) designation of *Leptogenys mexicana* as a junior synonym of *L. elongata* extends the reported range of this species south into central Mexico (Fig 1). Despite the paucity of records, *L. elongata* appears to show an uninterrupted range across much of Texas (65 counties) into southernmost Oklahoma (one county), east to central Louisiana (eight parishes), and south through much of Mexico (nine states) (Fig. 1). This continuous range gives no indication that *L. elongata* is exotic to any part of this region. The one questionable record from Colorado could be an isolated northern extension of this native range, but seems more likely to be an error, and the one record of *L. elongata* from the District of Columbia is almost certainly an error. The relatively recent first records of *L. elongata* from some states in Mexico (Table 1) are likely to be due to the scarcity of specimens and the difficulty of distinguishing *L. elongata* from the 16 other *Leptogenys* species known from Mexico (Antweb 2015), including five other members of the *elongata* species group (*L. chamela*, *L. oaxaca*, *L. peninsularis*, *L. sianka*, and *L. sonora*), rather than recent expansion into parts of Mexico.

Trager and Johnson (1988) listed *Leptogenys manni* only from Florida and wrote that *L. manni* “must be added to the growing list of Florida’s endemic ants.” *Leptogenys manni* records are now known from much of Florida (22 counties), plus one isolated record from a natural area in central Georgia that could be based on a labeling error and needs confirmation.

*Leptogenys elongata* and *L. manni* are large, distinctive ants that have been rarely collected, perhaps due to largely subterranean habits. In fact, Reddell and Cokendolpher (2001) and Cokendolpher et al. (2009) found *L. elongata* relatively often when surveying caves in Texas. Trager and Johnson (1988) speculated: “in south Florida, *L. manni* may be entirely subterranean.” Virtually all records of *L. elongata* and *L. manni* come from relatively undisturbed natural areas, a character not normally indicative of an exotic species. In fact, I found no credible evidence that *L. elongata* or *L. manni* have established exotic populations beyond their native ranges. I conclude that Wittenborn and Jeschke (2011) were wrong in classifying *L. elongata* and *L. manni* as exotic to North America.

In documenting the ranges of other species on Wittenborn and Jeschke’s (2011) list of North American exotics, I have found that numerous other species also appear to be misclassified. For example, Wittenborn and Jeschke (2011) categorized *Gnamptogenys*

*hartmani* (Wheeler), *Labidus coecus* (Latreille), and *Pachycondyla harpax* (Fabricius) as exotics in North America, but all three species have apparently continuous ranges from South America, through Central America, and into Mexico and the southern US and give no indications of being exotic in any part of their ranges (Wetterer 2014, in press a, Wetterer and Snelling 2015). Similarly, *Cephalotes varians* (Smith), *Tapinoma litorale* Wheeler, *Temnothorax allardycei* (Mann), and *Trachymyrmex jamaicensis* (André), also on the list of exotics, appear to be native throughout their seemingly continuous ranges in the West Indies and southern Florida (Wetterer in press b, in prep.). It is unfortunate that native North American ant species wound up on Wittenborn and Jeschke's (2011) list of exotics. Exotic species are an important ecological problem around the world. In order to protect native species and minimize the negative impacts of exotic species, it is essential to distinguish which species are native and which are exotic.

## Acknowledgments

I thank M. Wetterer and J. Lattke for comments on this manuscript; M. Deyrup (ABS), S. Cover (MCZ), and T. Schultz (SI) for help with their respective ant collections; W. O'Brien for GIS help; 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.

## References

- Bolton B (2015) An online catalog of the ants of the world. <http://www.antcat.org/catalog/430052> [accessed 4 September 2015]
- Buckley SB (1866) Descriptions of new species of North American Formicidae. *Proceedings of the Entomological Society of Philadelphia* 6: 152–172.
- Calixto Sanchez AA (2008) Implications of relative ant abundance and diversity for the management of *Solenopsis invicta* Buren with broadcast baits. PhD Thesis. Texas A and M University, College Station.
- Cokendolpher JC, Francke OF (1990) The ants (Hymenoptera, Formicidae) of western Texas. Part II. Subfamilies Ectoninae, Ponerinae, Pseudomyrmecinae, Dolichoderinae, and Formicinae. *Special Publications, The Museum, Texas Tech University* 30: 1–76.
- Cokendolpher JC, Reddell JR, Taylor SJ, Krejca JK, Suarez AV, Pekins CE (2009) Further ants (Hymenoptera: Formicidae) from caves of Texas. *Texas Memorial Museum, Speleological Monographs* 5: 151–168.
- Creighton WS (1950) The ants of North America. *Bulletin of the Museum of Comparative Zoology* 104: 1–585.
- Cresson ET (1872) Hymenoptera Texana. *Transactions of the American Entomological Society* 4: 153–292. doi: 10.2307/25076272



- Dash ST (2004) Species diversity and biogeography of ants (Hymenoptera: Formicidae) in Louisiana, with notes on their ecology. M.S. thesis, Louisiana State Univ., 290 pp.
- Dejean A, Olmsted I (1997) Ecological studies on *Aechmea bracteata* (Swartz) (Bromeliaceae). *Journal of Natural History* 31: 1313–1334. doi: 10.1080/00222939700770741
- Dejean A, Olmsted I, Snelling RR (1995) Tree-epiphyte-ant relationships in the low inundated forest of Sian Ka'an Biosphere Reserve, Quintana Roo, Mexico. *Biotropica* 27: 57–70. doi: 10.2307/2388903
- Deyrup M, Johnson C, Wheeler GC, Wheeler J (1989) A preliminary list of the ants of Florida. *Florida Entomologist* 72: 91–101. doi: 10.2307/3494972
- Emery C (1894) Studi sulle formiche della fauna Neotropica. *Bollettino della Societa Entomologica Italiana* 26: 137–241.
- Lattke JE (2011) Revision of the New World species of the genus *Leptogenys* Roger (Insecta: Hymenoptera: Formicidae: Ponerinae). *Arthropod Systematics and Phylogeny* 69(3): 127–264.
- Mayr G (1870) Neue Formiciden. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 20: 939–996.
- Mayr G (1886) Die Formiciden der Vereinigten Staaten von Nordamerika. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 36: 419–464.
- Navarrete-Heredia JL, Quiroz-Rocha GA, Vásquez-Bolaños M, Cortés-Aguilar J, Gómez-Flores V, López-Contreras E, Labrador-Chávez G (2007) Coleópteros y hormigas (Coleoptera e Hymenoptera: Formicidae) de algunas localidades del sur de Zacatecas. *Entomología Mexicana* 6(2): 1317–1320.
- O'Keefe ST, Cook JL, Dudek T, Wunneburger DF, Guzman MD, Coulson RN, Vinson SB (2000) The distribution of Texas ants. *Southwestern Entomologist* 22 (Supplement): 1–93.
- Pergande T (1893) On a collection of Formicidae from Lower California and Sonora, Mexico. *Proceedings of the California Academy of Sciences* (2) 4: 26–36.
- Pergande T (1894) Formicidae of Lower California, Mexico. *Proceedings of the California Academy of Sciences* (2) 4: 161–165.
- Pergande T (1896) Mexican Formicidae. *Proceedings of the California Academy of Sciences* (2) 5: 858–896.
- Quiroz Robledo L, Valenzuela González J (2003) Las hormigas ponerinas y cerapachinas (Formicidae: Ponerinae y Cerapachyinae) de las Estación de Biología Tropical “Los Tuxtla”, Veracruz, México. *Folia Entomológica Mexicana* 42: 381–395.
- Quiroz Robledo L, Valenzuela González J (2007) Distribution of poneromorph ants (Hymenoptera: Formicidae) in the Mexican state of Morelos. *Florida Entomologist* 90: 609–615. doi: 10.1653/0015-4040(2007)90[609:DOPAHF]2.0.CO;2
- Reddell JR, Cokendolpher JC (2001) Ants (Hymenoptera: Formicidae) from the caves of Belize, Mexico, and California and Texas (U.S.A.). *Texas Memorial Museum, Speleological Monographs* 5: 129–154.
- Smith MR (1947) A generic and subgeneric synopsis of the United States ants, based on the workers. *American Midland Naturalist* 37: 521–647. doi: 10.2307/2421469

- Trager JC, Johnson C (1988) The ant genus *Leptogenys* (Hymenoptera: Formicidae, Ponerinae) in the United States. In: Trager JC (Ed.) *Advances in myrmecology*. E. J. Brill, Leiden, 29–34.
- Vásquez-Bolaños M (2005) Hymenoptera: Formicidae. In: Navarrete-Heredia JL, Guerrero-Vázquez S (Eds) *Colecciones Zoológicas del Centro de Estudios en Zoología*. Universidad de Guadalajara, Guadalajara, 23–35
- Wetterer JK (2005) Worldwide distribution and potential spread of the long-legged ant, *Anoplolepis gracilipes*. *Sociobiology* 45: 77–97.
- Wetterer JK (2008) Worldwide spread of the longhorn crazy ant, *Paratrechina longicornis* (Hymenoptera: Formicidae). *Myrmecological News* 11: 137–149.
- Wetterer JK (2011) Worldwide spread of the tropical fire ant, *Solenopsis geminata* (Hymenoptera: Formicidae). *Myrmecological News* 14: 21–35.
- Wetterer JK (2012) Worldwide spread of the African big-headed ant, *Pheidole megacephala* (Hymenoptera: Formicidae). *Myrmecological News* 17: 51–62.
- Wetterer JK (2013a) Exotic spread of *Solenopsis invicta* (Hymenoptera: Formicidae) beyond North America. *Sociobiology* 60: 53–63. doi: 10.13102/sociobiology.v60i1.50-55
- Wetterer JK (2013b) Worldwide spread of the little fire ant, *Wasmannia auropunctata* (Hymenoptera: Formicidae). *Terrestrial Arthropod Reviews* 6: 173–184. doi: 10.1163/18749836-06001068
- Wetterer JK (2014) Geographic distribution of *Gnamptogenys hartmani* (Hymenoptera: Formicidae), an “agro-predator” that attacks fungus-growing ants. *Terrestrial Arthropod Reviews* 7: 147–157. doi: 10.1163/18749836-07021078
- Wetterer JK (2015) Geographic origin and spread of cosmopolitan ants (Hymenoptera: Formicidae). *Halteres* 6: 66–78.
- Wetterer JK (in press a) Geographic distribution of *Pachycondyla harpax* (Hymenoptera, Formicidae). *Sociobiology*.
- Wetterer JK (in press b) Geographic distribution of *Trachymyrmex jamaicensis* (Hymenoptera, Formicidae). *Florida Entomologist*.
- Wetterer JK, Snelling GC (2015) Geographic distribution of *Labidus coecus* (Hymenoptera, Formicidae), a subterranean army ant. *Journal of Hymenoptera Research* 44: 31–38. doi: 10.3897/JHR.44.4672
- Wetterer JK, Wild AL, Suarez AV, Roura-Pascual N, Espadaler X (2009) Worldwide spread of the Argentine ant, *Linepithema humile* (Hymenoptera: Formicidae). *Myrmecological News* 12: 187–194.
- Wheeler WM (1902) A consideration of S. B. Buckley’s “North American Formicidae.” *Transactions of the Texas Academy of Sciences* 4: 17–31.
- Wheeler WM (1904) A crustacean-eating ant (*Leptogenys elongata* Buckley). *Biological Bulletin* 6: 251–259. doi: 10.2307/1535818
- Wheeler WM (1908) The ants of Texas, New Mexico and Arizona. (Part I.). *Bulletin of the American Museum of Natural History* 24: 399–485.
- Wheeler WM (1923) The occurrence of winged females in the ant genus *Leptogenys* Roger, with descriptions of new species. *American Museum Novitates* 90: 1–16.
- Wittenborn D, Jeschke JM (2011) Characteristics of exotic ants in North America. *NeoBiota* 10: 47–64 (in supplementary material). doi: 10.3897/neobiota.10.1047