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BRACHYMYRMEX PATAGONICUS (HYMENOPTERA: FORMICIDAE), AN EMERGING PEST SPECIES IN THE SOUTHEASTERN UNITED STATES

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ABSTRACT

Brachymyrmex patagonicus Mayr is a recently introduced species that is well established in the Gulf Coast region of the United States. This species is abundant in Georgia, Florida, Alabama, Mississippi, and Louisiana and has spread into other states. It has become a nuisance pest with occasional large infestations occurring in homes, hospitals, and other businesses. Brief descriptions and illustrations of all castes, biological and economic importance, and known distribution in the United States are given.

Key Words: exotic insects, ants, distribution, dark rover ant

RESUMEN

Brachymyrmex patagonicus Mayr es una especie introducida recientemente que esta bien establecida en la región de la Costa del Golfo de los Estados Unidos. Esta especie es abundante en los estados de Georgia, Florida, Alabama, Mississippi y Louisiana y se ha esparcido a otros estados. Esta hormiga ha convertido en una plaga fastidiosa con infestaciones ocasionales grandes en hogares, hospitales y otros negocios. Se provee una descripción breve con ilustraciones de todas las castas, su importancia biológica y económica, y la distribución conocida en los Estados Unidos.

Members of the genus *Brachymyrmex* Mayr (Hymenoptera: Formicidae: Formicinae) are small, soft-bodied ants that are only 2.5 mm or less in length (workers of most species are smaller), range in color from pale yellow to blackish-brown, and possess distinctive nine-segmented antennae. Most species nest in soil or in rotting wood, although a few are arboreal. The genus includes 38 species worldwide, with most occurring in the Neotropical region (Bolton 1995). However, due to their minute size, there are likely many more undescribed species. Currently, at least eight distinct species, four of which appear to be undescribed (from the southeastern United States), are known to occur in the United States. This genus needs revision because most species descriptions are brief, and type specimens of many species are lost or are poorly preserved, some being shriveled. Although the genus was revised by Santschi (1923), the morphological characters he used to define species were ill-defined and, in many cases, were useless for differentiating species. For these reasons, species epithets and identifications in the genus are suspect (Deyrup 2003). Compounding this problem, there are several known undescribed species, and undoubtedly more to be discovered. However, revisions of the genus (Quirán 2005; Quirán et al. 2004) have resulted in six species being redescribed, including the type species, *B. patagonicus* Mayr, for which the original types are lost.

Brachymyrmex patagonicus is native to Argentina (Quirán et al. 2004). This species was first reported from the United States as *Brachymyrmex musculus* Forel from St. Tammany Parish, Louisiana in 1978 from a single colony collected in 1976 from sawdust beneath a recently cut live oak tree (Wheeler & Wheeler 1978). Wheeler & Wheeler (1978) note that they identified the species by using Santschi's key to species (1923). They speculated that it could have been introduced into the United States through nearby New Orleans, which is a reasonable entry point for tropical species, although other localities, such as Mobile, Alabama, or Pensacola, Florida, are just as likely. In his unpublished dissertation Naves (1976) also reported the presence of this species, which he referred to as *B. patagonicus* from the Southeast. In his monograph of *Pheidole* of Florida, Naves (1985) again mentioned *B. patagonicus* as occurring in the southeastern United States. Although Naves (1985), whose research was conducted in Florida, implied that this species occurred in Florida, subsequent faunal lists of ants for the state failed to mention *B. patagonicus* (Deyrup 2003; Deyrup et al. 1989; Deyrup et al. 2000). In 2000 this species, then referred to as *B. musculus*, was reported from Florida (Deyrup et al. 2000). The name *B. patagonicus* again reappeared in the literature from collections in Louisiana when Hooper-Bùi et al. (2000) mentioned it as an unwelcome house pest. A subsequent thesis on ants

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of Louisiana (Dash 2005) did not mention *B. patagonicus*, but referred to *B. obscurior* Forel and *B. musculus*, occurring in 3 parishes.

The first goal was to determine whether the southeastern species named *B. musculus* and *B. patagonicus* were actually 1 species. Specimens identified as *B. musculus* and *B. patagonicus*, and on which the Louisiana records are based, were borrowed from the Louisiana State University Arthropod Collection (LSUC) and were compared with specimens identified as *B. musculus* from Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. All of these specimens appeared to be the same species. Additionally, specimens from LSUC identified as *B. obscurior* also appeared to be this species, not *B. obscurior*. The next goal was to assign the proper name to this species. The original descriptions of both *B. musculus* as a race of *B. tristis* Mayr by Forel (1899) and *B. patagonicus* by Mayr (1868) are brief, and of little use for identification. However, the redescription of *B. patagonicus* (Quirán et al. 2004), which includes all castes, is much more detailed, and appears to closely match our southeastern species. To verify this tentative identification, representatives of all castes were sent to Estela Quirán, who identified them as *B. patagonicus*, the name that we use in this publication. We suggest, therefore, that all references to *B. musculus* in North America be referred to as *B. patagonicus*. This has no bearing on the taxonomic status of *B. musculus*, originally described from Costa Rica (Bolton 1995).

Although *B. patagonicus* recently was redescribed from Argentinian specimens (Quirán et al. 2004), a few errors in the publication concerning measurements give an impression that the overall lengths of workers and queens are less than they actually are. Additionally, the castes have not been illustrated except for the heads of the male and worker, mesosoma of worker, and some male genitalic structures. Therefore, a brief diagnosis and illustration of each caste is given here to aid in identifying this species in the United States. A common name of "dark rover ant" is proposed for the species.

Materials and Methods

Ants for this study were collected as part of larger surveys of Formicidae in Florida (Deyrup 2003), Alabama (MacGown & Forster 2005), and Mississippi (MacGown et al. 2005; MacGown & Brown 2006), with additional collecting trips made to southern Georgia, Arkansas, Louisiana, and Texas. Specimens were collected in 90% ethanol, and representatives were pinned and labeled. Vouchers are deposited in the Archbold Biological Station Collection (ABSC) and the Mississippi Entomological Museum (MEM).

The gaster of *B. patagonicus* is soft and often shrivels when pinned. Consequently, mesosomal lengths (measured from the anterior edge of the pronotum to the posterior edge of the metapleural gland) are given in *lieu* of overall lengths. Head width was measured in full frontal view at the widest point on the head including the eyes, and head length was measured in full frontal view from the anterior edge of the clypeus to the posterior border of head. Eye length refers to the longest measurement of the compound eye. Measurements were made with a micrometer mounted in a 10× eyepiece on a Leica MZ16 stereomicroscope at 50× (for females) and 100× (for males and workers). Drawings were made with a drawing tube mounted on a Leica MZ16 stereomicroscope.

Results

Diagnosis of the Worker (Figs. 1 and 4)

Size minute, mesosomal length 0.43-0.51 mm (n = 10). Head and mesosoma medium brown to blackish-brown, gaster usually blackish-brown, often darker than head and mesosoma, tarsi and mandibles pale, and antennae brownish-yellow. Head slightly longer than wide, covered with fine pubescence, and with a few longer erect hairs; antennal scapes surpassing occipital border of head by 1/5 their total length; eyes relatively large, about as long as length of malar space and placed at approximately the middle third of side of head; 3 tiny, barely visible ocelli present. Promesonotum with 3-9 (usually 4-6) stout, erect hairs present dorsally, with fine pubescence that does not obscure the shiny sheen of integument. Gaster with scattered, long, erect hairs, especially along the edges of the tergites, and with sparse, decumbent hairs, separated by about 1/3 to 2/3 their length.

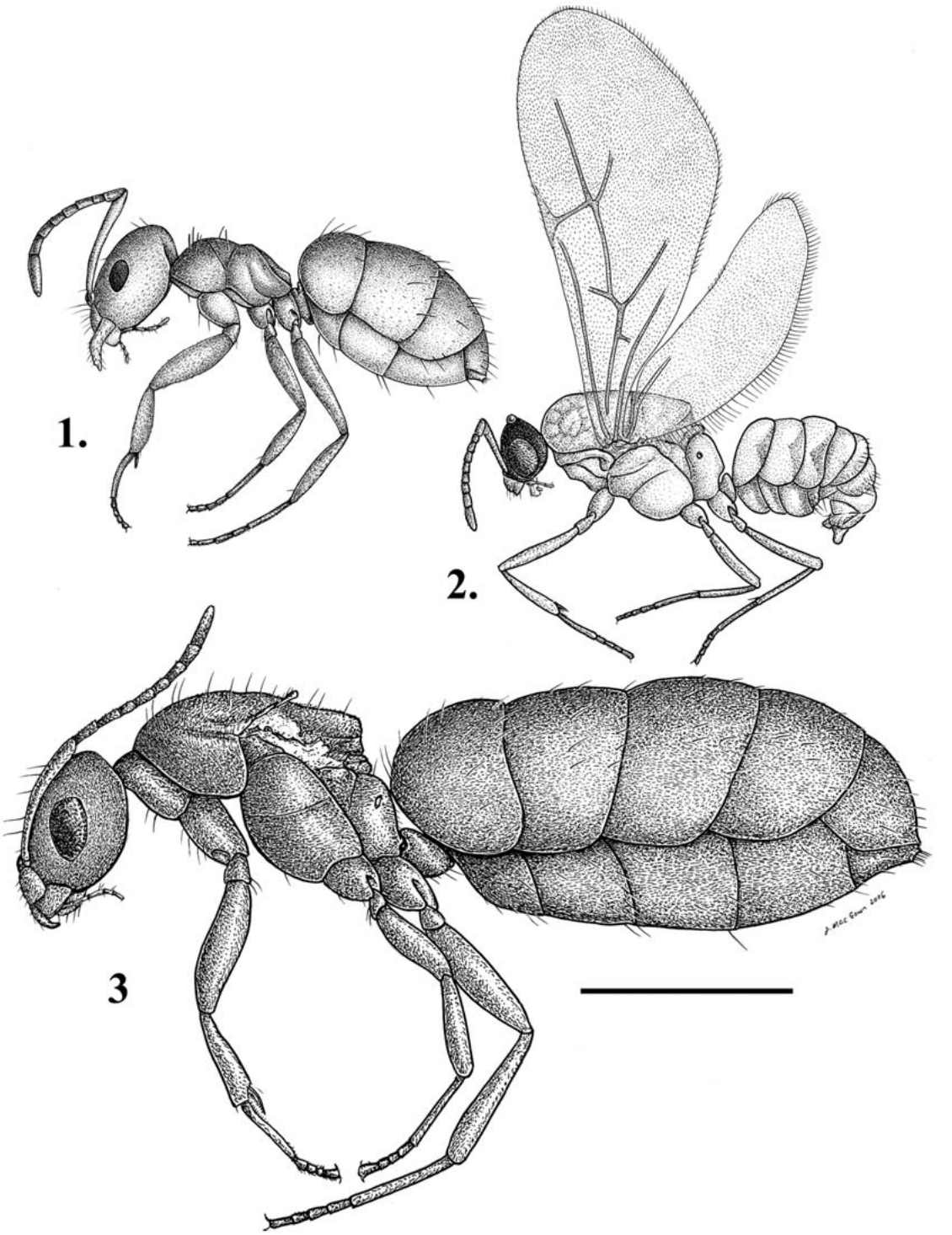
Diagnosis of Female (Figs. 3 and 6)

Mesosomal length 1.24-1.42 mm (n = 10). Concolorous light brown. Head wider than long, with abundant, fine pubescence, and with long erect hairs present; large compound eyes located at middle of side of head; 3 large ocelli present; frontal lobes well developed; scapes surpassing occipital border by 1/4 their length. Mesosoma with moderately dense, fine pubescence, and 30-40 long erect hairs (about 3-4 times length of fine pubescence); anepisternum and katepisternum separated by a distinct suture, with erect hairs present. Forewing with pterostigma; hind wing with 7 hammuli. Gaster with moderately dense, fine pubescence, and erect hairs along apical edges of sternites and tergites.

Diagnosis of Male (Figs. 2 and 5)

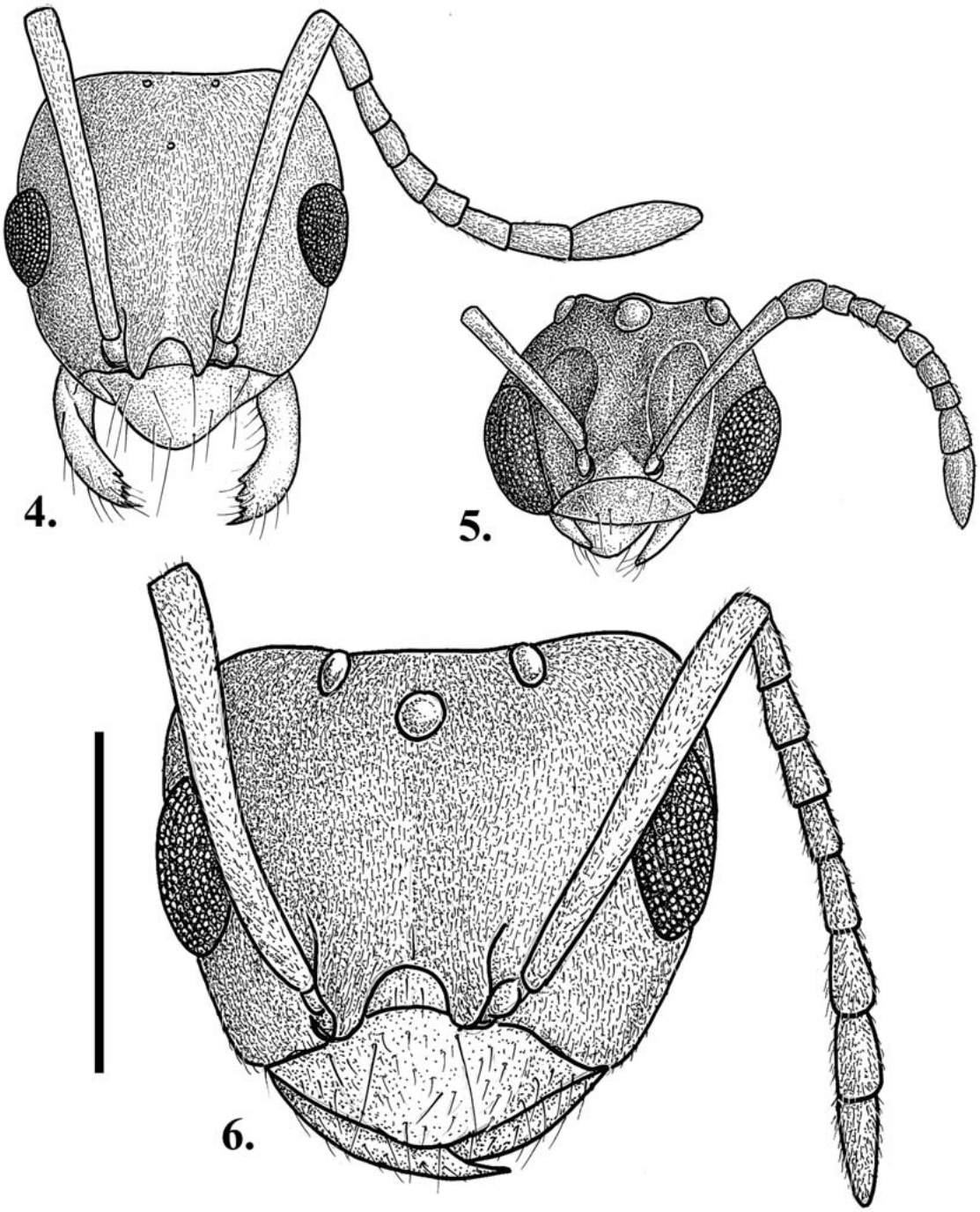
Mesosomal length 0.8 mm (n = 2). Head dark brown to blackish-brown, rest of body, including

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Figs. 1-3. Profile views of *Brachymyrmex patagonicus*: (1) worker, (2) alate male, and (3) dealate female. Scale bar equals 1.0 mm.

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Figs. 4-6. Full-face views of *Brachymyrmex patagonicus*: (4) worker, (5) male, and (6) female. Scale bar equals 0.5 mm.

appendages, very light brown. Head wider than long, with fine, sparse pubescence, lacking erect hairs except on mouthparts, and with smooth, shiny integument; frontal lobes reduced; scapes surpassing occipital border by more than 1/5 their length, first segment of funiculus enlarged, almost globular, wider than succeeding segments; eyes large, about 1/2 length of head, and located on lower half of head; 3 large, prominent, raised ocelli present. Mesosoma with sparse pubescence

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and shiny integument, lacking erect hairs. Hind wing with 5 or 6 hammuli. Gaster shiny, lacking pubescence, with scattered erect hairs on last few sternites and tergites.

Similar Species

In the United States, *B. patagonicus* is most similar to *B. obscurior*, another exotic species. Workers differ in the size of the eye, which is about the length of the malar space in *B. patagonicus*, and conspicuously shorter than the malar space in *B. obscurior*. Additionally, the gaster of *B. patagonicus* has scattered pubescence, giving it a more shiny appearance, whereas *B. obscurior* has more dense pubescence. An undescribed species of *Brachymyrmex* recorded from Florida (referred to as *B. brevicornis* Emery in some publications-Deyrup 2003; Deyrup et al. 2000) is also dark brown in color, but lacks erect hairs on the body. Another undescribed, brown colored species, known only from 2 queens from Arkansas, differs from *B. patagonicus* in that the queens are tiny, approximately the size of typical workers (pers. comm., Lloyd Davis). *Brachymyrmex heeri* Forel is another similar species that could be potentially found in the United States, but has not been found here yet. Workers of this species are brownish-yellow and lack ocelli. Other species of *Brachymyrmex* found in the United States are yellowish in color.

Biology and Economic Importance

This species nests in a variety of habitats, both natural and disturbed. Natural habitats include pine forests (with nests often in loose bark at the bases of the tree trunks), beaches (with nests at the bases of plants), mixed forests (nests in soil, dead wood, and litter), and prairie remnants (nests in soil, accumulations of organic litter, and grass thatch). In disturbed areas, nests of *B. patagonicus* are especially frequent in landscaping mulch, a habitat that is increasing exponentially throughout the Southeast, and which positions colonies to make forays into buildings. In disturbed areas it also nests in soil under objects on the ground (stones, bricks, railroad ties, lumbers, or a variety of other objects), under grass at edges of lawns and parking lots, in leaf litter, at the bases of trees, in rotting wood, in piles of dead wood, and in accumulations of trash. Colonies may contain many hundreds of workers packed into a small sheltered area. Where this species is found, colonies are often abundant and even may be found within a few centimeters from one another. The social structure of *B. patagonicus* has not been studied, but apparently separate colonies show considerable mutual tolerance.

In many sites the occurrence of *B. patagonicus* appears to be centered around urban areas or places frequented by people, such as the more intensive recreation areas of state parks, gas stations, restaurants, grocery stores, and along highway edges. As is the case with many other pest plants and animals, this species appears to act as an invasive organism that is likely to return quickly whenever there are attempts to control it or other species of ants. It has been reported that this species may be found in higher numbers after imported fire ant suppression has taken place (Dash et al. 2005). This does not imply that populations of this species are excluded in areas where large populations of fire ants are present, as recent surveys of ants in the Southeast by the MEM have found this species to be abundant in areas with high numbers of imported fire ants. We have observed this species nesting side-by-side and freely roaming about with both *Solenopsis invicta* Buren and *S. invicta* × *richteri* on numerous occasions and have seen no obvious correlation of its abundance to that of the fire ants' presence and abundance.

This species is considered a nuisance pest species, as both alates and foraging workers may enter houses, hospitals, schools, or other man-made structures to forage and/or nest. Occasionally these infestations may be quite large, with nests being found in the structure of the buildings, especially in bathrooms and kitchens, in light sockets and in electrical outlets, inside cinder blocks of exterior walls, and under shingles. During recent years (2005-2006), the Department of Entomology and Plant Pathology at Mississippi State University has had more requests by pest control operators in Mississippi about this species than all other ant species totaled together. Pest control operators have found this species in very high numbers in hospitals and other businesses, especially in metropolitan areas, and have expressed difficulty in controlling it. This may be partly due to the fact that many indoor infestations of foraging workers may be coming from outdoor nests some distance from control efforts. As in the case of *B. obscurior* and other ants whose alates fly into openings in buildings or clutter up swimming pools, there may be no effective control of alate *patagonicus* where the ambient population is high, except by restricting access. The attention received by this ant may be more associated with its novelty than with any harm it causes, as it does not cause structural damage, bite, sting, or transmit disease, nor has it been shown to invade stored foods. As a nuisance species, however, invading buildings and causing annoyance, *patagonicus* shows considerable potential, perhaps comparable to the effects of *Tapinoma melanocephalum* (Fabricius) in tropical and subtropical regions.

The diet of *Brachymyrmex patagonicus* is thought to consist largely of honeydew from various insects, especially subterranean homopterans (Dash et al. 2005). They undoubtably supplement their diet with other food sources and will readily

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come to sweet baits such as honey or cookies. Workers of these ants can be commonly seen scurrying about during the day as they forage. Female and male alates have been collected from mid May through early Aug.

Distribution (Fig. 7)

Since its first report in the United States, *B. patagonicus* has become extremely common and abundant in the Gulf Coast states, and in the last few years its range in the southeastern United States has grown considerably. In a study (Storz & Tschinkel 2004) of the spread of another exotic South American ant species, *Pheidole obscurithorax* Naves, *B. patagonicus* (referred to as *B. musculus* in their publication) was also reported. They made collections along a transect through 46 counties and parishes in Georgia, Florida, Alabama, Mississippi, and Louisiana and found this species in Thomas County, Georgia; Liberty and Santa Rosa Counties, Florida; Escambia and Baldwin Counties, Alabama; Pike and George Counties, Mississippi; and did not find it in Louisiana. It is now known to occur in 27 counties in Georgia (MEM; Ipser et al. 2004-reported as *B. musculus*), 23 counties in Florida, but reported to be widespread throughout (Deyrup 2003-reported as *B. musculus*), 27 counties in Alabama (MEM; MacGown and Forster 2005-reported as *B. musculus*), 31 counties in Mississippi (MEM), and 15 parishes in LA (MEM; Wheeler & Wheeler 1978).

In May of 2007, two transects were made across central Georgia by the MEM, and *B. patagonicus* was found to be abundant. It is likely that this species is abundant throughout the entire southern half of Georgia, although the northern limit of its distribution in the state is not known. The easternmost record from Georgia, in Chatham County, borders South Carolina, and it is probable that this species occurs there as well. In Florida, *B. patagonicus* appears to be much more common in the northern portions of the state, whereas in Alabama and Mississippi it is most common in the southern halves of the states, with scattered northern records. The earliest known collection date of *B. patagonicus* from Mississippi is 1977, which is only 1 year later than the earliest published record of this species in the United States. Surprisingly, that record is from Holly Springs, Marshall County, located in ex-

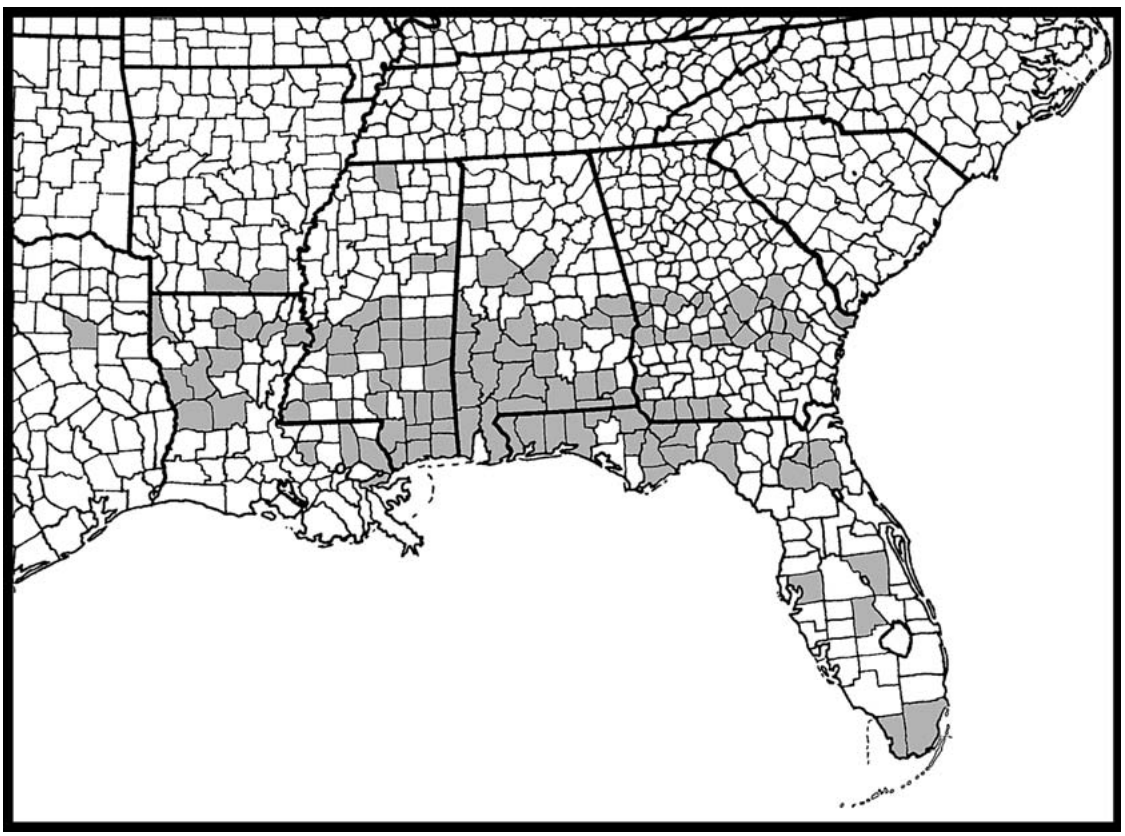


Fig. 7. Map of the southeastern United States showing the known distribution of *Brachymyrmex patagonicus*.

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treme north Mississippi and bordering Tennessee near the Memphis area. It has not yet been reported from Tennessee, but it will likely expand its range to this state, if it is not already found there. In a recent thesis documenting the ants of Louisiana (Dash 2005), this species was only reported in Louisiana from 3 parishes (reported as *B. musculus* and *B. obscurior*). Recent collections by the MEM have revealed that this species is now widespread in that state. The MEM also collected this species in 2006 in 2 counties in southern Arkansas. In a paper documenting the distribution of ants of Texas (O'Keefe 2000), *B. patagonicus* was not reported from the state. However, during a collecting expedition in Jul, 2006 by the MEM, which traversed Texas from east to west, it was collected at one locality in Smith County, in the eastern portion of the state. This species was also collected in 2004 on the grounds of a hotel near the Tucson Airport in Pima County, Arizona (M.A.D., unpublished data). Considering the climatic regimes under which this species thrives in southeastern North America and southern South America, there is no obvious reason why *B. patagonicus* should not extend its range through the entire Gulf Coast, and through the states bordering Mexico, at least in irrigated urban and suburban areas.

The distribution by county and parish in the southeastern United States of *B. patagonicus* based on specimens examined and literature records is given below (also see Fig. 7). Gaps in the distribution map do not imply absence of this species, but may reflect a lack of collecting. **Georgia:** Appling, Brooks, Chatham, Chattahoochee, Crisp, Decatur, Dodge, Early, Emanuel, Grady, Houston, Jeff Davis, Laurens, Muscogee, Peach, Stewart, Sumter, Talbot, Tattnall, Taylor, Telfair, Thomas, Toombs, Treutlen, Webster, and Wilcox Counties (MEM); Seminole County (Ipser et al. 2004—reported as *B. musculus*). **Florida:** Alachua, Bradford, Calhoun, Clay, Dade, Escambia, Franklin, Gadsden, Highlands, Hillsborough, Holmes, Jackson, Leon, Liberty, Madison, Monroe, Okaloosa, Osceola, Putnam, Santa Rosa, Taylor, Wakulla, and Walton Counties (ABSC, MEM). **Alabama:** Baldwin, Bibb, Butler, Choctaw, Clarke, Coffee, Conecuh, Covington, Dale, Dallas, Escambia, Geneva, Houston, Lee, Lowndes, Macon, Marengo, Marion, Mobile, Monroe, Montgomery, Russell, Shelby, Sumter, Tuscaloosa, Washington, and Wilcox Counties (MEM; MacGown & Forster 2005-reported as *B. musculus*). **Mississippi:** Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Jackson, Jasper, Jefferson Davis, Lauderdale, Leake, Lowndes, Madison, Marion, Marshall, Newton, Oktibbeha, Pearl River, Perry, Pike, Rankin, Smith, Scott, Stone, Warren, Wayne, and Wilkinson Counties (MEM). **Arkansas:** Ashley and Union Counties (MEM). **Louisiana:** Caddo, East Baton Rouge, Jackson, Lincoln, Madison, Natchitoches, Orleans, Quachita, Rapides, Richland, Sabine, Tangipahoa, Vernon, and Winn Parishes (MEM); St. Tammany Parish (Wheeler and Wheeler 1978). **Texas:** Smith County (MEM).

Discussion

Although *B. patagonicus* is a relatively recent introduction to the United States, it is now well established and abundant in both natural and disturbed areas throughout much of the Southeast, especially in Georgia, Florida, Alabama, Mississippi, and Louisiana. To give an indication of how common *B. patagonicus* is within its range is the fact that the authors have usually been able to find workers of this species at new localities within 5 minutes by simply stopping at gas stations, motels, restaurants, and other such businesses, and searching at the edges of parking lots, at edges of grass areas, on tree trunks, exteriors walls of buildings, or on bare ground. Random stops at highways and rural roadsides have revealed similar abundance and ease of detecting this species.

A major reason for the success of *B. patagonicus* in the United States may be its ability to thrive in a variety of habitats, especially disturbed sites. Other contributing factors could be its ability to coexist with a variety of other dominant ant species, such as *Dorymyrmex bureni* (Trager), *S. invicta*, *Pheidole moerens* Wheeler, and *P. obscurithorax*. This is similar to other species of *Brachymyrmex*, which also usually occur where there are many other ant species that are larger, faster, more hard-bodied, and armed with stingers and more powerful mandibles. It is difficult to avoid the conclusion that this species may be protected by potent chemicals.

Because colonies can fit into a small space, they easily could be transported by man from site to site, making it likely that this species will increase its range further. This hypothesis is supported by isolated collections in the northern parts of both Alabama and Mississippi where this species was collected in landscaped areas of state parks, campuses, or other public areas, but not yet found in more natural areas. Several isolated populations in Mississippi have been found in mulch, which may have been transported from areas where this species was already common.

It is unclear what affect, if any, this species will have on native species in the area, but based on its abundance where it is now established, it might have some negative impact. In many areas in the southern portions of Alabama and Mississippi, this species, along with several other introduced species including *Linepithema humile* (Mayr), *Pyramica membranifera* (Emery), *Cyphomyrmex rimosus* (Spinola), *S. invicta*, *P. moe-*

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rens, and *P. obscurithorax*, are now the most commonly found ants. Its effect, if any, on honeydew-producing sap-sucking insects is also unknown. It also will be interesting to see how *B. patagonicus* interacts with the related, exotic species, *B. obscurior*, over the next few years. Enormous populations of *B. obscurior* are found in southern Florida, and this ground nesting species might compete with *B. patagonicus* for food resources, and to a lesser extent, nesting sites. *Brachymyrmex patagonicus* shows the explosive increase and spread that is typical of some recently imported species, especially those that thrive in the ever-expanding zone of habitats profoundly disturbed by human activities. It is not known whether this will lead to permanently high population levels, or whether some form of biotic resistance will eventually catch up with this species.

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