A Survey of Structural Ant Pests in the Southwestern U.S.A. (Hymenoptera: Formicidae)

by

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ABSTRACT

A year-long survey of structural pest ants was conducted by Pest Management Professionals in San Diego, California, and Phoenix, Arizona to determine the species of ants, location of infestations, and types of treatments in residential and commercial accounts. Two short-term surveys were also conducted in Tucson, Arizona, and Tijuana, Mexico to obtain similar information. The key pests and their frequencies varied in these different regions: Argentine ants, *Linepithema humile,* were the most common species (85%) in San Diego; southern fire ants, *Solenopsis xyloni* (34%), and *Forelius pruinosus* (18%) in Phoenix; harvester ants, *Pogonomyrmex* spp. (26%), and leaf-cutting ants, *Acromyrmex versicolor* (18%) in Tucson; and harvester ants, *Messor* spp. (35%) in Tijuana. In all regions, most infestations were located outside. Insecticidal sprays were the primary method of treatment except in Tucson where baits were applied almost as frequently (49%).

Key Words: Urban pest ants, structural pest control, house-infesting, ant control

INTRODUCTION

Ants are ranked the number one urban pest by the structural pest control industry, with an estimated 1.7 billion dollars generated annually for Pest Management Professionals (PMPs) in the United States (Curl 2005). Hedges (1998) described about 40 species that are common structure-infesting pests in the U.S. The importance of each species in structural pest control, however,

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varies depending on geographic location. Carpenter ants, for example, are the most frequently encountered ants by PMPs in certain parts of the country: *Camponotus modoc* and *C. vicinus* in the Pacific Northwest (Hansen and Akre 1985), *C. pennsylvanicus* in the Northeast (Fowler 1983), and *C. floridanus* and *C. tortuganus* in Florida (Klotz et al. 1995). Each species has its own unique biology, which needs to be taken into consideration when developing a pest management strategy.

Several exotic species of ants thrive in disturbed habitats and are becoming more common due to increasing urbanization and globalization. There have been approximately 150 transferred species of ants that have been collected in non-native habitats worldwide (McGlynn 1999). Some of these introduced species, such as imported fire ants, *Solenopsis invicta,* and Argentine ants, *Linepithema humile,* are invasive and spread aggressively into urban, agricultural, and wildlife areas displacing native species of ants and disrupting ecosystems. Both species are becoming more of a problem in the U.S. as well as other countries (McGrath 2005). In California, for example, a major infestation of imported fire ants was discovered in 1998 in a suburb of Orange County. Other infestations were found soon thereafter in Riverside and Los Angeles Counties, and as a result a multi-million dollar eradication program was implemented by the State to manage these outbreaks. The actual and potential economic impact from these introduced pests is enormous. Based on costs incurred from imported fire ant damage in the southeastern U.S., it is estimated that imported fire ants could cost almost one billion dollars if they become established and spread in California (Jetter et al. 2002).

Another exotic species that originated in South America and has also had a significant economic impact in California is the Argentine ant (Vega and Rust 2001). In a survey of urban pest ants of California, which did not include the greater San Diego area, the Argentine ant was the most commonly encountered ant pest by PMPs and the most difficult to control (Knight and Rust 1990). Argentine ants can also cause problems in wildlife areas by displacing native species of ants, and in agriculture by interfering with biological control programs (Vega and Rust 2001).

The objective of this year-long survey was to identify native and exotic species of ants that are encountered by structural PMPs in the greater met-

ropolitan areas of San Diego, California, and Phoenix, Arizona. The survey also provides information on the location of infestations and treatments. In addition, we obtained similar information over a shorter time period from PMPs in Tucson, Arizona, and Tijuana, Mexico, which is also included in this survey.

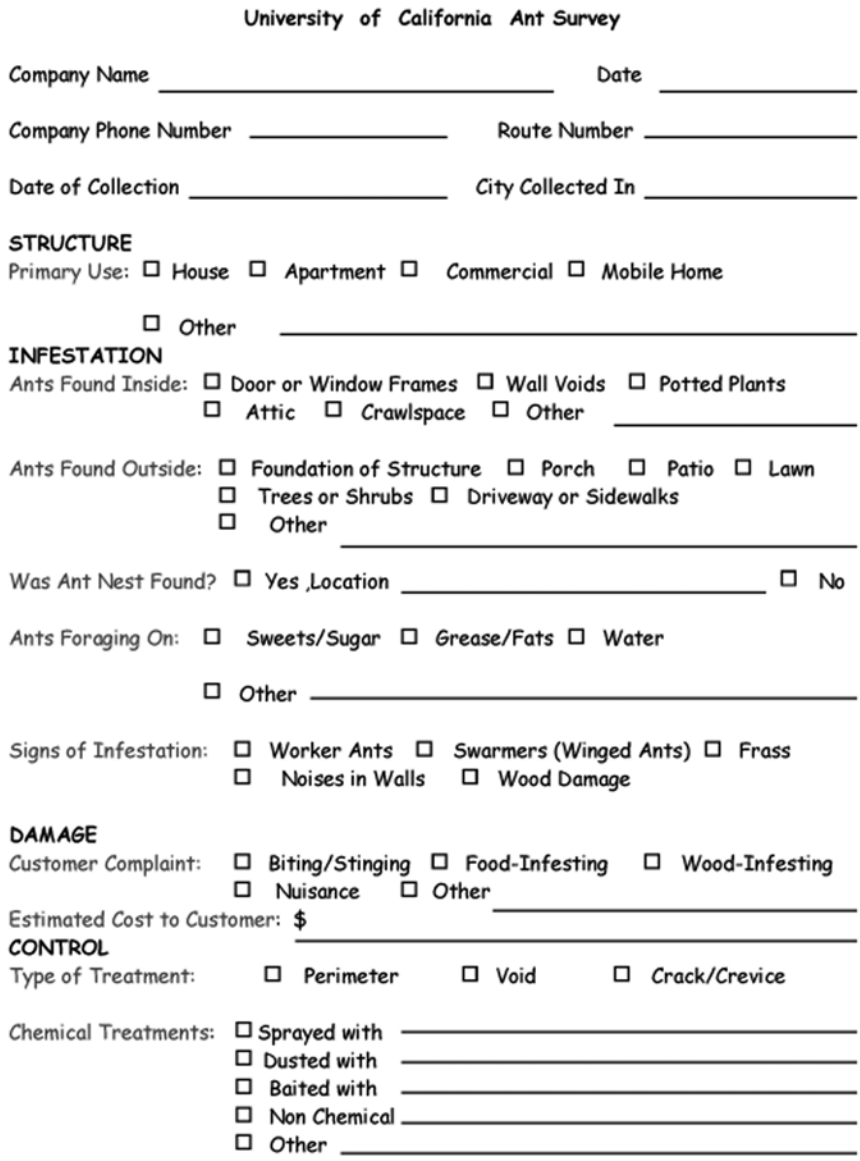
MATERIALS AND METHODS

A year-long survey (from July 1, 2005 to June 31, 2006) of ant control was conducted by Lloyd Pest Control in San Diego, California, and Ed Evans Pest Control in Phoenix, Arizona. PMPs were directed to collect specimens of ants in 2-dram glass vials (BioQuip Products, Rancho Dominguez, CA) containing isopropyl alcohol, and to complete a survey questionnaire (Fig. 1) from each site of infestation when responding to a customer complaint for ants. The sites included both commercial accounts, such as hotels and apartment complexes, and private accounts, such as single-family dwellings. Similar but shorter-term surveys were conducted with Truly Nolen Pest Control in Tucson, Arizona (from June to September 2006) and Univar in Tijuana, Mexico (June 2005). In the latter instance we supplied PMPs with a Spanish version of the survey questionnaire. Using information from the surveys, we determined the relative frequency of the different species of pest ants in the different regions of the Southwest as well as key points about the infestations and how they were treated by the different pest control companies. Ants were identified using several taxonomic keys including: Creighton (1950), Bolton (1994), Hölldobler and Wilson (1990), Wheeler and Wheeler (1986), and Snelling and George (1979).

RESULTS AND DISCUSSION

Greater San Diego Survey

Argentine ants made up 85% of the collections by PMPs in the San Diego area (Table 1). In comparison, Argentine ants made up 41.5% of the collections by PMPs in the San Francisco/Monterey Bay region, 34% in the North Coast region, 29.3% in the Greater Los Angeles region, and 6.1% in the Central Valley and Desert region in a 1990 survey of urban pest ants in California (Knight and Rust 1990).



University of California Ant Survey

Company Name _____ Date _____

Company Phone Number _____ Route Number _____

Date of Collection _____ City Collected In _____

STRUCTURE

Primary Use: ☐ House ☐ Apartment ☐ Commercial ☐ Mobile Home

☐ Other _____

INFESTATION

Ants Found Inside: ☐ Door or Window Frames ☐ Wall Voids ☐ Potted Plants
☐ Attic ☐ Crawlspace ☐ Other _____

Ants Found Outside: ☐ Foundation of Structure ☐ Porch ☐ Patio ☐ Lawn
☐ Trees or Shrubs ☐ Driveway or Sidewalks
☐ Other _____

Was Ant Nest Found? ☐ Yes ,Location _____ ☐ No

Ants Foraging On: ☐ Sweets/Sugar ☐ Grease/Fats ☐ Water

☐ Other _____

Signs of Infestation: ☐ Worker Ants ☐ Swarmers (Winged Ants) ☐ Frass
☐ Noises in Walls ☐ Wood Damage

DAMAGE

Customer Complaint: ☐ Biting/Stinging ☐ Food-Infesting ☐ Wood-Infesting
☐ Nuisance ☐ Other _____

Estimated Cost to Customer: $ _____

CONTROL

Type of Treatment: ☐ Perimeter ☐ Void ☐ Crack/Crevice

Chemical Treatments: ☐ Sprayed with _____
☐ Dusted with _____
☐ Baited with _____
☐ Non Chemical _____
☐ Other _____

Fig. 1. Survey questionnaire to be completed by Pest Management Professional on a service call for ants.

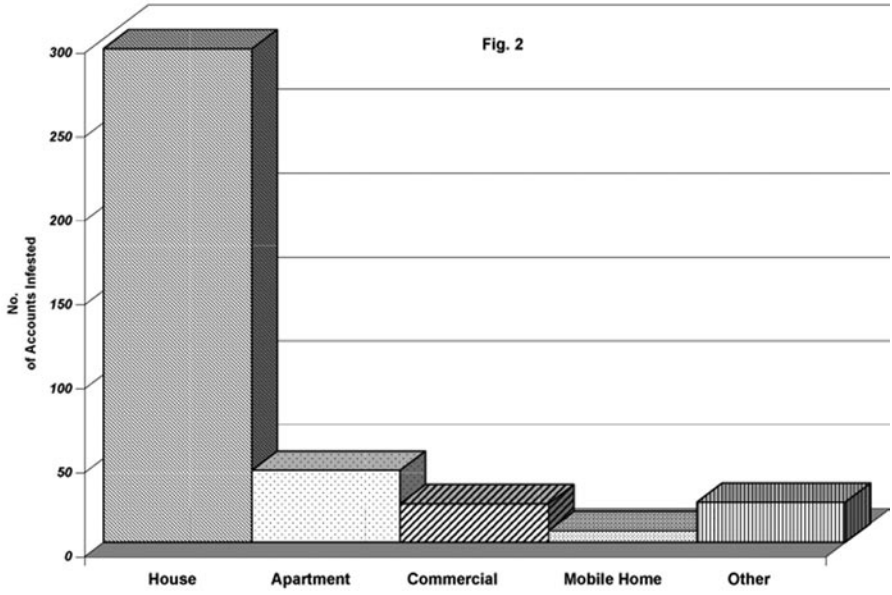


Fig. 2. Distribution of Argentine ant infestations in San Diego by type of account.

The majority of Argentine ant infestations were located outside (Table 1) in residential accounts (Fig. 2). This may be due to the frequency of exterior applications to homes, which were done on a quarterly basis. Commercial, apartments, and mobile home parks were typically treated on a monthly basis. According to one of the authors (HCF) the incidence of indoor infestations was higher in previous years but has been significantly reduced by the application of non-repellent insecticides. About half of the outside infestations were found around sidewalks and driveways (Fig. 3), probably due to increased ground moisture under the concrete and their use as structural guidelines. A majority (72%) of customers considered the ants a nuisance, despite the fact that most infestations were located outside. A perimeter treatment around the structure with a non-repellent insecticide (fipronil) was the standard method of control.

The other occasional pest ants collected by PMPs in San Diego (Table 1) are listed below in alphabetical order along with a brief description of their pest status.

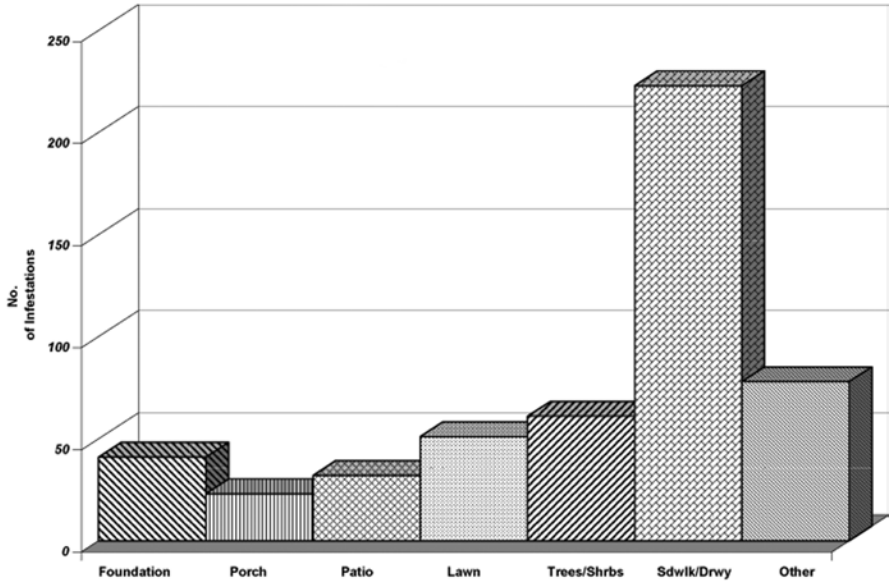


Fig. 3. Distribution of Argentine ant infestations in San Diego by outside location.

Camponotus spp.: Although carpenter ants are considered to be the most common structural pest ant in the U.S., in San Diego they made up only 1% (4 samples) of the collections by PMPs. Two species were collected: *C. vicinus*, an important wood-destroying pest in western states, and *C. hyatti*, mainly a nuisance pest in structures (Hansen and Klotz 2005).

Crematogaster californica: There was one sample collected of this species commonly known as California acrobat ants. The common name is derived from their scorpion-like posture when alarmed, with the gaster raised above the head and thorax (Wheeler and Wheeler 1986). These ants nest in soil or rotting wood in southern California and Baja (Ebeling 1975).

Dorymyrmex bicolor: There was one sample collected of this species commonly known as pyramid ants due to a pyramid-like projection on the posterior dorsal surface of their propodeum. These are ground-nesting ants found in open habitats (Ward 2005). They may become a nuisance in gardens and when they forage on patios or porches (M. Martinez, pers. comm. 2005).

Lasius spp.: Species of *Lasius* (2 samples) are a relatively unimportant group of structural pests in California (Ebeling 1975). However, in other

Table 1. Ant species collected by PMPs in San Diego (N = 380) and their percent frequency and location of infestation.

Species (Samples)	% Frequency	Location of Infestation[1] No. Inside	No. Outside
Linepithema humile (321)	84.5	84	305
Camponotus hyatti (2)	0.5	1	1
Camponotus vicinus (2)	0.5	0	2
Crematogaster californica (1)	0.3	0	1
Dorymyrmex bicolor (1)	0.3	0	1
Lasius spp. (2)	0.5	0	2
Liometopum occidentale (4)	1.0	0	4
Messor andrei (7)	1.8	1	6
Messor pergandei (5)	1.3	0	5
Monomorium minimum (6)	1.6	1	5
Monomorium pharaonis (2)	0.5	0	2
Paratrechina longicornis (7)	1.8	0	7
Pheidole hyatti (3)	0.8	0	3
Pogonomyrmex californicus (8)	2.1	0	8
Solenopsis invicta (1)	0.3	0	1
Solenopsis molesta (2)	0.5	0	2
Solenopsis xyloni (5)	1.3	0	5
Tapinoma sessile (1)	0.3	1	1

[1]Total may not add up to no. of samples because some samples were found both inside and outside.

parts of the country such as the Pacific Northwest they are more frequently encountered by PMPs. These ants tend aphids and other homopterans for honeydew, especially on roots (Ebeling 1975).

Liometopum occidentale: There were four samples collected of this species commonly known as the velvety tree ant. It is an arboreal species that is often found on oak, elm, cottonwood, pine, sycamore, and alder (Gulmahamad 1995). They frequently infest structures and excavate wood or insulation to construct their nests or temporary resting places. Infestations resemble carpenter ants, but the excavated material has a finer texture.

Messor spp.: Two species were collected (12 samples): *M. andrei* and *M. pergandei*. They resemble *Pogonomyrmex* spp. except their stingers are vestigial and nonfunctional. Some of the largest colonies of ants in North America belong to *M. pergandei* (Rissing 1988).

Monomorium spp.: The little black ant, *M. minimum* (6 samples), is a native species that was one of the most common household pest ants in the

Table 2. Ant species collected by PMPs in Phoenix (N = 44) and their percent frequency and location of infestation.

Species (Samples)	% Frequency	Location of Infestation[1] No. Inside	No. Outside
Solenopsis xyloni (15)	34.1	1	14
Forelius pruinosus (8)	18.2	1	8
Brachymyrmex musculus (4)	9.1	0	4
Dorymyrmex bicolor (3)	6.8	0	3
Paratrechina vividula (3)	6.8	0	3
Pheidole spp. (3)	6.8	2	2
Camponotus spp. (2)	4.5	1	1
Pogonomyrmex barbatus (2)	4.5	0	2
Formica nitidiventris (1)	2.3	0	1
Solenopsis invicta (1)	2.3	0	1
Cardiocondyla nuda (1)	2.3	0	1
Paratrechina longicornis (1)	2.3	0	1

[1]Total may not add up to no. of samples because some samples were found both inside and outside.

U.S. (Smith 1965), but due to displacement by exotic species, such as the imported fire ant and Argentine ant, it is no longer a major pest (Keck et al. 2005; Alder and Silverman 2005). The pharaoh ant, *M. pharaonis* (2 samples), is an exotic species whose origin is thought to be South America, Africa, or India (Vail and Williams 1994). This tramp species has been widely dispersed and probably exists in every town or city of commercial importance in the U.S. (Smith 1965).

Table 3. Ant species collected by PMPs in Tucson (N=113) and Tijuana (N=17) and the percent frequency and number of samples of each species, respectively.

Tucson		Tijuana	
Species	% frequency	Species	No. of samples
Pogonomyrmex spp.	26	*Messor* spp.	6
Acromyrmex versicolor	18	*Linepithema humile*	4
Solenopsis xyloni	17	*Solenopsis invicta*	3
Forelius pruinosus	15	*Pogonomyrmex californicus*	1
Dorymyrmex spp.	12	*Lasius niger*	1
Tapinoma sessile	10	*Pheidole hyatti*	1
Paratrechina longicornis	2	*Solenopsis molesta*	1

Paratrechina longicornis: Seven samples of this species, commonly called crazy ants, were collected. The common name is derived from its erratic, jerky movement (Thompson 1990). This exotic tramp species originated in Asia or Africa and has been distributed worldwide by commerce (McGlynn 1999; Morgan et. al 2005). They are found sporadically from Los Angeles to San Diego (Snelling and George 1979).

Pheidole hyatti: The genus *Pheidole* is possibly the largest and most diverse genera of ants with 624 described species in the New World (Wilson 2003). *P. hyatti* (3 samples) has been reported previously as a household pest in the western U.S. (Ebeling 1975).

Pogonomyrmex californicus: This was the second most common species (8 samples) collected by PMPs in the San Diego area. Commonly known as the California harvester ant, it is one of the most common ants in the Colorado and Mojave Deserts (Snelling and George 1979). It is infamous for its sting, which unlike most ants is left in the wound (Wheeler and Wheeler 1986).

Solenopsis spp.: The most common species of *Solenopsis* collected by PMPs was *S. xyloni* (5 samples). Also known as the southern fire ant, this native species can sting but is less aggressive than its exotic sister species, *S. invicta* (1 sample). The thief ant, *S. molesta* (2 samples), is extremely small and often confused with the pharaoh ant. Thief ants, however, have a 10-segmented antenna with a 2-segmented club versus the 12-segmented antenna and 3-segmented club of pharaoh ants.

Tapinoma sessile: One sample of odorous house ants was collected. One of the authors (HCF) recalls that 20 years ago this ant was the major pest species in the San Diego area before being displaced by the Argentine ant.

Phoenix survey

The most common species collected by PMPs was the southern fire ant, *S. xyloni* (34%). The other major pest was *Forelius pruinosus*, which made up 18% of the ants collected on service calls (Table 2). Foraging workers of this latter species form conspicuous trails and have a high temperature tolerance (Snelling and George 1979). All of these collections were from outside infestations, except for one case of fire ants foraging on dog food in a kitchen, and a case of *F. pruinosus* inside an entryway of a commercial building.

Other ants found outside included rover ants, *Brachymyrmex musculus,* pyramid ants, *D. bicolor*, and *Paratrechina vividula*. *Brachymyrmex* species are small (1.5-2 mm long) nondescript ants (Snelling and George 1979), which have been previously reported as occasional structural pests in Florida (Klotz et al. 1995). Wheeler and Wheeler (1986) collected *P. vividula* 16 times in Nevada and all were associated with man-made structures. In one of our cases workers of *P. vividula* were collected at a hummingbird feeder.

There were three cases of *Pheidole*, two that were inside infestations (Table 2). One species that was not identified because there were no major workers collected. These ants were found in the pantry. The other species found inside was *P. californica,* which was also found outside around the foundation. The third species, *P. hyatti*, was found in the lawn.

There were two cases of carpenter ants, one where swarmers of an unidentified species of *Camponotus* were collected around the exterior foundation of a house, and the other of *C. acutirostris* inside a commercial building where they were nesting in a void behind a wall outlet. A perimeter treatment with a synthetic pyrethroid was applied at the house, and a spot treatment with spray and dust formulations was applied in the wall void.

There were two cases of red harvester ants, *Pogonomyrmex barbatus*, nesting alongside a driveway or sidewalk. Their nests may be six feet deep and are characterized on the surface by a large circular clearing (Taber 1998).

There was one case each of *Formica nitidiventris*, imported fire ants, *Solenopsis invicta*, *Cardiocondyla nuda*, and crazy ants, *P. longicornis*, all found outside. The taxonomy of *F. nitidiventris,* which belongs to the *pallidefulva* species group, has long been in a confused state (Coovert 2005). *Cardiocondyla* are small ants of Old World Origin (Ward 2005). Several species including *C. nuda* are tramp species, which thrive in disturbed habitats (McGlynn 1999).

Contact sprays were used in 95% of the service calls for ants in Phoenix, and in most cases applied as perimeter treatments. Baits were used alone only twice for southern fire ants, and three times in combination with sprays.

Tucson survey. Harvester ants, *Pogonomyrmex* spp., were the most frequently collected ants by PMPs in the Tucson area (Table 3), predominantly the rough harvester ant, *P. rugosus* (21%). Another common species in Tucson is the Maricopa harvester ant, *P. maricopa*. Over a one-year period in Tucson,

eight patients were treated for allergic reactions to stings by the Maricopa and rough harvester ants (Pinnas 1977).

The second most common species was a leaf-cutting ant, *Acromyrmex versicolor*. A colony consists of only a few thousand workers that generally nest in sandy regions (Snelling and George 1979). These ants were found mostly in northwest Tucson. Next in frequency was the southern fire ant, *S. xyloni*, followed by *F. pruinosus*. Pyramid and odorous house ants each made up about 10% of the samples collected, and crazy ants were the least common (2%).

Similar to the San Diego survey, the majority of ants (95%) were collected in residential accounts, with the remaining 5% in commercial accounts. A large majority (90%) of the ants was collected outside, most frequently around driveways and sidewalks. Most of the homeowner's complaints concerned ants as nuisance pests, however, 13% were associated with biting and stinging. Treatments were about equally split between sprays (51%) and baits (49%).

Tijuana survey

Compared to urban areas in San Diego, there is less irrigation and fewer shade trees in Tijuana so the high incidence of harvester ants and low incidence of Argentine ants was not surprising (Table 3). The three samples of imported fire ants, *S. invicta,* were the most significant finding of this survey. In addition to the U.S., the imported fire ant has also been introduced into Puerto Rico, the Lesser Antilles, Australia, southern China, New Zealand, and Hong Kong (Tschinkel 2006). It has been reported in northeast Mexico (Sanchez-Pena 2005), and now northwest Mexico can be added to the list.

Concluding remarks. The surveys show the regional differences in species of structural pest ants in the Southwest that has been reported in other parts of the country. The arid desert environment of Phoenix and Tucson supports a different set of pest ants from the coastal Mediterranean climatic zone of San Diego, where extensive irrigation contributes to the prevalence of Argentine ants and the higher diversity of pest species. Although the sample size is too small to draw any solid conclusions, the prevalence of harvester ants in the Tijuana survey suggests a more arid environment possibly due to much less landscape irrigation. The pest control companies have adapted their management strategies for their particular suite of ant pests. Baiting, for

example, is more commonly used in the arid environments where harvester ants and native fire ants are common, because there are some very effective baits available for these species (Wagner 1983), versus the Argentine ant, which currently can be controlled most effectively with sprays.

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