Consequences of Harvester Ant Incursion into Urbanized Areas: A Case History of Sting Anaphylaxis

by

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ABSTRACT

Over a two-year period in Arizona, there were 237 reported cases of people stung by ants. Most of these cases were caused by harvester ants and native fire ants, which pose a significant health risk to a small percentage of the population who are allergic to their sting. We report a case of anaphylaxis in Tucson caused by a sting of *Pogonomyrmex rugosus*. In addition, due to the severity of their sting, harvester ants can also become a nuisance pest when they infest urban environments. A field survey and a phone survey of pest control companies in Tucson demonstrate the prevalence of harvester ants in residential areas. Increasing urbanization in the habitat of *Pogonomyrmex* species will lead to increasing numbers of serious reactions to their stings.

Keywords: *Pogonomyrmex*, harvester ants, stings, allergic reaction, anaphylaxis.

INTRODUCTION

Harvester ants in the genus *Pogonomyrmex* are common in the arid grasslands and deserts of the western United States. Of the twenty-three species in North America, only *P. badius* (Latreille) is found east of the Mississippi (Taber 1988). As pests, their most significant impact is in agriculture where they sometimes cause damage to crops, rangelands, and livestock (Taber 1998). For example, four species are sometimes considered to be agricultural pests due to their seed-harvesting activities on cultivated crops and their damage to rangelands from their nests: *P. badius, P. occidentalis* (Cresson), *P. californicus* (Buckley), and *P. barbatus* (F. Smith) (Cole 1968). The last species creates large circular nest clearings, denuding vegetation and contributing to soil erosion. Their nests also damage roads and airport runways by causing potholes and erosion (Taber 1998). In urban

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environments harvester ants can also become serious pests when homes are located in infested areas (Ebeling 1975; Davis & Wildermuth 1931). Although they rarely invade homes, they are occasional pests in lawns, playgrounds, parks, and athletic fields because of their severe sting (Ebeling 1975; Bennett *et al.* 1997).

The stings of most species of *Pogonomyrmex* are extremely painful (Creighton 1950), being described as "ripping muscles or tendons" and like "turning a screw in the flesh" (Schmidt 1986). Envenomation causes a unique local sweating and piloerection at the sting site, accompanied by pain and tenderness in nearby lymph nodes (Cole 1968; Schmidt & Blum 1978; Schmidt 1983). Their venom is, in fact, the most lethal of all the insect venoms (Schmidt 2003). Allergic reactions to harvester ant venom protein have been reported, including occasional fatal reactions, but these are immunologic responses that are not due to venom toxicity.

Three species of harvester ants have been reported to induce serious systemic reactions: *P. rugosus* Emery, *P. maricopa* Wheeler, and *P. barbatus* (Pinnas 1977; Stablein & Lockey 1987). The last species is found from Kansas through Texas and into Arizona. At least two deaths have been attributed to stings by this species in Oklahoma (Brett 1950; Young & Howell 1964). The other two species are found from west Texas into California. Over a one-year period in Tucson, Arizona, eight patients were treated for stings by *P. maricopa* and *P. rugosus* (Pinnas *et al.* 1977). Four of these patients had systemic allergic reactions and the other four were large, local reactions. Immunological studies have shown venom cross-reactivity of patients to these two species as well as seven other species of *Pogonomyrmex* (Schmidt *et al.* 1984). Therefore, an individual sensitized to one species of *Pogonomyrmex* would be expected to react again to a sting from another species.

We report here a new case in Tucson of a man who suffered anaphylaxis from a sting by *P. rugosus*. We present his case history along with survey information on the prevalence of *Pogonomyrmex* in Tucson, and the incidence of ant stings in Arizona.

MATERIALS AND METHODS

Case History. Our case report was documented in September of 2003 by SAK. Ambulance records were retrieved and the exact site where the patient was picked up, an abandoned gas station was visited. A harvester ant nest was located under the edge of the sidewalk where the patient had been sitting. Ants were collected and later identified by JOS as *P. rugosus*.

Surveys. A field survey of ant nests around the outside perimeter of the University of Arizona Campus Agricultural Center was conducted in May of 2004 to determine the spatial distribution of nests and species composition. The Agricultural Center encompasses approximately 75-hectares and is located in an urban residential area of Tucson. A 5.7 m band of the property adjacent to the street was systematically searched to determine the location of all nests. Collections were made of ants entering or exiting each nest for species identification.

A phone survey was conducted of owners and technical directors of four large pest control firms, representing approximately 40% of the structural pest control business that is conducted in Tucson: Arizona Pest Control Co., Truly Nolen Pest Control, Arizona Exterminating Co., and University Termite and Pest Control. An urban entomologist and an extension specialist at the University of Arizona also provided information for the survey. The pest control representatives and the entomologists were asked first to list the most important pests with respect to generating revenue, and second to name up to five of the most common pest ants.

The Arizona Poison and Drug Information Center of the University of Arizona Health Sciences Center provided their electronic database on the incidence of envenomation by poisonous animals in Arizona excluding Maricopa County (the major urbanized area in the state outside of Tucson).

RESULTS AND DISCUSSION

Case History. A 41-year old disheveled and intoxicated Caucasian male was brought to the University Medical Center, Tucson, Arizona by ambulance in September of 2003. He stated that he had painful ant "bites" to his groin and that he was now short of breath and dizzy. Upon admission to the Emergency Room, the patient's blood pressure was 89/64 mm Hg; pulse, 112 beats/minute; respirations, 22/minute and a temperature of 36.0^0 C. There was marked periorbital and perioral edema with cyanosis of the lips. There was severe wheezing present throughout both lung fields and marked erythema of the right groin area, including the scrotum. Symptoms resolved within four hours after treatment with epinephrine, diphenhydramine and steroids. At the time, an extremely tender and enlarged lymph node was present in the right groin along with a large, red papule, ~1x1x1 cm, with piloerection of the surrounding hairs in the vicinity of the papule. The lymphadenopathy, pain, piloerection, and papule at the site of envenomation noted in this patient are characteristic of *Pogonomyrmex* stings.

In their natural habitat, *P. rugosus* creates large circular nest clearings, sometimes with a low mound in the center of the disc, which they often pugnaciously defend (Wheeler & Wheeler 1986). Nests have also been found under stones on rocky slopes (Snelling & George 1979). In the urban setting reported here the ants were nesting under a sidewalk. Mature colonies may contain several thousand ants with as many as 6000 foragers (Taber 1998; Whitford & Ettershank 1975). Workers are large (7.0-9.5 mm) and variable in color (Taber 1998; Wheeler & Wheeler 1986), typically blackish-brown, and often with a reddish gaster (Fig. 1). They are frequently seen running with the gaster tucked under the alitrunk (Snelling & George 1979). Their sting is particularly painful (Snelling & George 1979).

Surveys. In a survey of ant nests around the perimeter of the University of Arizona Campus Agricultural Center, located in a residential area of Tucson, there were 25 harvester ant nests, 17 of which were *P. rugosus* (Fig. 2). The other eight nests were *P. maricopa*, a smaller more aggressive red congeneric that frequently stings without provocation (Pinnas *et al.* 1977). The geographic distribution of these two species broadly overlap and they are frequently found nesting in the same habitat. However, the nests of *P. maricopa* are more widely spaced than those of *P. rugosus* due to the difference in their foraging strategies (Hölldobler 1974). Colonies of *P. maricopa* have a more individualistic foraging behavior, with the ants relying primarily on visual cues for orientation. In contrast, *P. rugosus* colonies use chemically marked trunk trails to channel their foragers to resource sites, which allows for more densely packed nests.

Another large species, *Aphaenogaster cockerelli* (E. André), which resembles a harvester ant was also prevalent around the perimeter (121 nests). They compete for seeds with *P. barbatus* by plugging the harvester ant nest entrances with pebbles and bits of soil early in the morning, thereby delaying the onset of their foraging (Gordon 1988; Barton *et al.* 2002). A variety of other smaller species were also found including, *Myrmecocystus mimicus* Wheeler, *Dorymyrmex bicolor* Wheeler, *Forelius mccooki* (McCook), and *Solenopsis xyloni* McCook. The last species is a native fire ant, which can sting and has been reported to cause allergic reactions (Hoffman 1997). All of the nests along the southern boundary were established within a two-year period. The fenced area was graded and new concrete posts were placed in the summer of 2002.

In a phone survey of four major pest control firms in Tucson, ants were listed as one of their top ranking revenues along with subterranean termites, scorpions, spiders, packrats, cockroaches, and dog

Fig. 1. Close-up frontal view of the head of a *Pogonomyrmex rugosus* worker.

ticks (Table 1). All of the companies listed harvester ants as a common pest in Tucson, and three companies also listed native fire ants. The urban entomologist and extension specialist at the University of Arizona provided similar information (Table 1), naming harvester ants as pests primarily because of their nest clearings, which blemish lawns and landscapes.

The reported incidence of people being stung by harvester ants and native fire ants in Arizona is relatively high. For example, from March 2002 to March 2004, 237 stings were reported in the state excluding Maricopa County (Fig. 3a,b). For both years the incidence rose in April and May and then tapered off after October. In all likelihood, there are many more cases, which go unreported. The species of ant was not specified in this database; however, ant stings in Arizona are almost always caused by harvester ants or native fire ants (Pinnas 1980). Over the same period and locations, the Center recorded 623 bee and wasp stings, 4655 scorpion stings and 346 snakebites.

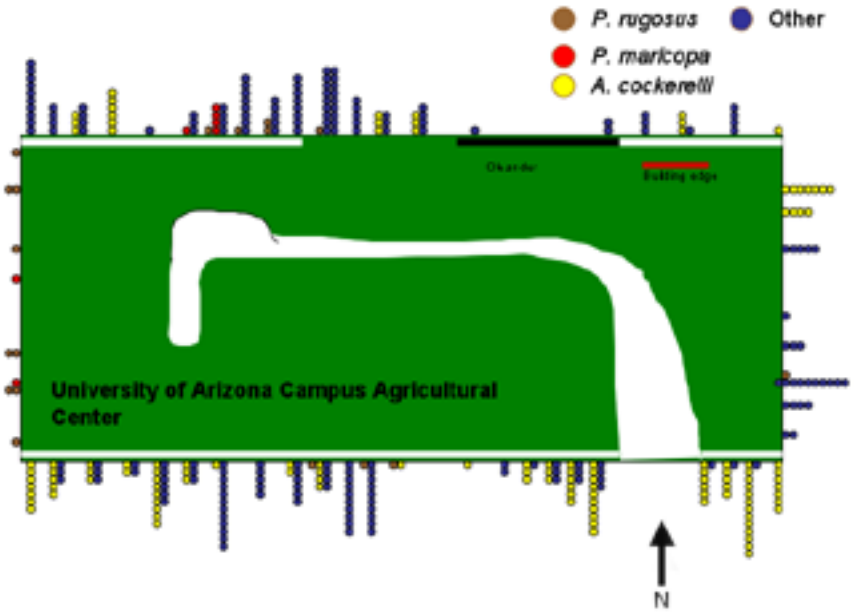

Fig. 2. Birds-eye view of the University of Arizona Campus Agricultural Center showing the locations of ant nests around the outside perimeter.

In the past, stinging insects have been considered to be a problem primarily in rural areas; however, many species thrive in urban environments (Schmidt 1983) as for example, the colonies of *P. rugosus* and *P. maricopa* that nest alongside roadways (Snelling & George 1979). The asphalt retains moisture and softens adjacent soil for nesting as well as promoting growth of grass, which provides seed for harvester ants.

Harvester ants play a critical role in the desert ecosystems of the southwestern U.S. as one of the principal granivores along with rodents, birds, and other insects (Davidson *et al.* 1980). In the urban environment, however, they can become serious medical pests especially for those who are allergic to their sting. In one case, a patient in Tucson who was being treated for anaphylaxis had a history of numerous stings by harvester ants, which were abundant in his yard but had not been successfully exterminated (Pinnas *et al.* 1977). When elimination is warranted as in this case, there are a number of baits formulated with corn grit and soybean oil that are effective against harvester ants. For example, ant activity in nests of *P. californicus* and *P. rugosus* ceased within 48 hours and 2-3 wks of treatment with Amdro Insecticide Bait, respectively (Wagner 1983).

Table 1. Phone survey of four major pest control companies in Tucson, Arizona and an urban and extension entomologist at the University of Arizona to determine the top ranking pests as far as generating revenue, and the most common pest ants.

Source of Information	Top Ranking Pests	Common Pest Ants
University Termite & Pest Control	subterranean termites, ants	Argentine ant, odorous house ant, harvester ant, pharaoh ant, native fire ant
Arizona Exterminating Company	subterranean termites,scorpions, packrats, ants	carpenter ant, harvester ant, acrobat ant, odorous house ant, native fire ant
Truly Nolen Pest Control	subterranean termites,scorpions, black widows, brown dog ticks, ants	leaf-cutting ant, harvester ant, native fire ant, odorous house ant
Arizona Pest Control	subterranean termites, mice, scorpions, ants, cockroaches	pavement ant, harvester ant, leaf-cutting ant, pharaoh ant
Urban Entomologist	subterranean termites, ants scorpions, spiders	native fire ant, harvester ant, pyramid ant, carpenter ant
Extension Specialist	Subterranean termites, ants	harvester ant, native fire ant

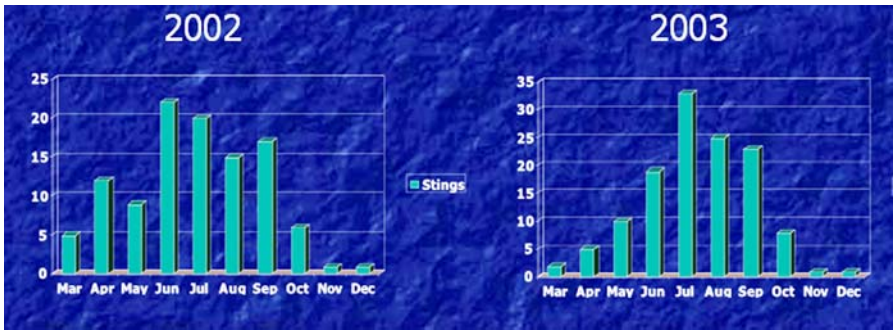

Fig. 3. Monthly incidence of people stung by ants in Arizona excluding Maricopa County for the years of 2002 (a), and 2003 (b).

The increasing numbers of people in rapidly growing urbanized areas and ant dispersion within these areas is likely to lead to increasing numbers of encounters such as we report here.

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