Management of the Red Harvester Ant *Pogonomyrmex barbatus*

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Introduction

This publication is designed to address 3 main questions:

1. What are harvester ants?
2. What is happening to them?
3. What can I do about it?

The following information will introduce you to the fascinating world of harvester ants. You will learn about their interesting society and foraging behavior, as well as their reproductive cycle. You will learn that indiscriminate pesticide use as well as fire ant invasion is causing their decline. Finally, you will learn what you can do to help them thrive on your property.

What are harvester ants?

Harvester ants belong to the genera *Pogonomyrmex* or *Ephebomyrmex*. There are 12 species of harvester ants found in Texas. Since *Pogonomyrmex barbatus* (the Red Harvester Ant) is the most widespread in our state, it will be the one focused on in this paper. If you have access to the internet, you can learn which species occur in your county by visiting http://fasims.tamu.edu/nativeexotic/.

The Colony

The Mound or Nest

Though there are harvester species that prefer wooded areas and/or

Figure 1: Two Harvester Ant mounds side by side. Notice the absence of plant material around the mounds.

sandy soil, the red harvester does not. This species prefers open grassland or arid habitats and seems to especially prefer a clay loam soil. It is generally said to avoid pure sand.

Red harvester ants are fairly easily identified by their large size (up to a half inch) and their generally conspicuous mound (Figure 1). These ants clear vegetation, forming a large circular pattern of bare ground around their nest. This bare ground is often covered with small pebbles dug from within the nest itself. Extending in various directions from the main mound are foraging trails leading to various foraging zones.

Near the entrance to the nest is an area called the midden. This area will vary in diameter depending on the diameter of the mound itself. The midden is the "trash dump" for the colony. It is where the ants deposit pebbles, dead workers, unusable matter from plants and animals brought in by foragers, etc. Colonies 1 year old have a midden diameter of about 8 inches. Five-year-old colonies have middens about 39 inches in diameter.

Below ground, the tunnels and chambers inside a mature nest (5 or more years old) extend downward an

average total depth of about 6 feet. The first chamber encountered when an ant enters the nest is the sorting chamber. This is where the foragers drop the bounty they have gathered and head back out for more. Extending beneath the sorting chamber are tunnels leading to storage and brood chambers. Storage chambers contain seeds that are neatly stacked and stored for consumption. Brood chambers contain the young and/or the queen.

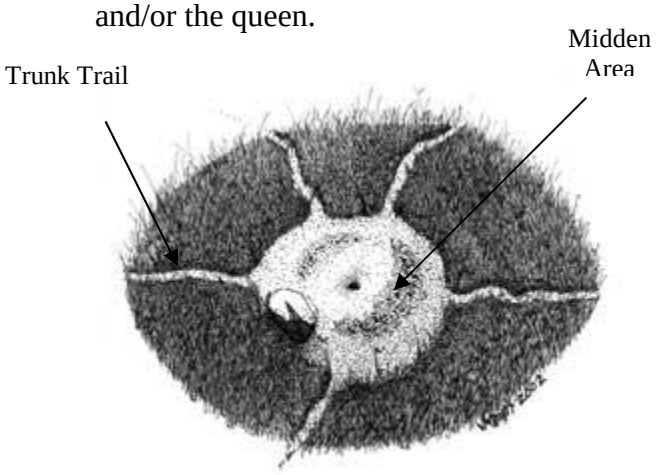

Figure 2: Harvester Ant mound with its trunk trails.

The Ants

The average colony contains around 10,000 individuals. There are three types of individuals within a colony…

1. the queen
2. "alates" or "reproductives" (males and females that will leave the colony to reproduce)…
3. sterile female workers.

A red harvester colony has only one queen. She is the only one to produce workers and alates. She often lives 15-20 years. When she dies, the colony dies. She is not replaced. Alates are fertile males and females the queen produces to leave the colony, mate, and begin new colonies. They do not contribute work or offspring to the colony that produced them. Workers are sterile females. Individual workers only live a year. It is simply amazing that the queen can pump out 10,000 workers a year for 15-20 years!

Within the worker class, there are several occupations that each will perform over the period of her one-year life. The occupations are: nest maintenance worker, midden worker, forager, and patroller.

Nest maintenance workers are the youngest of all the workers. They tend to the queen and the young as well as perform routine maintenance to the nest should it need repair. These workers do not venture more than a few feet into the outside world. They move to the surface or just beneath it, sorting seeds from debris in the sorting chamber then transporting them to the lower sections of the nest. Research reveals that 75% of the individuals in the colony are involved in this type of work.

Toward the end of her life, the maintenance worker shifts jobs, becomes a midden worker, and joins the 25% of the workforce that interacts with the outside world. She then takes the "trash" that maintenance workers and foragers bring into the sorting chamber and removes it outside to the midden.

When a predator has reduced the number of foragers, or when there is a windfall of food to be gathered, midden workers may shift and become foragers.

Workers may be foragers until they die, or they may shift again and become patrollers. It is unclear what makes some become patrollers and others not. Patrollers are the "decision makers" in many cases. They decide where the colony is to forage each day.

This is discussed further in the next section.

Diet and Foraging Behavior

Harvesters, as the name implies, harvest seeds. Grass seeds make up the majority of their diet. A 17-year study of the red harvester in Arizona revealed that they have a special affinity for needle grama (Bouteloua aristidoides). Other researchers have recorded them gathering love grass (*Eragrostis sp.*), panic grass (*Panicum sp.*), crabgrass (*Digitaria sp.*), buffalo grass (*Buchloe dactyloides*), and three-awn (*Aristida sp.*). Suzanne Tuttle at the Fort Worth Nature Center and Refuge has noted them collecting Texas grama (*Bouteloua rigidiseta*). I have seen them bringing in Texas winter grass seed (*Nasella leucotricha*). Agricultural crops such as millet and barley are on their menu as well.

Harvesters are known to gather seeds from plants outside the grass family like pine (*Pinus sp.*), ragweed (*Ambrosia sp.*), pokeweed (*Phytolacca sp.*), palmetto (*Sabal sp.*), nettle (*Urtica sp.*), evening primrose (*Oenothera sp.*), bluebonnets (*Lupinus sp.*), and mormon tea (*Ephedra sp.*).

Though they are mostly seed eaters, they will take animal matter as well. This includes lice, screwworm maggots, ticks, mites, snails, worms, millipedes, silverfish, spiders, grubs, beetles, other ants, termites, fire ant alates, and many other small insects unfortunate enough to get caught. They are also known to eat animal feces.

Harvesters do not forage at night. Depending on the species, they may plug the entrance to their nest, or they may not. Either way, activity ceases at night. As the sun rises, the patrollers are among the first individuals to emerge. They fan out in various directions. Mature colonies have an average of 8 foraging "zones" that may extend as far as 130 feet from the nest. They use only 3 or 4 zones each day. The patrollers decide which ones. Patrollers locate food sources first thing in the morning (between 6:00 and 7:30am) then head straight back to the nest leaving a chemical trail to the food. Foragers are then sent to collect the food. (Foraging peaks around 8:30am.)

In general, foragers will not "recognize" food items unless patrollers have "told" them it is food. Research (and personal observation) has shown that after the foraging zones have been determined for the day, foragers will ignore (sometimes even walk right over) birdseed placed very near the colony. It will be ignored until the next morning when patrollers "discover" it and "tell" the foragers it is food. Then they will quickly gather it.

Foragers spend an average of 20-30 minutes out per trip. They may travel up to 130 or so feet from the nest to forage (Figure 3). 90% of them come back with something. However, they do not always return with food. They sometimes return with inedible bits of "trash" that midden workers simply discard. It is unclear why they do this.

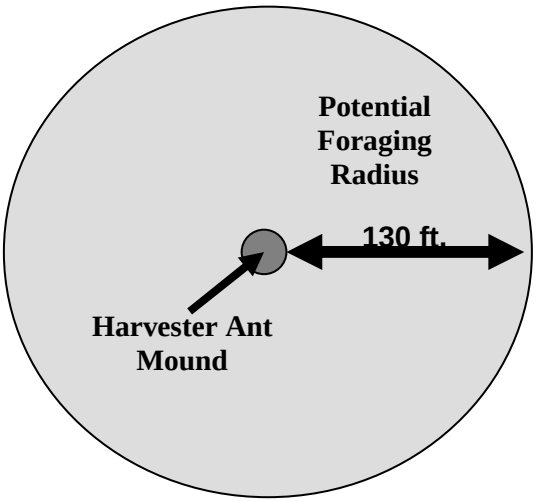

Figure 3: The potential foraging zone may extend about 130 ft. from the mound.

As an aside, harvesters generally get water they need by metabolizing fats in the seeds they eat, but they have been seen lined up drinking around water puddles like cows around a stock tank.

Reproduction

The queen produces sterile workers from the beginning to the end of the colony's life, but when the colony reaches 5 years of age she begins also producing alates. As mentioned earlier, the alates do not produce offspring for the colony. Their purpose is to mate with other alates from other colonies and create new colonies.

Mating occurs from spring to fall each year, but generally follows summer rains. After a couple days of rain, the alates gather at the nest entrance of each colony and seem to move in and out indecisively. On the first, clear day after rain, alates from all neighboring colonies simultaneously lift off and meet in one location which changes from year to year. It is thought that the first female to arrive at a suitable spot for mating emits a chemical signal that draws all other alates in the area to that spot. They all breed in a writhing mass on the ground during that afternoon. Once a female has mated with several males, she will shake them off and fly to a seemingly random location. She will dig down about 18 inches and may never return to the surface. She will begin producing workers, and with luck she will succeed at starting a new colony.

Starting a new colony is apparently not an easy task. Survivorship of mated females is less than 1%. They make tasty treats for most every predator out there, hence many are eaten before they can make it underground. If the female survives long enough to dig in, she still has an "uphill road" to travel. Many new colonies are begun in areas incapable of supporting them. Consequently, they starve. However, since survivorship for colonies two years or older is 95%, ones that reach that age are likely to live out their 15-20 year life span.

What's happening to harvester ants?

There are several factors that have a negative impact on harvesters. These include predation, competitive exclusion, and pesticide exposure.

Harvesters have many natural predators. Perhaps the most well known is the horned lizard. Though the threatened Texas Horned Lizard is known to occasionally eat beetles, spiders, and flies, 65% of its diet is harvester ants. As harvesters decline or are eliminated from an area, Texas Horned Lizards are eliminated as well.

In addition to horned lizards, other lizards will prey on harvesters. Various frogs and toads will too. Birds such as chickens, mockingbirds, plovers, flycatchers, cardinals, shrikes, blue jays, woodpeckers, and doves all eat harvesters. Invertebrates including robber flies, wasps, assassin bugs, ant lions, sun spiders (Solfugids), and dragonflies are also natural predators on harvesters. But it is not the natural predators that are causing the decline in harvester populations. Natural predation is part of the life cycle and is not problematic.

However, fire ants are impacting harvester ant populations by competitive exclusion. Generally fire ants do not kill harvesters directly. Instead, they efficiently gather food within the harvester's foraging zone, thus eventually starving the colony.

Indiscriminate use of insecticides, however, has also taken a heavy toll on harvester populations. Many people have waged war directly on harvester ant colonies not realizing how fascinating and valuable they are. I believe that many people would not have poisoned colonies had they known how critical harvesters are to the survival of horned lizards.

Today, I believe that most people no longer intend to harm harvesters. However, they inadvertently do so by broadcasting insecticides intended to kill fire ants.

Controlling fire ants is important. Unfortunately, some professionals are recommending broadcasting bait products over large areas. This kills fire ants, but unfortunately it kills native ants (including harvesters) as well. Once native ants are eliminated from an area, it becomes even easier for fire ants to invade again. Ways to address this problem are discussed in the following section.

What can I do to help harvester ants?

Though difficult, it is possible to transplant or reintroduce harvester ants to a property where they no longer exist. By using an extremely large tree spade and removing the entire colony during the night when they are inside, some people have been successful at moving mounds. However, if harvesters were once present and are now absent, there is a reason. Reintroducing them without solving the initial problem that eliminated them in the first place may only cause the newly transplanted colony to suffer the same fate as those before them. Therefore, should you have existing colonies, treasure them!

Since mating occurs in a mass of chaos, it is next to impossible to track particular alates and, therefore, determine how far they disperse to start a new colony. If you do not have existing colonies, manage your property so that it is suitable for harvesters, and check for colony establishment each fall.

There is a combination of two basic strategies that you can employ to help harvester ants. First, you can manage and enhance the habitat to provide optimal foraging for your colonies. Second, you can help keep fire ants from destroying the colonies you are encouraging.

Habitat Management and Enhancement

You now know that harvester ants are seed eaters, preferring grass seeds most of all. You also know that a mature colony will forage up to 130 feet from the mound. Using this information, I recommend planting locally native grasses within the forage radius. Check with your local Texas Parks and Wildlife biologist to determine which grasses are native to your county.

During the winter many of our native grasses can be divided and transplanted from wild stock should you be fortunate enough to have the desired species growing on your property. If this is the case, you may simply dig a portion of the plant (making sure to get plenty of root mass along with it) and transplant it into the forage radius of your harvester ant mound(s). Be sure to water the transplants well. A thick layer of mulch around the transplants will help them as well. If possible, watering the area once a week during the following summer will greatly increase survival of the transplants, but many may survive with adequate rainfall alone.

Should you choose to sow seeds of desirable species, I recommend you use the "seedball" method. Harvesters are seed eaters, so they are likely to harvest any seed you scatter within their forage zones. To help decrease the chance of unintended seed loss, create seedballs. Mix (dry) commercially available red pottery clay, compost, and seeds (using a ratio of 5 parts clay, to 3 parts compost, to 1 part seeds). While still mixing, moisten the ingredients to the consistency of a thick paste. Roll the paste-like mixture into marble sized balls. This will encase much of the seed in the clay, protecting it from harvesters, birds, rodents, etc. The compost in the mix will serve to nourish germinating seeds. As rainfall melts the clay, the seed has all it needs to sprout and grow.

Though I believe it is best to plant the plants that the harvesters will feed on, you may also choose to feed your colonies directly. Before beginning a feeding program, you must first eliminate or greatly reduce the fire ant population within the foraging zones of your harvester mounds. Otherwise you will only be feeding fire ants. Ways to accomplish this are discussed later.

Once you have gotten fire ants under control, you may begin to feed your harvesters. There are several ways to do this. At sunrise, simply pile native seed, crushed peanut hearts, oat flakes, or other similar food items near the mound and watch them haul it to the nest. Or you can create feeders that better ensure harvesters get the food. Either way you choose, be careful to avoid generic birdseed mixes as these may contain seeds of exotic plants that can become a problem on your property.

To make a feeder, simply punch a series of 3/16" holes (on 1" centers) in a container (such as a coffee can) just below the top rim (Figure 4). Driving a 16 penny nail through the can will be about the easiest way to do this. Fill the container with the food you are offering. Secure the lid. Place the container upside down near the mound. Doing this will allow the seed to fall such that harvesters can access the seeds by the holes punched in the container (Figure 5). This should create a feeder that reduces the chance of birds, rodents, or other seed eaters getting the food.

To take full advantage of the harvester's behavior, remember to feed colonies at sunrise so that the food is out the shortest amount of time before the patrollers find it.

Fire Ant Management

I have had good luck using beneficial nematodes (microscopic worm-like creatures) to control fire ants. However, we do not know how these nematodes affect harvesters. Until we know they will not harm harvesters, I cannot recommend them.

Figure 4: You can make a feeding station by punching 3/16" holes into a coffee can just beneath the rim of the lid.

To control fire ants while protecting harvesters, treat fire ant mounds individually with organic methods or bait products. Do NOT broadcast poisons or baits as recommended in some fire ant control programs.

Individual fire ant mounds outside a harvester forage zone (130ft. radius from a colony) may be treated at various times of the day depending on the product used. Organic contact killers, such as compost and citrus oil sprays, drenches, etc. may be home made or found in local organic nurseries and are quite effective at killing fire ant workers. Contact local organic nurseries for these products or visit the website www.dirtdoctor.com to learn how to make your own.

Though these methods are effective against workers, they are not always fatal to the queen. Killing her may require a bait product that the workers feed her.

For fire ant mounds outside a harvester forage zone, first use the organic methods to knock the colony back, then use a fire ant bait product containing fenoxycarb a few days later to get the queen(s). Fenoxycarb is an insect growth regulator with low toxicity to birds and mammals. It works by interfering with the metamorphosis from larva to adult. The colony will run out of workers. The queen will starve. Products containing fenoxycarb include Award, Logic, and Hi-Yield fire ant baits. Always follow instructions on the label.

Fire ants tend to aggressively defend a food source. If only enough bait to treat an individual mound is used, fire ants will defend the bait as a food source and should not allow other ants to get to it. Do not over treat a mound as this may allow other ant species to be killed. Do not place bait material directly on the mound as fire ants do not typically forage on top of the mound. Place the bait around the mound so that it will be treated as food and collected.

Figure 5: As you turn the feeder over, the seeds will become available to the harvesters through the holes you created.

To treat fire ant mounds within harvester forage zones, use the organic methods as described earlier but follow up with a more time-restricted use of a bait product containing spinosad. Spinosad is a mild stomach toxin that kills fire ants, but doesn't affect harvesters. Products containing spinosad include Justice and Eliminator.

Recall that harvesters don't forage at night. Fire ants do. Therefore, to further reduce the chance of harming harvesters, place fire ant bait material around individual fire ant mounds within harvester forage zones during the evening. Use just enough for the workers to haul it underground before sunrise the next morning.

When treating fire ant mounds that are extremely close to harvester mounds or simply as an extra precaution, bait stations may be beneficial. To create bait stations, drill holes into the lids of small containers such as film canisters (Figure 6). The holes should be 1/16" to allow fire ants to enter while

excluding all other larger species. Place the bait product in the containers, secure the lids and place the containers on their side near an active fire ant mound. This allows fire ants to get the bait while excluding harvesters. More than one station per mound may be required depending on the size of the mound.

Conclusions

Harvester ants are fascinating and highly beneficial insects. They are crucial to the survival of the Texas Horned Lizard. Though there are pockets in our state where harvester ants are plentiful, overall they are facing a difficult challenge to their survival. The Red Imported Fire Ant actively out-competes the harvesters for food. As a result, harvesters are declining in areas where fire ants are abundant.

To help harvester ants thrive, fire ant populations must first be reduced to minimal levels. Once this is accomplished, an active management strategy to benefit harvesters directly can then be implemented. Harvesters are seed eaters, specifically preferring grass seed. By planting native grasses within the forage zones of harvester ant mounds landowners can provide long term food supplies. A more immediate, albeit labor intensive, approach is to feed harvester colonies directly using feeding stations.

There are many things that can be done to help increase harvester ant populations. If you have harvester ants on your property, appreciate them and do what you can to ensure the continued survival of this fascinating member of our native ecosystems.

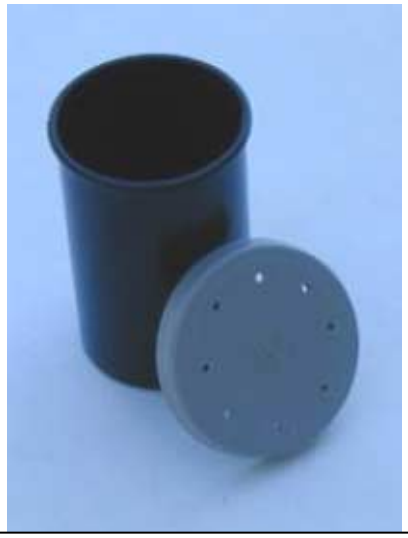

Figure 6: Bait stations can be created by drilling 1/16th inch holes in the lids of small containers.

Harvester ants working diligently to harvest seed from a coffee-can feeder.

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