The Turfgrass Ant
Lasius neoniger

By Sean F. Werle, University of Massachusetts, Amherst

What are ants? This question has almost as many answers as there are people who might consider it.

To your child, ants may be the industrious residents of an antfarm on a bookshelf or the fascinating combatants that engage in epic battles on the pavement of your driveway. To an ecologist, they are members of the insect family *Formicidae*, and are one of the most important cogs in the complex biological machinery that they study, exerting an effect on every other part of a given ecosystem.

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If one is in the business of managing turf however, ants are more and more often becoming a problem that has to be dealt with. The pest status of ants is a phenomenon that has developed fairly recently, within the last 20 to 30 years. The reasons are not quite clear, but some hypotheses have been advanced and this article will address those ideas and also try to answer the question posed above.

The Ant World

It has been said that the combined number of ants on the Earth is greater than all other land animals combined, which is quite possible. Studies of the turfgrass ant, *Lasius neoniger*, reveal populations greater than 10 million ants per acre in heavily infested turf. A single ant colony can have as few as 35 ants, in some species, to as many as 1 million or more in others.

There are over 12,000 described species of ants; a large proportion of these are tropical, but there are many temperate and even arctic species. The state of Massachusetts is home to approximately 110 species of ants, and this number is probably a good estimator of the diversity in any temperate area. Ant diversity will increase with decreasing latitude — the closer to the equator one looks, the more species of ants one can find.

Why Ants Succeed

The reasons for the evolutionary success of ants are numerous, but there are several that stand out. These are eusociality, chemical adaptation and general hardiness, probably in that order of importance.

Eusociality refers to the fact that ants are social insects, similar to some of the bees and wasps. E.O. Wilson defines eusocial insects as those that possess three traits: cooperative brood care, reproductive caste differentiation and overlapping generations.

All ants exhibit these traits. Immature ants are completely helpless and depend upon adult "worker" ants to care for and feed them. These worker ants are incapable of reproducing; that is the job of the reproductive castes, which include the queen, or queens, and the winged males.

Ant colonies can be monogyne, with only one queen, or polygyne, with multiple queens. Both of these conditions can occur in the same species, as is the case with *Solenopsis invicta*, the red imported fire ant, a notorious ant pest that is discussed in another article in this issue.

"Overlapping generations" refers to the fact that ant queens survive for many seasons, and thus can produce many generations of offspring in a lifetime. Wilson had a turfgrass ant colony that lived for 30 years with a single queen.

The extreme chemical adaptation of ants is another factor in their success. Ants have evolved many glands to produce chemicals that help the colony function. Some are used to raise an alarm in the case of danger from outside, some are for making trails that other ants can follow to a source of food or water and still others are antiseptic, keeping the colony free of infections caused by fungi or bacteria. This extreme chemical dependence has given ants a highly developed sensitivity to many chemical compounds and some studies have shown that they are capable of detecting and avoiding insecticide applications (Vittum and Werle, unpublished data).

The general hardiness of ants is quite remarkable. Some are able to survive immersion in water for as long as two weeks and others have been exposed to intense radiation with no ill effect. This toughness means that, for many species, an established colony is unassailable by other insects or animals.

Many ants can both bite and sting, and are very capable defenders of their colony. The tropical ant (*Paraponera clavata*), from Central and South America, is commonly known as the bullet ant because it is said that the sting of this ant is more painful than a gunshot wound, though the accuracy of this is debatable.

Colony Life Cycle

The life cycle of a colony is roughly similar for all ant species. In the turfgrass ant, *Lasius neoniger*, the egg-laying queen spends most of the season laying fertilized eggs that will develop into female worker ants. These workers comprise the majority of the colony and are responsible for all of the food gathering, defense and brood care for the nest. Many ants share food within the colony through a process called trophalaxis where liquid food is regurgitated and passed between workers or from workers to the queen or the brood (larvae).

Late in the summer, the queen begins to lay fertilized eggs and also to feed some of her female larvae differently than normal worker larvae. The unfertilized eggs develop into winged male ants and the specially treated larvae develop into large winged females. These winged ants, called alates, build up in the nest and are prevented from leaving by the workers. Sometime near the end of August, some poorly understood signal causes the workers to allow the alates out of the nest and they take

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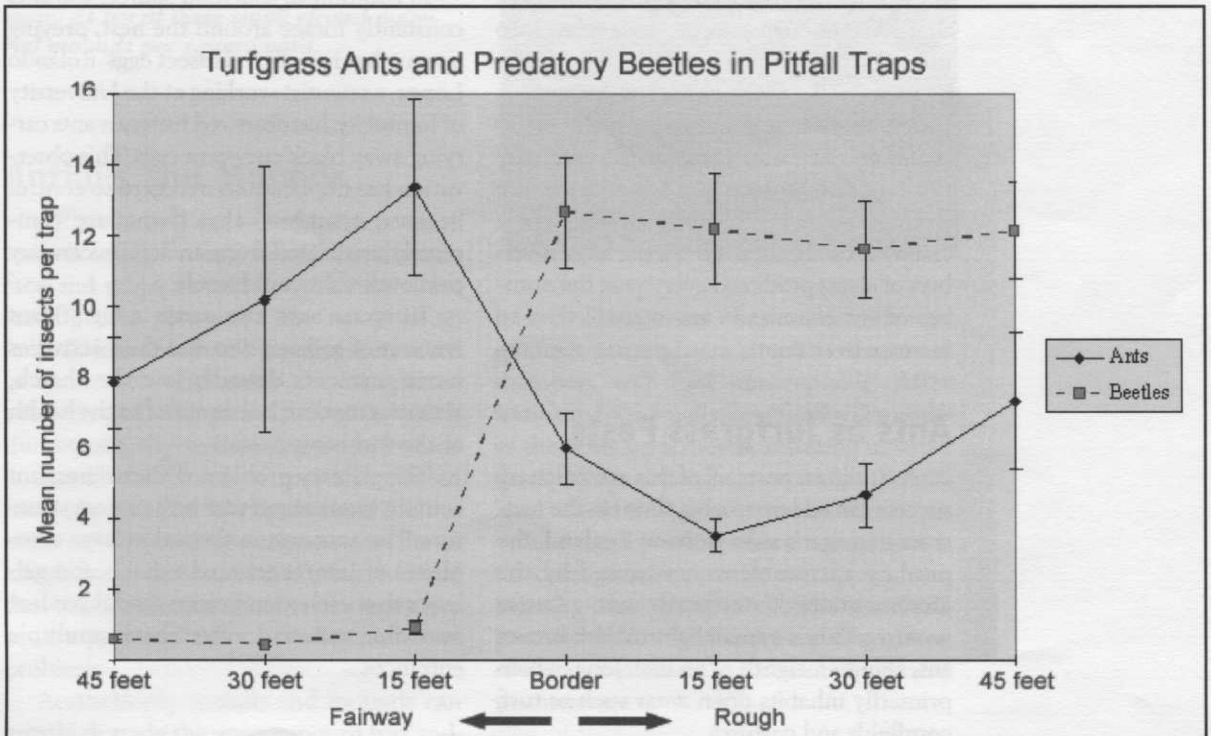

flight simultaneously across large regions. This is called the nuptial flight and it occurs once every year. During this flight the male and female ants mate and, after flying some distance, settle back to the ground.

The males have served their purpose at this point and are doomed, falling prey to other ants or insects or dying of starvation. The females, now mated and ready to establish new colonies, will fly in search of an open grassy area. Studies have shown that the queens will avoid entering wooded areas. Thus, if they began their flight on a golf course, they will likely remain somewhere on the course. Once they have found a suitable spot, they will chew off their wings, burrow into the ground and lay a small clutch of eggs. These eggs develop into undersized workers called nanitics that immediately begin foraging. Once they have brought back enough food, the queen begins laying eggs that have enough energy to develop into normal workers.

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Despite the ant's reputation for organization, this whole process is actually rarely successful. There are many dangers faced by the foundling queen and her tiny nanitic workers. But, when she does succeed, a new colony is established. Given the large numbers of alates produced every year, the number of ant colonies in an area will tend to increase over time.

Ants as Turfgrass Pests

As turfgrass pests, all of this evolutionary success can add up to a big thorn in the turfgrass manager's side. In New England, the primary ant problems are caused by the aforementioned turfgrass ant, *Lasius neoniger*. This is a small light to dark brown ant, about an eighth of an inch long, which primarily inhabits open areas such as turf, cornfields and pastures.

These ants need grasses in order to survive because a large part of their food is indirectly derived from the grass itself. The ants don't consume plant material; instead, they tend small aphids (*Anuraphis maidiradicis*, the corn root aphid), which feed on the grass roots and produce a sugar-rich excretion called honeydew which the ants consume. These aphids, in turn, are completely dependent on the ants.

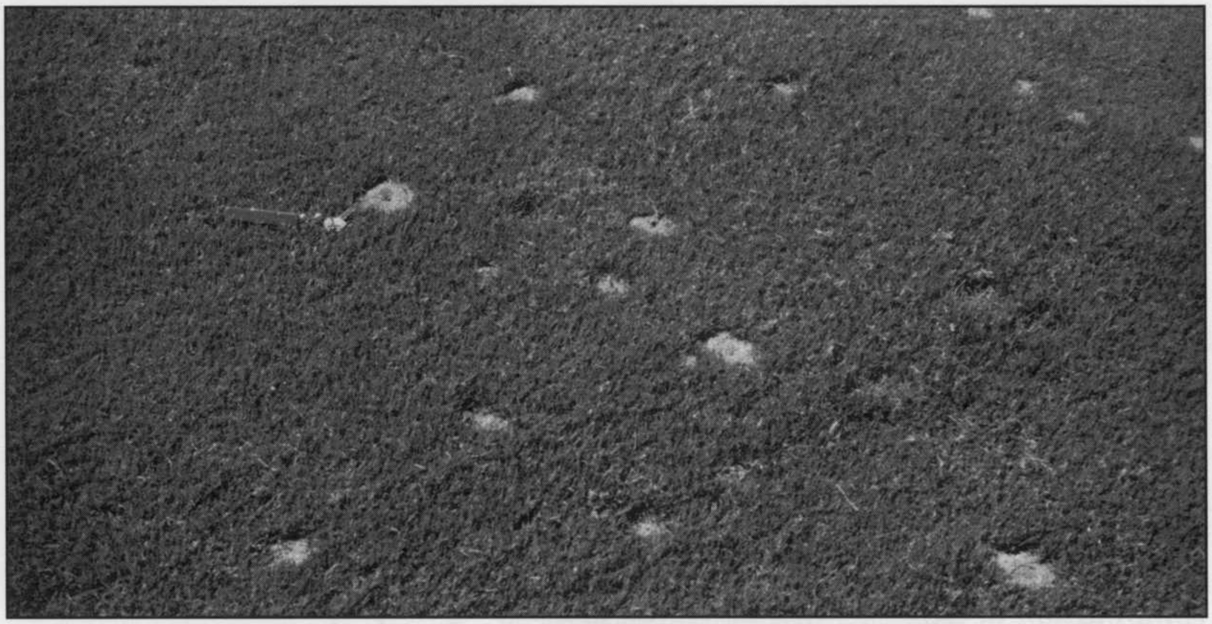
Metcalf described this relationship as follows: "This aphid is rarely found on roots except where attended by the ants and, if placed on the surface of the ground, is apparently helpless so far as finding a place to feed is concerned. An ant finding one of these aphids, however, immediately picks it up, carries it underground and places it on the roots of one of the aphid's food plants."

In the winter, the ants bring the eggs of the aphid down below the frost line and in the spring they place the newly hatched aphids back on the roots of the grass. The root zone of ant-infested turf often supports large populations of these aphids, though seldom enough to cause pathology in the plant.

In addition to this food source, the ants constantly forage around the nest, preying upon other insects and insect eggs. Rolando Lopez, a scientist working at the University of Kentucky, has observed turfgrass ants carrying away black cutworm eggs. This observation has implications in regard to control because it suggests that if ants are completely eradicated from an area, secondary pest outbreaks could result.

Turfgrass ants also cause a significant amount of soil aeration and their activities move nutrients down below the thatch; activities that can be beneficial to the health of the turf ecosystem.

The primary problem with turfgrass ant activity in managed turf is their nest structure. The ants nest in the soil in large complexes of interconnected tunnels and galleries that can extend more than three feet into the soil and often have multiple entrances.



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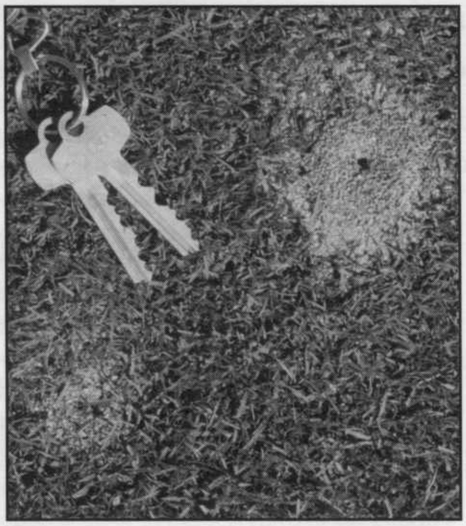

Anthills and Mounds

All of the soil excavated to form these tunnels and galleries is brought to the surface and piled around the entrance holes leading into the nest. The result is an "anthill" like structure. This term is enclosed in quotes to emphasize the distinction between an anthill or ant mound in which the ants actually reside, and an anthill which is simply composed of material ejected from beneath the soil by the ants such as those constructed by turfgrass ants. In an infested area there can be as many as ten of these small ejected material mounds per square yard and this causes a number of problems.

Aesthetically anthills and mounds can greatly degrade the appearance of turf and, on golf course greens, they can detrimentally affect game play, a situation that most members will find unacceptable. After some time, the small piles of soil will smother the grass underneath, resulting in small dead patches that remain even after the ants have ceased using that entrance.

The most pressing concern, however, is the damage to equipment that results from mowing over the mounds. The small soil particles dull mower blades and clog rollers, causing a significant increase in equipment maintenance costs.

Why ants increase

Among a number of possible causes for the recent increase of ants as turf pests, the two that stand out are decreased mowing height and the loss of organochlorine insecticides. For many years, chlorinated organic compounds such as chlordane were used extensively in turf to control a number of pests, mainly scarab beetles. These compounds are highly toxic to ants and thus ant populations were probably secondarily controlled by these applications. Since the use of these materials was discontinued in the 1970s, ants have possibly been released from this chemical constraint and thus are able to emerge as pests.

The best long-term solution is probably to find ways to coexist with the ants, using a combination of carefully timed pesticide applications and adjustments to fairway and greens mowing heights.

Another possibility is the "Stimpmeter factor." As golf courses have competed to increase green speed, mowing heights have steadily decreased. Turfgrass ants are seldom cited as home lawn pests and their presence is difficult to detect in a golf course rough. This is because the grass is mowed at a height that masks ant activity. On short-mowed fairways and greens, this masking is removed and ants that may have been present but undetected at a slightly higher mowing height are revealed as pests.

Controlling Turfgrass Ants

Lasius neoniger has proven difficult to control. Many insecticides are ineffective against them and, as mentioned before, they are capable of detecting applications and avoiding materials in some cases. Studies at Dr. Vittum's lab at the University of Massachusetts have revealed no material that is effective for more than a few weeks in controlling mound-building activity.

Some patterns have been seen that may be helpful, however. Since the ants spend the winter deep in the soil and move rapidly to the surface in the spring (early April in western Massachusetts), timing of application can be an important factor in control. If an effective material is applied at this time, the colony will suffer a serious setback in its initiation of warm weather activity and this can delay the onset of turf management problems.

Another possible avenue of control is to adjust mowing height in order to mask ant activity. Fairways mowed at three quarters of an inch are unlikely to exhibit ant problems because the soil ejected from the nests will not reach above the grass. Often changes such as this are unacceptable to club memberships and so ants remain a difficult and expensive problem for the people in charge of managing turf.

Conclusion

It is appropriate to return to the question posed at the beginning: what are ants? Hopefully the point has been made that while ants are a serious problem in many turfgrass settings, they are beneficial in other ways also.

Understanding what ants are and how they fit into the local turf ecosystem (i.e., identifying and controlling food sources) is important for responsible ant management. However, if all your efforts prove fruitless, then the best long-term solution is probably for turf managers to find ways to coexist with the ants, using a combination of carefully timed pesticide applications and adjustments to fairway and greens mowing heights.

Think of it this way: With all of the myriad insects out there that eat grass, can insects that eat other insects be all that bad?

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