

Black Turfgrass Ataenius Management Programs for 1999

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Bottom line: White grubs continue to be some of the most difficult turf insect pests to control due to their cryptic (hidden) life style in the soil and the lack of simple detection techniques. Of all the white grubs that occur on golf courses, the black turfgrass ataenius is perhaps the most frustrating to manage, particularly because it can cause damage over a long period of time – from June through October. Based on our current knowledge, a grub monitoring program, in conjunction with preventive grub control programs implemented in June are the most reliable and effective way to manage the BTA.

Black turfgrass ataenius: a small grub that can cause big headaches

Figure 1. The immature stage of the black turfgrass ataenius (BTA) is the white grub pictured below. It measures $\frac{1}{10}$ inch in length when it first hatches from the egg (eggs are laid in the soil by adult female beetles), and reaches no more than $\frac{3}{8}$ inch when it is full grown, as illustrated below. These grubs were found feeding on roots near the thatch/soil interface of a bentgrass fairway which resulted in the damage seen in Figure 2.



Figure 2. By feeding on turf roots, BTA grubs caused serious damage to this bentgrass fairway. The damage seen in this photo was the result of the grub population pictured in Figure 1.



When seen for the first time, the small grubs of the black turfgrass ataenius (*Ataenius spretulus*) seem incapable of causing serious damage to turfgrass. However, because they can build up to very high numbers in the soil before their presence is detected,

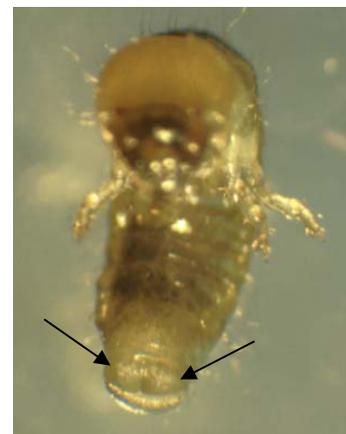
these innocuous, rather cute looking insects can devastate cool season greens, tees, collars and fairways by feeding on, and destroying the root system.

How to identify BTA grubs and adults

Grubs: The damaging stage of the BTA is a grub that can easily be overlooked, because of its small size and because it spends its lifetime hidden – feeding near the thatch/soil interface on turf roots.

The BTA grub is a soft-bodied insect that is fatter and shorter than a typical caterpillar, and lies in a “C” shape when resting (Figure 1). The color of the grub can vary from opaque white to almost transparent, which allows you to see the grub’s digestive tract, a tube filled with dark colored plant tissue and soil. These features are typical for all white grubs (including Japanese beetles, chafers and June beetles), but BTA grubs are unique in two ways. First, they are very small, never growing above $\frac{3}{8}$ inch in length (most other grubs reach over $\frac{1}{2}$ inch in length). The only other common grub that is as small as the BTA is *Aphodius* (Figure 4). Secondly, BTA grubs have two pad-like structures on the rear end of their bodies (Figure 3); these structures are not present on *Aphodius* or any other grubs.

Figure 3. BTA grub. Note the two pad-like bumps (arrows) on the rear end of the grub. A hand lens is required to see these structures, which distinguish BTA grubs from all other commonly occurring grubs.



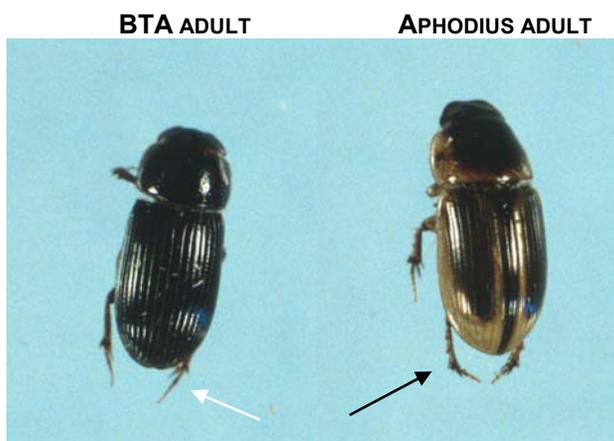
Adult identification: Although they do not damage turf as adults, female BTA beetles lay eggs at the thatch/soil interface from which grubs hatch several

days later. Therefore, being able to recognize BTA adults can help you determine whether you are in for a serious grub year or not.

BTA adults are somewhat easier to identify and detect than their progeny. However, they are similar in appearance to several other small, dark colored beetles that typically occur on golf courses, some of which are not pests at all. For this reason, it is important to be able to distinguish BTA adults from other small beetles that occur on golf courses.

BTA adults are small ($1/10 - 2/10$ inch long), hard, shiny black beetles that are cylindrical in shape (Figure 4). Another small beetle that occurs frequently on the golf course in the West is *Aphodius lividus*. Although it is closely related to the BTA, we have yet to find grubs of *Aphodius* damaging turfgrasses. Since it does not appear to be a pest (at least in Western U.S.; *Aphodius* can be a serious turf pest in the Eastern, U.S., however), insecticide applications should not be made against the *Aphodius* beetle. It can be distinguished from BTA adults in two important ways. First, the *Aphodius lividus* beetle is not black, as is the BTA adult. Instead, it is dark brown with lighter brown markings. Secondly *Aphodius* has several small projections on its hind leg, known as transverse carinae, which are not present on the relatively smooth hindlegs of BTA beetles (Figure 4).

Figure 4. Although they are approximately the same size and shape, BTA (left) and *Aphodius lividus* (right) adult beetles differ in color and in the shape of their hind legs. BTA adults have relatively smooth hind legs, with no obvious projections (white arrow), while *Aphodius* has a series of small projections, known as transverse carinae (black arrow) on their hind legs.



BTA adults are also easily confused with a beneficial insect, the ground beetle (Figure 5). Ground beetles are typical inhabitants of golf courses, and are predators – they feed on the eggs and small larvae of cutworms, grubs and other small insects. For this reason, insecticide applications against these

biological control agents should be avoided. There are a few easy ways to tell the difference between ground beetles and BTA beetles. First, ground beetles are very active, and are frequently seen running across the surface of the turf. In contrast, BTA beetles are slow walkers, and will not run even when prodded. Ground beetles have long, thin antennae emerging from the sides of their heads, while the antennae of the BTA are so short that they are invisible to the naked eye.

Figure 5. Comparison of BTA beetle (left) to ground beetles (right). Note the long, thin antennae on the ground beetle (black arrows) and the lack of obvious antennae on the BTA beetle. Ground beetles are typically larger than BTA beetles, but because we don't usually see these insects side-by-side, size is an unreliable feature to use for identification.

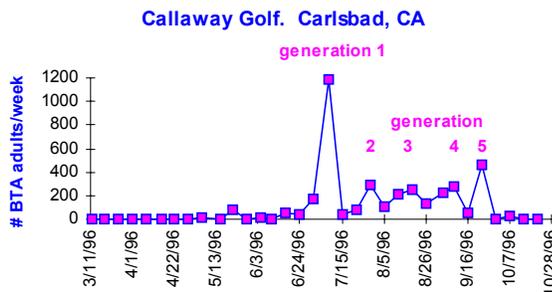


Timing of BTA Infestations

In most parts of the U.S., the BTA has one to two generations a year, with the major activity occurring between June and August of each year. It was generally assumed that this pattern held true for the southwest as well, but because the BTA was not even recognized as a pest in California until the mid-1980s, very little information on its behavior in the West was available until recently. To address this, beginning in 1994, the PACE Turfgrass Research Institute began a four year black light monitoring program in California to determine when and where key insect pests occurred on golf courses. One of our most important findings from the study was that the BTA can have three to five generations per year in our warm weather climate. As a result, the grubs can reach high numbers and cause damage for a longer period of time – between July and October in most locations (Figure 6).

It is important to note that low numbers of BTA adults and grubs can be found on Western golf courses throughout the year, as a result of the fact that our temperatures are not cold enough to drive them into diapause (hibernation), as occurs elsewhere in the U.S. However, the numbers of adults that occur during the cooler months should not be cause for alarm or for insecticide applications.

Figure 6. A typical pattern for BTA adult activity in California is illustrated in this black light trap data from 1996. Note that significant adult activity begins in late June and ends in October. Since grubs appear 1-2 weeks after each peak of adults, grub activity should be expected beginning in July and ending in October.



There are two important implications of these findings:

- Since BTA grubs do not appear on golf courses in significant numbers until late June (at the earliest), sampling and control procedures should not be initiated until then. This strategy also applies to most other white grub pests. Literature and training based on older, incomplete data suggested that superintendents begin their white grub programs in April or May. *Data generated here in California by PACE, and elsewhere by other turf researchers now indicates that there is little value in beginning white grub procedures before June.*
- The long period of time (4 or more months) during which BTA grubs can cause damage presents a management problem, since there are few (if any) products with four months of residual activity. Methods for dealing with this are discussed under “Management Strategies” below.

Warning signs for triggering grub sampling

Beginning in late June, keep an eye out for the following symptoms of BTA infestations. If BTA grubs or adults are observed, the sampling program described in the next section below should be implemented.

- Increased bird activity on greens: crows, blackbirds and starlings are very fond of BTA adults and grubs. Examine the soil underneath areas of bird damage for either adults or grubs.
- Adult BTA beetles in clippings: periodically check for BTA adults by placing a few handfuls of fresh clippings into a bucket of water. The clippings will sink and BTA adult beetles will float to the surface.
- Small areas of wilting or thinning turf and/or areas of scalped turf. These symptoms may be due to

BTA grub feeding on roots. Sample underneath the affected area as described below to determine whether grubs are present.

- Remember: adult BTA beetles do not cause any damage to turf themselves, but can be a good indicator that grubs will appear within the next few weeks.

Sampling for BTA grubs

Problem areas should be monitored for grubs every 2-3 weeks, beginning in late June/early July and ending in October. Keeping good records of what you find can help you predict the timing and location of BTA problems in the coming years.

BTA grubs are notoriously difficult to detect. Unlike many other insects (including BTA adult beetles, cutworms and others), soap drenches are not effective in bringing these animals to the turf surface. Only a soil sampling strategy, such as the procedure illustrated in Figure 7 below, can help you to detect the presence of BTA grubs before they build up to damaging levels.

Figure 7. If you suspect that BTA grubs are present based on the warning signs listed above, sample at least three areas on three greens by cutting an “I” shaped slit in the soil that is approximately 6 inches long, with horizontal slits that are 4 inches long. Peel back turf, as illustrated in the photo below, and examine the soil for BTA grubs.



Management strategies

If you find BTA adults or grubs at your site, there are a number of management strategies to choose from. These are described below, and are summarized in Tables 1 and 2.

BTA grubs -- preventive vs. curative control: Products currently available for control of BTA grubs rely on two different control strategies. The first strategy uses a preventive approach, which requires application in June, before grubs are ever detected. Products that are effective using this preventive approach include Merit, Mach 2, and Novartis’ experimental product, thiamethoxam. These products are taken up systemically by the plant roots and have activity for 2 – 3 months. Usually one application per year, in June, is sufficient for good control. In some locations,

particularly the Low Desert of California, two applications of Merit or Mach 2, spaced 6-8 weeks apart, may be necessary to obtain season-long BTA control.

The second strategy calls for a **curative** approach, which triggers insecticide application only after BTA grubs are detected, and relies on the product killing the grub on contact. Products that are effective using a curative approach include trichlorfon (Dylox or Proxol) and Mach 2. There is also evidence from our research, and the experiences of others, that Merit has moderate curative activity against BTA grubs. However, the Merit label does not yet include this use (Bayer representatives tell us this change will be made soon).

Targeting adults vs. grubs: There are several products available, which, because they cannot penetrate the thatch, are ineffective against BTA grubs. However, these products (which include chlorpyrifos [Dursban] as well as pyrethroids such as Deltagard, Scimitar, Tempo and Talstar) are highly active against BTA beetle adults, due to the fact that the beetles reside on the surface of the turf, where they can be easily contacted by insecticides. When these surface-active products are applied against the first big generation of adult BTA beetles, the number of grubs that appear

later on in the season can be significantly reduced, as results from our 1998 tests show (Figure 8). This approach relies on very accurate timing of insecticide applications, so that they coincide with the first BTA adult peak of activity, and for this reason can be a bit tricky to implement.

Figure 8. The effect of BTA adult control on populations of BTA grubs. Los Coyotes Country Club, Buena Park, CA, 1998. Products were applied on 7/14 and 7/20/98. Grubs counts were made 8/13, 9/8 and 9/30/98. Bars represent the total number of grubs observed on all 3 sampling dates per 24 sq in area.

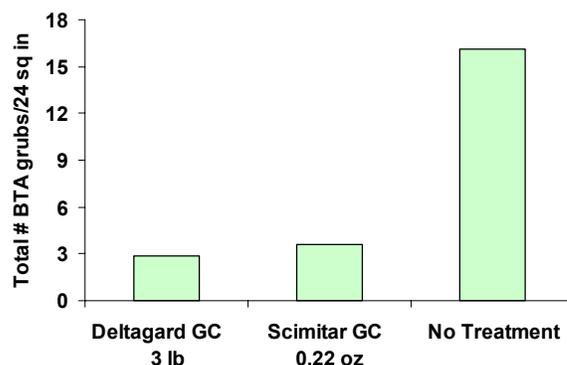


Table 1. Control options for the black turfgrass atenius

STRATEGY	1) Target grubs preventively	2) Target grubs curatively	3) Target adults
PROCEDURE:	One late June application	Apply only when grubs are detected	2 weekly adulticide applications
PRODUCTS:	Merit, (Mach 2, thiamethoxam)	Dylox, Proxol (Merit, Mach 2, Orthene)	Deltagard, Dursban, Scimitar, Talstar, Tempo
ADVANTAGES:	Easy, consistent performance, less toxic	Avoids unnecessary applications	Controls cutworms too
DISADVANTAGES:	Applied before infestation is confirmed.	Extensive grub monitoring required	Applied before infestation confirmed, timing of sprays is tricky

Table 2. Products tested by PTRI with good efficacy against BTA larvae and/or adults

PRODUCT	ACTIVE INGREDIENT	STAGE CONTROLLED	MANUFACTURER
(CGA 293,343)	thiamethoxam	grubs	Novartis
Deltagard	deltamethrin	adults	AgrEvo
Dursban	Chlorpyrifos	adults	Dow
Dylox	trichlorfon	adults and grubs	Bayer
(Mach 2)	halofenozide	grubs	Rohmid
Merit	Imidacloprid	grubs	Bayer
(Orthene)	acephate	adults and grubs	Valent
Scimitar	λ cyhalothrin	adults	Zeneca

Products appearing in parentheses () are not registered in California for this use