ATAENIUS AND *APHODIUS* 1992 FIELD OBSERVATIONS

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As a graduate student in the Crop and Soil Science department I cooperate with **Dr. Jeffrey Andresen**, extension agricultural meteorologist; **Dr. Paul Rieke,** agronomist and turfgrass extension specialist; **Dr. Dave Smitley,** entomologist and extension specialist; **Dr. Bruce Branham** in the Crop and Soil Sciences department.

When we met to discuss and design a **research project** I would be responsible for, we looked for an issue or situation that challenges the turf manager, a project that would allow me to draw from several disciplines (such as soils, climatology, entomology, biology), and would provide the opportunity to look at the entire turfgrass ecosystem and the interactions between several components. The following are situations we identified as important and are what lead us to pursue a project observing the turfgrass insect pest *Ataenius spretulus.*

A. There are several white grub pests of turfgrass, and the occurrence of these pest populations are on the rise. The Black Turfgrass Ataenius (BTA) is in the order of coleoptera, a member of the scarbaeidae family, well known for their damaging white grub stage. The Black Turfgrass Ataenius is a growing problem yet, information available for making management decisions is limited.

B. In Michigan, the golf course turf industry spends approximately $1 million on insecticides annually. Many golf course–applied pesticides are used as preventative measures.

C. The political and regulatory atmosphere surrounding the use of pesticide is becoming more restrictive.

A transition to a curative, rather than preventative–use of pesticides needs to be examined. Improved decision–making tools and information will lead to reduced potential for turf injury and increase turf managers' confidence in making this transition to making pesticide applications on an as needed basis.

While pesticides are a vital tool in any agronomic production setting, they must be used judiciously. Turf managers must consider the potential for:

- turfgrass injury if measures are or are not taken,
- environmental impacts of selected mgmt practices including surface and ground water,
- non-target organisms,
- pest resistance, and,
- the health and safety of the applicators and golf course players,
- increased number of regulations surrounding the handling and use of pesticides.

OBJECTIVES of PROJECT

Objective 1. Confirm the seasonal habits of the Black Turfgrass Ataenius (*Ataenius spretulus*) in Michigan.

Objective 2. Begin establishing two degree day models for the Ataenius' life cycle. The degree day models will be based on air temperatures and another based on soil temperatures.

Biological activity can frequently be correlated with accumulation of heat units, or degree days (DD). Most DD data currently available are based on air temperature. the BTA spends a majority of its life in the soil environment. Comparisons of two degree day models (air and soil) will be made to determine;

1) if there is a difference between soil and air temperature correlations, and

2) if one model is more accurate for predicting ataenius development and activity than the other. Using soil temperature-based DD may lead to more accurate life cycle tracking.

With timely monitoring, an understanding of the BTA's behavior and habitat preference, and the use of weather data in a predictive model, pesticide inputs can be more accurately placed, timed and possible reduced. This equates to less exposure for the applicator and non-target organisms, and reduces the potential for contaminating water resources and other aspects of the environment.
Transportation, storage, handling and disposing of pesticides may also be decreased. Fewer pesticide applications can also improve the economics of turf maintenance.

Objective 3. Identify phenological indicator plants (tree and shrub growth activity).

OVERVIEW OF MATERIALS AND METHODS

Four sites equipped with weather monitoring devices, including soil temperature probes (Envirocaster, Neogen Corp.), were monitored and sampled from April to October on a weekly basis during 1992.

What was monitored:

1. Air temperature and soil temperature,
2. Insect activity: adult emergence, egg laying, larval hatch and development,
3. Turf injury level.

Weather Sampling procedures:

Weather data was collected from Envirocaster (Neogen) units at each site. Hourly air temperature data was collected, amounting to 5,000 data per week. Hourly, soil temperatures at two depths were also obtained. Envirocasters hold a maximum of two weeks of hourly information. Data was downloaded once per week from Envirocasters and weather stations.

A computer program was written to calculate the degree day accumulations from the air and soil data points.

A portable soil temperature probe was used to check the accuracy of Envirocasters and to see if the measurements were representative of other areas on the golf course. Readings were taken close to the envirocasters to compare with temperatures where soil samples were being taken.

Sampling Techniques for Insects

Adults were sampled with black light traps and then monitored weekly using sticky cards, and by sampling soil cores pulled with a cup-cutter.

Using a cup-cutter, several soil cores were pulled from golf playing surfaces once per week to check for grub populations. Areas at each of the courses were designated so they would **not receive pesticide applications.** The soil cores were put in coolers, taken back to the Hancock research Center where they were broken apart thoroughly, spending 3–5 minutes per core looking for grubs. Grubs were put in vials and preserved. Grub species identification was confirmed with a microscope. Using an eyepiece micrometer the grub's head caliper was measured to determine its stage of development.

Insect development was then correlated with DD information.

1992 FIELD OBSERVATIONS

The Black Turfgrass *Ataenius* (BTA) has been taking quite a bit of blame for golf course turf damage in recent years.

- In 1992, observations of *Ataenius* has lead to the discovery of equal or greater numbers of *Aphodius*.
- Two of the four sampled sites had extremely limited numbers of grubs.
- The one course with an *Ataenius* population also had a few *Aphodius* grubs found in the samples. At another site only *Aphodius* grubs were found.
- The sites sampled suffered no turf loss or injury since the grub populations were low and the growing conditions were ideal for cool season turfgrass during the 1992 summer.

While efforts to find and learn about *Ataenius* were taking place, *Aphodius spp.* information was obtained. This is beneficial since there is a gap in available *Aphodius* information. The life cycles between the two insects parallel quite closely, with *Aphodius* being one to two weeks ahead of the *Ataenius* development. Based on head capsule size of grubs collected, it appears that the *Aphodius* in southern lower Michigan is *Aphodius granarius*.

Only two *Aphodius* adult beetles were found during the spring, so emergence from overwintering sites could not be correlated to DD.

With an understanding of the biology and habits of these golf course turf pests we can be better prepared for making safe and effective pest management decisions.

OBSERVATIONS FROM 1992

Objectives of Project:

1. **Confirm seasonal habits**
2. **Begin Degree Day model development**

ATAENIUS - BTA

- One complete generation
- Adult emergence, flight activity, and ovipositing ranged from 250–700 DD (about 5 weeks in 1992)
- Grubs matured over approximately 600 DD (575–1175)

APHODIUS

- Eggs had been laid by 100 DD
- Grubs were developing while BTA adults were ovipositing
- Grubs mature over approximately 500 DD (100–600 DD), (about 5 weeks '92)
- One complete generation
- Adult beetles are inconspicuous
- Adults overwinter in turfgrass

3. Phenological Indicators (Preliminary summary)

PLANT IN BLOOM	DEGREE DAY RANGE	ACTIVITY OF ATAENIUS & APHODIUS
Mountain Ash	200–400	BTA adult emergence & ovipositing, Aphodius grubs in soil.
Van Houtte Spirea	275–500	
Black Locust	275–500	
Cornus Kousa	400–575	
Mock Orange	600–800	BTA grubs present in soil, Aphodius grubs have pupated.
Hawthorne spp.	650–850	
Elderberry	800–1100	
Hydrangea spp.	1400–1900	BTA adults emerging.