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ASIATIC GARDEN BEETLE *MALADERA CASTANEA* (COLEOPTERA: SCARABAEIDAE) GRUBS FOUND IN DAMAGED TURF IN ALABAMA

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Root-feeding white grubs (Coleoptera: Scarabaeidae) are among the most important group of pests attacking grasses in pastures and landscapes in the United States. Throughout the continental United States, about 10 species of grubs and several species in the genus *Phyllophaga* are reported pests of turfgrass (Vittum et al. 1999). In southeastern states, grubs of *Phyllophaga*, southern masked chafer (*Cyclocephala lurida*), the green June beetle (*Cotinus nitidia*), and Japanese beetles (*Popillia japonica*) are traditionally associated with damaged turfgrass. However, recent publications (Buss 2006, 2008) challenge the assumption that just a few species account for the alleged increase in damage to turfgrass from white grubs in the southeast. Furthermore, introduced and native species may be expanding their range into or throughout the southeast. This paper documents the occurrence of white grubs of the Asiatic garden beetle *Maladera castanea* (Arrow), an exotic species, in damaged turfgrass in Alabama.

Asiatic garden beetles, native to China and Japan, were first detected in New Jersey in 1921. They have since spread to most of the northeastern states, west to Indiana, and south to South Carolina (Vittum et al. 1999, NAPIS 2008). Spread of Asiatic garden beetles in the northeast was attributed to natural dispersal of adults as well as movement of infested nursery stock and turfgrass (Hawley & Hallock 1936).

All known biological information is based on only a few reports (Hawley 1931; Hawley & Hallock 1936) of populations in the northeastern United States. Adults are nocturnal, emerging when temperatures are 18.3-21.1°C (65-70°F), and actively fly at temperatures ≥21.1°C (Hawley & Hallock 1936). Adult flight begins in late Jun and can last into the fall. At night, adults are attracted to lights and light traps are the suggested means of trapping adults (Hawley & Hallock 1936). Adults feed on foliage or flowers of 100 or more hosts (Hawley & Hallock 1936), and sparingly on grass blades (Heller 1995). Damage to woody and herbaceous plants from adults can be misdiagnosed since the damage appears overnight and adults are rarely observed. Damage to foliage begins from the edges, progressing inward until only the midvein remains. Adults seem to prefer flowers attacking roses, chrysanthemums, dahlia, sunflower, strawflowers, and zinnias (Hawley & Hallock 1936), aster, and goldenrod (Vittum et al. 1999). Even though adult damage can be extensive when present, adults are only considered minor pests of ornamentals (Vittum et al. 1999).

In daylight hours, adults are in the soil near host plants or in turf adjacent to these host plants. Females lay eggs in clusters in the soil and seem to prefer weedy patches of turf that are well-irrigated (Hawley & Hallock 1936; Heller 1995). Eggs are present in the soil beginning in Jul. Eggs absorb moisture from the soil, swell, and hatch (Hawley & Hallock 1936) similarly to other white grubs. Newly-emerged grubs are 1.4 mm long, and develop to 19 mm when mature. There are 3 instars with mature grubs present in the mid-Oct. Grubs can be found under weedy turf, or in fields of sweetpotato, beans, and other field crops (Hawley & Hallock 1936). Grubs are distinguished from other scarabs by a distinctive raster pattern and enlarged bulbous stipes on the maxillae (Hawley & Hallock 1936; Ritcher 1966). In the northeastern United States, there is 1 generation per year.

On 2-3 Oct, 2008, a stand of weedy turfgrass on the Turfgrass Research Unit in Auburn, AL was sampled for grubs. This stand, 27.2 × 21.9 m (90 × 72 ft), is composed mostly of crabgrass (*Digitaria* sp.), dichondra, and various sedges and grasses. This stand was established in 1997 on a sandy loam soil and recently has been used for herbicide research, and in 2008, the area was irrigated weekly with about 2.54 cm (1 inch) of supplemental water and maintained at 3.8 cm (1.5 inch). The area generally stays moist after rain and wet during the winter months.

The grubs collected on both days were mostly southern masked chafer (*Cyclocephala lurida*), a few billbug larvae, 1 Japanese beetle (*Popillia japonica*) grub, and 5 unidentified larvae. All grubs were collected into containers along with field soil and transported to the lab. The previously unidentified grubs had a raster pattern and swollen stipes characteristic of Asiatic garden beetle. The grubs were preserved in ethanol and the identity later confirmed with the key of Ritcher (1966). Grubs had an average length of 17.1 mm (0.67 inch) and head capsule width of 2.77 mm. These data indicate that the grubs are likely third instars (Hawley & Hallock 1936; Ritcher 1966).

This is the southernmost report of Asiatic garden beetle in the United States. Recent trapping studies in Alabama (Flanders et al. 2000) and, in Florida, Buss (2006) did not detect adult *M. castanea* in blacklight trap samples. The Alabama study, conducted in pastures, was within 50 km of

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the site where the Asiatic garden beetle grubs were collected. Hawley and Hallock (1936) suggest that infested nursery stock or turfgrass are the most likely means to transport Asiatic garden beetle grubs. Human intervention is likely in this case especially since there have been no detections of Asiatic garden beetles in any states between Alabama and South Carolina, the closest infested state. Grubs may not have been detected elsewhere because they occur deeper in the soil than other pest grubs (Hawley & Hallock 1936).

Because this is a new geographic region for this pest, the flight period or number of generations for this species is unknown. Hallock (1936) suggested Asiatic garden beetles would thrive in the south and may have a partial or complete second generation. Flight occurs on evenings with air temperatures at or above 21.1°C (70°F) (Hawley & Hallock 1936). In Auburn, AL, suitable evening temperatures for flight of Asiatic garden beetle may occur as early as Apr or May. In the northeastern United States, adult flight begins in late Jun and continues through late Oct (Heller 1995). Adult *M. castanea* were first captured in a blacklight trap at the Turfgrass Research Unit in Auburn on 5 Jun 2009. Adults were also collected on that site and 2 sites in Lee Co., AL in Japanese beetle traps baited with only the food lure. Adult *M. castanea* were collected periodically at the residence of CHR, also in Auburn, AL. At the time this paper was revised (Aug 2009), adult *M. castanea* were still active and had been collected at 4 different sites in the Auburn-Opelika area (Lee Co.), AL. Adults from trap collections in 2009 have been placed in the collection in the Entomology Dept. at Auburn University.

Japanese beetles are another introduced species with similar ecology and seasonal occurrence as Asiatic garden beetle. As adult Japanese beetles have spread into the south, they have remained a univoltine pest. The previously mentioned trapping study will continue through 2009 and is planned for 2010 to determine the adult flight period. These data will provide insight about the possible number of generations in AL.

Management of this species is based on studies conducted in bluegrass (*Poa* spp.) and fescue (*Festuca* spp.) turf in the northeastern United States. Products containing imidacloprid (e.g., Merit) and other neocnicotinoid class insecticides (e.g., thiamethoxam, clothianidin), and halofenozide are commonly used for grub control (Vittum 2003, Vittum et al. 1999). Efficacy of imidacloprid and other neconicotinoids targeting Asiatic garden beetle larvae is equivocal (Swier & Rollins 2005, 2006a, 2006b, 2007; Vittum 2003). Asiatic garden beetles are insensitive to halofenozide (Mach2). If only halofenozide is used to control mixed populations of grubs, Asiatic garden beetles will likely survive and the pesticide may appear as a product failure (Cowles et al. 1999).

J. Harris and the staff of the Auburn University Turfgrass Unit assisted in locating grub-damaged areas, and provided details on the site history and maintenance. S. Parker and S. A. Barden (Auburn University) assisted with field collection of beetles and trap maintenance. Beetle identification was confirmed by P. Lago (University of Mississippi). Kathy Flanders and David Han (Auburn University) provided helpful comments on an earlier draft of this manuscript.

Summary

In Oct 2008, five grubs of the Asiatic garden beetle, *Maladera castanea* (Coleoptera: Scarabaeidae) were collected from a weedy stand of turf in Auburn, AL. Adult *M. castanea* were collected at traps on this site in Jun 2009. This is the southernmost collection of this species and a new species record for Alabama. Both adults and grubs cause damage. However, Asiatic garden beetles are considered minor pests of turfgrass and ornamentals. In the south, this species may have 2 generations per year. Blacklight trapping is ongoing to determine the adult flight period in AL.

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