Agrilus auroguttatus (Waterhouse)

Coleoptera: Buprestidae

Goldspotted oak borer (GSOB)

Host(s)	CAPS-Approved Survey Method
Major/Primary Hosts *Quercus agrifolia* (Coast live oak), *Quercus chrysolepis* (Canyon live oak), *Quercus engelmannii* (Engleman oak), *Quercus kelloggii* (California black oak) (Coleman and Seybold, 2008b) **Possible Hosts** *Quercus devia* (Black oak), *Quercus hypoleucoides* (Silverleaf oak) "associated with", *Quercus rugosa* (Netleaf oak) (Coleman and Seybold, 2008b) The host range of this insect has not been well studied.	One of the following options: 1) Purple prism trap (without a lure), hung in oak trees, or 2) *Cerceris* wasps.

Reason for Inclusion in Manual

The U.S. Forest Service recommended the addition because of the mortality that *A. auroguttatus* is causing to oaks in California.

Taxonomy

The scientific name for the goldspotted oak borer has gone through several taxonomic changes in the past few years. It was listed in the 2011 EWB/BB manual as the sub-species *A. coxalis auroguttatus.* There is a separate species that is present in Mexico and not in the United States that was previously listed at the sub-species level as *A. coxalis coxalis.*

Now, *A. coxalis auroguttatus* has risen to species status and is referred to as *A. auroguttatus*. *A. coxalis coxalis* is now *A. coxalis.* The following is a history of the taxonomy:

1. Original description:

A. auroguttatus (1905) (Arizona)

A. coxalis (1889) (Mexico)

2. Synonymized into one species (1979)

A. coxalis (Arizona and Mexico)

3. Assigned sub-species status (2009)
A. coxalis auroguttatus (Arizona and California)
A. coxalis coxalis (Mexico)

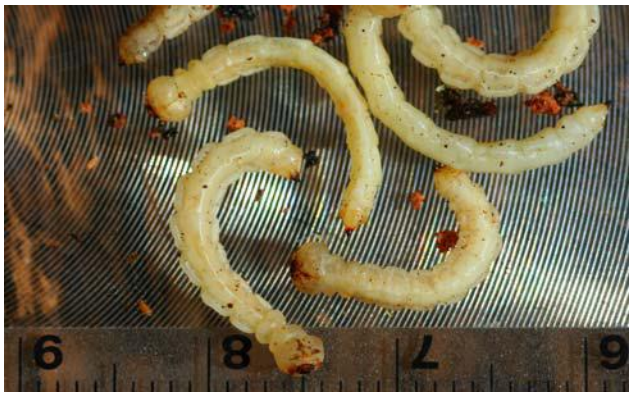
4. Returned to original species status (2011):
A. auroguttatus (Arizona and California)
A. coxalis (Mexico)

Mortality of oaks in California is being caused by *A. auroguttatus*. It is not known if the species *A. coxalis* (not present in the United States) will cause damage to oaks in the United States.

Pest Description

From "Pest Alert: New Pest in California, The Goldspotted Oak Borer, *Agrilus coxalis* Waterhouse" (Coleman and Seybold, 2008a):

> "Adults are about 10 mm long and 2 mm [approx. $^{3}/_{8}$ by $^{1}/_{16}$ in] wide. They are bullet-shaped and can be identified by the six golden-yellow spots on the dark green forewings. Mature larvae are about 18 mm long and 3 mm wide [approx. $^{3}/_{8}$ by $^{1}/_{8}$ in]. They are legless, white, and have a long slender appearance. The larvae have two pincher-like spines at the tip of the abdomen. Pupae are found in the outer bark and resemble adults, but are commonly white in color."



Mature larvae of *A. auroguttatus* removed from coast live oak (Tom Coleman, U.S. Forest Service)

An adult *A. auroguttatus* with gold colored spots on forewings and body (Tom Coleman, U.S. Forest Service)

Biology and Ecology

In southern California, one generation a year has been observed, although part of the population may take more than one year to develop. This species has only been observed in older, mature oaks with diameters at breast height over 12 cm (approx. 4 ¾ in) (Coleman and Seybold, 2008a).

Larvae of *A. auroguttatus* feed beneath the bark, primarily between the sapwood and phloem of the trunk and larger branches. Galleries are formed mainly on the sapwood surface. Mature larvae can be found in the tree beginning in late May (Coleman and Seybold, 2008a).

If similar to other flatheaded borers, adults likely feed and mate on tree foliage. According to preliminary flight data, flight occurs from June to October, with a peak flight in late June (Coleman and Seybold, 2008a).

Countries of Origin

A. auroguttatus is native to the United States, specifically the state of Arizona (Hespenheide and Bellamy, 2009).

Current Distribution

This pest is now found in the states of Arizona and California.

Distribution in United States

From "Pest Alert. New Pest in California: The Goldspotted Oak Borer, *Agrilus coxalis* Waterhouse" (Coleman and Seybold, 2008a):

> "[*A. auroguttatus*] GSOB has been known since the late 1800's from museum records from southeastern Arizona [and] southern Mexico. It was first collected in California in 2004. Currently, [*A. auroguttatus*] GSOB occurs in southern California in a 50 x 40 km area east of San Diego."

A. auroguttatus was first found in southern California in 2004 (Coleman and Seybold, 2008a). California is the only state that has recorded positive NAPIS survey data (K. Handy, personal communication). Positive data has been recorded in 2004 and 2006, the only two years the pest was surveyed for by the state (K. Handy, personal communication, 2009).

Pathway

There are no reports of interception of *A. auroguttatus* in AQAS from 1980 to the present (AQAS Database, accessed November 13, 2009).

This species could potentially move to new areas through infested firewood, logs, and timber of host materials (Baez, 2009). Oak firewood is thought to be a pathway of this pest (Coleman and Seybold, 2008a).

Pathogens Vectored

A. auroguttatus is not a known vector; however, it is playing a major role in the current oak mortality in southern California (Coleman and Seybold, 2008b). Drought stress may be pre-disposing trees to mortality from *A. auroguttatus* (Coleman and Seybold, 2008b).

Damage

From "Pest Alert. New Pest in California: The Goldspotted Oak Borer, *Agrilus coxalis* Waterhouse" (Coleman and Seybold, 2008a):

"GSOB attacks can be recognized by extensive bark staining, which can appear as black regions or red blistering with sap oozing from under the bark. Adult exit holes signify previous GSOB attack. These emergence holes are D-shaped and about 3 mm in width. On coast live oak, the bark is frequently removed by woodpeckers as they forage for larvae and pupae; this reveals the deep red-colored outer bark that contrasts starkly with the gray exterior bark.

Larvae construct galleries primarily on the sapwood surface along the main stem from the base of the tree up to larger branches. Larval galleries are dark in color and have a meandering appearance with a general vertical orientation. Extensive larval feeding can strip or patch-kill areas of the tree, which turn black as they die. Patch-killed regions are commonly saturated with sap, which is expelled when the bark is cut open. GSOB attacks also lead to crown thinning, which begins with premature leaf drop and progresses to twig and branch die back. Crown thinning may only be evident after two to three years of attack."

Bark staining found along main stem. (Tom Coleman, U.S. Forest Service)

D-shaped exit holes of GSOB adults on the bark. (Tom Coleman, U.S. Forest Service)

Larval galleries are primarily found on the sapwood surface. (Tom Coleman, U.S. Forest Service)

Survey

CAPS-Approved Method

There are no known attractants for *A. auroguttatus.* There are two CAPS-approved survey methods: 1) Purple prism trap (without a lure), hung in oak trees (Coleman, personal communication, 2009) and 2) *Cerceris* wasps.

1. Trapping

1.1 Survey Site Selection

Because the host range of this pest has not been well studied, surveys should be targeted towards known hosts as well as prospective hosts in the *Quercus* genus. Follow the general instructions on **General Site Considerations for Trap Placement** in the manual section **Planning a Survey**.

1.2 Trap and Lure

The CAPS-approved survey method is a purple prism trap (without a lure), hung in oak trees (Coleman, personal communication, 2009).

IPHIS Survey Supply Ordering System Product Names:

1) Prism Trap - Purple

1.3 Trap Placement

Place un-baited, three-sided, sticky purple flight-intercept prism traps (30.5 cm x 60 cm; 12 x 24 in) at 3 to 6 m (10 to 20 ft) height on the stems of >13 cm (5 in) diameter oak trees or oak tree branches (Coleman and Seybold, 2008a, 2008b; Coleman, personal communication, 2009). Larger diameter trees in the stand may be the best locations to place the traps. Traps should be serviced every two weeks.

In California, traps have been placed in fairly open forest areas (i.e., along the edges of the forest). Trapping locations in California have included oak savannahs and high elevation sites with California black oak. Both habitats consist of fairly open, well-lit forest stands (S.J. Seybold, personal communication, 2009).

1.4 Time of year to survey

Agrilus auroguttatus has one generation per year (Coleman and Seybold, 2008a, 2008b). In California, adults begin flying in mid-May and are most active in flight from mid-June through mid-July, but small numbers of adults continue to fly throughout summer and fall, with trap captures as late as November (Coleman and Seybold, 2008a, 2008b; S.J. Seybold, personal communication, 2009; Seybold et al., 2009). Surveys in southeastern Arizona suggest the insect has a similar life cycle to populations in California (S.J. Seybold, personal communication, 2009).

2. *Cerceris* Wasps

Starting in the 2012 survey season, *Cerceris* wasps are an approved method for *A. biguttatus.* The solitary ground-nesting wasp, *Cerceris*, collects buprestid beetles from the nearby environment. By collecting the beetles from *Cerceris*, surveyors can detect the presence of *Agrilus* spp. in the nearby area. See the *Cerceris* Wasps Survey Protocol for further information.

Identification

CAPS-Approved Method

Morphological.

Mistaken Identities

Agrilus auroguttatus has may be confused with other species of *Agrilus*. There are 171 *Agrilus* species documented in America north of Mexico.

Resources and High Resolution Images

Images

"Pest Alert. New Pest in California: The Goldspotted Oak Borer, *Agrilus coxalis* Waterhouse" http://www.nps.gov/yose/naturescience/upload/pest-oak-borer-alert.pdf

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