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Agrilus is a genus of beetles belonging to the family Buprestidae, commonly called jewel beetles as adults, or flatheaded borers as larvae. This genus is one of the most speciose in the Kingdom Animalia, with nearly 3,000 taxa. These small, slender beetles are characterized by their flattened head, a doubled lateral pronotal margin consisting of marginal and submarginal carinae, a pronotum with a prolonged and elevated keel-like structure from each side (pronotal carina), the presence of a prosternal lobe, and the relatively elongate metatarsal segments (see Jendek and Grebennikov 2011).

Larvae of Buprestidae develop in dicotyledonous plants, and beetles often feed on their host plants until maturity. Many *Agrilus* species are forest and agricultural pests, killing off plant parts or the entire host plant through larval feeding. Some are also known to transmit tracheomyces (pathogens) to various plant species.

While several exotic species of *Agrilus* have been introduced into North America, the most well-known and most destructive to date is the Emerald Ash Borer (EAB), *Agrilus planipennis* Fairmaire. Native to east Asia, this colorful buprestid attacks and kills both damaged and healthy ash trees (*Fraxinus* sp.). *Agrilus auroguttatus* Schaeffer, the Goldspotted Oak Borer, (often in literature as *Agrilus coxalis auroguttatus*) is native to oak forests (*Quercus* sp.) of Mexico and in Arizona, where it is not considered a pest. In 2008, *A. auroguttatus* was found attacking oaks in California and it continues to cause significant damage to oak trees in that state. Two additional oak-feeders, *Agrilus biguttatus* (Fabricius), the Oak Splendor Beetle, and *Agrilus sulcicollis* (Lacordaire), the European Oak Borer, are native to Europe. The latter is also established in North America in New York, Michigan, and Ontario. With widespread hosts, there is high potential for rapid dissemination of these *Agrilus* throughout North American forests.

Approved detection methods for these *Agrilus* species include visual survey of host plants, purple prism traps, and the *Cerceris* wasp survey method is approved for negative data reporting. Any suspect buprestid should be pinned, clearly labeled, and forwarded for professional identification by a trained coleopterist. Suspect *Agrilus* collected by *Cerceris* survey should be submitted to the appropriate identifiers following the CAPS 2014 *Cerceris* Wasp Survey Protocol. Basic knowledge of Coleoptera morphology is necessary to screen for *Agrilus* suspects.



Fig. 1: Larvae (dead) of *Agrilus auroguttatus* (Photo by M. S. Hoddle).



Fig. 2: Tree death as a result of damage by *Agrilus* sp. (Photo by Mike Lewis, Bugwood.org).

Traps and collected specimens should be sorted initially for the presence of beetles of the appropriate size, color, and shape. Beetles meeting all of the following requirements should be moved to Level 1 Screening (Page 3):

- 1) Beetles measure between 0.5–1.5 cm in length (Fig. 3).
- 2) Beetles have an overall shape that is similar to the outline depicted in Fig. 3.
- 3) Beetles are elongate with elytra tapering at their apices (Figs. 4–7).
- 4) Beetles are metallic with variable coloration and pubescence (Figs. 4–7).



Fig. 3: Outline of an adult *Agrilus* sp.



Actual size of *A. auroguttatus*



Actual size of *A. biguttatus*



Actual size of *A. planipennis*



Actual size of *A. sulcicollis*



Fig. 4: Elytra of *A. auroguttatus*.



Fig. 5: Elytra of *A. biguttatus*.



Fig. 6: Elytra of *A. planipennis*.



Fig. 7: Elytra of *A. sulcicollis*.

Beetles that meet the sorting requirements should be screened for suspect *Agrilus*. When in doubt distinguishing or evaluating first-level screening characters, forward specimens that have passed the sorting requirements to a trained taxonomist.

Separation to genus can be accomplished by observing general body shape and the presence of a combination of key morphological characters:

- 1) Double lateral pronotal margin consisting of marginal and submarginal carinae (Fig. 8).
- 2) Pronotum with a prolonged and elevated keel-like structure from each side (pronotal carina; Fig. 8).
- 3) Base of the pronotum is produced backward as a lobe (Fig 9).
- 4) Prosternal lobe present (Fig. 10).
- 5) Elongate metatarsal segments (Fig. 11).

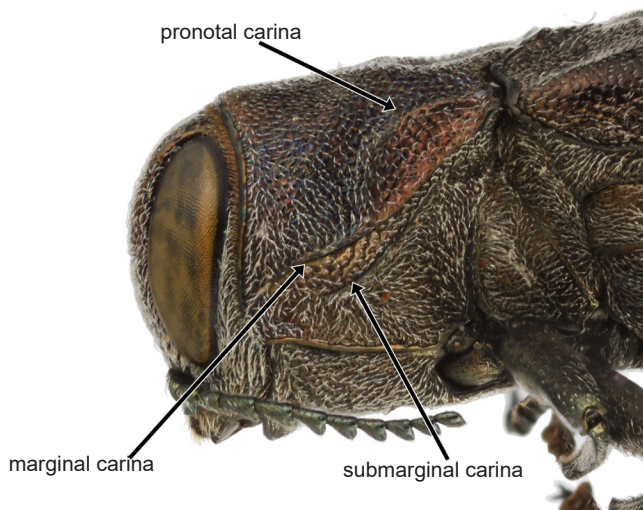


Fig. 8: *Agrilus anxius*



Fig. 9: *Agrilus cuprescens*



Fig. 10: *Agrilus vittaticollis*



Fig. 11: *Agrilus lacustris*

There are 171 valid species of *Agrilus* native to North America. Their similarities in general appearance and variability in coloration, even among species, makes identification of some *Agrilus* species difficult. Any suspect *Agrilus* specimen should be forwarded for professional identification.



Fig. 12: *A. auroguttatus*



Fig. 13: *A. biguttatus*

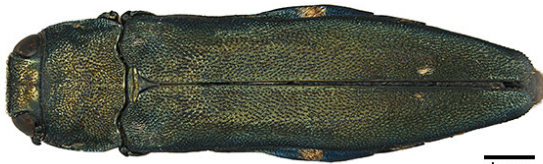


Fig. 14: *A. biguttatus*



Fig. 15: *A. planipennis*



Fig. 16: *A. anxius*



Fig. 17: *A. arcuatus*



Fig. 18: *A. arizonicus*



Fig. 19: *A. arizonicus*



Fig. 20: *A. crataegi*



Fig. 21: *A. cuprescens*



Fig. 22: *A. cuprescens*



Fig. 23: *A. cyanescens*



Fig. 24: *A. difficilis*



Fig. 25: *A. difficilis*



Fig. 26: *A. lacustris*



Fig. 27: *A. lacustris*



Fig. 28: *A. macer*

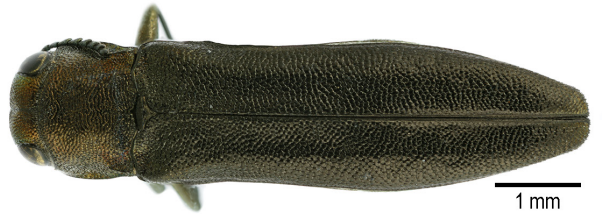


Fig. 29: *A. masculinus*



Fig. 30: *A. masculinus*



Fig. 31: *A. obsoletoguttatus*



Fig. 32: *A. politus*



Fig. 33: *A. politus*



Fig. 34: *A. politus*



Fig. 35: *A. quercicola*



Fig. 36: *A. ruficollis*

1 mm

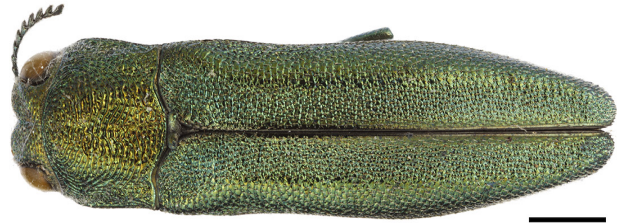


Fig. 37: *A. strigicollis*

1 mm



Fig. 38: *A. subcinctus*

1 mm



Fig. 39: *A. sulcicollis*

1 mm



Fig. 40: *A. vittaticollis*

1 mm



Fig. 41: *Buprestis langii*

1 mm

Agrilus auroguttatus (Fig. 12) is nearly identical to *A. coxalis* (not shown) but the latter is not found north of Mexico. The Oak Splendor Beetle, *A. biguttatus* (Figs. 13–14), is similar in coloration to many native *Agrilus* species, but may be differentiated by the presence of two pubescent spots in the distal third of the elytra. Other species may have pubescence but none forming such spots. The Emerald Ash Borer, *Agrilus planipennis* (Fig. 15), is similar to many *Agrilus* species but is one of the largest in North America. It can be differentiated from other North American *Agrilus* by its large size, bright emerald green coloration and the dorsal side of the abdomen, which is bright red/copper (Fig. 42). *Buprestis langii* (Fig. 41) has a similar green color, but this beetle is much larger and broader than any *Agrilus* in North America.



Fig. 42: Red/copper abdomen of *Agrilus planipennis*.

The European Oak Borer, *Agrilus sulciollis* (Fig. 39) is similar to *A. cyanescens* (Fig. 23), a European species that has been introduced into the northeastern U.S. where it is present from Michigan to Maine. These two species can be differentiated based on the morphology of the head and pronotum (Fig. 43). *Agrilus sulciollis* has a pubescent (in males) and ungrooved frons and vertex, while *A. cyanescens* has a grooved frons and vertex. In *A. sulciollis*, short prehumeral carinae (pronotal carinae) and a wide medial depression are present on the pronotum. In *Agrilus cyanescens*, the prehumeral carinae are usually absent and the medial depression is present but usually indistinct. The lateral pronotal margins are weakly convex in *A. sulciollis* and obviously convex in *A. cyanescens*. [Adapted from <http://download.ceris.purdue.edu/file/534> by J. E. Zablotny].

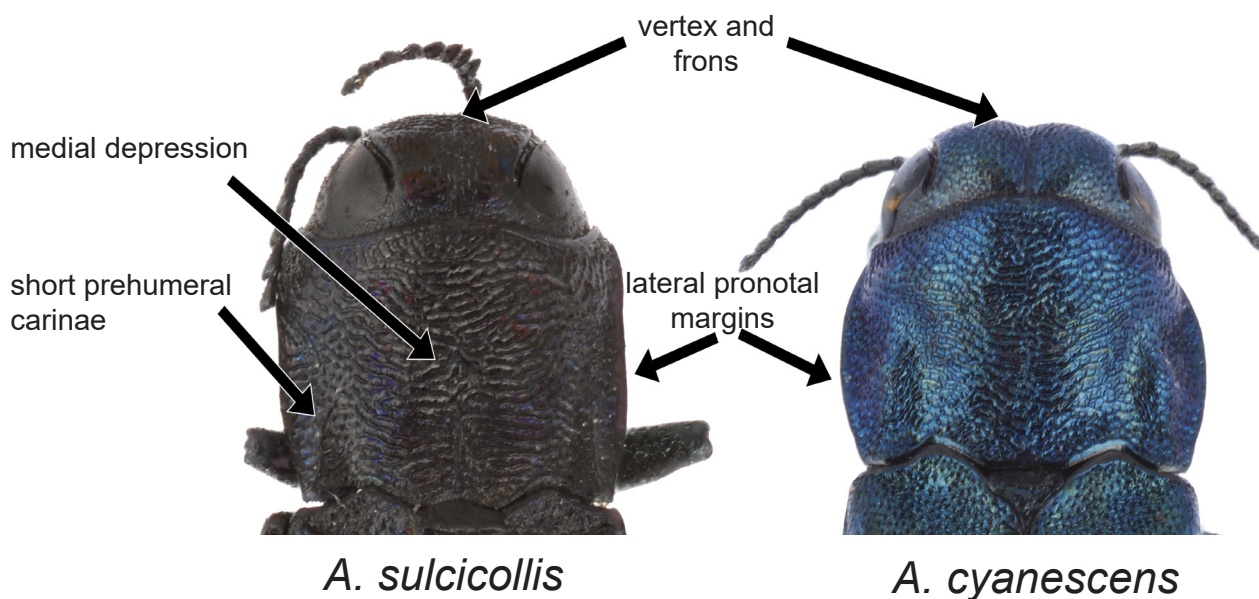


Fig. 43: *Agrilus sulciollis* versus *A. cyanescens*.

Key to Sort and Screen *Agrilus* Suspects in the United States

1. Double lateral pronotal margin and pronotal carinae present (Fig. 8); base of pronotum produced backward as a lobe (Fig. 9); prosternal lobe present (Fig. 10); total body length between 0.5–1.5 cm..... **Agrilus suspect (2)**
- 1'. Double lateral pronotal margin and pronotal carina absent; base of pronotum not produced backward as a lobe; prosternal lobe absent; total body length less than 0.5 or greater than 1.5 cm Not *Agrilus*
2. Dark metallic green-brown with 3 spots of orange pubescence on each elytron **A. auroguttatus suspect**
 Metallic color variable, with two pubescent spots in the distal third of the elytra **A. biguttatus suspect**
 Bright emerald green in color, with red/copper abdomen..... **A. planipennis suspect**
 Metallic color variable; pubescent (in males) and ungrooved frons and vertex; short prehumeral carinae (pronotal carinae) and wide medial depression present on the pronotum; lateral pronotal margins weakly convex **A. sulcicollis suspect**
- 2'. Not with the above characters..... Not *Agrilus* suspect

Citation

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Acknowledgments

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