HOW to

Identify Common Nitidulid Beetles Associated with Oak Wilt Mats in Minnesota

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Cover photos:
Top left: Nitidulid eggs on a mature oak wilt mat collected during midspring.
Center: Nitidulid larva: *Epuraea corticina* Erichson.
Bottom left: Nitidulid adult: *Glischrochilus sanguinolentus* (Olivier).

Illustrations by:
The authors are grateful to Julie Martinez for her expert drawings of nitidulid larvae.

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Purpose

We developed this handbook for forestry professionals, land managers, and homeowners to help them identify the most common adult and larval sap beetles found in oak wilt mats in the North Central States. Although the photographs depict the natural color of adults, preserved specimens may not have exactly the same color as those in the pictures. All sizes given are length ranges and mean lengths based on measurements of our specimens using a light microscope with an ocular micrometer. The brief written descriptions are not intended to be taxonomically complete, but to pinpoint the features most useful in distinguishing species from one another. The descriptions are largely based on those of Parsons (1943).

Introduction

Oak wilt, caused by the fungus *Ceratocystis fagacearum* (Bretz) Hunt, is an important disease of oaks throughout the Eastern United States. Thousands of native oaks, particularly those in the red oak group (Section Lobatae = *Erythrobalanus*), succumb to the disease each year across the Midwest. The pathogen is spread in two ways: underground through root grafts and overland by insect vectors. Insect transmission is the primary means of establishing new oak wilt infection centers, and the principal vectors in the North Central States are sap beetles (Coleoptera: Nitidulidae) (Juzwik 2001). Although there are many nitidulid species associated with oaks, six species make up the majority of those typically collected from oak wilt mats in Minnesota (Cease and Juzwik 2001), Wisconsin (McMullen *et al*. 1960), and Illinois (Himelick and Curl 1958). These species are *Carpophilus sayi* Parsons, *Colopterus truncatus* Randall, *Epuraea corticina* Erichson, *Glischrochilus fasciatus* (Olivier), *G. quadrisignatus* (Say), and *G. sanguinolentus* (Olivier). *Carpophilus sayi* and *Colopterus truncatus* are the predominant species collected from fresh wounds on red oak trees in Minnesota (Juzwik *et al*. 1999), making these two nitidulids the primary vector species in this State. Of the six nitidulid species, *Carpophilus sayi* is more abundant in oak wilt mats in the spring than in the fall, the three *Glischrochilus* species are more abundant in oak wilt mats in the fall than in the spring, whereas, *Colopterus truncatus* and *Epuraea corticina* are similarly abundant in oak wilt mats in the spring and fall.

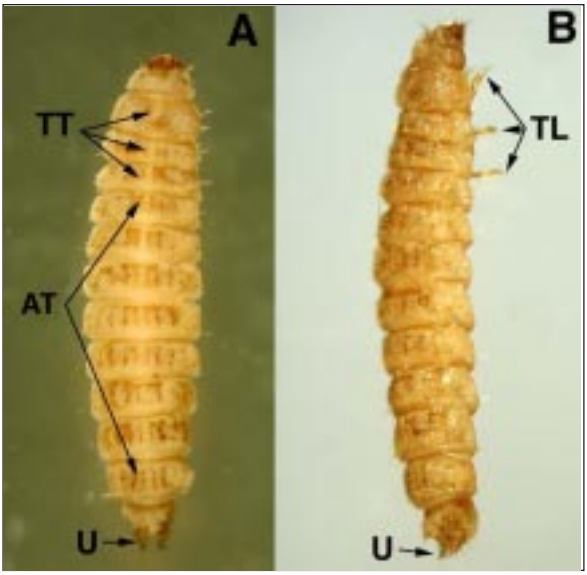
Characteristics of General Nitidulid Adult

Adult sap beetles are generally small (~2 to 12 mm long) with flattened and broadly oval to somewhat elongate bodies (see **A** below). The body color of the adults ranges from reddish brown to black, in some cases with red, orange, or yellow patterns on the elytra (wing covers). Certain species have short elytra that expose the upper surface of the last two or three abdominal segments. Adult sap beetles are distinguished from other beetles visiting oak wilt mats by having 11-segmented antennae that end in a 3-segmented, ball-like club (**B**). Adults are attracted to and live in fermenting plant sap, decaying fruit, or fungi (Downie and Arnett 1996).

Adult sap beetle, *Glischrochilus fasciatus* (**A**) and enlarged 11-segmented right antenna showing the 3-segmented club (**B**).

Characteristics of General Nitidulid Larva

Larval sap beetles are elongate and cylindrical, range from ~3 to 8 mm in length, and have three pairs of well-developed thoracic legs (see below). The first thoracic tergum (hardened plate on upper surface of the body segment bearing the first pair of legs) is usually pigmented, but in some species terga on both the thorax and abdomen are pigmented. The ninth abdominal tergum is especially important for identifying the larvae. This tergum usually has paired urogomphi (fixed, hornlike structures) that may be simple or branched and often have paired pregomphi located anteriorly (in front of them).

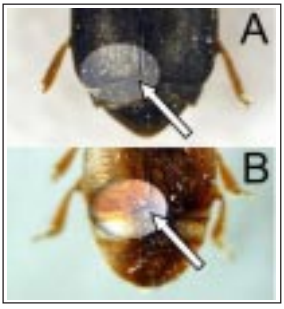


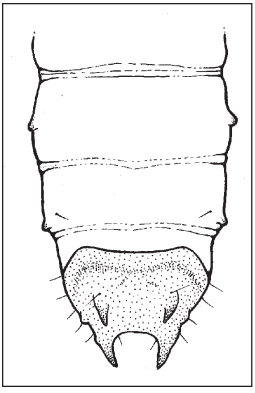
Larval sap beetle, *Epuraea corticina*, showing (**A**) dorsal view with plate-like and pigmented thoracic and abdominal terga (TT and AT) and urogomphi (U) on the last abdominal tergum. Thoracic legs (TL) are evident in (**B**) the lateral view.

Species Descriptions

***Carpophilus sayi* Parsons**

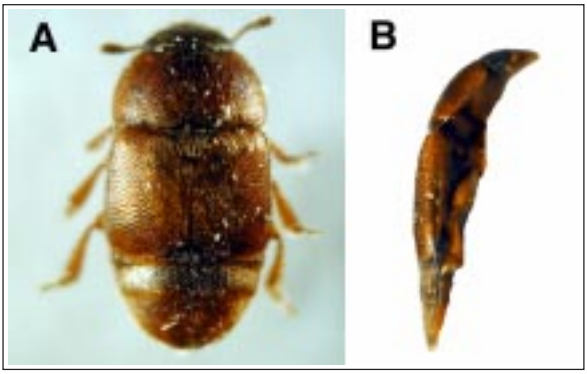
Adults: Small (3.5 to 5.1 mm, mean = 4.2 mm, n = 15), very dark brown to black, sometimes with pronotum (shoulders) and pronotal margins rufous (pale red). Sparsely pubescent ("fuzzy") and punctate. Elytra short, revealing last two abdominal segments. Nearly perpendicular angle formed by median suture (line where two elytra meet) and tip of elytron (see **A** below). For comparison, an obtuse angle is formed by median suture and tip of elytron in *Colopterus truncatus* (see **B** below).





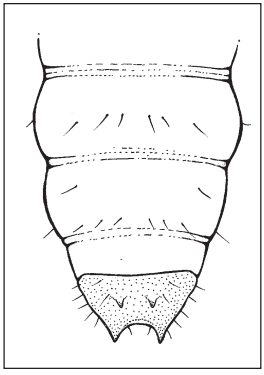
Larvae: Length, based on one specimen, 4.2 mm. Very similar to *Colopterus truncatus*, but pregomphi are longer, and the space between urogomphi is more angular or deeply truncate.

***Colopterus truncatus* Randall**



Adults: Very small (1.9 to 2.6 mm, mean = 2.2 mm, n = 24), medium brown, sparsely pubescent; head, pronotum, and elytra punctate; elytra short, revealing last three abdominal segments (**A**, dorsal view). Obtuse angle formed by median suture and tip of elytron (see **B** on previous page). Lateral view (**B**, this page) illustrates how extremely flattened adult *Colopterus truncatus* can be.

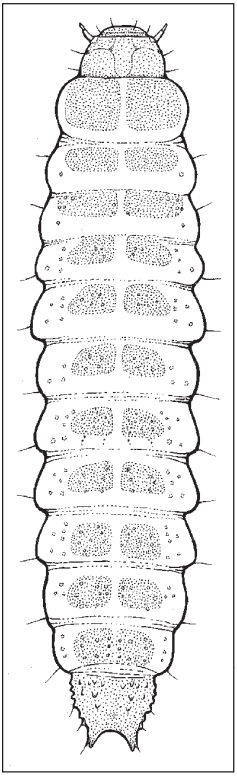
Larvae: Length 3.2 to 5.3 mm. Body entirely creamy white. Head and prothorax sclerotized (hardened) and golden brown. Ninth abdominal segment sclerotized dorsally, with one small pair of pregomphi and one pair unbranched urogomphi.



***Epuraea corticina* Erichson**

Adults: Small (2.8 to 4.0 mm, mean = 3.3 mm, n = 29), oblong, brownish yellow, mottled with dark brown; pronotum usually with acute hind angles; elytra covering all but last abdominal segment.

Larvae: Length, 4.8 to 5.9 mm. Body mostly creamy white. Head golden brown. Body appears to have dorsal horizontal stripes, caused by debris trapped in the tubercles on the dorsum of each segment. Ninth abdominal segment with two pair of small, straight urogomphi and numerous tubercles from which setae (single small hairs) protrude.



The following species of *Glischrochilus* are relatively large, oblong, shiny sap beetles. Those described here are attractively marked dorsally (on top) with yellow, yellow-orange, or red. The elytra leave only the tip of the last abdominal segment exposed. *Glischrochilus* spp. are common in a variety of habitats other than oak wilt mats. Their presence in oak woodlands is not necessarily an indication of oak wilt.

***Glischrochilus fasciatus* (Olivier)**

Adults: Medium to large (4.2 to 6.6 mm, mean = 5.6 mm, n = 26), head and pronotum black. Elytra black with large, paired yellow blotches that are symmetrical relative to the median suture. The yellow blotches located anteriorly (toward the head) are tri-lobed.

Larvae: Unknown.

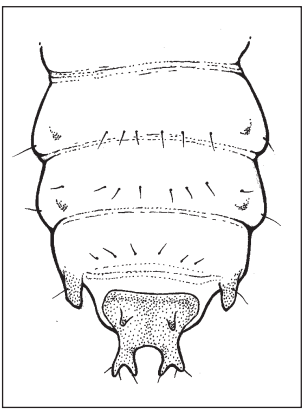
***Glischrochilus quadrisignatus* (Say)**

Adults: Medium to large (3.9 to 6.7 mm, mean = 5.2 mm, n = 28). *Glischrochilus quadrisignatus* can be distinguished from *G. fasciatus* in two ways: the yellow elytral blotches are smaller, and the anterior blotches are farther from the median suture than the posterior (rear) blotches.

Larvae: Similar to *G. sanguinolentus* (Connell 1991).

***Glischrochilus sanguinolentus* (Olivier)**

Adults: Medium to large (4.4 to 6.4 mm, mean = 5.2 mm, n = 20); elytra red with black submedian spot and black apical one-third.



Larvae: Length, based on two specimens, 7.9 to 8.4 mm. Body mostly creamy white and somewhat flattened. Head, pronotum, and ninth abdominal segment golden brown. Abdominal spiracles protrude, increasing in length down the body, and are golden brown at the tips. Ninth abdominal segment with one pair pregomphi and one pair branched urogomphi.

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Glossary

Abdomen.—The third or posterior division of the insect body; consists normally of 9 or 10 apparent segments; bears no functional legs in the adult stage.

Anterior.—In front; before; having to do with the forward section of something.

Apical.—At, near, or pertaining to the apex, which is that part of any joint or segment opposite the base by which it is attached. For example, that point of a wing furthest removed from the base or at the end.

Dorsal.—Of or belonging to the upper surface.

Elytron/Elytra.—The anterior leathery or chitinous wings of beetles, serving as coverings to the hind wings, commonly meeting in a straight line down the middle of the body when the beetle is at rest and not flying.

Larva/Larvae.—A young insect that quits the egg in an early stage of development and differs fundamentally in form from the adult. The immature form of animals that undergo metamorphosis; other related terms are nymph, caterpillar, slug, maggot, and grub.

Lateral.—Relating, pertaining, or attached to the side.

Posterior.—In the rear; after; having to do with the hind section of something; opposite of anterior.

Pronotum.—The upper or dorsal surface of the prothorax.

Prothorax.—The first thoracic ring or segment; it bears the anterior legs but no wings in adult insects.

Pubescent.—Downy; clothed with soft, short, fine closely set hair.

Punctate.—Having impressed points or punctures.

Root graft.—Roots that have grown together so that a graft union is made between the conducting tissues of both roots. The oak wilt pathogen can move through grafted roots between infected and healthy trees to cause new infections.

Rufous.—Pale red.

Sclerite.—Any piece of the insect body wall bounded by sutures. Sclerotization is the hardening of the insect body wall by the deposition of sclerotizing substances.

Seta/Setae.—Hairs or bristles that are hollow structures developed as extensions of the insect epidermis.

Spiracles.—Breathing pores or openings in the sides of the insect body through which air enters the body.

Submedian.—Below a line drawn through the middle of a structure or animal.

Tergite.—A dorsal sclerite or part of a segment, especially when such part consists of a single sclerite or plate.

Tergum/Terga.—The upper or dorsal surface of any body segment of an insect, whether it consists of one or more than one sclerite or plate.

Thorax/Thoraces.—The second or intermediate region of the insect body bearing the true legs and wings, made up of three rings, named in order, pro-, meso-, and metathorax. As adjective, thoracic.

Truncate.—Cut off squarely at the tip.

Tubercles.—Little solid pimples or small buttons on the surface of the insect body, sometimes bearing setae or bristles.

Urogomphus/Urogomphi.—Fixed or mobile structure found on the terminal segments of certain larval insects. Pregomphi are related structures that are generally smaller and are located anterior to the urogomphi.

Vector.—An organism such as an insect, mite, nematode, or a higher animal such as a bird or rodent that carries a pathogenic agent to a susceptible host.

Companion Publications

Pokorny, J. 1999. **How to collect field samples and identify the oak wilt fungus in the laboratory**. NA-FR-01-99. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. 12 p.

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Additional Notes

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