Tetropium castaneum (Linnaeus)

Coleoptera: Cerambycidae

Black spruce beetle

Host(s)	CAPS-Approved Survey Method
Major hosts *Abies sibirica* (Siberian fir), *Abies* spp. (Fir), *Picea* spp. (Spruce), *Picea abies* (Norway spruce), *Picea obovata* (Siberian spruce), *Pinus* spp. (Pine), *Pinus sibirica* (Siberian pine), *Pinus sylvestris* (Scots pine) **Other hosts** *Abies alba* (Silver fir), *Abies holophylla* (Manchurian fir), *Abies sachalinensis* (Sakhalin, fir), *Juglans* spp. (Walnut), *Juniperus communis* (Common juniper), *Larix* spp. (Larch), *Larix sibirica* (Siberian larch), *Picea jezoensis* (Ajan spruce), *Picea omorika* (Serbian spruce), *Picea sitchensis* (Sitka spruce), *Pinus cembra* (Swiss stone pine), *Pinus nigra* (Austrian pine), *Pinus strobus* (Eastern white pine), *Pseudotsuga* spp. (Douglas-fir), *Quercus* spp. (Oak) (BioLib, n.d.; Novák, 1976; Cherepanov, 1990; Kolk and Starzyk, 1996; Dobesberger, 2005)	Spruce blend, geranyl acetol, and ethanol in a cross-vane panel trap.

Reason for Inclusion in Manual

Tetropium castaneum was a target species in the original EWB/BB National Survey Manual.

Pest Description

Eggs:

The egg is white with some silver, oblong to oval and is 1.2 mm by 0.5 mm (approx. $^{1}/_{16}$ in) (Dobesberger, 2005). The surface of the egg is generally smooth with a band of microsculpture that run approximately $^{1}/_{5}$ of the length of the egg (Dobesberger, 2005). *Tetropium* eggs cannot be determined to species (Dobesberger, 2005).

Larvae:

"The larva is yellow-white in color, with conspicuous legs on the thorax, the tarsi of which bear tiny spinules (Schimitschek 1929, Cherepanov 1990). Larvae range from 15-27 mm [approx. $^{9}/_{16}$ to $^{11}/_{16}$ in] in length and are slightly flattened. The head measures 3.5 mm [approx. $^{1}/_{8}$ in] wide (Švácha and Danilevsky 1987, Cherepanov 1990). Hairs on the sides of the head are sparse and the head is rust or reddish brown, with a narrow white band laterally, typical of the genus. Long, but numerous setaceous hairs with a tubercular sclerotized base occur in the anterior half. Sclerotized and elongate spinules occur on the posterior margin of abdominal tergum IX, which look like spots and are usually not separated by a space. If they are separated by a space then the width of the space is less than the diameter of the spinule. These elongate spinules are set on their tubercular base with extensive, but indistinct sclerotization (Cherepanov 1990)" (Dobesberger, 2005).

T. castaneum larva and frass.
(Stanislaw Kinelski, Poland, Bugwood.org)

Pupae:

"The pupa is white, about 15 mm long (range 10-20 mm) [approx. $^{3}/_{8}$ to $^{13}/_{16}$ in] and about 4.0 mm [approx. $^{3}/_{16}$ in] wide (Cherepanov 1990). The mesonotum (in the region of the scutellum) is tubercularly elevated at the apex and bears highly numerous and sometimes quite large spinules. The pronotum is transversely oval, bulges moderately and occasionally bears a small transverse tubercular protuberance on the anterior margin, particularly on the male. Also fine light colored setae occur laterally and fine transverse streaks are in the middle of the disk with distinct spinules. Tergum VII is broadly rounded posteriorly and has stray minute spinules on the disk that sometimes form a transverse row. Tergite VIII is glabrous and is without spinules (Cherepanov 1990)" (Dobesberger, 2005).

Adults:
"The adult varies in size and color throughout its natural range and many forms occur (Juutinen 1955, Novak et al. 1976, Cherepanov 1990). This insect has a flattened body that varies in length from 8-19 mm [approx. $^{5}/_{16}$ to ¾ in] (Novak et al. 1976, Villiers 1978, Cherepanov 1990, Bense 1995). The typical form is black in color, with a shiny pronotum and brown elytra (Novak et al. 1976, Cherepanov 1990). The antennae and legs are either brown or reddish. The antennae and femora (upper legs) are markedly thick and the pronotal punctation is distinctly sparse. These characteristics of the adult distinguish it from other species of the genus. The elytra are uniformly pubescent, with two longitudinal ridges on the disk and with dense, but very fine punctuation (Cherepanov 1990). A deep groove is found on the forehead between the eyes. When viewed from the side, the pronotum has dense granulate punctation and its plate is only rarely punctured. The scutellum has parallel sides and is broadly rounded posteriorly" (Dobesberger, 2005).

T. castaneum adult. (M.Hoskovec).

T. castaneum adult. (M.Hoskovec).

Biology and Ecology

Both biology and life cycles of *Tetropium castaneum* and *Tetropium fuscum* are similar and both have one generation every one to two years, depending on climate and nutritional requirements (Dobesberger, 2005; Kolk and Starzyk, 1996). Neither species undergoes maturation feeding (Kolk and Starzyk, 1996). Copulation occurs immediately after emergence and generally lasts a few minutes (reviewed in Dobesberger, 2005).

Once mating occurs, females oviposit eggs singly in bark crevices (Kolk and Starzyk, 1996). One female lays about 80–100 eggs (Novak et al., 1976). Eggs hatch 10 to 14 days later boring into the phloem and cambium (Kolk and Starzyk, 1996).

Mature larval galleries can be up to 2 cm (3/4 in) wide and are filled with brown shredded bark and then white shredded wood (Dobesberger, 2005; Kolk and Starzyk, 1996). The gallery depth is 2 to 4 cm (3/4 to 1 ½ in) perpendicular to the bark and then curves in a parallel direction to the stem axis where it continues for another 3 to 4 cm (approx. 1 $^{3}/_{16}$ to 1 $^{9}/_{16}$ in), making a hook-like tunnel (Novak et al., 1976). Larvae go through five instars (Kolk and Starzyk, 1996).

Overwintering is usually carried out in the larval stage although some adults can also overwinter (Dobesberger, 2005; Novak et al., 1976).
Pupation occurs in autumn in pupal chambers at the end of the hook-like tunnel (Novak et al., 1996). The chamber's entrance is plugged with frass (Novak et al., 1976). Both larval galleries and pupal chambers are similar between *Tetropium castaneum* and *Tetropium fuscum* (Kolk and Starzyk, 1996). Pupation takes approximately 14 days to complete (Novak et al., 1976).

Emergence occurs several days after pupation through oval exit holes approximately 7 mm ($^1/_4$ in) in diameter (Kolk and Starzyk, 1996) and occurs from May throughout the entire summer, depending on location and weather (Novak et al., 1976). This generation will produce overwintering larvae (Dobesberger, 2005).

Flight of *Tetropium castaneum* occurs from May to September although a peak occurs from June to July (Kolk and Starzyk, 1996). Between 240 and 300 degree-days are needed above 5°C (41°F) in 1 year to observe first flight; the peak in flight activity usually occurs around 450 degree-days above 5°C (41°F) (reviewed in Dobesberger, 2005). Adults live approximately three weeks (Novak et al., 1976).

Countries of Origin

Tetropium castaneum is a palearctic species found throughout most of Europe, northeastern Asia, China and Japan (Johnson et al., 2002).

Current Distribution

T. castaneum is currently distributed in Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Japan, Kazakhstan, Korea, Latvia, Lithuania, Luxembourg, Moldova, Mongolia, Montenegro, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, and Turkey (USDA-APHIS, 2010).

Distribution in United States

This pest is not currently known to occur in the United States. In 2000, it was intercepted in Dalles, Oregon (Johnson et al., 2002). According to NAPIS survey data, this pest has not been found in any other state (K. Handy, personal communication, 2009).

Pathway

Most interceptions of *T. castaneum* in the United States have occurred on general cargo with a few exceptions occurring in holds, mail and permit cargo (AQAS, accessed October 14, 2009). Most interceptions have occurred on wood products, including crating, dunnage, pallets and wood (AQAS, accessed October 14, 2009).

Pathogens Vectored

This species is not known to be associated with any pathogens. However, galleries can leave trees susceptible to secondary infection caused by fungi and other pathogens (Dobesberger, 2005).

Damage

During favorable environmental conditions, *T. castaneum* can reach damaging numbers, especially when forests have been severely defoliated previously (Dobesberger, 2005). Although this insect is considered a secondary forest pest, it can attack and kill healthy trees (Dobesberger, 2005). Symptoms caused by *T. castaneum* are not specific to this species, but are typical of most wood borers (Dobesberger, 2005). These include larval feeding galleries with granular frass, oval shaped exit hoes, fading foliage of living trees and wind-snapped tree trunks due to loss of structural integrity (Dobesberger, 2005).

Gallery of *Tetropium castaneum*. (Gyorgy Csoka, Hungary Forest Research Institute, Bugwood.org)

Larval feeding tunnel. (Michael Henn)

Survey

1.1 Survey Site Selection

Sites selected should be plantings or natural settings with *Abies*, *Picea* and/or *Pinus* species present, preferably near warehouses or other businesses that receive wood crating, pallets and dunnage from foreign sources. *T. castaneum* prefers freshly cut trees and stumps and weakened or stressed trees, although healthy trees may be attacked. Follow the general instructions on **General Site Considerations for Trap Placement**.

1.2 Trap and Lure

The CAPS-approved survey method for *T. castaneum* is a cross-vane panel trap with a three lure combination: 1) spruce blend, 2) geranyl acetol, and 3) ethanol. Refer to **Appendix C: Assembly Instructions for Cross-vane Panel Traps** for guidance on assembling cross-vane panel traps. The spruce blend lure simulates monoterpenes that are emitted from red spruce, a host of *T. castaneum* (Sweeney et al., 2004; Sweeney et al., 2006). The geranyl acetol lure simulates the male-produced sex pheromone emitted by *Tetropium fuscum* (F.) and *Tetropium cinnamopterum*) (Silk and Sweeney, 2007; Silk et al., 2007) and is a powerful attractant to *T. castaneum*. Ethanol is released by microorganisms in decaying woody tissue and is used by insects to locate stressed trees (Byers, 1992).

The release rates of these lures are highly temperature-dependent. However, CAPS has listed a conservative length of effectiveness (8 weeks all three lures) that will be effective for even the warmest climates in the CAPS community.

IPHIS Survey Supply Ordering System Product Names:

1) Spruce Blend Lure,
2) Geranyl Acetol Lure,
3) Ethanol Lure,
4) Cross Vane Panel Trap, Black

1.3 Trap Placement

Follow the general instructions on **Trap Placement** and **Trap Setup** for cross-vane panel traps.

1.4 Time of year to survey

Csóka and Kovacs (1999) report that adults begin to fly in April in Hungary while Dobesberger (2005) states that adults emerge and are present from May throughout summer, depending on geographical location and weather conditions (Novak et al., 1976).

Identification

CAPS-Approved Method

Morphological.

Mistaken Identities

Exotic *Tetropium* species are similar in appearance to indigenous species and may be difficult to distinguish (Dobesberger, 2005). Both the larvae and pupae of *T. castaneum* and *T. fuscum* are similar but have some differences in body structure (Kolk and Starzyk, 1996). *T. castaneum* is also similar to *T. cinnamopterum* which is present in the United States.

Resources and High Resolution Images

Images

http://www.forestpests.org/hungary/longhorntc.html

http://www.zin.ru/Animalia/Coleoptera/eng/tetrob.htm

http://www.uochb.cas.cz/~natur/cerambyx/tetcas.htm

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