

Seasonal emergence of invasive ambrosia beetles in Western Kentucky in 2017[©]

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NATURE OF WORK

Xylosandrus crassiusculus (granulate ambrosia beetle, GAB) and *X. germanus* (black stem borer, BSB) are considered the most destructive insect pests to the nursery crop industry. These beetles usually mass attack nursery crops in spring, causing important loss due to the negative effect on the plant growth, aesthetic, economic value and unmarketable tree quality (Ranger et al., 2016). Ambrosia beetles bore sapwood and inoculate the galleries with fungi, which are collectively named as ambrosia fungi. These fungi are derived from plant pathogens in the ascomycete group identified as ophiostomatoid fungi (Farrell et al., 2001). Ambrosial fungus garden is the food source for ambrosia beetles and larvae. According to the field and container nursery growers of southeastern USA, GAB was ranked third as a key pest, 18% nursery growers identified it as prevalent and difficult to control. In Tennessee, *Cnestus mutillatus* (camphor shot borer, CSB) was found widely distributed and considered a new pest for nursery crops with unknown magnitude of damage (Oliver et al., 2012). Camphor shot borer was first reported from Kentucky in 2013, although a single specimen was found in Whitley Co., it was believed it would be everywhere in the state due to its wide spread in the neighboring states (Leavengood, 2013). The main objective of this study was to determine the phenology of the most abundant invasive ambrosia beetles in western Kentucky.

MATERIALS AND METHODS

Double bottle Baker traps were baited with ultra-high release ethanol (Contech Enterprises Inc., Canada). The ethanol pouch was attached to the upper bottle and set over 1 m above the ground. The catching bottle contained approximately 150 mL commercial antifreeze to collect and kill insects. Four traps per location were set at the edge of the woods surrounding nursery stocks and orchards, and inside the orchards and nursery stocks. Traps were deployed in Calloway, Caldwell, Graves, and Todd Counties, in western Kentucky in March 2017. Catching bottles were replaced weekly during March and April, and biweekly thereafter until early August, 2017. In the laboratory, after filtering and rinsing each bottle's content, ambrosia beetles were grouped and tallied under a dissecting stereoscope. Total number of beetles per trap per week was recorded.

RESULTS AND DISCUSSION

The most common and numerous ambrosia species identified were GAB, BSB, CSB and *Xyleborinus saxesenii* (Fruit-tree pinhole borer, PHFB), which are identified as invasive species. Invasive ambrosia beetles once established in new habitats surpass the populations of native species (Miller and Rabaglia, 2009; Helm and Molano-Flores, 2015; Werle et al., 2015; Gandhi et al., 2010).

Granulate ambrosia beetle populations started to rise the last week of March to reach the highest populations in April in the four counties (Figure 1A). In Todd Co., the highest GAB population (768 beetles/week) was captured the 3rd week of April, thereafter the number decreased abruptly. The second largest population was recorded in Graves Co. the 2nd week of April. In Caldwell and Calloway Counties the maximum populations (141 and 182, respectively) occurred the 1st week of April. The GAB populations were still high in May and June, with very low captures in Caldwell Co. Apple and peach orchards have a pesticide

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program that includes frequent insecticide sprays, thus it could deter ambrosia beetles. In chestnut nurseries, ambrosia beetle population peaks in spring and fall coincided with the time of attacks and tree damage (Oliver and Mannion, 2001).

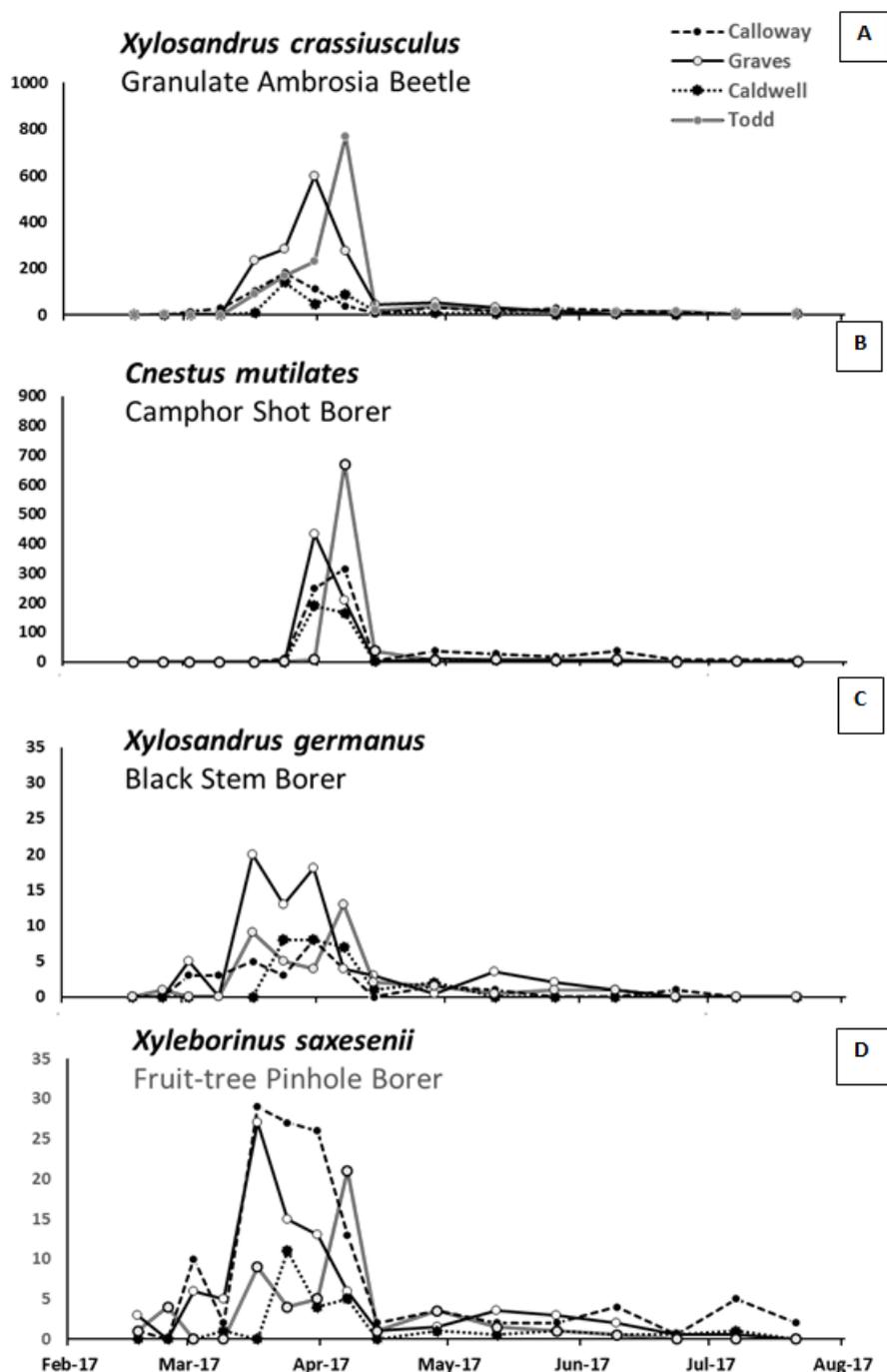


Figure 1. Seasonal captures of *Xylosandrus crassiusculus* (A), *Cnestus mutilates* (B), *Xylosandrus germanus* (C), and *Xyleborinus saxesenii* (D) in western Kentucky.

Camphor shot borer was the second most abundant invasive ambrosia beetle. The largest captures of CSB were recorded the second and third weeks of April, with the highest counts in Graves and Todd Co. (Figure 1B). Populations decreased considerably the last week

of April in all counties. More CSB were captured in Calloway Co. in May and June. Spring Ambrosia beetle attacks to nursery, landscape and fruit trees have been reported in western Kentucky year after year. In 2017, we identified GAB as responsible of a mass attack to 'October Glory' maple in a nursery. Few CSB were also found in the galleries of infested trees. These two species were also identified attacking nursery apple trees in Jackson Co., and 5-7mm diameter red bud branches from a home garden.

Regarding BSB, low populations were recorded from the four counties for short time in the growing season (Figure 1C). Black stem borer started to emerge in March in Graves and Todd Counties, and disappeared in late June. In Caldwell, it was found from early April to mid-May, whereas in Calloway, the BSB was captured until early July. Low counts of BSB have recorded previously in the southeastern USA (Miller and Rabaglia, 2009; Oliver and Mannion, 2001, Werle et al., 2015), but larger populations have been reported from northern states such as Ohio (Reding et al., 2011, 2015) and New York (Agnello et al., 2017), which might be related with its adaptability to high altitudes and cool climates (Reding et al., 2011).

Fruit-tree pinhole borer reach the highest population in April, but its presence was detected during the growing season. Highest populations of FTPB were recorded in Calloway and Graves counties from late March to the third week of April, with a maximum of 29 beetles/trap/week (Figure 1D). In Todd and Caldwell Co., the FTPB population showed a single peak, with 21 and 11 beetles/trap/week, respectively. From late April on, the populations were low in all four counties. High PHFB populations have been reported in avocado (Carrillo et al., 2012) and stressed black walnut (Reed et al., 2015). Despite the high population of PHFB in nursery crops, the attack number is low and non-significant (Oliver and Mannion, 2001; Reding et al., 2011).

SIGNIFICANCE TO THE INDUSTRY

Granulate ambrosia beetle and camphor shot borer were found in large numbers in western Kentucky in early spring. Ambrosia beetle attacks were identified in nursery and land scape plants. Regrettably, nothing can be done to recover infested plant, especially those that belong to a nursery. Knowing Ambrosia beetle seasonal flight timing will provide valuable information to opportunely schedule preventive application of pyrethroids and thus increase the insecticide spray efficiency. Other more effective management strategies need to be evaluated.

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