

# Insect Pests of Chestnuts

## With Emphasis on Ambrosia Beetles

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(Orange-striped Oakworm on Chestnut at UGA Hort Farm)

Dr. Martin L. Cipollini

Berry College and Georgia Chapter of The American Chestnut Foundation

# Asian Chestnut Gall Wasp (ACGW) *Dryocosmus kuriphilus*

ACGW was brought into GA in 1974; distribution now includes many eastern states (Rieske-Kinney 2012). <http://pest.ca.uky.edu/EXT/ACGW/welcome.htm>

Lays eggs in developing leaf and flower buds.

Galls are initiated as larvae develop, resulting in death/deformation of leaves and flowers.

Control: no pesticides have been found to be effective; parasitoids are being studied. (*Torymus sinensis* effective in European studies; Colombari and Battisti 2016)

<http://onlinelibrary.wiley.com/doi/10.1111/epp.12297/pdf>

Breeding for resistance may be possible using American and Chinese chinquapins, *C. pumila*, *C. ozarkensis*, and *C. henryi*, which have shown some resistance in field observations (Anagnostakis 2012)

<http://apsjournals.apsnet.org/doi/pdfplus/10.1094/PDIS-04-12-0350-FE>



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# Large Chestnut Weevil and Lesser Chestnut Weevil

## *Curculio caryatrypes* and *Curculio sayi*

Egg laying begins when the nuts are nearly mature and (at least for the LCW) most eggs are laid after the burr begins to open (Bessin 2003)

<https://entomology.ca.uky.edu/ef206>

Eggs hatch in ~10 days and larval development is completed in 2-3 weeks.

After nuts fall, larvae chew a hole in the side of the nut to enter the soil for pupation.

Control: harvest burs from tree, rather than waiting for nuts to fall, or harvest frequently from the ground.

Post-harvest heat treatment: after curing, immerse in 140° F water bath for 30 minutes, then cool.



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# Japanese Beetle

## *Popillia japonica*

Adult beetles feed in mid-summer, with peak activity in July and August (Lizotte 2013)

[http://msue.anr.msu.edu/news/japanese\\_beetle\\_adults\\_arrive\\_in\\_chestnuts](http://msue.anr.msu.edu/news/japanese_beetle_adults_arrive_in_chestnuts)

Control: Carbamates can provide immediate knockdown and 7 days residual activity.

Organophosphates take up to three 3 days to act, but provide 10-14 days of residual control.

Pyrethroids have good immediate activity and 7-10 days of residual control, but may be toxic to beneficial predatory mites.

Neonicotinoids act initially as a contact poison for two to five days, and have a longer residual period as anti-feedants.

Organic options include neem-based products which have 1-2 day residual activity and kaolin clay which acts as a physical barrier and irritant.



David Cappaert, Michigan State University



Mario Mandujano, MSU

# Asiatic Oak Weevil (AOW) *Cyrtopistomus castaneus*

Adults emerge and feed on trees in late May through September (data from TN and NC; Case et al., 2016) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4801056/>

Defoliation may range from 15-20%, and may be higher near stands of *Quercus*, which serve as a primary host.

While insects may be found in greater abundances on *C. dentata* and various hybrid generations, defoliation may be higher on *C. mollissima*.

Control: So far, observed damage levels have been below the 30% threshold considered necessary for treatment.

Chemical sprays rated for similar foliage-eaters may be necessary if damage levels higher than this are seen elsewhere.



James Solomon, USDA Agricultural Research Service, Bugwood.org



Natasha Wright, Cook's Pest Control, Bugwood.org

## Ambrosia Beetles (AB)

- Small stem-boring beetles
- Fungal symbiosis, some carry specific pathogens
- Exotic species are of most concern for chestnuts
- Spring emergence and attacks most common
- <http://www.nurserymag.com/article/ambrosia-beetle-research-2017/>



*Xylosandrus crassiusculus* (female). (by J Hulcr, University of Florida).  
Hulcr, J. 2012. <http://xyleborini.myspecies.info/gallery> (last accessed October 22, 2012).



[http://en.wikipedia.org/wiki/File:Xylosandrus\\_crassiusculus\\_galleryR.jpg](http://en.wikipedia.org/wiki/File:Xylosandrus_crassiusculus_galleryR.jpg)

# Ambrosia Beetle Species Attacking Chestnut, Berry Orchard 2012

## Exotics



*Xyleborinus saxesenii*

[https://commons.wikimedia.org/w/index.php?title=Landcare\\_Research&action=edit&redlink=1](https://commons.wikimedia.org/w/index.php?title=Landcare_Research&action=edit&redlink=1)



*Xylosandrus crassiusculus*

Hulcr, J. 2012. <http://xyleborini.myspecies.info/gallery> (last accessed October 22, 2012).

## Natives



*Ambrosiodmus tachygraphus*

Hulcr, J. 2012. <http://xyleborini.myspecies.info/gallery> (last accessed October 22, 2012).



*Monarthrum mali*

Wright, N., Div. Plant Industry, Florida Dept. Agric. Cons. Serv.). Bugwood.org

## Ambrosia Beetle Trap Collections, Berry College 2012

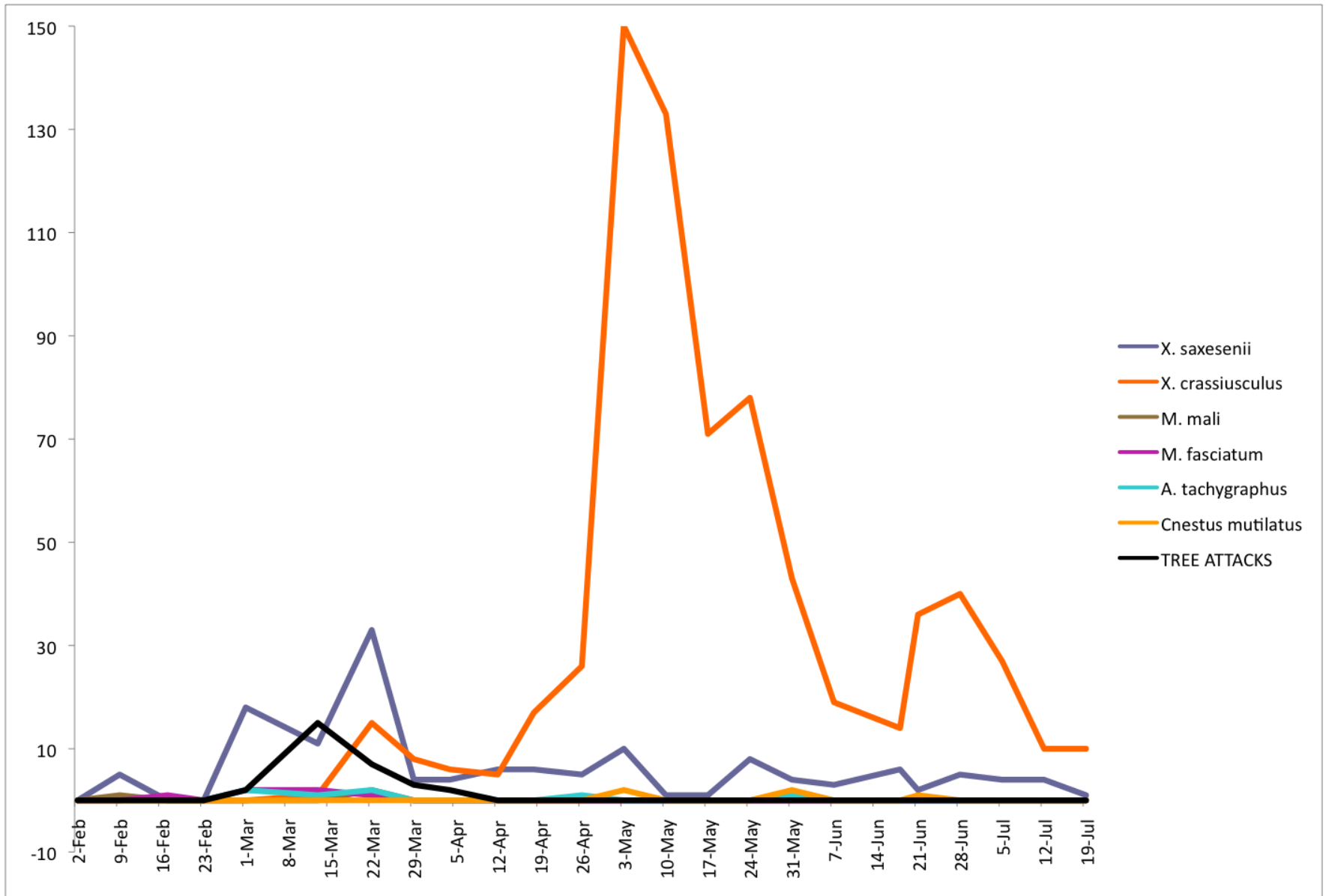
Species	Range	Attacking trees?	Relative Density	Relative Frequency	Importance Value
<i>Xylosandrus crassiusculus</i>	Exotic	yes	0.78	0.23	0.51
<i>Xyleborinus saxesenii</i>	Exotic	yes	0.14	0.24	0.19
<i>Dryoxylon onoharaensum</i>	Exotic	no	0.03	0.15	0.09
<i>Xyleborus affinis</i>	Native	no	0.02	0.10	0.06
<i>Xyleborus ferrugineus</i>	Native	no	0.01	0.05	0.03
<i>Ambrosiodmus tachygraphus</i>	Native	yes	0.01	0.05	0.03
<i>Xylosandrus germanus</i>	Exotic	yes	0.01	0.05	0.03
<i>Monarthrum fasciatum</i>	Native	yes	0.01	0.04	0.03
<i>Cnestus mutilatus</i>	Exotic	yes	0.00	0.03	0.02
<i>Monarthrum mali</i>	Native	yes	0.00	0.02	0.01
<i>Cyclorhpidion badoadum</i>	Exotic	no	0.00	0.01	0.01

Take-home message: Several species that infest trees are not commonly attracted to ethanol traps in great numbers.

Species commonly attracted to ethanol traps include: *Ambrosiodmus tachygraphus*, *Anisandrus sayi*, *Dryoxylon onoharaensum*, *Monarthrum mali*, *Xyleborinus saxesenii*, *Xyleborus affinis*, *Xyleborus ferrugineus*, *Xylosandrus compactus*, *Xylosandrus crassiusculus*, and *Xylosandrus germanus*



# AB Attacks and Trap Collections, Berry College 2012





## Henry/Berry College Backcross Orchard

Year	2014	2015	2016	2017	Avg
Number trees alive	324	264	275	256	
Number trees attacked	34	99	22	83	
% attacked	10.5%	37.5%	8.0%	32.4%	22.1%
Number dead (no re-sprouting)	1	30	0	3	
% of attacked that died	2.9%	30.3%	0.0%	3.6%	9.2%
Treatment used	Permethrin + Chlorothalonil <sup>a</sup> Verbenone <sup>b</sup> Bifenthrin <sup>c</sup> Bifenthrin <sup>c</sup>				
No. of treatments	2	1	4	4	
Date of first observed attacks	11-Apr	17-Apr	24-Mar	17-Apr	9-Apr
Min stem DBH (cm)	1.9	0.0	?	0.5	0.8
Max stem DBH (cm)	6.1	4.0	?	6.1	5.4
Avg. stem DBH (cm)	4.3	1.5	?	1.2	2.3
Average low temperature (°F) <sup>d</sup>	45	57	40	60	50.5
Average temperature (°F)	58	65	54	72	62.3
Average high temperature (°F)	70	72	67	82	72.8

<sup>a</sup> Standard maximum label rates for retail products Ortho Bug Be Gone and Daconil®

<sup>b</sup> 20 g bags of Verbenone Disrupt Micro-flakes attached to all trees in susceptible size range.

<sup>c</sup> 6/L BifenIT + 1.5 g/L Pentrabark

<sup>d</sup> Averages for the week prior to initial attack observations, nearest weather station at Russell Airfield, Rome, GA

Summary: First AB attacks on chestnuts noted:

2011 April 15

2012 March 2

2013 April 1

2014 April 11

2015 April 17

2016 March 24

2017 April 17

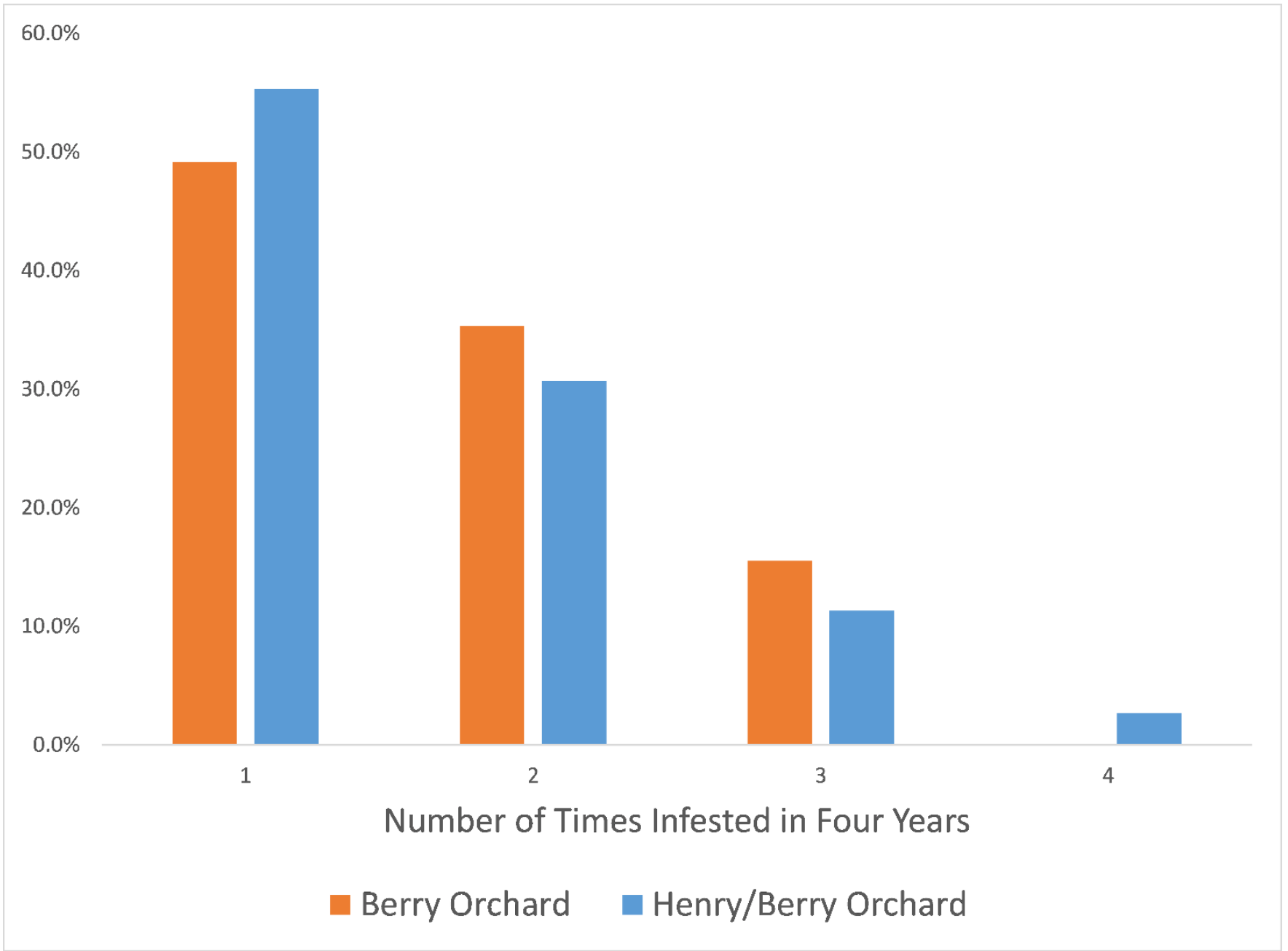
2018 April 3

2019 April 11

2020 March 31

So, considering that observations are often made at some time after the actual initiation of infestation, the critical time period in GA is likely to be roughly March 1 – April 15.

Spraying should precede this time frame.



## ABs attacking traps in chestnut orchard, middle Tennessee in 1998-99 (Oliver and Mannion 2001)

Progeny captured in ethanol traps:

49.7% *Xyleborinus saxeseni* - Exotic

17.6% *Xylosandrus crassiusculus* - Exotic

12.5% *Monarthrum fasciatum* - Native

5.8% *Monarthrum mali* - Native

4.1% *Xyleborus pelliculosus* (*Cyclorhaptidion pelliculosum*) - Exotic

2.8% *Xyleborus atratus* (*Ambrosiophilus atratus*) - Exotic

Others including *Xylosandrus germanus* (<1.7%) – *X.g.* Exotic

Progeny emerged from galleries:

35.9% *Xylosandrus germanus* - Exotic

10.3% *X. crassiusculus* - Exotic

3.3% *Hypothenemus* spp. - Native?

1.1% *X. saxeseni* - Exotic

Peak attacks in mid-April, average basal diameter +/- 10 cm.

Again, some species that attack trees are not commonly attracted to traps.

## Take home lessons for AB in chestnut breeding orchards – expect . . .

- attacks to begin during a periods when nighttime lows average nearly 50° F and daytime highs average about 70° F. Generally, March 1 to April 15 in GA.
- attacks to trees that are 0.5 to 8 cm (1/4 in to 3 in) DBH, with an average DBH of +/- 3 cm (1.2 in).
- to have about 20-25% of trees infested and to lose 2-10% of the trees each year, *even with spraying*.
- the majority of attacks to subside upon complete leaf out.
- most trees to be attacked once or twice, but that some may sustain at least 4 sequential attacks and still be able to re-sprout.
- variation in stem diameters at the time of inoculation tests. Take AAB infestation and multiple attacks into account in data analysis, if possible.
- Control: Spray all stems in susceptible size range the week prior to anticipated attacks (see above). Alternatively, use ethanol traps and begin spraying program as soon as AABs appear in traps. Use bifenthrin (6 g/L of 7.9% active ingredient) and bark penetrant. Continue bi-weekly until full leaf out. Remove attacked trees by cutting at the base within 50 days after the first attacks. Burn or chip culled trees.
- See [https://acf.org/wp-content/uploads/2021/02/FactSheet\\_AmbrosiaBeetle\\_v1\\_Feb2021.pdf](https://acf.org/wp-content/uploads/2021/02/FactSheet_AmbrosiaBeetle_v1_Feb2021.pdf)



Camphor Shoot Borer, *Cnestus mutilatus*, (3-4 mm) - Exotic

Kira Metz, USDA/APHIS

Just when you think you have things figured out, this beastly was discovered boring and causing tree losses in the middle of July and early August 2017 in Georgia...





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