From the Editor
Ruthann Anderson, Editor

WHAT YOU ARE HOLDING in your hands is my best version of the CAPCA water cooler. In our society, people congregate around the water cooler to share stories, ideas and build connections between departments of a company or industry. Applicators and PCAs rarely have this opportunity to interact, especially at the height of a busy season. PCAs are making a recommendation alongside a grower and the applicator, using the recommendation as a guidebook, typically makes the application in the cover of night. So where do these two groups whose schedules rarely match find space to interact over the issues, emerging solutions and the industry that they both are licensed to safeguard?

We hope that the Applicator Alerts you hold in your hand will serve as an industry-wide water cooler where PCAs and QALs can talk about invasive species like the shot hole borer featured in this edition. You are another set of eyes in the field during an application. Your knowledge of invasive species and emerging pests only add value to this industry.

This publication is a space where innovative solutions and industry talking points create a united platform as we share the value of each of our roles in the bigger story of production agriculture and keeping turf and ornamental spaces healthy for Californians to enjoy. After you take a few minutes to skim the articles, I encourage you to pass this along to a grower, a fellow applicator or even a PCA you work with to bridge the conversation about this invasive species and find a way we can work together to continue to keep California plants healthy.

SAVE THE DATES
AVOCADO / PSHB SEMINARS

January 25, 2017
Museum of Ventura County
100 E. Main St., Ventura, CA 93001

January 26, 2017
Temecula Conference Center
41000 Main St., Temecula, CA 92590

Watch our website for more information:
https://capcaed.com/
2016 HAS BEEN A SUCCESSFUL year for CAPCA ED. By the end of 2016, we will have hosted nearly 50 seminars and have moved into new regions throughout California. New meetings have been held in Corona, Gilroy, San Luis Obispo and a seminar in Arcadia is planned for later this November.

As the CAPCA ED team is starting to plan for 2017, the success that we have had in new areas is promising for the future. Additionally, CAPCA ED will be holding some commodity-specific seminars next year, especially in the areas where current invasive species are challenging California crop production.

Avocado Production Seminars Slated for 2017
Some of our first commodity-focused seminars will be two Avocado Production seminars in January 2017. Addressing the threat of the Polyphagous Shot Hole Borer, Fusarium Dieback and other issues in avocado production are a continuing concern for the pest management industry. Besides featuring some articles on updates and research in this newsletter, CAPCA will be teaming with the California Avocado Commission in these two Avocado Production seminars next year.

These seminars will be another opportunity to improve the connection between the PCA making the recommendation and the QAL making the application. Providing a venue/forum for applicators and PCAs to interact, exchange knowledge and experiences will help build a bridge and strengthen the various components of the industry and provide us with a united voice in the state.

For information on these seminars, please feel free to contact Ariana Zamora, our Southern California Representative and CE Coordinator at (805) 704-3255 or ariana@capca.com.

Visit https://capcaed.com/
FROM AN INITIAL INFESTATION in Los Angeles County, Southern California’s landscape and riparian tree infestations have reached epidemic levels, with the devastation of 140,000 willows in the Tijuana River Valley as an example of what can happen when an exotic pest population is allowed to increase in the absence of biological, regulatory and regional control efforts. The Polyphagous Shot Hole Borer and Kuroshio Shot Hole Borer (Euwallacea sp.), and Fusarium Dieback (Fusarium euwallacea, Graphium euwallacea) have been observed on a wide variety of trees common to urban landscapes, natural areas and commercial avocado production of Los Angeles, Orange, Riverside, San Bernardino, Ventura, and San Diego Counties, with San Diego and Orange being the only counties infested with the Kuroshio Shot Hole Borer (see map at PSHB.org or Eskalenlab.ucr.edu). What makes Polyphagous Shot Hole Borer (PSHB), Kuroshio Shot Hole Borer (KSHB), and Fusarium Dieback (FD) so dangerous is that it is a beetle/fungal complex that causes FD disease. This disease, caused by the fungi that PSHB and KSHB vectors, is fatal to susceptible host species and unlike the bark beetles killing drought stricken trees, this beetle seems to require well hydrated trees that can support the growth of the Fusarium and Graphium that the beetles feed on.

The beetle’s long host list includes over 110 tree species that are susceptible to FD. New reproductive hosts—tree species in which PSHB or KSHB can cultivate the fungus and successfully produce offspring—continue to be discovered. The original list of 12 reproductive hosts from 2012 has now increased to 42 (see host list at Eskalen.ucr.edu).

PSHB and KSHB are tiny: females are black in color and about 0.07-0.1 inches long, while the brown-colored males are smaller, at 0.05 inches long. Its entry/exit hole is a mere 0.033 inches in diameter. Some host trees respond with obvious gummy (e.g. Goldenrain), bleeding (e.g. California sycamore), or white-sugar exudate (e.g. Avocado) at the entry hole, but staining can be subtle, tricky to recognize, and differs greatly from host to host (see the Select a Tree to View PSHB symptom feature at PSHB.org).

Only a few holes may be evident on a tree’s bark, but PSHB and KSHB can bore a network of galleries from that single entrance. It is in these galleries that PSHB inoculates the host species with Fusarium, and proceeds to farm the fungus in the tree’s living tissue. In reproductive hosts, females lay their eggs at the ends of the galleries. When the larvae hatch, they too will feed on the fungus. Brothers and sisters mate with each other (so that when females leave the gallery, they are already pregnant) and the mother may mate with her sons (so that she never needs to find a male when she travels). This means that pheromones are worthless to this particular species—and that pheromone trapping methods are not an option, although an attractant (less specific and effective range than pheromones), Querciverol, has been used at a density of 2-5 traps per square mile or a minimum of 98 feet apart for detection.

Research at the University of California at Riverside is investigating PSHB, KSHB and FD biology and potential control methods. Drs. Akif Eskalen and Richard Stouthamer have made several trips to Vietnam and Taiwan, where it is believed the PSHB and KSHB infestations originated from, in search of biological control agents. Drs. Eskalen and Tim Paine are currently conducting efficacy trials on landscape trees, Dr. Joe Morse conducted efficacy trials and the California Avocado Commission secured a Section 18 on avocados (refer to page 6 of this newsletter or www.californiaavocadogrowers.com/), and Dr. Stouthamer is continuing work on trapping methods and use of an anti-aggregation signal chemical.

Managing PSHB, KSHB, and FD
Once a tree is heavily infested with PSHB, KSHB and FD, it is probably too late to save the tree and the tree should be removed, and chipped (1 inch or less), solarized, composted, burned (at a biogeneration plant), or taken to the dump. However, experience has shown that in the urban forest, regular monitoring and detection enables the use of imidacloprid as a soil injection or drench, and bifenthrin and Bacillus subtilis as a bark application to the main trunk, plus selective pruning (making sure to dispose of pruned branches the same as wood from trees being removed and to treat cut surfaces with bifenthrin and Bacillus subtilis) to protect lightly infested trees (see Prioritizing Management Methods at PSHB.org). Check PSHB.org and eskalenlab.ucr.edu regularly for updates on research results and management information.

John Kabashima, Ph.D., University of California Cooperative Extension, Emeritus
TWO CLOSELY RELATED ambrosia beetles (Euwallacea sp.) have been identified in commercial avocado groves in California. The polyphagous shot hole borer (PSHB), detected in Los Angeles, Orange counties and recently in Ventura county, and the Kuroshio shot hole borer (KSHB), detected in San Diego and recently in Orange counties, are morphologically indistinguishable, but genetically distinct. Already widespread in a variety of reproductive host trees common in the urban landscape (including box elder, willow, several maple, oak and sycamore species), the beetles represent a significant threat to trees in both landscape and agricultural settings. Adult females construct galleries in the xylem system of host trees, where they cultivate symbiotic fungi (Fusarium, Paracremonium and Graphium spp.) as a food source for their developing young. The fungi are taken up by progeny females in specialized organs within their mouthparts, and transported to other sites within the same tree, where new colonies are established, or to newly colonized hosts. The galleries compromise the structural integrity of infested trees, which can represent a serious safety hazard in urban environments, and disrupt the flow of water and essential nutrients within the xylem. In addition to the physical damage, the fungi extract nutrients from the xylem system, further depriving the tree of nutrients essential for healthy growth and fruit production.

An effective biological control agent is not yet available to manage the SHB in California, and so management for now must rely on the use of chemical pesticides. The control of ambrosia beetles and their associated fungi using chemical pesticides is complicated because of their location inside the host trees. The application of insecticides to the external surfaces of trees, where the beetles must first alight prior to boring, has the potential to kill beetles by contact activity, and they...
may also have the potential to control emerging progeny females before they can re-infest the trees. The drawback of surface treatments is that multiple applications are often required because of the relatively short duration of efficacy. In addition, once the beetle burrows inside the tree, surface treatments become ineffective. One possible solution to this problem may be the use of systemic pesticides, and scientists at UC Riverside are evaluating the use of both systemic insecticides and fungicides in a 2-pronged attack against the symbiotic system. Systemic pesticides are mobile within the xylem system of plants, and the fungicides could potentially target the fungi growing in the xylem and deprive the beetle larvae of a food source. The insecticides would prevent the beetle from establishing galleries within susceptible tree hosts, and prevent the survival of beetles and their offspring already present within trees. The big problem with systemic pesticides is getting sufficient concentrations of chemicals to the areas within the trees where the beetle and fungus occur. Although there are exceptions, most systemic treatments are administered to the soil for uptake through the roots. However, in mature avocado groves, the high organic matter content of the soil can prevent effective absorption by roots because the pesticide becomes bound to organic components within the soil. Trunk injection of pesticides directly into the vascular system of trees eliminates the potential for binding of pesticides within the soil, and increases the amount of active ingredient inside the tree available to impact the beetle/fungal system. Systemic pesticides must be formulated for trunk injection and so careful evaluation is needed to ensure optimal efficacy. Trials are being conducted with the assistance of avocado industry and grower collaborators in areas where the SHB has been recorded. The chemicals are injected into the trees using commercially available equipment, and the movement of the active ingredients is then monitored over time in wood core samples taken at different heights of the trees. Two methods are being used to confirm the presence of the chemicals. Insecticides are being quantified using ELISAs that are specific for the active ingredients under investigation. Wood cores taken from trees treated with fungicides are placed in direct proximity to the fungal pathogens growing on agar plates to determine if growth of the fungus is inhibited.

The investigations are still at an early stage, but the researchers are optimistic that they will develop effective control strategies for the SHB that growers can incorporate into their overall pest management programs. Laboratory based bioassays have been used to identify several pesticides that are toxic to the beetle and fungi. The objective of the field trials is to determine whether these chemicals can be utilized as trunk injection agents for the protection of avocado trees.

Anyone interested in finding out more about the SHB should go to the web site maintained by Dr. Akif Eskalen at: http://eskalenlab.ucr.edu/pshb.html
THE POLYPHAGOUS SHOT HOLE BORER (PSHB) is a new species of ambrosia beetle closely related to and morphologically indistinguishable from the tea shot hole borer (TSHB), *Euwallacea fornicatus*. PSHB is still undergoing taxonomic description. PSHB originates from Southeast Asia, with distinct populations of the beetle being found in Vietnam, Taiwan, Thailand and Japan. Outside of Southeast Asia it is only known to exist in Israel and California where it is a pest of avocados (*Persea americana*) and numerous ornamental and native tree species.

Because of the potential threat to the California avocado industry, the California Avocado Commission (CAC) funded research to determine the correct identity of the beetle and potential control strategies starting in August 2012. Since Hero® EW insecticide (3.24% zeta-cypermethrin, 9.72% bifenthrin) is in the IR-4 program for full registration on avocados, toxicology and residue data already existed, which could be supplemented with efficacy data to request a Section 18 Emergency Exemption. These efficacy data were collected and a Section 18 was granted for the use of Hero® EW against PSHB on avocados effective April 11, 2016 through April 8, 2017.

It is believed that Hero® EW insecticide is effective against PSHB as a trunk and branch spray in three ways: 1) contacting the adult females as they sit guarding the entrance to their galleries, 2) contacting emerging beetles as they walk along the trunk/branch surface before creating a new gallery or flying to a new host tree, and 3) contacting new fly-ins when they land and walk along the trunk/branch surface determining if the tree is a suitable host.

Based on this premise, the following are general usage guidelines based on the Section 18 Emergency Exemption (CA No. 16-01, Amended April 18, 2016):

- You must have a copy of the most current Section 18 label in your possession during application and you must read and follow all label instructions. The label can be downloaded from the California Department of Pesticide Regulation's website (http://www.cdpr.ca.gov/).

- The Section 18 only applies to the following counties: San Diego, Riverside, Orange, San Bernardino, Los Angeles, Ventura, Santa Barbara, San Luis Obispo, Monterey, and Tulare.

- A permit must be obtained from the County Agricultural Commissioner prior to use under this Section 18 Exemption. Agricultural pest control businesses shall submit a pesticide use report within seven days of treatment. Growers who apply this material shall submit a pesticide use report by the 10th day of the month following treatment.

- The Section 18 authorizes use of up to 11.2 fl oz Hero® EW in 50-300 gallons of water per acre per application on avocados. All applications must be made by or under the supervision of a certified applicator.

- Up to five (5) applications (56 fl oz) may be made per year at no less than 15-day intervals.

- Applications must be made using a hand-held sprayer targeting the trunk and major scaffold limbs. The product must not be allowed to run off the target tree onto the ground or soil.

- PSHB infests the wood of avocados, not the leaves or fruit, often from the top of the tree down and appear to prefer branch crotches of primary and secondary branches rather than the main trunk. Sprays should target these areas.
Membership with CAPCA provides:

**LEGISLATIVE & REGULATORY ADVOCACY**
CAPCA communicates with California policy makers about the State’s agricultural and horticultural industries. CAPCA plays an active role in the legislative and regulatory process to ensure the safety and viability of California plant production.

**EDUCATION**
In addition to local chapters’ continuing education meetings and CAPCA ED CE Seminars, CAPCA hosts an annual conference.

**PROACTIVE ORGANIZATION**
CAPCA works closely with allied organizations to make sure the concerns of CAPCA members are addressed. Communication is maintained with producer organizations, agricultural commissioners, agribusiness interests, regulatory agencies, the legislature, media and the educational institutions that provide new research to our industry.

*Associate Membership does not provide CE hours tracking.

CAPCA’s MEMBERS ONLY WEB PAGE
www.capca.com

RESOURCES & FEATURES:
- Access a CE Meeting List
- Access Our Legislation Link
- Access Job Postings
- Crop Team Resources

ALSO AVAILABLE:
- Insurance Information
- Member Alerts
- Additional Resources

Contact Dee Strowbridge, Membership Director, at (916) 928-1625 x203 for more information.

BECOME AN ASSOCIATE MEMBER TODAY!

All applicators are invited to join CAPCA at the Associate Membership level for $45*

★ SPECIAL OFFER! Attend a CAPCA ED event June - December, 2016 and receive FREE Associate Membership for the remainder of 2016 and all of 2017!

- This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops while bees are foraging.

- The Restricted Entry Interval (REI) is 12 hours and the Pre-Harvest Interval (PHI) is seven days.

- Read all label instructions regarding PPE required for application and early entry to treated areas.

- This product is toxic to fish and aquatic organisms; read all label instructions regarding applying the product in calm weather and avoiding run off.
APPLICATOR ALERTS (AA):
Since 2012, when it was determined that a number of tree species in the urban landscape of Los Angeles were declining due to the *Fusarium* infection spread by the Polyphagous Shot Hole Borer (PSHB), what has been the most significant impact for applicators?

Rick Harrison (RH): Determining the proper control methods to effectively and safely combat PSHB. It is a challenge to spray for PSHB, especially in areas that are heavily traveled by the public or in sensitive areas such as homes, schools, and riparian areas.

AA: In 2012, it came to light that the PSHB had originally been collected in California in 2003, but was misidentified as tea shot hole borer. What identification and detection methods are important to keep in mind when evaluating damage due to this PSHB species?

RH: Work with a qualified Pest Control Adviser and local Cooperative Extension Farm Advisors if there are any signs of boring activity or limb dieback of any kind within a tree. Be diligent; PSHB are very small and difficult to identify properly. Early detection is key.

AA: What efforts or involvement within the industry will be key to continuing the fight against the threat posed by PSHB?

RH: Prevent the movement of PSHB. Continue to educate the public and industry on the severity of PSHB and how easily it can be moved around via firewood, mulch, plant stock, etc.

AA: In your opinion, what industry collaborations have proved to be the most beneficial since the concern of this invasive species arose in 2012?

RH: The California Avocado Commission and CAPCA have both been working very hard to educate PCAs, industry personnel, and the public on how to identify and control PSHB. However, this pest is not exclusive to avocados and avocado growers. It is everyone’s responsibility to collaborate and communicate on this issue.

Photo of possible PSHB found in an avocado branch in Ventura County (beetle recently sent to UCR for identification). Inset shows how small the insect is compared to a house key, demonstrating how hard PSHB is to detect and identify. Photos by Rick Harrison
THE SOLUTION FOR POLYPHAGOUS SHOT HOLE BORER

ARBORJET OFFERS THE ONLY PCA-APPROVED RECOMMENDATION FOR POLYPHAGOUS SHOT HOLE BORER

©2016 Arborjet, Inc. Important: Always read and follow label instructions. Some crop protection products may not be registered for sale or use in all states or counties. Please check with your state or local extension service to ensure registration status. TREE-age® Insecticide is a Restricted Use Pesticide and must only be sold to and used by a state certified applicator or by persons under their direct supervision. TREE-age® is a registered trademark of Arborjet, Inc. In addition to the pests noted on the TREE-age federally registered label, Arborjet supports a FIFRA Section 2(ee) recommendation for TREE-age insecticide to control additional bud and leaf and shoot, stem, trunk and branch pests. Please see the section 2(ee) recommendation to confirm that the recommendation is applicable in your state. In addition to the pests noted on the Propizol federally registered label, Arborjet supports a FIFRA Section 2(ee) recommendation for Propizol fungicide to control additional diseases. Please see the Section 2(ee) recommendation to confirm that the recommendation is applicable in your state.

Dawn Fluharty, Northwestern Regional Technical Manager
650-996-8291 • dfluharty@arborjet.com • PCA #126831
LICENSE RENEWAL Reminder

SUBMIT APPLICATIONS BEFORE NOVEMBER

Mail your application before November so that your license or certificate can be issued before it expires. If you submit before October, you will be renewed by early December and you can register with the County before the New Year.

A-L LICENSEES
DPR will mail renewal packets in August to license and certificate holders with surnames and business names starting with letters A-L.

AVOID PROCESSING DELAYS
Submitting earlier allows DPR staff additional time to deal with issues or problems that could delay processing your license.

RENEW YOUR QUALIFIED APPLICATOR FIRST
For pest control businesses, the qualified applicator must be renewed before the business license can be renewed.

FOR MORE INFORMATION:
Department of Pesticide Regulation Licensing and Certification Program
Phone: (916) 445-4038
Email: LicenseMail@cdpr.ca.gov
Save The Date: OCTOBER 13, 2016
San Diego CAPCA & UC Riverside ENTOMOLOGY CONFERENCE
8:00 a.m. – 5:00 p.m.
South Coast Winery Resort & Spa
34843 Rancho California Rd., Temecula, CA 92591

Approved for: 7.5 DPR CE hours
(7.5 Other) & 7.5 CCA CE hours (6.0 IPM, 1.5 Crop Management)

Agenda topics include: Overview of Plant Diseases Spread by the Polyphagous Shot Hole Borer, Bagrada Bug Updates, Asian Citrus Psyllid Biocontrol Update, Argentine Ant Control in Citrus orchards, and more.

Visit https://capcaed.com/ for full agenda and registration information.
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- Fusarium Dieback Trunk Infection Research
- Section 18 Insecticide
- Boots on the Ground Q&A
- SFRA Updates

Photo: John Kabashima, UCCE