POLYPHAGOUS SHOT HOLE BORER (PSHB)

MARCH 24, 2015

California Pest Rating Analysis
Euwallacea sp. nr. *fornicatus*: Polyphagous Shot Hole Borer (PSHB)
Coleoptera: Curculionidae
Current Pest Rating: Q
Proposed Pest Rating: B
FINAL: Pest Rating: B

Initiating Event: In 2003 ambrosia beetles collected at the Whittier Narrows nature center in Los Angeles County were identified as *Euwallacea fornicatus*, tea shot hole borer, a new state record. In 2012 these beetles were found associated with a disease on avocado trees in Los Angeles County. Molecular analysis by UC Riverside revealed that the beetles are a distinct species from tea shot hole borer[1]. They have been designated *Euwallacea* sp. nr. *fornicatus*, polyphagous shot hole borer (PSHB), pending species description. PSHB presently has a temporary rating of "Q". A pest rating proposal is needed to determine future direction on this pest.

History & Status: **Background:** PSHB is an ambrosia beetle that feeds on a wide variety of trees and other large plants. Mated adult females fly in search of a host tree. They bore into the trunk or branches and inoculate the wood with several species of fungi, including *Fusarium euwallaceae*[2]. Eggs are deposited in these fungal-lined galleries and larvae consume the fungi. The larvae pupate inside the galleries. The sex ratio is heavily female biased. The few males that emerge mate with siblings in their gallery. Males may crawl to other galleries on the same plant but do not fly. Females are strong fliers and may fly in search of a new host. The females are known to feed on more than 200 species of plants, but only 30-40 of these plants have been confirmed as good reproductive hosts suitable for larval development. The fungal disease vectored by the adult female beetles may eventually kill the host tree. PSHB may disperse long distances when wood or nursery stock is moved.

Worldwide Distribution: Molecular evidence indicates that PSHB is native to Vietnam and other parts of southeast Asia[1]. From there it has spread to Israel, South Africa, and California.

Official Control: PSHB is not known to be under official control in any states or nations. However, *Euwallacea fornicatus* is listed as a quarantine pest by Colombia, Honduras, Japan, South Korea, and Mexico[3]. All species of Euwallacea are considered quarantine pests by Japan and Peru[3]. These regulations are likely to also apply to PSHB.

California Distribution: **PSHB has been found in the environment of Los Angeles, Orange, San Bernardino, and San Diego counties.** Molecular analysis indicates that the population in San Diego County is a separate introduction of the species. A single beetle was trapped in Santa Cruz County but was not suitable for molecular analysis to determine if it was polyphagous shot hole borer or tea shot hole borer. Tea shot hole borer is present in Hawaii and occasionally intercepted.

California Interceptions: *Fusarium euwallaceae* was found in one California nursery, indicating that PSHB may have been present. Infected plants were destroyed. PSHB has never been intercepted at California's borders. Unidentified beetles (*Euwallacea* sp. possibly *fornicatus*) have been intercepted seven times on bamboo, cut flowers, ginger, macadamia, and *Draceana compacta* from Hawaii. PSHB is not known to occur in Hawaii so these interceptions are likely tea shot hole borer.

The risk *Euwallacea* sp. nr. *fornicatus* (PSHB) would pose to California is evaluated below.

Consequences of Introduction: 1) **Climate/Host Interaction:** PSHB has an extremely wide host range including many street trees and native species. Protected from the environment while inside trees, the beetle can be expected to establish wherever host trees are grown. It receives a **High (3)** in this category.

Evaluate if the pest would have suitable hosts and climate to establish in California. Score:

– **Low (1)** Not likely to establish in California; or likely to establish in very limited areas.
– **Medium (2)** may be able to establish in a larger but limited part of California.
– **High (3)** likely to establish a widespread distribution in California.

2) **Known Pest Host Range**: PSHB is highly polyphagous, feeding on over 200 species of trees. The 30-40 known reproductive hosts account for approximately 25% of street trees in southern California. New reproductive hosts are regularly discovered and the host range of this species can be expected to grow. PSHB receives a **High (3)** in this category.

Evaluate the host range of the pest. Score:

– **Low (1)** has a very limited host range.
– **Medium (2)** has a moderate host range
– **High (3)** has a wide host range.

3) **Pest Dispersal Potential** PSHB is a strong flyer and in Israel has spread naturally 10-20km/year Populations of the beetles may also spread long distances when infested wood or nursery stock is moved. The beetles also have a high reproductive rate. PSHB receives a **High (3)** in this category.

Evaluate the natural and artificial dispersal potential of the pest. Score

– **Low (1)** does not have high reproductive or dispersal potential.
– **Medium (2)** has either high reproductive or dispersal potential
– **High (3)** has both high reproduction and dispersal potential.

4) **Economic Impact**: PSHB and its associated fungal pathogens can be expected to lower the yield of avocado groves and commercial forests by triggering dieback, large scale pruning of dead branches, and removal of dead trees. The damage caused by this pest is likely to increase crop production costs by triggering new pest management programs. *Euwallacea fornicatus* and *Euwallacea* sp. are listed as quarantine pests by several of California's trading partners The presence of this pest on consignments may disrupt trade. PSHB also vectors several fungal pathogens that may eventually lead to the death of host plants PSHB receives a **High (3)** in this category.

Evaluate the economic impact of the pest to California using the criteria below Score:

A. The pest could lower crop yield.
B. The pest could lower crop value (includes increasing crop production costs).
C. The pest could trigger the loss of markets (includes quarantines).
D. The pest could negatively change normal cultural practices.
E. The pest can vector, or is vectored, by another pestiferous organism.
F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

– **Low (1)** causes 0 or 1 of these impacts.
– **Medium (2)** causes 2 of these impacts.
– **High (3)** causes 3 or more of these impacts

5) Environmental Impact: PSHB vectors fungal pathogens that may lead to the death of a wide variety of slow-growing trees that are the foundation of forest ecosystems and an integral component of the urban environment. Damage from this pest is expected to have significant environmental impacts including disrupting natural communities and changing ecosystem processes. PSHB is likely to trigger additional official and private treatment programs. It is also likely to significantly impact cultural practices and ornamental plantings. PSHB receives a **High (3)** in this category.

Evaluate the environmental impact of the pest on California using the criteria below.

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Score the pest for Environmental Impact. Score:

– **Low (1)** causes none of the above to occur.
– **Medium (2)** causes one of the above to occur.
– **High (3)** causes two or more of the above to occur

Consequences of Introduction to California for *Euwallacea* sp. nr. *fornicatus* (PSHB): High (15)

Add up the total score and include it here.

– **Low** = 5-8 points
– **Medium** = 9-12 points
– **High** = 13-15 points

6) Post Entry Distribution and Survey Information: PSHB is known to be established in Los Angeles, Orange, San Bernardino, and San Diego counties. It receives a **Medium (-2)** in this category.

Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication, or have been delimited with no further detections should not be included.

– **Not established (0)** Pest never detected in California, or known only from incursions.
– **Low (-1)** Pest has a localized distribution in California, or is established in one suitable climate/host area (region).
– **Medium (-2)** Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.

– **High (-3)** Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

Final Score: The final score is the consequences of introduction score minus the post entry distribution and survey information score: **High (13)**

Uncertainty: A single specimen identified as *Euwallacea fornicatus* was trapped in Santa Cruz County in 2013. This could be PSHB, or it could be tea shot hole borer. Low density populations of PSHB are difficult to detect; it could be present in other parts of the state.

Conclusion and Rating Justification: PSHB is expected to have significant economic and environmental impacts as it expands its range in California. However, an "A"-rating is not justified because the pest has been present in the state since 2003 and is not under official control.

A "B"-rating is justified.

PEST RATING SYSTEM; DEFINITIONS

"A" An organism of known economic importance subject to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine regulation, containment, rejection, or other holding action.

"Q" An organism or disorder requiring a temporary "A" action pending determination of a permanent rating. The organism is suspected to be of economic importance but its status is uncertain because of incomplete identification or inadequate information.

In the case of an established infestation, at the discretion of the Director, the Department may conduct surveys and may convene the Division Pest Study Team to determine a permanent rating.

"B" An organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion of the individual county agricultural commissioner.

OR An organism of known economic importance subject to state endorsed holding action and eradication only when found in a nursery.

"C" An organism subject to no state enforced action outside of nurseries except to retard spread. At the discretion of the county agricultural commissioner.

OR An organism subject to no state enforced action except to provide for pest cleanliness in nurseries.

"D" No Action. (Parasites, predators and organisms or little or no economic importance.)