

## SUBJECT: POLYPHAGOUS SHOT-HOLE BORER (PSHB) INFORMATION BROCHURE

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### 1. BACKGROUND:

City of Johannesburg has a new, unwelcome resident: a tiny beetle that could lay waste to several tree species found planted widely in the City. This is particularly concerning as considered one of the world's man-made urban forest, with more that 10 million trees. The polyphagous shot-hole borer (PSHB) or *Euwallacea formicatus*, seems to be a newcomer to South Africa. It was discovered in the country for the first time in 2017 by Dr. Trudy Paap, postdoctoral fellow at the biotechnology institute at the University of Pretoria. During a survey for diseases in the KwaZulu-National Botanical Gardens in Pietermaritzburg, Paap found a lane of infested plane trees (*Platanus x. acerifolia*).

The Polyphagus Shot Hole Borer (PSHB), *Euwallacea* sp. (Figure A), is an invasive beetle that carries a number of fungal species with it when it infests living trees. One of these is *Fusarium euwallacea*. The adult female (A-B) tunnels galleries into a wide variety of host or susceptible trees, where it lays its eggs and grows the fungi. The fungi causes a disease called Fusarium Dieback (FD), which interrupts the transport of water and nutrients in various tree species. Once the beetle/fungal complex has killed the host tree, pregnant females fly out in search of new host.



Figure A. Polyphagus shot hole borer. A-B female and C-D male. (Photo by Jiri Hulcr, University of Florida and You Li, University of Florida)

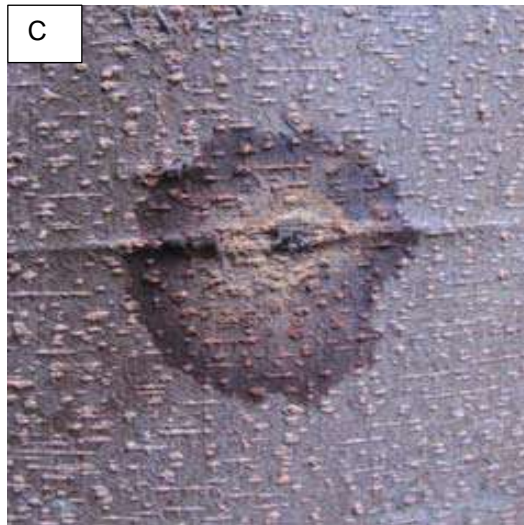
## 2. HOST TREES

The following are the host trees are the Box elder, Avacado, English oak, Japanese maple, Liquidamber and London planes. It is now believed that it is also attacking some of our native or indigenous trees such as Forest bushwillow, Coastal tree and Cape willow. For the full list please refer to Annexure 1.

## 3. SYMPTOMS

### EXTERNAL SYMPTOMS

Attack symptoms vary among host tree species. Staining (Figure B-C), sugary exudate (Figure D), gumming (Figure E-F), and/or frass (Figure G) may be noticeable before the tiny beetles (females are typically 1.8 to 2.5mm long). Beneath or near these symptoms, you may also see the beetle's entry/exit holes (Figure H), which are 0.85mm in diameter. The abdomen of the beetle can sometimes be seen sticking out of the hole. "Gun-shot" wounds (Figure I)





## INTERNAL SYMPTOMS

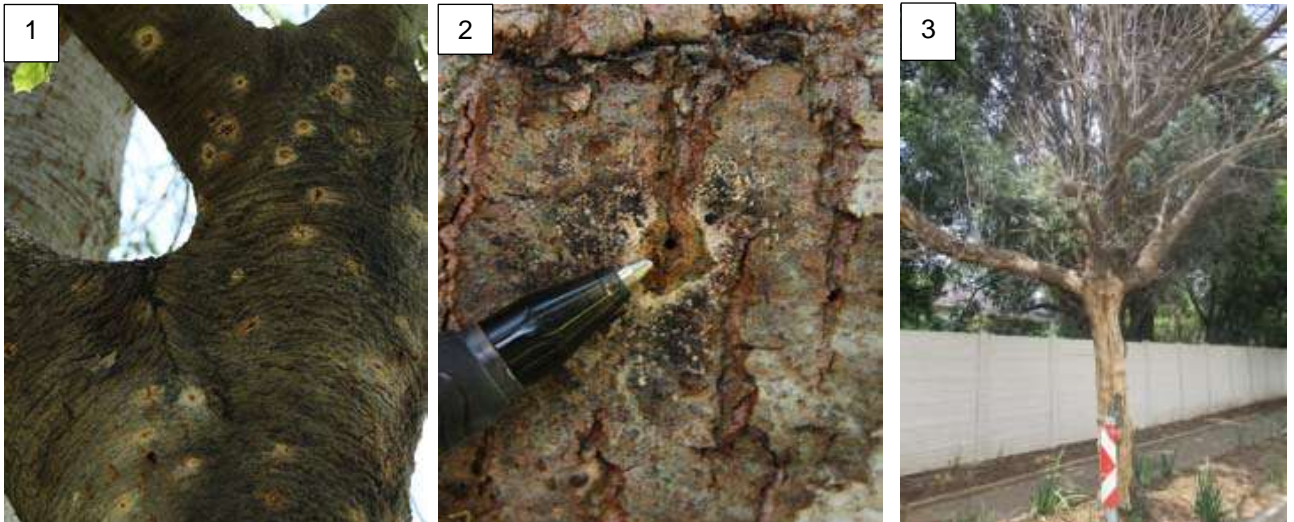
*Fusarium euwallaceae* causes brown to black discoloration in infected wood. Scraping away bark over the entry/exit hole reveals dark staining around the gallery (Figure J), and cross sections of cut branches (Figure K) show the extent of infection. Advanced infections eventually lead to branch dieback (Figure L).



## HOW TO REPORT A SUSPECT TREE

Please report suspected tree infestations at Johannesburg City Parks and Zoo (JCPZ) to [pshb@jcpz.com](mailto:pshb@jcpz.com) or twitter account. Report the following information:

- Your contact information (name, ward, suburb, street name, phone number, e-mail)
- Suspected tree species
- Description of suspected tree's location ( and / or GPS coordinates)
- Description of suspected tree's symptoms
- Photos of suspected tree and close-up photos of symptoms (see below examples)



Take photos of suspected trees from several distances. Include photos of:

1. The trunk or symptomatic branches
2. The symptoms (close-up) or entry/exit hole, if visible, with a ballpoint pen for scale (remove gumming or exudate if necessary)
3. If dieback is observed, include a picture of the entire tree.

Based on the symptom description and photos, JCPZ will decide whether a field assessment is warranted.

### ACKNOWLEDGEMENTS:

1. Paap T, de beer ZW, Migliorini D, Nel W, Wingfield MJ. (2018). The polyphagous shot hole borer (PSHB) and its fungal symbiont *Fusarium euwallaceae*: a new invasion in SA.
2. University of California: Agricultural and Natural Resources (Printed 07/2014):  
<http://escalenlab.ucr.edu>
3. University of Pretoria: Food and Agricultural Biotechnology Institute:  
<http://fabinet.up/index.php/pshb>



Annexure 1: Current host trees on which infestations in South Africa have been confirmed

**Reproductive host trees:** Host trees in which both the beetles and the fungus establish, and where the beetle successfully reproduces. In most cases the reproductive hosts will eventually be killed by the fungus

**Exotic species:**

**Indigenous species (Native SA species)**

<i>Acacia melanoxylon</i>	Blackwood		<i>Combretum krausii</i>	Forest bushwillow
<i>Acacia mearnsii</i>	Black wattle		<i>Erythrina caffra</i>	Coast coral tree
<i>Acer buergerianum</i>	Trident (Chinese) maple		<i>Podalyria calyptata</i>	Water blossom pea
<i>Acer negundo</i>	Boxelder		<i>Psoralea pinata</i>	Fountain bush
<i>Acer palmatum</i>	Japanese maple		<i>Salix mucronata</i>	Cape willow
<i>Brachychiton discolor</i>	Pink flame tree			
<i>Gleditsia triacanthos</i>	Honey locust			
<i>Liquidambar styraciflua</i>	American sweetgum			
<i>Magnolia grandiflora</i>	Southern magnolia			
<i>Pearsea americana</i>	Avocado			
<i>Platanus x acerifolia</i>	London Plane			
<i>Quercus palustris</i>	Pin oak			
<i>Quercus robur</i>	English Oak			
<i>Ricinus communis</i>	Castor bean			
<i>Salix alba</i>	White willow			



**Non-reproductive host trees:** Host trees that are attacked by the beetle and where the fungus establishes, but where the beetle does not successfully breed. The fungus might, or might not cause disease and kill the trees.

**Exotic species:**

**Indigenous species (Native SA species)**

Latin name	Common name		Latin name	Common name
<i>Bauhinia purpurea</i>	Butterfly orchid tree		<i>Bauhinia galpinii*</i>	Pride of De Kaap
<i>Betula pendula</i>	Silver birch		<i>Buddleja saligna*</i>	False olive
<i>Camellia japonica</i>	Common camellia		<i>Calodendrum capense*</i>	Cape chestnut
<i>Carya illinoensis</i>	Pecan nut		<i>Calpurnia aurea*</i>	Geelkeurboom
<i>Ceiba pentandra</i>	Kapok		<i>Combretum erythrophyllum*</i>	River bushwillow
<i>Cinnamomum camphora</i>	Camphor		<i>Cordia caffra*</i>	Septee tree
<i>Citrus limon</i>	Lemon		<i>Cussonia spicata*</i>	Cabbage tree/ Kiepersol
<i>Citrus sinensis</i>	Orange		<i>Diospyros dichrophylla*</i>	Star apple
<i>Eriobotrya japonicum</i>	Loquat		<i>Diospyros lycidioides*</i>	Monkey plum
<i>Erythrina livingstoniana</i>	Aloe coral tree		<i>Ekebergia capensis*</i>	Cape ash
<i>Eucalyptus camaldulensis</i>	River red gum		<i>Erythrina lysistemon*</i>	Common coral tree
<i>Ficus carica</i>	Common fig		<i>Ficus natalensis*</i>	Natal fig
<i>Fraxinus excelsior</i>	European ash		<i>Grewia occidentalis*</i>	Cross berry
<i>Jacaranda mimosifolia</i>	Jacaranda		<i>Gymnosporia buxifolia*</i>	Spike thorn
<i>Melia azedarach</i>	Syringa		<i>Halleria lucida*</i>	Tree fuschia
<i>Morus sp.</i>	Mulberry		<i>Harpephyllum caffrum*</i>	Wild plum
<i>Platanus occidentalis</i>	American plane		<i>Melianthus major*</i>	Honey flower/ Kruidjie-roer-my-nie
<i>Platanus racemosa</i>	Californian plane		<i>Nuxia floribunda*</i>	Forest elder
<i>Plumeria rubra</i>	Frangipani		<i>Olea europea</i> subsp. <i>africana*</i>	Wild olive
<i>Populus nigra</i>	Lombardy poplar		<i>Podocarpus falcatus*</i>	Outeniqua yellowwood
<i>Prunus nigra</i>	Black plum		<i>Podocarpus henkelii*</i>	Henkel's yellowwood
<i>Prunus persica</i>	Peach		<i>Protea mundii*</i>	Forest sugar bush
<i>Psidium guajava</i>	Guava		<i>Rapanea melanophloeos*</i>	Cape beech
<i>Schinus molle</i>	Pepper tree		<i>Schotia brachypetala*</i>	Weeping boerbean/ Huilboerboon
<i>Taxodium distichum</i>	Swamp cypress		<i>Senegalia galpinii*</i>	Monkey-thorn
<i>Ulmus minor = procera</i>	English elm		<i>Vachellia karoo*</i>	Sweet thorn



<i>Ulmus parvifolia</i>	Chinese elm		<i>Vachellia sieberiana</i> var. <i>woodii</i> *	Paper bark thorn
<i>Viburnum sinensis</i>	Viburnum		<i>Virgilia divaricata</i> *	Keurboom
<i>Vitis vinifera</i>	Grapevine			