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1. Dying wild plum tree: wilting, drying and shedding leaves before complete branch dieback.

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2. English oak with branches dying back.

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3. Dieback of branches on paper bark thorn tree.

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4. Chinese maple killed by PSHB infestation.



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5, 6. Shotgun-like scars develop around PSHB entrance holes on London plane trees.

7. Lesions developing around entrance holes on pecan nut trees.



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8. Resin oozing from new infestations on the stems of paper bark thorn trees.

9. Resin dripping down from infested areas on paper bark thorn trees.



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Photo: T. Paap



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10. Entrance holes in castor bean.

11. Entrance holes with frass (wood powder).

12. Entrance holes with frass ('noodles') extruding on wild plum trees.



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13. Fresh entrance hole with 'wet' spot on pecan nut trees, and (14) after some months.

15. Gelatinous drops oozing from entrance holes on kapok trees.

16. Gluey resin drops from entrance holes on paper bark thorn trees.



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17. Typical infestation in non-reproductive host tree: beetle bores into the bark, but does not establish a breeding gallery. The beetle either dies or leaves the tree.



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18. In some non-reproductive host trees the beetle can inoculate the fungus. The fungus may or may not cause disease (streaking seen here). Trees are generally not expected to die.



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In reproductive host trees where the beetles successfully establish galleries, breed and multiply, fungal stain develops in the sapwood around the galleries as can be seen here in (19) wild plum, (20) kapok, (21) Chinese maple, and (22) English oak trees.



Photo: T. Paap

23, 24. Terminating gallery and fungal streaking in sapwood a **non-reproductive host**, where the beetle cannot reproduce.

Internal symptoms in **reproductive host trees** such as castor bean (25, 26) and Chinese maple (27, 28). Here the beetles establish a network of galleries, surrounded by fungal staining, in which larvae and young adults are often visible.



Photo: T. Paap



Above: Beetle entrance hole on older part of the tree with thick bark (left), resin drop at another entrance hole on older bark (middle), and point of entrance and fungus inoculated under bark (right).



Above: Beetle entrance hole with resin droplet on branch with thinner bark (left). Other three photos: Point of entrance and fungus inoculated under bark - as you chop deeper (from left to right), the streaking of the fungus through the sapwood becomes more visible (arrows).