

Tackling the PSHB beetle

Sue Matthews

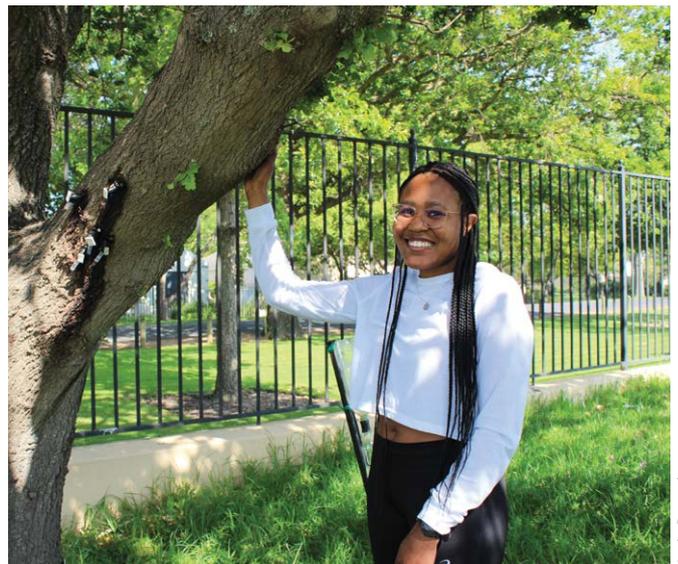
Student and historic estate managers join forces to save the trees

It's been more than three years since the polyphagous shot hole borer (PSHB) beetle was found to have infested the 100-year-old London plane trees in the KwaZulu-Natal National Botanical Garden in Pietermaritzburg. This was the first time the tiny beetle – native to South East Asia – was detected in South Africa, but it has since been recorded in all provinces except Limpopo.

In the Western Cape, the first report of the invasive alien's presence was in Somerset West in April 2019. Managers of the historic Vergelegen wine estate on the town's outskirts put measures in place to protect the farm's important tree collection, which includes five camphor trees planted by Cape Governor Willem Adriaan van der Stel soon after he established Vergelegen in 1700, as well as an English oak believed to be the oldest specimen in South Africa. The measures ranged from banning the transport of firewood onto the estate, to installing monitoring traps and repellent on the farm border.

Nevertheless, in February 2020 the PSHB beetle was discovered to have breached these defences and taken up residence in some of Vergelegen's trees. The estate, owned by Anglo American Farms since 1987, has been the site of numerous research projects conducted by staff and students from various universities, so the natural next step was to facilitate a study on this unwelcome intruder.

Heather Nependa from the Department of Conservation Ecology and Entomology at Stellenbosch University is undertaking research on the pest for her PhD, and has installed two types of traps on the estate to collect the beetle. One type uses chemical lures inside plastic bottles on steel stakes, intended to divert the beetles away from the trees, while the other is a 3D-printed trap secured over holes made by the beetles on trees. All traps are inspected every two weeks and their contents are delivered to the university for identification.



Judy Bryant



Heather Nependa

Stellenbosch University doctoral student Heather Nependa with 3D-printed traps over holes made by the beetle on an English oak within the Vergelegen Estate.



Judy Bryant

Heather Nependa checks a bottle trap with Vergelegen’s risk and commercial manager, Leslie Naidoo. Fitted with a chemical lure, 50 of these traps have been staked out on the estate to divert PSHB beetles away from trees.

This monitoring programme is just one tool used by Nependa to meet the aims and objectives of her research, which are to:

- Learn more about the life history of the beetle, how it spreads, and the symptoms of damage on different tree species
- Improve understanding of the PSHB–fungus–tree relationship

- Test the effectiveness of lures and repellents
- Test potential pesticides (both insecticides and fungicides) and review their side effects and appropriateness
- Collect and analyse data in the field for a PSHB management plan geared to South African conditions.

Assisted by two honours students, Nependa has already produced an inventory of over a thousand Vergelegen trees. The data, including measurements of the diameter of each tree and its reproductive state, has been submitted to the USA-based website www.itreetools.org, which has free software for assessing and managing forests and community trees.

Next, temperature loggers will be placed at each of the monitoring sites to determine how climatic conditions affect beetle dispersal. This data will also be important for lab experiments on beetle and fungus biology and physiology. The fungus will be grown in the lab, and experiments conducted with nutrients and plant volatiles (the metabolites that plants release into the air) to determine the criteria required for successful fungus establishment. All of this information will be useful in modelling the PSHB’s impact and potential distribution within the Somerset West area.

Issued by Judy Bryant of Meropa for Vergelegen Estate.

The polyphagous shot hole borer beetle, *Euwallacea fornicatus*, is known to have attacked more than 100 different tree species in South Africa, introducing its symbiotic fungi that cause weakening, branch die-back and ultimately the death of many trees. Worst affected are those species in which the beetle can breed, and to date more than a third of the tree species affected countrywide have been identified as such ‘reproductive host trees’.

The adult female beetle, which is only about 2 mm long, bores into the tree, creating a tunnel through the wood. During this process, fungal spores carried in specialised structures near her mouthparts are deposited in the tunnels. The fungus subsequently grows on the tunnel walls and invades the tree’s water-conducting tissue, the xylem. The female beetle lays her eggs in the tunnel, where the larvae feed on the fungi after hatching. They grow and develop, then pupate together in the tunnel. Once they emerge from the pupal stage as adults, the male and female beetles mate. The males, which cannot fly, remain in the tunnel or sometimes crawl out onto the tree bark. The females leave the tree through the entrance tunnel and fly off in search of a suitable host tree to lay their eggs.

The PSHB was already considered a serious pest in Israel and California by the time it was detected in South Africa in 2017. In an effort to curtail its spread, Minister of Forestry, Fisheries and the Environment, Barbara Creecy, published a call for comment in September 2020 on a proposed PSHB emergency intervention under the National Environmental Management: Biodiversity Act. The measures outlined would require owners or occupiers of land in certain areas to report the beetle’s presence on tree species listed in the notice. In addition, people would be prohibited from bringing those tree species into protected areas, even as firewood. The sale of any PSHB-infested wood or other material would also be outlawed.

The Minister of Agriculture, Land Reform and Rural Development, Thoko Didiza, had likewise invited comment on draft control measures under the Agricultural Pests Act in July 2020. These would make it compulsory for people to report the beetle’s occurrence – whether confirmed or suspected – on any land, especially where it has been recorded for the first time in a previously pest-free area.

- For more information, refer to the recent paper in *Quest’s* sister publication, the *South African Journal of Science*, by the researcher credited with discovering PSHB in South Africa, Dr Trudy Paap, and her co-authors. Paap T, Wingfield MJ, De Beer ZW, Roets F 2020. Lessons from a major pest invasion: The polyphagous shot hole borer in South Africa. *S Afr J Sci* 116 (11/12). <https://doi.org/10.17159/sajs.2020/8757>



The polyphagous shot hole borer (PSHB) beetle

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2021

Quest Volume 17 Number 1 2021

Academy of Science of South Africa (ASSAf)

Academy of Science of South Africa (ASSAf)

Cite: Academy of Science of South Africa (ASSAf), (2021). Quest: Science for South Africa, 17(1). [Online] Available at: <http://hdl.handle.net/20.500.11911/180>

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