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Three species of termite in a *Melaleuca cajuputi* tree

Subjects: Termite, *Macrotermes gilvus* (Insecta: Isoptera: Termitidae).
Termite, unidentified species, possibly *Termes rostratus* (Insecta: Isoptera: Termitidae).
Termite, *Coptotermes gestroi* (Insecta: Isoptera: Rhinotermitidae).
Gelam tree, *Melaluca cajuputi* (Magnoliophyta: Myrtales: Myrtaceae).

Subjects identified by: Contributor.

Location, date and time: Singapore Island, Singapore Botanic Gardens, Tanglin Core, Lawn H, 19 December 2012.

Habitat: In a fallen 90-year old *Melaleuca cajuputi* tree grown in open parkland. Termites were found in soil at the base of the tree, in decayed wood under the bark, and in the heartwood of the tree.

Observer: Contributor.

Observation: Three species of termites were found in a 90 year old *Melaleuca cajuputi* which fell over during a storm (Fig. a). The gelam is known for its medicinal properties which is a form of natural protection for the tree. The tree had a series of old branch pruning wounds and the major stem of the tree had been removed in the past for an unknown reason. The remaining tree was less than half of its original size. As a result the tree had a significant proportion of dead wood which was in the process of decay by a fungus (an unidentified species of *Ganoderma*), which led to the failure of this tree (refer to Wijedasa, 2014).

A small colony of *Coptotermes gestroi* was found 3 m above the ground (Fig. c.i & c.ii). This species is known to feed on the heart wood of trees. No trace of this colony was found at ground level, so the termites most likely entered from pruning wounds higher up in the tree. The entrance of *Coptotermes* species into trees in this manner has apparently not been documented before. The colony was very small, suggesting nutrient limitation due to the high concentration of medicinal chemicals in the tree. This colony was located far away from the root system, which was the point of failure, and thus did not contribute to the failure of the tree.

An unidentified termite species (Fig. d.i & d.ii) was found at about 0.5 m above the ground, below the bark. An examination of the insects' guts and the substrate they were on indicates that they feed on decaying organic matter. The worker termites resemble *Termes rostatus*, and only these were collected. However, in the absence of soldier termites, the identification could not be confirmed.

A small gallery nest of the fungus-growing termite, *Macrotermes gilvus* (Fig. e.i & e.ii), was found at the base of the tree. This species is known to feed on dead wood and fallen leaves. These termites may have been feeding on the wood decayed by the fungus. There was no sign of this species feeding on the live wood.

Remarks: Over 50% of known termites feed directly on soil (Braumann, 2000), while a smaller proportion feed on dead wood. An even smaller minority among the wood feeders consume heartwood. Termites digest food by a combination of enzymes produced by the insect as well as symbiotic microorganisms in different segments of termites (Bignell, 2000; Brune & Ohkuma, 2011). The termite digestive mechanism for each particular food type requires unique enzymes and microorganisms that have co-evolved with each species, which in turn does not allow termites to easily switch between food sources.

The presence of termites in failed trees has led to the belief that the termites are the cause of tree failure. This belief stems from the lack of understanding of termite diversity, biology, documentation of termites in trees and the causes of the tree failures in which termites are found. A closer inspection may show that most of the termites are feeding on dead wood, decaying organic matter, bark and lichens, and not the heart wood.They mostly appear after mechanical damage, or damage caused by fungal pathogens. None of the three species of termite documented here contributed directly to the failure of the tree.

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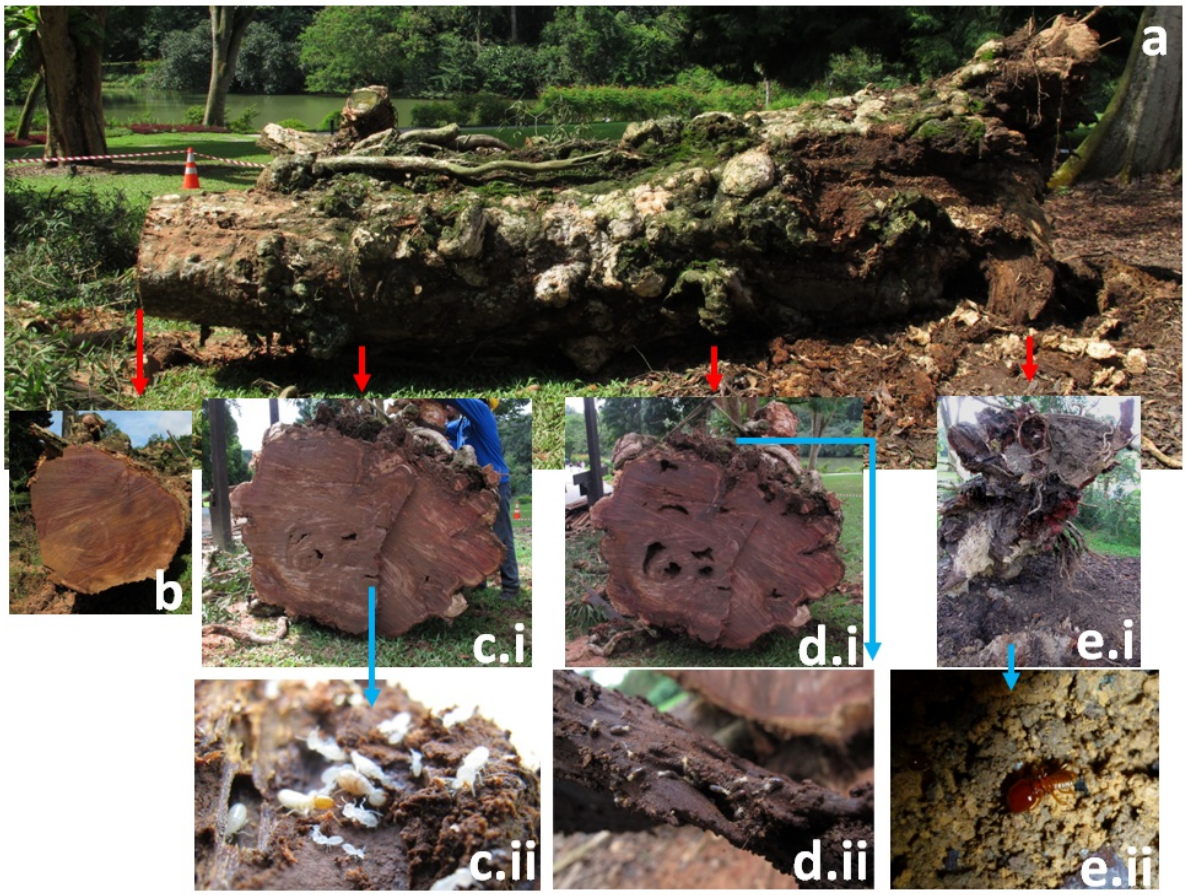

Fig. a. Trunk of fallen *Melaleuca cajuputi* tree. Fig. b. Cross section of trunk indicated by red arrows and locations of termites indicated by blue arrows. Fig. c. *Coptotermes gestroi* (c.ii) colony in centre part of trunk (c.i). Fig. d. Unidentified humus feeding termite (d.ii) below bark on trunk (d.i.). Fig. e. *Macrotermes gilvus* (e.ii.) colonly at base of tree on decayed roots (e.i.). Photographs by Lahiru S. Wijedasa

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