Giant Termite

Assessor—Michael Haverty

Scientific name of pest—*Mastotermes darwiniensis* Froggatt (Isoptera: Mastotermitidae)

Scientific names of hosts—*M. darwiniensis* will attack or infest just about any hardwood or softwood species, including live fruit trees.

Distribution—*Mastotermes darwiniensis* is a tropical species that is widely distributed in the Northern Territory, north Queensland, and Western Australia. The southern limit of its distribution is approximately the Tropic of Capricorn, both in coastal and inland localities (Gay and Calaby 1970, French 1986, Elliott and others 1998).

Summary of natural history and biology of the pest—All species of termites are social insects and live in colonies. Some species of the higher termites, such as *Coptotermes* or *Nasutitermes,* are found in discrete nest structures and construct mounds. *Mastotermes* lives in diffuse nests, much of them below ground. If a colony is somehow broken into one or more subunits, even without reproductives, these subunits are capable of continuing all of the functions of the parent colony. Generally there are five types of individuals in a colony: immatures or larvae, workers, soldiers, reproductives, and nymphs (Miller 1969). Nymphs will eventually metamorphose into adults with wings (alates) that serve to disperse and establish new colonies a significant distance from the natal colony. Colonies contain a large proportion of wingless workers whose role is the care of the immatures and reproductives, whereas the soldiers defend the colony from predators. Workers are the individuals that damage the wood. Flights of the future reproductives (alates) generally occur during summer. In *Mastotermes* workers and nymphs are capable of becoming replacement (or supplementary) reproductives and assuming the reproductive role if their subunit is permanently separated from the main colony. It is primarily this capacity for establishing new colonies (by budding) from subcolonies that makes the giant termite a threat for introduction into non-endemic sites.

Mastotermes is one of the most destructive Australian termites, although its total economic impact on forests and timber is less than several others because of its limited distribution. It attacks wood in service as well as growing trees, shrubs, and vegetables (Peters and others 1996). *Mastotermes* is not a mound builder, and normally it nests in or under the boles of trees or in logs or stumps (Elliott and others 1998). Under natural conditions, colonies of *M. darwiniensis* attain population levels less than 100,000 but may have colonies of more than 1,000,000 (Gay and Calaby 1970). Knowledge of the foundation of new colonies is scant. Colonies are normally headed by replacement reproductives; primary queens have only been seen once. Neither the primary nor replacement reproductives are significantly physogastric. The rarity of primary reproductives and the prevalence of relatively small colonies containing replacement queens suggest that new colonies are likely formed by budding from the parent colony (Gay and Calaby 1970).

Edwards and Mill (1986) mention several species of termites as significant pests of wood in buildings, but seldom have they been exported and established in other countries. *Mastotermes* has become established in New Guinea and has been found attacking structural timber, posts, and numerous living trees and shrubs (Gay 1969).

Specific information relating to risk elements

A. Likelihood of introduction

1. Pest with host-commodity at origin potential: Logs—*High* (RC) (Applicable risk criteria, from Ch. 1: a, b, c, d, e, f, g, h)
   Chips—*Low* (MC) (Applicable risk criteria, from Ch. 1: c, d, f, g)

   Just about any of the commercial eucalypt species could supply harborage for colonies or subcolonies of the giant termite. The likelihood of association of these termites with freshly cut logs is greater in natural forests in which silvicultural practices include precommercial thinning and use of prescribed fire. *Mastotermes* has a limited distribution for eucalypts that are harvested for wood chips, either from native or plantation forests. However, the damage done by these termites is easily detected in logs and would result in redirecting logs to a local chip mill rather than being shipped overseas as whole logs. Even though many of the rating criteria apply, termite colonies or subcolonies would not likely survive the chipping process.

2. Entry potential:
   Logs—*High* (RC) (Applicable risk criteria, from Ch. 1: a, b, c)
   Chips—*Low* (MC) (Applicable risk criteria, from Ch. 1: d)

   Mastotermes darwiniensis has been introduced and is established in New Guinea. Viable colonies of *M. darwiniensis* would likely survive the 14-day journey to port cities in the United States, although they should be detectable within the log by the presence of an extensive gallery system. Recently cut logs would provide conditions suitable to *Mastotermes* during transit. The greatest danger exists if items are shipped from plantations in Australia with these species present and remain in storage at the import site, in a suitable habitat such as Hawaii or Puerto Rico, for extended periods of time. Wood chips are unlikely to harbor viable groups of termites, because the chips are handled roughly when moved from the home port to the ship and from the ship to the receiving port, then again when transported to the paper mill.

3. Colonization potential: *High* (RC) (Applicable risk criteria, from Ch. 1: a, b, c, d, e)

Mastotermes has become established in New Guinea and is not restricted by hosts. *M. darwiniensis* can infest numerous species of live trees. Even partial colonies can contain many individuals capable of differentiating into a reproductive caste. If a colony contains alates and they were to fly after arriving in the United States, incipient colonies could easily be established. Because these dampwood termites can infest numerous tree species and wood in service, the presence of an acceptable host is not the critical factor. Rather, a suitable environment with an adequate supply of wood and appropriate temperature and moisture conditions are the key factors. The initiation of a colony is a slow process, but wood in ground contact, moist wood in structures, and suitable host trees with scars or wounds at ports and storage facilities may provide an infestation site. The adults (alates) fly only about 100 m (328 ft) but are capable of moving up to 1 km (0.62 miles), depending on wind conditions and weather. Long-range [>10 km (>6.2 miles)] establishment of colonies from alates has a very low probability. Colonization potential for *Mastotermes* would be greatest under warm, moist conditions.

4. Spread potential: *High* (RC) (Applicable risk criteria, from Ch. 1: b, c, d, e, f, g)

Termites spread slowly [15 to 300 m (49 to 984 ft) per year], and less than 1% of the alates eventually establish a new colony. However, an important factor concerning *Mastotermes* is that infested wood or plants in containers with soil, moved by humans in commerce, spreads termites at a much faster rate than their natural spread. Also, once established at the receiving seaport or inland destinations, *Mastotermes* might not be detected because of their cryptic habits; colonies can be large before the first evidence of their activities is apparent. By this time multiple colonies will already be established adjacent to the invading colony, and additional wood or plants could become infested and distributed within the continental United States or its possessions.

B. Consequences of introduction

5. Economic damage potential: *High* (VC) (Applicable risk criteria, from Ch. 1: a, b, c, d, f)

The giant termite will attack untreated wood and live trees. *Mastotermes* would not fare well in extremely cold climates but could be a problem in moist, warm climates along the western, southern, and southeastern coasts of the continental United States, and subtropical and tropical locations of the United States and its protectorates and possessions. They could pose a significant hazard to the numerous eucalypt trees planted as ornamentals, for windbreaks, or for fiber. Furthermore, many of these same areas are known for fruit and nut trees. Control methods for termites are available but can be expensive and could be a risk to environmental quality through increased pesticide use.

6. Environmental damage potential: *Moderate* (MC) (Applicable risk criterion from Ch. 1: d)

These termites would not likely cause large outbreaks or kill an excessive number of trees. Trees at greatest risk would be orchard trees, street trees, or native trees with limited distribution, such as Torrey pine (*Pinus torreyana*).

7. Social and political considerations: *High* (RC) (Applicable risk criterion from Ch. 1: a, c)

Damage to wood in structures and to fruit or ornamental trees would cause significant concerns, adding to concerns about other exotic termite species.

C. Pest risk potential:
Logs—*High* (Likelihood of introduction = *High*; Consequences of introduction = *High*)
Chips—*Low* (Likelihood of introduction = *Low*; Consequences of introduction = *High*)

Termite colonies or subcolonies are not likely to survive the chipping process.

Selected bibliography

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Miller, E.M. 1969. Caste differentiation in the lower termites. In: Krishna, K.; Weesner, F.M., eds. Biology of termites, Vol. I. New York, NY: Academic Press: 283–310.

Peters, B.C.; King, J.; Wylie, F.R. 1996. Pests of timber in Queensland. Queensland, Australia: Queensland Forestry Research Institute, Department of Primary Industries. 175 p.

Reviewers' comments—"Entry potential. Is the statement 'Wood chips are not likely to harbor viable groups of termites' supported by references?" (Cameron)

Response to comments—The team is not aware of any literature that documents termites in shipments of chips. The statement above was made from empirical observations of the chipping of logs at mills in Australia, the transportation of the chips from the mill to the chip pile, and subsequent transportation to the ship (see trip report). The assumption was made that the chips would be similarly handled from the ship to the port and then to the vehicles that would take them to the paper plant. The statement in question has been modified to reflect these empirical observations.