

Subterranean termites in Queensland

Termites (Isoptera) are an ancient order of insects whose origins date back more than 100 million years to the Cretaceous period. Although commonly called 'white ants', the resemblance to ants is superficial and they are more closely related to cockroaches (Blattodea).

Australia has a diverse termite fauna. There are five families in the order: Mastotermitidae, Termopsidae, Kalotermitidae, Rhinotermitidae and Termitidae. These families include about 30 genera with 258 described, and at least 90 undescribed, species.

Termites are divided into three categories: dampwood, drywood and subterranean. Dampwood termites generally live in damp rotting logs or rot pockets in dead or living trees. Drywood termites obtain water from the wood in which they live and have no contact with the soil, or with any other source of moisture. Subterranean termites are generally ground dwelling or require contact with the soil or some constant source of moisture.

Termites play a prominent part in recycling plant nutrients by disintegrating and decomposing dead wood and plant debris. Their excavations alter the structure of trees and provide spaces that are necessary parts of many vertebrate habitats (including bats, birds, reptiles and arboreal mammals). Many species of termite feed on grass. Only a few are of economic importance to timber in the built environment (timber-in-service).

The termite colony

Termites are social insects, working and living together in groups (colonies). Each colony contains several types (castes) that differ in body shape and behaviour, and each caste is specialised to perform different tasks.



Figure 1—The subterranean termite *Coptotermes acinaciformis*. (www.padil.gov.au).

The three principal castes are: workers, soldiers and reproductives (the primary king and queen and sometimes supplementary reproductives).

The worker caste (Figure 2B) is the most common and is wingless, sterile and blind. The workers build the nest and galleries, tend the eggs and young, gather food, and feed other castes incapable of feeding themselves. Older workers may engage mostly in activities outside the nest. The primitive termite family Mastotermitidae lacks a worker caste. Instead, workers' tasks are performed by a 'worker-like caste' (pseudergates), which may develop into other castes.

The soldier caste is the most distinctive and easiest from which to identify the species. The soldiers are distinguished from other castes by their heavily armoured and pigmented heads. Like the workers, they are wingless, sterile and blind. Two types of soldiers occur: 'mandibulate', with prominent jaws, (Figure 3A), and 'nasute', with a pronounced snout (Figure 3B). Because their mandibles are so modified or specialised, soldiers must be fed by the workers. The primary function of the soldiers is to defend the colony against predators such as ants.

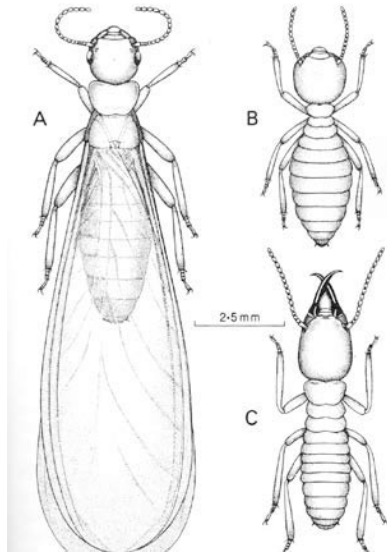


Figure 2 – Castes of *Coptotermes acinaciformis*. A: winged reproductive or alate B: worker C: soldier. (CSIRO Division of Entomology and Melbourne University Press)

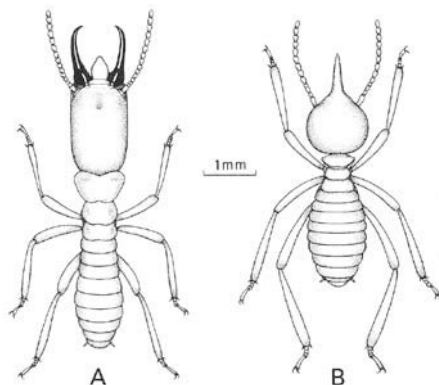


Figure 3: The soldier caste. A: a mandibulate soldier B: a nasute soldier. (CSIRO Division of Entomology and Melbourne University Press)

The alates (Figure 2A) are the potential kings and queens of new colonies, and have eyes, functional reproductive systems and wings. They usually swarm (leave the colony) in spring to early summer or late summer to early autumn, often through specially constructed exits. They normally swarm at dusk and may be attracted to lights at night. Alates do not fly strongly and, unless assisted by winds, their dispersal is limited.

After swarming, alates shed their wings and each mated pair seeks out a suitable place to establish a new colony. The king alters little in shape, but the queen's abdomen may become enormously distended with eggs. Some subterranean termite queens are capable of producing 2000 eggs per day. Mature termite colonies may number up to two million individuals and exist for as long as 50 years.

Nests

Termites build various types of nest. Some termites live completely underground, apparently without a central nest. Examples include some species of *Amitermes*. Others build a central nest in the soil, or in dead or living trees.

Many economically important termites build nests of this type, notably *Mastotermes darwiniensis* and species of *Coptotermes* and *Schedorhinotermes*. Still other species, for example in the genera *Microcerotermes* (Figure 4) and *Nasutitermes* (Figure 5), attach their nest to a tree but maintain a soil connection via galleries running down the surface of the trunk.

A termite mound is the most familiar form of termite nest. Mounds often have a very distinctive form, and their size and shape vary from hardened, flat areas to the tall, columnar structures of the spinifex termite *Nasutitermes triodiae* in North Queensland, which may be more than 7 m high.

Typically, each species builds a characteristic mound (Figure 6), although there may be geographical variation in the size and shape of the mound within species.

In the mounds of *Coptotermes* the outer wall is hard and built of soil and the inner region is generally composed of woody faecal material (carton) and soil.



Figure 4: Arboreal nest of *Microcerotermes* sp.



Figure 6: *Coptotermes acinaciformis* constructs a mound north of the Tropic of Capricorn.



Figure 5: Arboreal nest of *Nasutitermes* sp.



Figure 7: *Microcerotermes* sp. attacking painted timber decayed by the fungus *Pycnoporus coccineus*.

Feeding habits and behaviour

Cellulose found in plants is the basic food requirement of all termites, and they damage all types of plant material. Most termite species eat grass and other surface vegetation and have an important role in maintaining soil fertility.

They recycle nutrients, in particular nitrogen, which is essential for healthy plant growth. When termite mounds erode, the soil particles rich in nutrients such as calcium, magnesium and potassium wash into the soil and become available for plant growth.

Termite galleries improve soil structure, and assist water entry and storage in soil. This process reduces surface rainwater runoff and subsequent soil erosion. Other termite species infest timber and particularly timber that is in an early state of decay by wood rotting fungi (Figure 7).

Cellulose is digested by intestinal protozoa in many species of termites, or by bacteria in the family Termitidae. The plant tissues upon which termites feed contain very little protein and therefore little nitrogen. However, the protozoa and bacteria do contain nitrogen, and often termites dispose of excess, dead and diseased members of the colony by cannibalism, thereby conserving nitrogen.

Some termites are capable of fixing atmospheric nitrogen using gut bacteria.

Some species of timber are resistant to termites, but none is entirely 'termite proof'. Termites will often damage materials they cannot digest, for example, plastics, rubber, metal or mortar. This damage occurs when termites encounter the indigestible items as they search for food.

Some termites forage for food using subterranean galleries or covered runways that extend from the central nest to food sources above or below ground. The gallery system of a single colony allows them to exploit food sources over as much as one hectare, with individual galleries extending up to 50 m in length for most species. In the case of the giant northern termite *M. darwiniensis*, individual galleries may extend as far as 100–200 m.

Apart from grass-eating species, which forage in the open, all termites remain within a closed system of galleries, devoid of light. The only exceptions are during swarming flights, or periods of new construction. The advantages to the termites of this closed system are twofold. It protects them from natural enemies such as ants, and they gain a measure of protection from temperature and humidity extremes. Termites have a thin integument and have relatively little resistance to drying out.

Natural enemies

Termites' most important natural enemies are predators, especially ants. Winged termite reproductives emerging on their colonising flight are eaten in large numbers by lizards, snakes, frogs, insectivorous and omnivorous birds, ants and other predatory insects, especially dragonflies. Workers and soldiers form an important part of the diet of the echidna *Tachyglossus aculeatus*, which damages mounds and subterranean galleries with its strong, clawed feet.

Distribution and importance

There are about fifteen species of subterranean termite that commonly damage timber-in-service throughout Australia, and ten of these occur in Queensland. Our most serious pest species are *Coptotermes acinaciformis* and the giant northern termite. The former occurs throughout the State while *M. darwiniensis* is confined to the tropical northern region. Other species that commonly damage timber are *Schedorhinotermes actuosus*, *S. breinli*, *S. intermedius* and *S. seclusus* and *Nasutitermes exitiosus*. *Coptotermes frenchi* and *C. lacteus* also occur in southern Queensland. The latter constructs mounds usually associated with stumps, and primarily feeds on decayed wood.

Soil type appears to have an important influence on termite distribution in Queensland. For example, *M. darwiniensis* does not occur in rainforest soils or in the extensive bauxite soils of Cape York Peninsula. However, other termite species that damage timber may occur in these areas. The physical characteristics of heavy soils such as the black earths of inland Queensland (that crack deeply and widely in dry conditions and become waterlogged after rain), do not favour termite survival.

Although the coastal belt and northern parts of the state are generally regarded to be high hazard areas for subterranean termite infestation, species that damage timber-in-service occur throughout the State. In practice, any structure containing wood is exposed to possible subterranean termite infestation whether in the business heart of a city, in the suburbs or out in the country, unless protective measures are taken.

More information

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