

Why cockroaches and termites are great parents

19 June 2017, by David Yeates



Giant northern cockroaches are surprisingly caring parents. Credit: Urasimaru/Wikimedia Commons, CC BY-SA

To most people, cockroaches are abhorrent, disease-ridden pests, scuttling under the fridge when you go to the kitchen for a midnight snack. But those who know cockroaches well understand that they can be very caring creatures.

There are about 5,000 named cockroaches, and in a small minority of species mothers look after their babies (nymphs), and feed and care for them in a protective burrow. A good example is the [Australian giant burrowing cockroach](#) (*Macropanesthia rhinoceros*), which lives mainly in northern Queensland.

Around 20 baby cockroaches live with their mother for 5-6 months, and she drags leaves collected from the soil surface down into the burrow for food. If you're so inclined, you can buy a pair of adult giant burrowing cockroaches as pets for around A\$150.00, and see their maternal behaviour for yourself.

Some [cockroach](#) mothers are even more caring, with elaborate parenting behaviours to look after their babies. The mother [wood-burrowing cockroach](#) (*Cryptocercus*) from North America lays

its eggs in a nest formed in a rotting log.

Mum and dad wood roach then live in the nest with 20 or so nymphs for three years or more. The parents defend, extend and clean the gallery, feeding the young by regurgitating food (much like many birds do) and with specialised fluids produced by glands in their gut. The babies return the favour, spending [almost 10% of their time grooming the adults](#).



Macropanesthia rhinoceros. Credit: Frantisek Vecernik. Pinterest

These cockroaches have an unusual diet: they digest the cellulose in wood with the help of specialised [gut microbes](#). The nymphs don't have these microbes when they are born, but obtain them by feeding on the regurgitated contents of their parents' stomachs. Eventually the teenage cockroaches leave the parental nest to form their own nests.

Until recently, [maternal care](#) in cockroaches was considered an evolutionary oddity. A few other insect groups have similar behaviour, but it was considered to be just one of a [range of \(often](#)

[bizarre\) strategies](#) that insects have evolved to increase the survival chances of their offspring.

However, as our understanding of insect relationships has increased in recent years, maternal care in cockroaches is now seen not as a strange evolutionary dead end, but an important stepping stone in the development of the huge, complex and well-ordered societies formed by other insect species. This realisation is partly down to the fact that we now know [termites evolved from cockroaches](#). This was first discovered in 2000 by a team led by a laboratory at the University of Sydney, and has been confirmed numerous times since then.

Termite time

Termites are known as Isoptera to entomologists – and never as "white ants" because termites bear no close relation to true ants at all.



Cryptocercus adult (dark brown) and nymph (light brown) from the eastern US. Credit: David Maddison

As it happens, some of the earliest-evolved groups of termites live in Australia. The [giant northern termite](#) (*Mastotermes darwiniensis*) is found only in Australia, north of the tropic of Capricorn. They show similar maternal care to the wood roach in north America, but have extended this behaviour even further.

These termites live in colonies that number in the

thousands or millions. At the centre of the colony is a mother (queen), and father (king), and these are responsible for reproduction. A queen giant termite can [lay millions of eggs in its lifetime?](#) and live for decades. Giant northern termites live in a nest underground, or inside rotting wood, and because they almost never see the sunshine they have become pale (hence the erroneous term "white ant").

However small and pale, these termites can be a [major agricultural pest](#) in northern Australia because they consume almost anything organic, including living and dead plants, and trees, rubber, leather - even plastic. They digest cellulose from plant material using specialised gut microbes, much like wood roaches do.

How do giant northern termite colonies containing thousands or millions of individuals differ from the 20 nymphs of the wood roach? The first and most obvious difference is that the termite colony contains several types of individuals: the reproductive kings and queens; the soldiers who defend the nest; and the workers who clean and excavate the next, carry out running repairs, and gather food.

These different types (castes) have different anatomies, each tailored to their job. In contrast, all wood roaches look the same, and the nymphs leave the parental nest, find a partner and begin their own little families.



Giant northern termite, *Mastotermes darwiniensis*, worker

caste. Credit: scienceimage.csiro.au

The second major difference is that the king and queen termite outlive their children (the soldiers and workers) many times over, and as a result their offspring never leave home. This in turn begs the question: what makes the workers and soldiers forego reproduction and spend all their lives in the colony?

The king and queen produce biological signalling chemicals called pheromones, which are transferred to the workers that feed on the king and queen's excretions. In essence, the parents are feeding their young a chemical that makes them stay at home and help mum and dad with the housework.

This is a neat, self-regulating system: if mum or dad dies, the chemical isn't produced and some of the youngsters begin reproducing for themselves.

It is unusual for any animal to surrender the opportunity to propagate its own genes, and there must be a very good evolutionary reason for it. Highly cooperative behaviour is thought to develop when the benefits of living together outweigh the benefits of building or finding your own nest.

Perhaps we can even think of termites as cockroaches that love their babies a little bit too much.

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