

# Tropical Topics

An interpretive newsletter for the tourism industry



## Beetles

No. 57 September/October 1999

### Notes from the Editor

There is not much that beetles will not eat and few places, apart from the sea, where they do not live. They feed on almost every animal and vegetable material (including strychnine) and some inorganic materials as well.

Given the phenomenal number of beetle species in the world (see p2) it is amazing that we see so little of them. In fact, they are generally hidden away, many of them living just beneath the surface of things. This *Tropical Topics* takes a closer look.

I'd like to thank Simon Grove and Nigel Stork, Rainforest CRC, and Geoff Monteith, Queensland Museum, for their valuable help with this issue.

#### Please note

that you are welcome to photocopy *Tropical Topics*. However, if the text is reproduced separately it must not be altered and must acknowledge the Environmental Protection Agency as the source. Illustrations must not be reused separately without permission. Please contact the editor (details on the back page) if in doubt.

### The importance of the living dead

**Although a dead tree, in a living forest, is viewed as a loss of life, nothing could be further from the truth. The decaying wood is seething with life as insects, together with fungi, work on breaking it down.**

These insects — termed saproxylic — contribute to the health of forests and their inhabitants in many ways:

- They recycle the nutrients once gathered by the trees, eventually making them accessible to the next generation of forest growth.
- By converting wood into protein (themselves) in both adult and larval forms they provide food for numerous birds and other animals.
- They provide homes. Around the world, woodpeckers play an important role in creating holes in trees but in Australia, a continent with more hole-nesting birds and mammals than anywhere else, there are none of these wood-drilling birds. Our possums and parrots would have great difficulty excavating their nest and den holes if it were not for wood-boring insects.

To maintain numbers of these useful creatures, their habitat — 'overmature' trees and dead logs — needs to be protected. Studies in temperate forests have shown that logged forests have significantly fewer saproxylic insects than less disturbed forests, because trees have been removed before they are old enough to produce dead wood. Without noticing, Europeans were losing these insects to the point where a disproportionately high number of them now feature on the endangered lists.

Little is known of how logging has affected saproxylic insects in tropical forests. However, Rainforest CRC researcher, Simon Grove, is keen to redress the

balance. He is currently studying the saproxylic insects — specifically beetles, the main group — which munch on dead wood in the lowland Daintree rainforests. To date Simon has collected 450 different species but anticipates finding many more. He hopes to discover whether there are differences between what beetles are found in logged and unlogged areas of the Wet Tropics. His ultimate aim is to work out a standard, or indicator, which forest managers could use to measure sustainable rainforest management. Rather than looking at large animals, when evaluating whether a logging operation is causing long-term harm to a forest system, it may be more useful to look at the amount or variety of dead wood or overmature trees which would be needed to sustain the myriad insects that live there.

The greatest loss of biodiversity is probably at the micro level — but these little creatures are no less important for being small. Instead, they are a vital part of the whole.



*This beetle (Kaveinga frontalis) is a common beetle of old-growth forests in the Daintree where it depends on a continuous supply of well-rotted logs. Simon has found this and two closely related species in his study sites. The only European species of this family is almost completely extinct, presumably because of the way forests have been cleared or intensively managed over the centuries. Hopefully, the same fate does not await Kaveinga.*

Illustration James Gilbert



WET TROPICS  
MANAGEMENT AUTHORITY



Environmental  
Protection  
Agency

## Life in a rotten log

**“There is nothing more alive than a dead tree (*Il n’y a rien plus vivant qu’un arbre mort*).”** Jeannine Petit, French environmentalist.

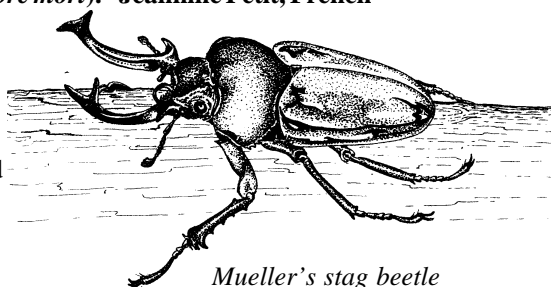


*Striped possums are particularly adept at locating and teasing beetle larvae out of dead wood, using their elongated fourth fingers. Logs prised apart by striped possums are a common sight in the lowland Wet Tropics.*

Beetles comprise the main group of wood-eating insects. Indeed, it has been calculated that the number of beetle species which live in dead and dying wood outnumber all the world's species of mammals, birds, reptiles and amphibians by at least two to one.

Beetles living in a rotten log may include some which feed directly on the dead wood (borers) as well as species which feed on the decomposing fungi. Yet others feed on the waste from these beetles — or simply prey on all the others. Some live there only as larvae, others spend their entire lives in the rotting wood.

Large numbers of jewel, stag and longicorn (longhorn) beetles as well as the celebrated rhinoceros beetle feed on dead wood.



*Mueller's stag beetle is completely dependent, in the larval stage, on dead wood which has been infected with fungus. Found only in the Wet Tropics this magnificent beetle, which gleams with metallic red and green highlights, has been called the most beautiful insect in the world. Only the males have 'antlers' which are used as levers during conflict. Each tries to pass them under the rival's body and, by raising them, to dislodge their opponent.*

A note to tour guides: Next time you find yourself in a quiet forest, bear in mind how much can be said about dead wood (see also pages 1, 4 and 5).

## Big on numbers, small on volume

**“The number of minute and obscurely-coloured beetles is exceedingly great. It is sufficient to disturb the composure of an entomologist's mind, to look forward to the future dimensions of a complete catalogue.”** Charles Darwin, *The Voyage of the Beagle* (1839)

Darwin, whose interest in the natural world began with a beetle collection, had an inkling of how many beetles there were, but it is unlikely that he had any real idea of the enormity of their numbers. It is now estimated that they make up fully one quarter of all species on earth — including plants, mammals, fish, birds and all the other insects put together. In just one hectare of forest in Sulawesi (Indonesia) researchers found more than 4000 while, even in the less beetle-rich temperate zone, it is possible to collect over 1000 species from a single British back garden. Worldwide, about 350 000 beetle species have received names, but many, many more remain unnamed. The total number is a matter for wild guesswork (see *How many?*, this page). As far as Australia is concerned, a total of 30 000 beetle species has been suggested — but this figure is bound to be an underestimate.

**“The Creator, if He exists, must have an inordinate fondness for beetles.”** J.B.S.Haldane.

While the most spectacularly large and colourful specimens are the ones often put out for public display, the collections hidden away in entomologists' cabinets give a more realistic idea of beetle dimensions. Tray upon tray, at first glance, appear to contain empty labels — long names without any accompanying specimens. Then you realise that those labels also carry little specks, no larger than full stops, and that those misplaced punctuation points are actually the beetles. The vast majority of beetles are under 2mm in length and many are less than half a mm.

It will be a long time — if ever — before a complete beetle catalogue is finalised, but, sadly, it will be a much smaller publication than it would have been in Darwin's time. The rate at which natural habitat is being destroyed has led scientists to estimate that anywhere between 2000 and 30 000 animal and plant species are being made extinct each year. A large proportion of these are likely to be beetles.

### How many?

The systematic cataloguing of plants and animals began with the Swedish biologist, Linnaeus, about 240 years ago. Since then roughly one and a half million different species\* have been described and named — but that is only the tip of the iceberg.

The question which now perplexes scientists is not how many more species there are, but, simply, how big is the iceberg? One thing they do know is that most of it is made up of insects. Relatively few mammals, birds and other large animals remain to be discovered but the more work which is done on insects, the more reluctant scientists become about putting a figure on how many there are. The greatest unknown is the insect fauna of the world's tropical rainforests. Trees experimentally fogged with insecticides have provided a rain of specimens and it is not unusual for 90 percent of them to be new to science. For example, in a set of 65 different species belonging to one minor family of beetles collected in Sulawesi, only three had previously been described.

Differentiating species is not simple. In some cases, the same species may be accidentally described several times — different scientists may have 'discovered' and named it, males and females may look like different species or the insect may have several quite distinct forms. On the other hand, different species may have been given the same name. The definition of a species is that it is not able to interbreed with any other species — but this is very difficult to prove with dead insects which are categorised on form alone.

The harder scientists try to answer the question “How many?”, the more likely they are to simply say, “A lot”.

*\*This refers to 'higher' organisms; an appropriate classification system has not been discovered for bacteria, viruses and the like.*

# Out and about

## Thornton Peak

Boulders in the Mist

*"That wilderness should be there for North Queenslanders,  
It should be there for people all round Australia.  
It should be there for everybody around the world.  
It should be there for the inhabitants of that wilderness.  
Our fellow creatures on this planet who don't have a vote ..."*

Dr Bob Brown

### General Notes

Getting to going the gradient of Thornton Peak can be appreciated if you slow down and pull over. Very often there are clouds rising up. This weather is a result of the rain forest which is so close to the ocean. It is a rare event when there are no clouds at all. This phenomenon is a result of the rain forest which is so close to the ocean.

Chatterbox is the name given to a strange phenomenon that occurs in the rain forest in cloud form of the uplands. In the cloud or rain forest through the vegetation, chatterbox (also called chatter) then drops like rain to the ground. In this case it is a good idea to get out of the rain forest by walking under a tree, you can better off in the open in the rain forest.

### Geology

Four hundred million years ago the Daintree Coast consisted of a vast shallow sea. The sea was very shallow and the sea floor was covered by a vast expanse of sand. The sea was very shallow and the sea floor was covered by a vast expanse of sand. The sea was very shallow and the sea floor was covered by a vast expanse of sand.

The granite boulders pecked in the Daintree Coast are a common sight. They are granite rocks which were once molten and small. These boulders had their origin 250 million years ago. They are granite rocks which were once molten and small. These boulders had their origin 250 million years ago.



2-38

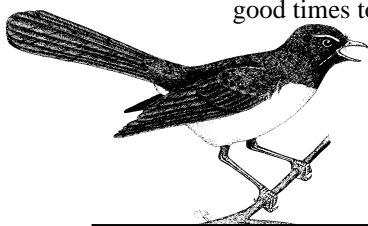
A **Handbook** for tour guides in the Daintree River to Cape Tribulation area was published by the Wet Tropics Management Authority recently. A large part of the Handbook is a section devoted to Talking Points, which relate to 18 sections of the trip north. Items of interest, such as history, local plants and animals, frequently asked questions and general facts are given for each point. Other sections deal with ecotourism, local Aboriginal custodians, special features of the area, maps and reading lists.

Thoroughly researched and written, largely by Juliana Ledger and Ellen Terrell, the Handbook contains a wealth of information and is of interest and relevance for tour guides throughout the Wet Tropics.

### Update note (2006):

This handbook is still available as a CD. Contact the Wet Tropics Management Authority, Ph: 4052 0555.

As spring progresses, **birdsong** is increasing and many pairs are getting busy with nesting. Listen for willie wagtails singing their 'sweet pretty little creature' song in the dead of night. Is this stimulated by moonlight — or perhaps by artificial streetlights? Certainly September and October are good times to hear this.



**Pied imperial-pigeons (PIPs)** were first spotted on Low Isles and in Cairns in mid-August this year. There is a general impression on the mainland that they seem to have arrived early this year, but this is not borne out by the survey on Low Isles where below average numbers (451) were counted at the beginning of September. Groups can be seen feeding on Alexander palm berries, a very important fruit early in the breeding season.

**Channel-billed cuckoos** have similar migratory habits, arriving from New Guinea to breed about the same time as the PIPs.

Known by birdwatchers as 'flying T-squares', because of their rather T-shaped form in flight, they lay their eggs in the nests of crows, currawongs, magpies and magpie-larks (pee-wees) — birds which might seem too clever and aggressive to allow such an imposition. The cuckoos do not attract much attention until the first storms which prompt them to emit loud racous calls — a habit which has earned them the name 'storm-bird'. These birds eat figs and sometimes gather on the trees in small feeding parties when they have finished breeding.



Some items, past their 'use-by date', have been removed from the web version of the newsletter.

Fruit-eating birds are attracted to corky bark (*Carallia brachiata*) trees at this time of year, as the orange fruit begin to ripen. This tree is a member of the Rhizophoraceae family of mangroves but is one which has adapted to rainforest habitats. A bushy tree, with glossy leaves, it makes a good addition to the garden or resort. It also attracts the attractive black, white and yellow day-flying four-o'clock moths, whose caterpillars feed on the foliage.

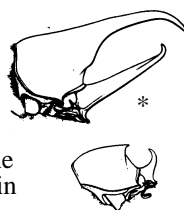
# Bits of beetle diversity\*\*

## Scarab beetles (Scarabaeidae)

One of the largest Australian beetle families, this group contains at least 3000 species. Adults tend to have front legs adapted for burrowing, since their larvae often feed in the soil. Cane beetles, whose larvae feed on the roots of sugar cane plants, are scarabs.



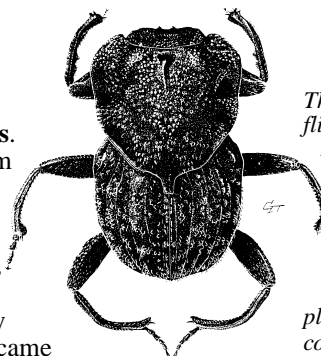
**Rhinoceros beetles**, which belong to this group, attract more interest than almost any other beetle species. The males develop long, horn-like mouthparts which are used in jousting matches between rivals competing for a female. The size of the 'horns' depends entirely on how well the beetle fed, in dead wood or compost, during its larval stage (see variations, right). The fiercesome appearance of these beetles, along with the loud hissing sound they produce when stressed, seems to act as an effective deterrent against many predators.



Also included in the scarab group are the nectar-feeding, day-flying, brightly-coloured **flower scarabs**, which buzz loudly in flight because they are able to fly without lifting their elytra — the hard wing covers (see p7). Flower beetles include the bright green 'grasshopper' beetles, and the fiddleback beetles, named for the violin-like pattern on their backs. Furrowed rose chafers, which have attractively lined black and tan backs, are fairly common in the tropics.

## Holy rollers

The sacred scarab beetles of Ancient Egypt were actually lowly **dung beetles**. They were thought to produce life from death because the balls of decayed matter which they rolled and buried (along with their eggs) produced new life. Similarly, the sun god was seen as a great scarab which rolled the ball of the sun across the heavens. Every day the sun was 'reborn' — so scarabs became the symbol of rebirth. Likewise, any good ecologist also appreciates the worth of these insects since they do indeed promote life by recycling nutrients from waste. Apart from feeding on it themselves, adult beetles use dung to provide food for their larvae. The ball rollers (there are also burrowers) do this by rotating a piece of dung with their hind legs and plastering with the front legs until the ball is the correct size. The female then hollows out a cavity and, after reversing in, lays an egg. When the egg hatches, the larva remains within the ball feeding on the dung until it pupates and emerges as an adult.



*This new species of large flightless dung beetle, Aulacopris matthewsi, was discovered by Queensland Museum researchers on the summit of Mt Sorrow, behind Cape Tribulation — the only place it has ever been collected.*

**Christmas beetles** also buzz loudly in flight. There are many types, a fact which sometimes leads to arguments between people with a fixed idea of their appearance. As larvae, these beetles feed on grass roots but as adults they can seriously defoliate trees, particularly eucalypts, during summer. The aptly-named golden scarab, found in the Wet Tropics, is a Christmas beetle.

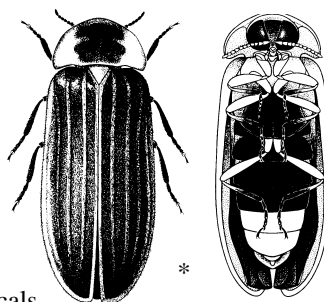
## Introduced rollers

More than 350 different species of dung beetles are native to Australia but they are accustomed to utilising the dry pellets of marsupials and are unable to cope with the large moist pats of introduced cattle. Apart from providing breeding grounds for bush flies and other pests, it was discovered that cowpats were rapidly covering up grazing land at the estimated rate of one million hectares a year! In order to deal with the growing problem, in the 1960s a number of European and African dung beetles were introduced. They got rolling and the result has been the improvement of pastures, as nutrients previously held in the pats are recycled, plus a welcome reduction in numbers of bush flies and other nuisances. Incidentally, certain mites which feed on fly and other insect larvae, use the dung beetles as vehicles for transportation between pats.

Some native dung beetles save themselves the trouble of searching for dung by clinging to the fur of wallabies, near to the anus. They are thus able to jump on to the faecal pellets as they are produced and fall to the ground with them. Others are 'cuckoos', laying their eggs in the dung balls collected by other species.

## Fireflies (Lampyridae)

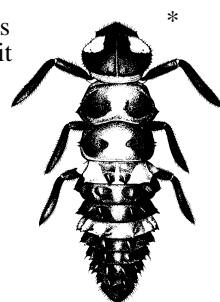
Fireflies are beetles. In Australia most are found in the wetter areas, favouring rainforests and mangroves. The blinking light, which comes from segments on the underside of the tip of the abdomen (far right), is created by a chemical process. This is triggered when the beetle opens small apertures to allow air in. The chemicals react to the presence of oxygen with a blaze of light, but are soon exhausted. However, they quickly recharge in time for the next burst — hence the flashing effect. Males are the main flashers, cruising at night in search of a mate. With enormous eyes and a visor to keep his attention focused, he is on the lookout for an answering blink which indicates a suitably impressed, but flightless, female.



Firefly larvae, and pupae, are also slightly luminous. The larvae feed on snails, which they are able to paralyse, but it is thought that the adults (like some other beetles) do not feed at all. Their short lives add a certain urgency to their flashy courting behaviour.

## Ladybirds (Coccinellidae)

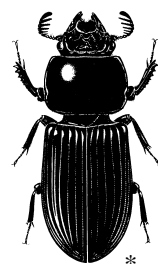
A favourite among beetles, the standard ladybird is welcomed by gardeners for its, and its larva's, habit of feeding on garden pests such as aphids, mealybugs, mites and scale insects. In fact, a number of Australian species have been used to combat agricultural pests overseas. However, some species, such as the twenty-eight spotted ladybird, feed on foliage of tomato, pumpkin and potato plants. The bright colours of many of these beetles warn potential predators that they are poisonous — toxins are exuded from their knees. There are over 300 species of ladybirds in Australia, most of them small and easily overlooked.



*Ladybird larvae are just as useful as adults at controlling pests.*

## Passalid beetles (Passalidae)

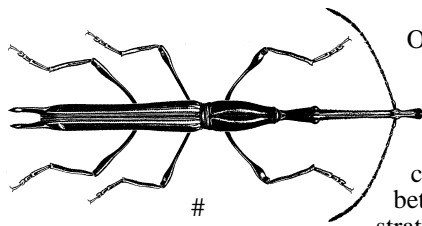
Passalid beetles are found particularly in wet tropical and subtropical forests where they feed on decaying wood. Many are large and shiny black with 'waists' between front and back sections. They are of particular interest because they live in semi-social family groups, with parents caring for and feeding their young. The young larva lets its parents know where it is by rubbing hind and mid legs together to produce a sound. The adults (which rub hind wings against abdomens in reply) then chew up wood for the larva to feed on. Their presence in a log can often be detected by the presence of large piles of sawdust collecting beneath the log.



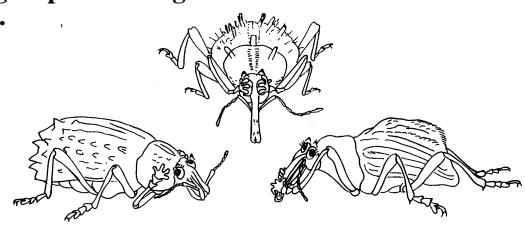
Weevils (Curculionidae)

The largest Australian beetle family, with 6000 known members at the last count, is the group containing weevils. No fewer than 150 different species have been collected just from the absolute summit of Mt Bellenden Ker.

Weevils are distinguished by the elongated snout (rostrum) which they use to drill into leaves and bark to feed and, in the case of females, to create egg chambers. However, bark beetles and ambrosia beetles, whose rostra are inconspicuous, are also included in this group.



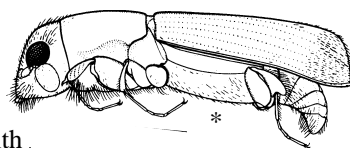
One particular long-snouted weevil (*Ithystenus hollandiae*) (left) which lives on the outside of logs has an interesting sex life. The males, which have unusually long legs, come in two sizes — large and small. The large male stands over his chosen female, but the small male sometimes sneaks between his legs and mates with the female instead — a strategy not unlike that of parrotfish!



Hear no weevil, see no weevil speak no weevil!

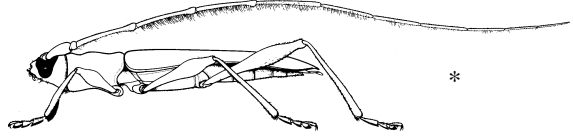
Many weevils are **pest species** feeding on all parts of trees, vegetables, grains and ornamentals. However, while we may curse the weevils which work their way into our bags of flour and spaghetti, other species have proven themselves to be very useful in the fight against weeds. Two different weevil species, both from Brazil, are being used to control *Salvinia* and water hyacinth, two South American water weeds which choke waterways into which they have been dumped.

**Ambrosia beetles** have earned their name from the yeast-like ambrosia fungi which they cultivate for food. Known also as pinhole borers, they make tiny tunnels into the heartwood of dead or dying trees, lining the tunnel walls with the fungi. They even carry it with them when they move from tree to tree. Some ambrosia beetles also build colonies with societies not unlike those of termites or bees. The burrows of ambrosia beetles are not a perfect refuge, since certain predatory beetles follow them into their tunnels for an easy meal.

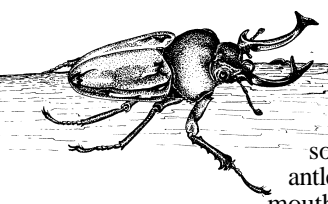


Longicorn beetles (Cerambycidae)

Also known as longhorn beetles, members of this large family have long antennae which measure from three-quarters to several times the length of their bodies. This increases their sensory powers and may also help them to survive attacks — a small bit of antenna lost to an ant doesn't matter so much if they are extra long. Larvae generally feed on dead and dying wood; some large ones are a favourite traditional Aboriginal food. This group contains Australia's largest beetle, the 80mm *Batrocera wallacei*, from the Cape York Peninsula, and the slightly smaller and brightly coloured *B. boisduvali*, common in the Wet Tropics.

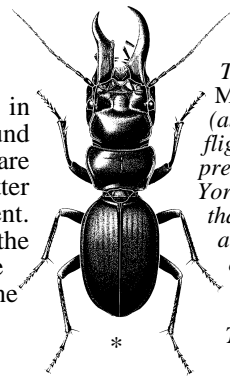


**Stag beetles (Lucanidae)**  
Named for the sometimes antler-like mouthparts of some males, stag beetles are found in wet areas where their larvae live in decaying fungus-infested logs. Adults, however, may frequent the canopy feeding on nectar, young leaves, sap or fruit. Being nocturnal, stag beetles are not often seen although they are sometimes attracted to lights. Australia is home to more species of stag beetle than most parts of the world, although the majority live in the cooler southern forests. In the Wet Tropics, they are most diverse at higher altitudes.



Ground beetles (Carabidae)

These beetles number about 2500 species in Australia, with 500 different species being found under the bark of eucalypts alone. Most are predators, both as larvae and as adults, the latter equipped with long legs for fast movement. Although many of the species which live on the ground are flightless, they are swift, effective hunters, which can often be seen by day. One particularly ferocious group of species has earned the name 'tiger beetles'.



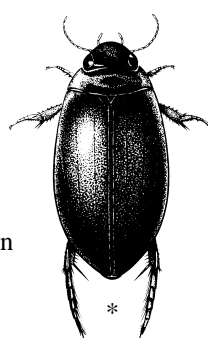
The ground beetle, *Mecynognathus dameli* (above), is a 75mm flightless scavenger and predator from the tip of Cape York peninsula. It is feared that cane toads, when they arrive, may threaten its existence, as they seem to be doing for many ground beetles in the Wet Tropics.

Jewel beetles (Buprestidae)

This large family includes some of our most attractively-coloured beetles, many with a metallic sheen. Adults tend to feed on nectar, with some preferring leaves, while most larvae feed under bark or bore into wood, stems or roots. Larvae which feed on hoop pine have been known to emerge as adults from furniture up to four years after it was made from the timber. Smaller species are responsible for the galls formed on many trees while others are leaf miners, tunneling around in the leaf tissue. Forest-dwelling tribes in many parts of the world use the colourful elytra in ear-rings or necklaces.

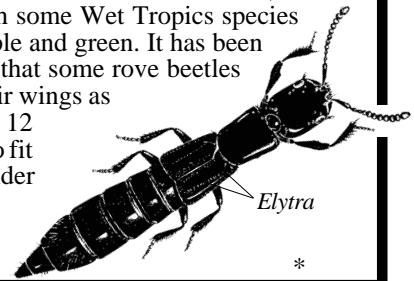
Aquatic beetles

Beetles inhabit every part of the world except the sea. Two large families live in freshwater, where they are able to dive by storing air under their elytra or abdomen. Most have streamlined bodies and modified legs which act as oars. Sometimes they crash-land on the shiny paintwork of cars in what is assumed to be an unfortunate case of mistaken identity. (For more details see *Tropical Topics* 44.)



Rove beetles (Staphylinidae)

Many rove beetles are long, with small elytra, and flexible bodies. Lacking the solid, hardened appearance of the standard beetle, they are easily mistaken for other sorts of insects, such as earwigs. Most are black or brown, although some Wet Tropics species are purple and green. It has been noticed that some rove beetles fold their wings as many as 12 times, to fit them under their small elytra.





## Questions & Answers

**Q What is the current situation with pharmaceutical extracts from Far North Queensland rainforest plants, in particular black bean (*Castanospermum australe*)?**

**A** The National Cancer Institute in USA was interested in the chemical properties of black bean. Scientists have found compounds in the seeds which are very active against enzymes in the HIV virus — but they cannot be used because the beans are also very toxic. However, the compounds are used as a benchmark against which other compounds can be tested so it has become a pharmaceutical tool for further investigation.

Researchers studying the seeds of the rare ribbonwood tree (*Idiospermum australiense*), found only in the Daintree and the Bellenden Ker area, have discovered a new chemical called idiospermuline which may prove to be medically useful. Idiospermuline affects transmission of messages between individual nerve cells and has been responsible for seizures in cattle which have eaten the seeds. However, in controlled doses it may have medical uses.

The Queensland Pharmaceutical Research Institute is in the process of investigating all Queensland plants and receives about 2500 plant samples a year. (A sample is just part of a plant, such as the flowers or the bark; roughly 10-15

samples are derived from each plant species.) After seven years they now have about 20 000 samples and hope to complete the job in 10. Potentially useful components need to be rigorously tested so the lead time between discovery of a compound and its arrival in the market place is about 10-15 years.

**Q Where do march flies go when they are not around?**

**A** Having mated and laid eggs, the adults probably die — but the bad news is that the larvae are developing in their absence. These larvae are aquatic and are found in creeks and, to a certain extent, in standing water. That is why the adults are common in river valleys where they have gathered to mate. They seem to be most abundant in the build up to the wet season — possibly the rains flush out many of the larvae, thus causing a drop in numbers.

Like mosquitoes, it is only the female march flies which bite, requiring a blood meal for reproduction. The males are quite rare and may frequent the treetops. Curiously, the pesky females of different types may prefer different parts of the anatomy, one type specialising in ankles while another type may be attracted to the head. They seem to be especially attracted to blue, black and colours in between.

Around the world, march flies have different names. They are also called horse or deer flies as well as green-heads — a reference to their large eyes which have iridescent reflections. (In males these eyes always meet in the middle.) The name 'march' may have originally come from the word 'marsh'.



## Facts and stats

**In England and the United States, foresters who are concerned about the loss of wood-inhabiting insects use ring-barking or even explosives to artificially age some of the trees.**

The world's largest beetles, from South America and Fiji, grow to a length of 200mm — almost the width of this page. They are almost 800 times larger than the smallest ones. The heaviest beetle, the African goliath, weighs up to 100g.

**The word 'beetle' comes from Old English words meaning 'little biter'.**

Fossils of beetle-like insects, found in Eastern Europe and Central Asia, date back about 280 million years. They differ from modern beetles in several ways — true beetles first turn up in the fossil record 40 million years later.

**Males of the largest Australian jewel beetle have an unfortunate habit of trying to mate with discarded brown beer bottles which resemble the females in colour, texture and sheen.**

Some beetles break the life cycle rules. Some females never develop beyond the larval stage, some larvae give birth to larvae, some adults do not lay eggs but produce live young and others reproduce without mating.

**Some larvae, particularly if their food has a low food value, may have long lives; an American longhorn beetle larva was recorded as living for over 40 years in dry wood. Other larvae have been kept without food for five years. Continuing to moult, they shrank to one six-hundredth of their original weight. More normally, beetles can become dormant (diapause) at any stage of their life.**

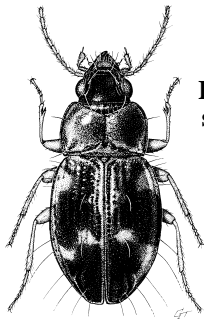
Stag beetles are kept as pets in Japan and can be bought from vending machines. Recently one measuring 80mm, which was 1mm longer than the previous record holder, changed hands for the equivalent of \$135 000.

**The chemicals used by fireflies to emit light do so in the presence of certain bacteria which cause urinary tract infections, so they have been used to test for the bacterial presence.**

Woodworms are actually the larvae of furniture beetles. They can reduce a piece of timber to a shell containing crumbling wood and powder. The deathwatch beetle also damages timber, usually oak. Its name comes from the belief that the ticking mating signal made by the adult beetles banging their heads on the floor of their tunnels indicated the approach of death in the house.

## Tourist talk

ENGLISH	GERMAN	JAPANESE
beetle	Käfer	kou chu 甲虫
forewing	Vorderflügel	mae bane 前ばね
rotten	vermodert	kusatta 腐った
wood	Holz	ki 木
larva	Larve	youchu 幼虫
fungus	Pilz	kabi カビ
to bore	bohren	hori nuku 掘り抜く
rhinoceros	Nashorn	sai サイ
rhinoceros beetle	Nashornkäfer	kabuto mushi かぶと虫
stag	Hirsch	o jika 雄鹿
stag beetle	Hirschkäfer	kuwagata mushi クワガタ虫
dung	Mist	fun 糞



**Life on the mountain tops**

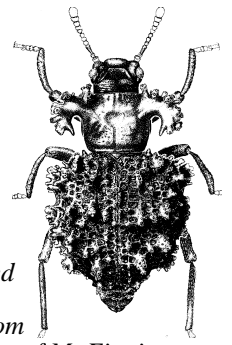
Researchers from the Queensland Museum have found that in the Wet Tropics many beetle species, notably the flightless ones, are found on just one mountain top and nowhere else. These mountains have isolated each beetle population from every other for millennia, and have gradually enabled them to evolve into separate species.

This small predatory beetle, *Philipis*

*bicolor*, is known only from the summit of Mt Demi, the 1100m mountain which looms above the town of Mossman. It lives on the trunks of mossy trees. Queensland Museum surveys discovered 32 new species belonging to the genus *Philipis* in the Wet Tropics, most of them restricted to just one or two mountains.

As part of this research, the beetle faunas of 49 mountain tops were assessed for species richness and rarity. When the numbers of species were counted, Mt Bellenden Ker came out top with 84 species, while Mt Elliot, south of Townsville, ranked 36<sup>th</sup> with only 17 species. But when their rarity values were compared, Mt Elliot came out top and Bellenden Ker dropped to fifth place. Mt Elliot is far from other mountains so the insect fauna presumably evolved in isolation from early times, whereas those on other mountain tops were able to move around a little more freely, leading to a more widespread distribution.

These findings are important to managers, who need to assess the natural values of different mountain tops when faced, for example, with requests for permission to build transmission towers.



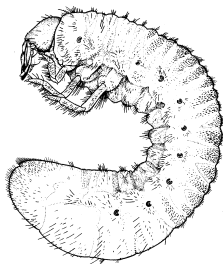
*Monteithium ascetum*, named in 1998, is known only from the summit zone of Mt Finnigan, near Cooktown, and Mt Sorrow, at Cape Tribulation. It lives in leaf litter and feeds on decaying wood. Its body surface, which looks almost like coral growth, is normally camouflaged with congealed soil. Its name commemorates the first collector of the species, Geoff Monteith of the Queensland Museum.

## What is a beetle?

The scientific name for the beetle group, *Coleoptera*, means 'sheath winged'. This refers to their most important characteristic — forewings which have become hardened coverings known as *elytra*. These protect the folded hindwings when they are not in use. The elytra are not completely useless when the beetle flies, but are often turned to point forwards and upwards, probably acting like aeroplane wings to give the beetle some lift.

Compared with many soft and vulnerable insects, the beetle is a well-armoured tank. Its hard but flexible shell (cuticle), the structure of which has been likened to fibre-glass, protects it well from predators and from infection by microorganisms, as well as against physical accident. An additional wax layer helps prevent water loss. With this tough construction, it is perhaps not surprising that these insects have become the most successful of all animal groups.

The majority of beetle larvae, on the other hand, are fat, soft and caterpillar-like, with or without legs — look in any compost heap and you are likely to find them. They take many varied forms, but are most easily distinguished from other insect larvae by their hardened heads. Many also have strong jaws, used to bite through tough roots and stems and even timber.



When the larva is ready to pupate it stops feeding and may leave the food source. Some simply tunnel under stones, but leaf and stem feeders often drop on to the soil and burrow beneath the surface. Some ground beetles burrow down for a matter of metres — but wood borers may head for the surface so that, as adults, they are able to escape easily. Water beetle larvae usually leave the water and burrow into nearby soil. The larvae hollow out a chamber in which to pupate, perhaps lining it with a type of faecal cement. Some produce a cocoon but this is rare in beetles.

## Not beetles

Cockroaches are not beetles: Although the toughened forewings of flying species are somewhat similar, they overlap instead of meeting in a straight line.

Bugs are not beetles: Beetles tend to have chewing mouthparts while those of bugs are adapted for sucking.

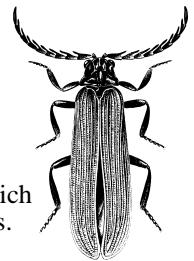
Earwigs are not beetles: They have forceps-like structures at the tips of their abdomens. Some rove beetles, with reduced wing covers and forceps-like mouthparts, can superficially resemble earwigs

Cockroaches, bugs and earwigs all develop their adult form gradually, developing wings (unless they are wingless species) during the last few moults. Beetles (like butterflies, bees and flies) start as larvae and after a period of pupation, emerge as fully-formed adults.



## Defence strategies

This rufous and black beetle is toxic — and is mimicked by numerous other non-toxic beetle species (and a moth) which copy its warning colours.



Beetles produce a variety of chemicals to protect them from their enemies — from bacteria and fungi as well as predators which may be tempted to make a meal of them. One of these chemicals is cantharidin, found in large quantities in the infamous 'Spanish fly', a beetle of southern Europe. Although poisonous, cantharidin has been used medicinally — and as an aphrodisiac.

## Life in the colonies

A number of beetle species live inside the colonies of termites, ants and bees for at least part of their lives. They are tolerated and even fed and protected by their hosts, some of them paying in the form of a food secreted from special glands — an arrangement somewhat similar to the relationship between certain caterpillars and ants (see *Tropical Topics* 54.) Other beetles are less friendly, living next to ant colonies and picking off the inhabitants for dinner, or raiding their food stores.

Another set of beetle larvae prey on bees. The adult female lays eggs on flowers. The young larvae then attach themselves to visiting bees to hitch a lift back to the nest. There they feed on the bee larvae as well as on the honey and nectar stores.

Some beetles have become honorary termites. Having taken on the appearance of termites, they are treated as colony members.

# Bookshelf

## Australian Beetles

John F. Lawrence and E.B. Britton

CSIRO

Melbourne University Press (1994)

A chapter from the much bigger, 2-volume, *The Insects of Australia* published by CSIRO in 1991. Although much is the same as the original, a new Introduction has been added with information on Fossil History, Australian Beetles and their Habitats.

## A Field Guide to Insects in Australia

Paul Zborowski and Ross Storey

Reed Books (1996)

Featuring a good section on beetles, this book is immensely useful to the amateur who is curious about insects. Both authors live in the Wet Tropics so many of our northern insects are featured.

## The Life of Beetles

Glyn Evans

George Allen and Unwin Ltd. (1975)

This book may be difficult to obtain now, but is a relatively easy-to-read introduction to beetle natural history.

*Wildlife Australia Vol 36 no 2 Winter 1999*

## Rolling your own

Sybil Monteith

Short, informative piece on dung beetles.

*Wildlife Australia Vol 35 No 2 Winter 1998*

## Fireflies

Dr Geoff Monteith

Answer to a reader's question about firefly behaviour.

*Wildlife Australia Vol 35 No 3 Spring 1998*

## Weevil Wonder

Ron Hohenhaus

Brazilian weevils and water hyacinth.

*New Scientist 11 August 1990*

## Counting species one by one

Nigel Stork and Kevin Gaston

*BBC Wildlife August 1990*

## Every little thing

Kevin Gaston and Nigel Stork

Two articles on the impossible task of counting the world's species.

*Journal of Insect Conservation, 3, 67-74 (1999)*

## The conservation of saproxylic insects in tropical forests: a research agenda

Simon J. Grove and Nigel E. Stork



This newsletter was produced by the Queensland Department of Environment and Heritage (now The Environmental Protection Agency) with funding from the Wet Tropics Management Authority.

Opinions expressed in *Tropical Topics* are not necessarily those of the Department of Environment and Heritage (EPA).

While all efforts have been made to verify facts, the Department of Environment and Heritage (EPA) takes no responsibility for the accuracy of information supplied in *Tropical Topics*.

© The State of Queensland.  
Environmental Protection Agency

## For further information contact...

Stella Martin

The Editor

*Tropical Topics*

Environmental Protection Agency

PO Box 2066

CAIRNS QLD 4870

Ph: (07) 4046 6674

Fax: (07) 4046 6751

e-mail: Stella.Martin@epa.qld.gov.au

## Wet Tropics Management Agency

(For general information on the Wet Tropics World Heritage Area only.)

PO Box 2050

CAIRNS QLD 4870

Ph: (07) 4052 0555

Fax: (07) 4031 1364

Website: [www.wettropics.gov.au](http://www.wettropics.gov.au)



**WET TROPICS  
MANAGEMENT AUTHORITY**



**Queensland Government**  
Environmental Protection Agency  
Queensland Parks and Wildlife Service