

Tropical Topics

An interpretive newsletter for the tourism industry



Rainforest invertebrates

No. 37 August 1996

Notes from the Editor

Invertebrates are spineless — but that is no reason to dismiss them. As pollinators, decomposers, recyclers and, not least, food sources for other animals they play a vital role in every ecosystem.

Try this quick quiz before you read on (answers at the bottom).

How many Australian insect species have so far been named?
a: over 85 000 b: over 1 million c: over 32 000

At least 80 percent of all animal species belong to one group. Is it
a: mammals? b: insects?
c: worms?

Which one of these is an invertebrate but not an insect?
a: silverfish b: spider c: moth

Despite being dominated by the order Insecta, there is more to invertebrates than insects. This issue therefore divides them up into rough categories of insects (on pages 2, 4 and 5) and non-insects (page 7). Obviously it is impossible to deal comprehensively with any group so a few species which may be commonly encountered and/or may have particularly interesting stories are featured.

If future funding allows, *Tropical Topics* will revisit some of the most important invertebrate groups in more detail in forthcoming issues.

Answers to quiz
'q pu'a'q'e

Links with the past

One of the criteria for listing the wet tropics as a World Heritage Area was the fact that it contains outstanding examples of major stages of the Earth's evolutionary history. Many of the plants and animals demonstrate links with the past and invertebrates are among the finest examples.

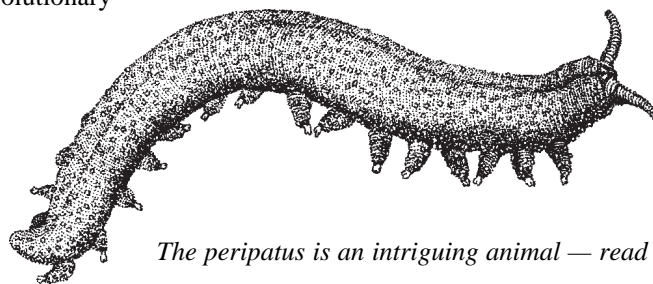
High on Mt Windsor and Mt Lewis a few special stag beetles have been found. Known scientifically as *Sphaenognathus*, they are black, the males sporting the long hornlike mouthparts which give this beetle group its common name. However, it is not their appearance which makes these beetles particularly significant but the fact that almost identical beetles are also found in Chile, in South America, at similar latitudes and altitudes.

They thus provide yet more compelling evidence that the two continents, now so far apart, were once connected in the supercontinent, Gondwana. When it broke up, about 55-80 million years ago, some of the beetles rafted off on the South American part and some on the part which was to become Australia.

Other invertebrates also tell a story of the past, many of them pointing to links not between continents but between groups of animals in evolutionary history. Long-legged amblypygids, which hide under logs and stones by day, look like spiders but in fact represent ancient evolutionary

predecessors of spiders. Giant bulldog ants demonstrate with their ferocious stings their ancient link with wasps and bees. Primitive, in evolutionary terms, bulldog ants have relatively small and simple colonies and are the only ants still capable of inflicting true stings.

Peripatus, commonly known as velvet worms, represent a particularly interesting link and are often referred to as 'living fossils'. With soft, many-segmented bodies they look like worms but they also have walking legs, antennae and a tracheal breathing system (see p2) — characteristics of insects, spiders and other members of the arthropod phylum. They are, in essence, half worms, half arthropods. Their status as the evolutionary link between these two rather different groups was reinforced when a 530-year-old fossil of an ancient marine peripatus-like creature was found. It is believed that this group emerged from the sea and eventually gave rise to hard-bodied millipedes, centipedes and insects. Peripatus represent those members of this group which opted not to make such radical changes.



The peripatus is an intriguing animal — read more on page 7.



WET TROPICS
MANAGEMENT AUTHORITY



Department
of Environment

The big picture

Scientists classify animals and plants by grouping together those which share similar body plans. In the hierarchy of classification, the phylum is the highest category. Currently about 39 phyla are recognised, only one of which is devoted to vertebrates — those animals with a backbone. Thus we are in the same phylum as pythons, gobies and cane toads. All the rest are invertebrates, divided into phyla such as molluscs, echinoderms and crustaceans.

About 80 percent of all animal species belong to one giant phylum, Arthropoda. Members all have a hard

outer skin with flexible joints, segmented bodies and paired limbs. The largest class in the arthropod phylum (each phylum is divided into classes, again on the basis of body shape) is the insect class.

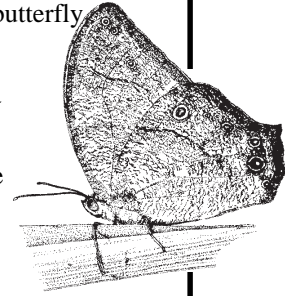
Class Insecta is further broken down into orders, according to similarities. For example, bugs all have tube-like mouth pieces and butterflies and moths all have scaled wings. Ants belong to the same order as bees and wasps, which is quite distinct from the termite order.

There are 26 insect orders comprising about 1000 families. These are again

divided into separate genera and then again into species at the individual species level. The scientific name of each animal includes the genus name and the species name.

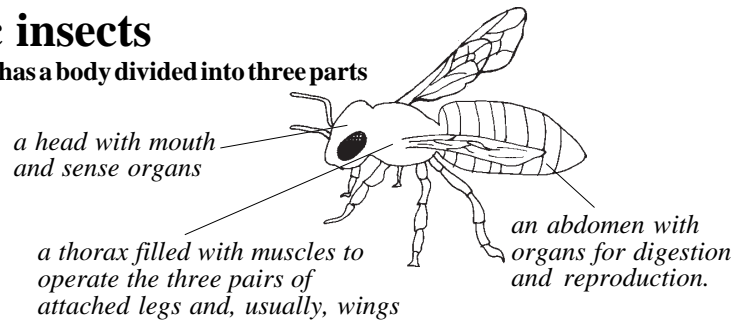
The evening brown butterfly is categorised as:

Phylum: Arthropoda
Class: Insecta
Order: Lepidoptera
Family: Nymphalidae
Genus: *Melanitis*
Species: *leda*



Basic insects

An insect has a body divided into three parts



The body of an insect is enclosed in an external shell. Although lightweight on the small scale, if insects were as big as humans their shells would make them too heavy to move.

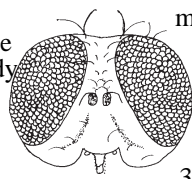
Another factor which restricts the size of insects is their breathing system. Along the side of an insect is a series of holes called spiracles, openings to a system of tubes (tracheae) which branch into the insect's body. Air passes along these tubes and oxygen absorbed internally. This can only work efficiently on a small scale so the largest possible size for an insect body is about 30cm or 100g. An insect has several hearts which pump blood through the body.

Insects were the first animals to evolve flight. Most have two pairs of wings. Bees, wasps and moths connect their two pairs of wings together and flies use just one pair. Their hindwings are reduced to club-shaped devices used for balance and to measure speed and direction of flight. A beetle's forewings have become hardened cases which protect the delicate hindwings. When the insect becomes airborne the wing cases are held up allowing sprung joints in the wings to unlock and the hindwings to unfold and begin beating.

The changing shape of the thorax

moves the wings. Muscles pull down the top of the thorax to force the wings up and when the thorax is pushed up again the wings drop.

Large compound eyes on an insect's head



contain many tiny eyes, each transmitting a small part of information to the brain. An ant has just a few 'eyelets' but a dragonfly can have over 30000. Additional small,

simple eyes on the top of the head detect light levels. Honeybees and butterflies can see ultraviolet light and appreciate special signs on flowers and other butterflies' wings. Antennae can be used to hear as well as touch, taste and smell. The scent of a female moth can attract a male from as far away as 11km. He uses both antennae to judge direction.

Considered the most primitive of the winged insects, creatures such as cockroaches, termites, grasshoppers and bugs have young forms (nymphs) which resemble the adults except that they do not usually have wings or reproductive organs until their final

Arthropods which are not insects

Spiders, scorpions, mites and ticks (arachnids) have

- two body segments
- four pairs of legs
- no antennae or compound eyes

Centipedes have

- At least 19 body segments
- A pair of legs to each segment

Millipedes have

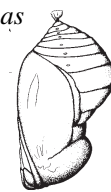
- At least 11 body segments
- Two pairs of legs to each segment

molt. They are said to go through incomplete, or gradual metamorphosis.

Other insects are unrecognisable in the junior form — caterpillars, maggots and grubs. Insects which go through what is known as complete or abrupt metamorphosis are considered more advanced, in evolutionary terms, and include flies, beetles, butterflies, wasps, bees and ants.

Butterflies and moths go through the most dramatic of these changes. Caterpillars are eating machines which can increase their weight by as much as 3000 times. When ready to pupate a cocoon is spun or a pupa (chrysalis) forms beneath the skin, the old skin falling away as the caterpillar twists and wriggles. The pupa hardens on contact with the air and inside the caterpillar dissolves into a soup, special cells building the winged adult. This takes as little as one to three weeks in the tropics. Some pupae are known to make clicking noises when disturbed, possibly to deter predators or alert ants which defend them.

The pupa of the crow butterfly has a striking metallic sheen. This may warn predators that it is poisonous; pupae are usually exceedingly well camouflaged.

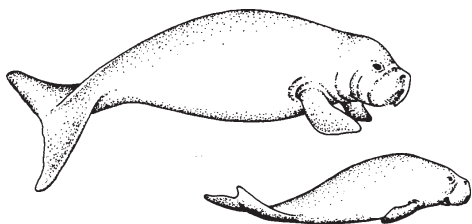


Out and about

The Great Barrier Reef Marine Park Information Manual and associated videos were launched by Warren Entsch MP in Cairns on 23 July 1996. Intended for reef tourism industry staff, a full set has been mailed to each permit holder.

Following the Question & Answers piece on threatened animals in *Tropical Topics* 36, Anne Reynolds of Marine and Coastal Community Network contacted us with this information about **dugong status**:

The number of dugongs in the Great Barrier Reef Region, south of Cooktown, has declined by 50 percent over the past eight years. In many areas this decline is over 80 percent. Populations of dugongs in this area are now considered to be critically endangered. The main threats are believed to be incidental capture in gill nets, indigenous hunting and habitat loss. (Marsh, H., Corkeron, P., Lawler, I.R., Lanyon, J. and Preen, A. (1995) *The status of dugong in the southern Great Barrier Reef Marine Park*. Report to the Great Barrier Reef Marine Park Authority. Unpublished.)



Early dugong babies will be born in August. Mothers come close inshore to calve, seeking protection from sharks. Mothers nurse infants for up to two years and may not carry another calf for another three to seven years.

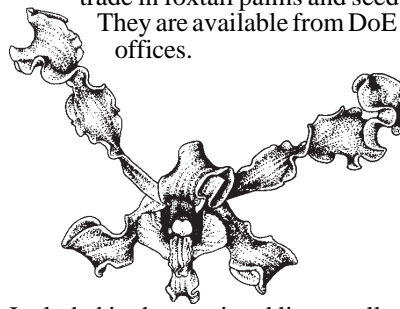
Please note

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

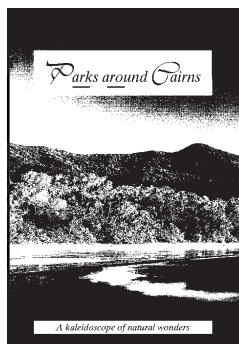
A series of pamphlets about the **native plants legislation** is available.

Collecting plants and plant parts from the wild and commercial trading in some native plants is controlled under the *Nature Conservation (Protected Plants in Trade) Conservation Plan 1995*. More than 1000 species are protected and 300 of the 8500 plants native to Queensland are restricted. *How are you affected?* gives general information and other pamphlets cover information for nursery owners, for plant harvesters, for recreational plant societies, for plant propagators and trade in foxtail palms and seed.

They are available from DoE offices.



Included in the restricted list are all epiphytic orchids, including this **golden orchid** (*Dendrobium discolor*). It often produces plumes of blossom in winter, especially if rain prompts this hardy plant to anticipate spring. It grows on mangroves, rainforest trees and even rocky headlands, producing flowering stems up to 60cm long.



Parks around Cairns, is a booklet, produced by DoE, with some outstanding photographs of the varied scenery and wildlife to be found in national parks around Cairns (and taken on days when the weather was on its best behaviour). An illustrative map in the centre shows the location of the parks, most of which are within 100km of Cairns. It would make a good souvenir — and a good present for residents to send to friends and relatives whom the wish to persuade to visit! It is available from DoE sales outlets, costing \$7.95. Bulk purchases are available at reduced cost. For wholesale enquiries contact Danuta Gur, Ph: (07) 3227 6887 or Fax: (07) 3227 8455.

Rocky Islets are the only known breeding site for the wedge-tailed shearwater within the Cairns Section of the Marine Park. Since there is a very real chance of trampling and damaging the nest burrows while walking on the islands, access restrictions have been in force between October and March each year. However, since the birds' nesting season extends beyond this period, restrictions have been extended to all year.

Reef Teach has moved premises.

This lively and informative slide show, suitable for all visitors to the reef, can now be experienced at the Boland's Centre, 14 Spence Street, Cairns (the block between Lake St and Abbott St), Mon-Sat at 6.15pm. Admission is \$10.

Intriguing insects

One calculation has put the number of individual insects in the world at any one time in the order of one thousand million thousand million — or a million insects per human being, together weighing 12 times as much as the human population. Some species are rarely seen but here we look at some representatives of those which are commonly encountered*.

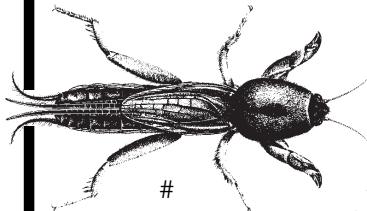
Grasshoppers and crickets

There are at least 2000 species of grasshoppers in Australia. They are divided into two main groups — short-horned grasshoppers, which are often called locusts, and long-horned grasshoppers.

Long-horned grasshoppers have ears below the knees on their front legs and produce noises by rubbing their wings together. Short-horned grasshoppers rub special pegs on their hind legs against the forewing and have eardrums on their abdomens. It is the pattern of pulses which is more important to them than the notes produced. We can hear only part of the noise.

The green colour of grasshoppers is due to pigments derived from their food; if raised on red petals instead of green leaves they can become quite pink.

An adult grasshopper has nearly 1000 different muscles. They can pull but not push so are arranged in groups which work in opposite directions. A grasshopper can jump a distance about 20 times its length, the equivalent of 36m in an adult male human.



Crickets are similar to grasshoppers in many ways, although they may eat other insects as well as vegetation. The mole cricket (left) has taken to living below ground in a burrow dug with strong clawed forelegs. It feeds on roots and small animals and males can sometimes be heard singing to attract a female, stopping temporarily if the ground vibrates. They sometimes find their way into houses where they scuttle rapidly across the floor.

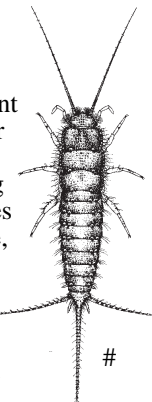
Termites

Although termites are also social insects, they belong to a different family to wasps, bees and ants, having evolved a social way of life separately. In fact they are much more closely related to cockroaches. Unlike ants, young termites hatch as nymphs, not as larvae, and their colonies have both queens and kings (ants, bees and wasps have no kings). Queen termites are among the longest-lived insects, reaching ages of over 25 and possibly even 100 years.

In common with other social insects, termites communicate by passing chemical substances, known as pheromones, around the colony. Pheromones from the queen, fed by the workers to the young, prevent them from developing sexually. From time to time the queen stops sending these messages and the young develop wings and leave the colony in droves. Those which survive predators mate and, as kings and queens, begin new colonies.

Silverfish

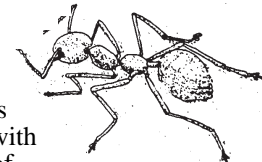
Silverfish belong to an ancient group of insects which never evolved wings. Like other insects they have six walking legs — but under their bodies are minute rudiments of more, a legacy from their many-legged ancestors. The silver sheen on their bodies is due to tiny reflective scales on their bodies. Apart from the familiar domestic species which feed on glues, paper and fabric there are others which live in leaf litter and under bark and stones or in ants' or termites' nests.



Bees, wasps and ants

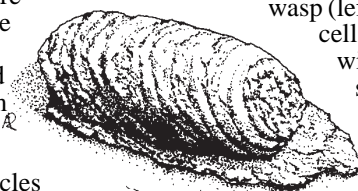


Only rarely does an insect meet its parent, exceptions being some unusually maternal earwigs and bugs, (notably the pretty harlequin bugs found on hibiscus plants) — and the social insects. Although some are solitary, most bees, wasps and ants coexist with the next generation and the females are helped by their offspring to raise subsequent generations. The colonies are in fact extended families, all children of one queen.



Bees, wasps and ants are the only insects with true stings, capable of administering poison. Most ants have lost their sting, the exception being bull ants which are considered a primitive form of ant and the evolutionary link with wasps and bees.

Along with certain fly species, some solitary wasps seek out living hosts for their offspring, laying eggs in or on insect larvae or spiders. The hatching grubs consume their hapless hosts. The mud-dauber wasp (left) builds mud cells and stocks each with paralysed spiders to feed its offspring. A special antibiotic in the wasp's venom prevents the spiders from decomposing. Adult wasps may take up to 18 months to appear from the cell.



Cockroaches

Not all cockroaches are pests. Those which we find scuttling around our kitchens are invariably introduced species. There are also over 400 Australian native species which live harmlessly under stones and logs. Their flat oval shapes enable them to squeeze into cracks. Sensory hairs on their legs respond to disturbance in the surrounding air and trigger leg muscles so a cockroach is up and running before it can think.

Like mantids, to which they are closely related, female cockroaches produce egg capsules. Hard and oval, they are sometimes deposited or carried around by the mother.

Beetles

Beetles are the most numerous of insect species. There are over 380,000 named species in the world (and many as yet unnamed) with about 28,200 in Australia, representing one third of all named insect species.

Characterised by their shell-like forewings, beetles are to be found in almost every environment except for the sea. They eat plants, wood, manure, other insects, dead carcasses, human foodstuffs ... almost everything. Some are useful to us — such as the ladybirds which feed on aphids and scale insects — or pests, such as the cane beetles or introduced furniture beetles (woodworm). In arid areas, where normal pollinators cannot survive, plants may rely on beetles to perform this essential service.

Residing only in the rainforests of the wet tropics, Mueller's stag beetle (below) is considered the most spectacular Australian beetle. Growing up to 6cm long its shell has a metallic green and purple sheen. Stag beetles are named for their antler-like mouthparts. Incapable of inflicting a bite because they do not close, they are used in grappling duels between rival males during which one may lift another off its feet. Inhabiting the forest canopy, they are rarely seen although they are sometimes attracted to lights. Eggs are laid in rotting logs but pigs are particularly good at detecting and consuming the plump white larvae.

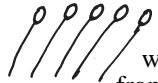




In dry sandy areas it is common to see little conical pits belonging to antlions. After hatching from eggs, each of these larval creatures burrows backwards into the sand flicking loose grains away with its head. It then hides at the bottom, with only its elongated mouthparts showing, waiting for lunch to literally drop in. When a small insect, often an ant, loses its footing and falls into the pit the antlion automatically flicks sand at it which further dislodges its scrambling victim. When it comes within reach the antlion grasps the victim with its pincer-like mouthparts and sucks it dry. Curiously, the antlion does not have a bottom and does not excrete waste until it becomes an adult. Adults (right) are closely related to lacewings and are also carnivorous.



The female green lacewing lays clumps of eggs attached to the top of long white stalks. This may prevent the larvae, which have cannibalistic tendencies, from reaching their siblings. They feed on aphids and scale insects, camouflaging themselves by wearing the remains of their prey on their backs attached, along with bits of debris, by special hooks. It has been calculated that three to four hundred aphids are eaten before the young lacewing is ready to pupate.

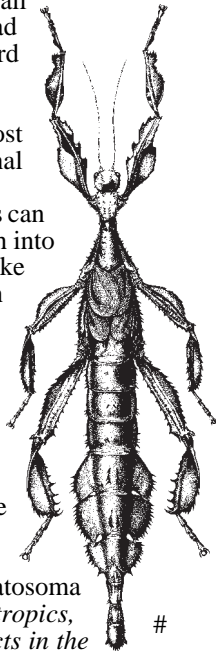


Stick insects

Despite sometimes exceeding 30cm in length, these vegetarian masters of disguise remain incredibly difficult to find. If disturbed they sometimes fall to the ground and play dead and may deliberately discard a limb if handled.

Stick insects fly poorly, most females having no functional wings at all. Males are sometimes rare but females can lay fertile eggs which hatch into females. These eggs look like seeds and, as mentioned in *Tropical Topics 35*, are sometimes taken by ants into their nests where a protein-rich attachment to the eggs is eaten, the undamaged egg remaining safely underground, sometimes for years, before it hatches.

The spiny stick insect, Extatosoma tiaratum, found in the wet tropics, is one of the heaviest insects in the world.

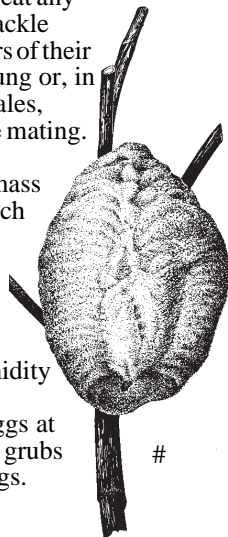


Mantids

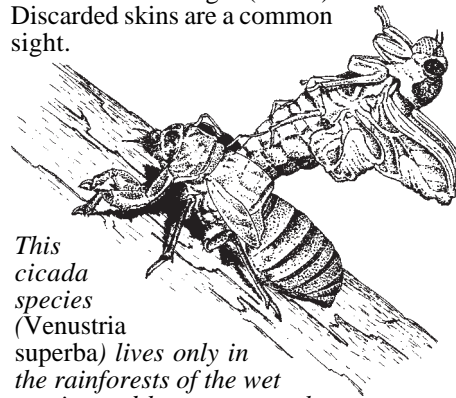
Like a stick insect, a praying mantis is well camouflaged, those on leaves being green and those on bark grey or brown.

A praying mantis has excellent vision and can judge distance well. Its front legs are equipped with sharp spines and held under its head in an apparent attitude of prayer, but swiftly unfold to snatch prey. (Unlike the mantis shrimp — see *Tropical Topics 36* — the insect traps its victim *under* its legs while the crustacean uses an upward movement.) Mantids will eat any insects small enough to tackle including smaller members of their own species, whether young or, in the case of the larger females, males with whom they are mating.

Eggs are laid in a frothy mass of bubbles and liquid which hardens, on a branch or post, into a blob of polystyrene-like material about the size of a plum. This may preserve the correct conditions of humidity and temperature. Often a parasitic wasp lays her eggs at the same time, the young grubs consuming the mantis eggs.



This cicada species (Venustria superba) lives only in the rainforests of the wet tropics and has an unusual frog-like call.

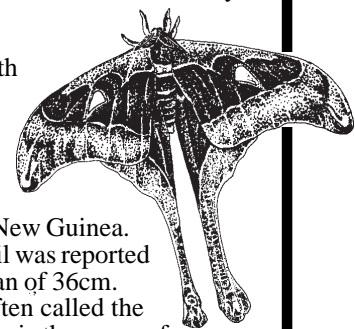


Butterflies and moths

The only real difference between butterflies and moths is the device used by moths to lock their wings together in flight. All butterflies, apart from the male regent skipper, lack this. Moths usually spread their wings when at rest while butterflies hold theirs together. Although many moths are nocturnal some also fly by day.

The Hercules moth (right) is the largest moth in the world and occurs only in north-east Queensland and New Guinea.

One from Innisfail was reported to have a wingspan of 36cm. This species is often called the atlas moth but this is the name of a smaller species from the Darwin area. In common with some other moth species, the adult females have no mouthparts and die when they have used up accumulated fat. Caterpillars can grow to 10cm.



Flies and mosquitoes

Using just one pair of wings, flies are exceptionally mobile flyers. Mouthparts are adapted to sucking or piercing and sucking, solid food dissolved in saliva and the liquid sucked up.

Male mosquitoes feed on plant sap or nectar, only the females feeding on blood, necessary before eggs can be laid. Males hear with their antennae, detecting the hum made by the female beating her wings, up to 500 times a second. March flies also feed on the blood of humans and animals but do not transmit diseases.

There are over 80 species of mostly native fruit flies in Australia, nearly all of them harmless. Fruit flies lay their eggs (or 'sting') fruit, the developing larvae causing it to become soft and decayed. Fruit growers often avoid problems with fruit flies by picking the fruit before it is ripe and attractive to the flies, but the papaya fruit fly (right) 'stings' unripe fruit. That is why, when it appeared in Queensland in 1996, it was important to bring it under control. It can be identified only by microscopic examination according to details such as markings on the abdomen and stripes on the legs.



Questions & Answers

Q Many rainforest nuts with hard shells have very small holes in them, presumably made by white-tailed rats. How does the rat manage to remove the seed — or does it leave it for ants to consume?

A White-tailed rats have very long, strong, lower incisors which can not only pierce the shells but also break up and remove the seeds. Very small holes may have been made by boring beetles.

Q A frog regularly blocks my laundry sink, remaining in place as the water slowly drains. How long can a frog remain underwater?

A It appears that the Australian lace-lid (*Nyctimystes dayi*) is capable of remaining under a rock in a stream for up to three months; frog skin is permeable, allowing oxygen to pass through.

Frog skin also allows less benign substances to permeate. Children in a Cairns pre-school were upset one morning recently to find all 'their' green tree frogs dead. It seems that gardeners had been spraying with a glyphosate weed killer and this is the most likely cause of the casualties.

If you are spraying with these types of weedkillers please consider the frogs and keep the spray well away from waterways. It is also best to use them in cool, dry weather since a warm damp night in winter will entice frogs to leave their hiding spots and make contact with the sprayed vegetation.

Those people who keep frog breeding ponds need fish in the water to control mosquito larvae. Some species, however, will also eat tadpoles and young frogs. Suitable

native fish for the job are the smaller rainbowfish including blue-eyes. McCulloch's rainbowfish, splendid rainbowfish, Pacific blue-eye, fly-specked hardyhead and firetail gudgeon are species which should be easy to obtain. Although these are native Australian fish, not all are native to this area and care should always be taken not to introduce them into local waterways.

Some aquatic insect larvae and adults also eat tadpoles and small frogs and should be removed from ponds. These include water beetles, giant water bugs, whirligig beetles, damselfly and dragonfly nymphs. On the other hand, backswimmers and water boatmen are useful.

Facts and Stats

on invertebrates

Worldwide, at least 750 000 insect species (and 130 000 non-insect arthropods) have been named. However, many more have not yet been discovered and/or named. It is thought there may be as many as 10 million unnamed insect species.

In 1926 the number of insect species recorded in Australia totalled 37 300. In 1970 this had increased to 54 071 and in 1990 to 85 920. Many more remain to be named and recorded.

You can tell the temperature on a warm night by timing the chirps of tree crickets and, if you know the species, applying a mathematical formula.

The Australian bombardier beetle, which is black with yellow spots, has an impressive defensive system. When the insect is alarmed, certain chemicals, produced by its glands, are mixed with an enzyme. The chemicals react, producing oxygen, the pressure of which causes the chemicals to explode from the back of the beetle with a loud bang, usually in the face of the attacker.

Of the 385 named Australian species of butterflies, 86 percent occur in Queensland.

Dragonflies are the fastest insect flyers, reaching speeds of 58 km/h.

Butterflies have chemical sensors on their feet and abdomen tips which 'taste' plants to find the correct ones on which to lay eggs.

Only worker termites gather food. They feed the queen and king as well as the soldiers whose defensive jaws prevent them from gathering their own food. Termites have yet tinier organisms, protozoan, in their stomachs which break down cellulose.

No one is sure of the function of the pincer-like appendages at the tail of an earwig — but sound receptors are found in its tail.

The largest cockroach in the world, *Macropanesthia rhinoceros* lives in north Queensland. It reaches lengths of 65mm and lives under the ground.

Insect shells (like those of crustaceans) are made from chitin which is chemically similar to cellulose, but covered with a protein called sclerotin which makes it hard enough, in some cases, to allow the insect bite through wood or even metal.

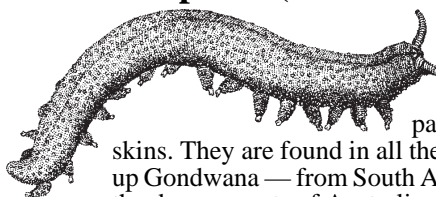
Tourist talk

ENGLISH	GERMAN	JAPANESE
invertebrate	wirbellose Tiere	musekitsui 無脊椎動物 dobutsu
insect	Insekt	kon chu 昆虫
beetle	Käfer	kou chu 甲虫
cicada	Zikade, Grille	semi 蟬
praying mantis	Gottes-anbeterin	kama kiri カマキリ
stick insect	Gespenscheuschrecke	nana fushi ナナフシ
grasshopper	Heuschrecke	batta バッタ
cockroach	Kakerlake	gokiburi ゴキブリ

Some other invertebrates

The majority of invertebrates in the wet tropics are insects but there are some important ones from other groups.

Peripatus (do it with their heads)



Peripatus are often called velvet worms for the flowing motion produced by their many legs (14-43 pairs) and their soft-looking skins. They are found in all the continents which once made up Gondwana — from South America to Africa — including the damper parts of Australia. In the wet tropics they can be found in damp leaf litter and rotting logs.

Peripatus are carnivores. When one encounters prey such as a cricket or beetle it shoots jets of slime out from its head which harden and trap the victim.

Some species of peripatus have a pretty bizarre sex life. On the male's head is a pit adorned with hooks or spikes. At mating time it seems that the male scoops a packet of sperm from his genital opening and stores it in the pit on his head. Then, when he finds a mate, he attaches himself, head first, to the female's genital opening.

Some peripatus females give birth to live young, which are often tiny white versions of the parents, while some species have even developed a type of placenta through which the young are nourished — a parallel with the evolution of reproduction in placental mammals. Australia and New Zealand are home to the only peripatus species which lays eggs, which have been recorded as taking 17 months to hatch.



Slugs and snails ...

Perhaps not the most charismatic creatures of the rainforest, the molluscs are a set of invertebrates with an important role to play. They are certainly popular with pittas, those beautiful ground dwelling birds whose feeding sites are littered with smashed shells.

The snail fauna of the wet tropics is particularly diverse. Many live in the tree tops and, as a result, have not been studied extensively. Others are ground dwellers, the largest, *Hadra bipartita*, growing to 7cm across.

One family of peculiar semi-slugs are common in the wet tropics. Half way between slugs and snails, helicarionids are too large to fit into their small, thin shells and rely on their moist environment to prevent them from drying out and their good camouflage to hide them from predators. Like marine cowries, these snails cover their shiny shells with a protective layer of mantle when stationary. Members of this family may be in the process of losing their shells in favour of a slug-like existence; slugs can crawl through narrower gaps. True slugs, however, are not common in the wet tropics, the one exception having a form at the top of Mt Bellenden Ker which is bright red.

Worms

Worms are so diverse in form they take up about 20 phyla (main animal groups). The most familiar, earthworms, are segmented worms but there are also many other types of free living and parasitic, terrestrial, marine and freshwater types.

A recent study of terrestrial flatworms in Queensland increased the number of named species in the state from nine to 62. Many of these were found in the wet tropics, this moist area suiting them because they die if they dry out. Flatworms are long and flat ranging in length from 5 to 100mm. Mainly nocturnal, they glide along on a track of slime but can crawl rapidly and are sometimes mistaken for leeches. They eat earthworms, small insects, slugs and snails, capturing prey with sticky secretions. Some scavenge dead animals. Flatworms are the simplest animal to possess a true brain and have a simple form of memory.

Arachnids

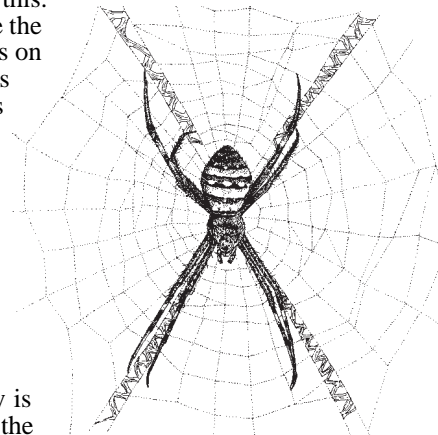


Unlike insects the arachnids — spiders, mites, ticks and scorpions — have only two body segments with the head and thorax combined as one cephalothorax. They have four pairs of legs instead of three and no antennae.

Only the larvae of insects have silk glands but all spiders are able to spin. Ground dwelling hunting spiders use silk chiefly for nest linings and egg sacs but about one third of Australian species construct webs, the hallmark of this animal group. Never having developed wings, this has been the spiders' method of keeping up with their flying insect prey.

It has recently been discovered that the webs of some spiders reflect ultra-violet (UV) light. Natural UV light comes from the sun and sky, and insects use this to guide them into open spaces. If a UV-reflecting web is across their path they may be confused and blunder into it.

It is thought that some spiders exploit the tendency of some flowers to produce UV-reflective patterns. These can only be seen by certain pollinating insects, such as bees, which are thus guided to the nectar and pollen. Some spiders, however, may imitate this. The silk used to make the prominent white cross on the St Andrew's cross spider's web (right) is unlike any other silk used in web construction — and it reflects UV light. When resting in its web, the spider generally holds its eight legs in pairs, aligned with the arms of the cross. It seems that the spider's body is also UV-reflective so the whole effect may be deceptively attractive to insect pollinators, particularly as the spider tends to build its web close to flowering plants.



Web-weaving spiders do not become stuck on their own webs because the silk threads slide through special claws on the ends of their feet.

Bookshelf

An Introduction to Australian Insects
P.W. Hadlington & J.A. Johnston
NSW University Press (1990)

Australian Insects in Colour
A. Healy and C. Smithers
Treasure Press (1989)

***The Insects of Australia**
CSIRO Melbourne University Press
(1991)

In two large detailed volumes, this is a textbook for students and research workers but also has much of interest for the amateur. Excellent illustrations (some used in this newsletter with kind permission).

Children's books (usually very informative and well presented)

The Alphabug book (Australian insects)
Helen Hunt
Lothian Publishing (1978)

The Australian Environment—Insects
R. Pinchin
Mulavon Pty Ltd (1986)

See Through Insects D. Burnie
Reed International Books (1995)

Focus on Insects J. Parker
Aladdin Books (1993)

Insects — a world of diversity
CD-ROM by CSIRO with teacher's kit
For information call (03) 418 7217 or
(008)034282.

Magazine articles

Australian Natural History
Vol 22 No 12, pp572-579: *Peripatus: Up Here for Thinking?*

N. Tait & D. Briscoe
Vol 23 No 3, pp220-224: *Fabians of the Forest* (snails/slugs) B. Scott

Vol 24 No 9, pp68-69: *Velvet Worms: Non-missing links* M. Archer

Nature Australia
Vol 25 No 2, pp 20-21: *Mud-slinging spider stingers* (wasps) S. Van Dyck
Vol 25 No 3, p7: *Head Start for Peripatus*

P. Meredith
and p8: *UV invitations* (spider webs)

B. Randell
Vol 25 No 4, pp30-38: *When an insect is more like a plant* (stick insects) L. Hughes

Wildlife Australia
Vol 32 No 1, p30-31: *The long, cool worm in a velvet dress*
M. Reid

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)40466674
Fax: (07)40466751
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)40520555
Fax: (07)40311364
Website: www.wettropics.gov.au

