Tropical Topics

An interpretive newsletter for the tourism industry

Wet Tropic Webs Vol 1 No. 13 July 1992

Notes from the Editor

Plants and animals use each other in a variety of ways. Only plants can produce food from soil, sun and water so many animals use them as a food source as well as for shelter. Animals, on the other hand, are able to move around - so plants utilise them to carry their pollen and their seeds. And, of course, plants use other plants - and animals make use of each other as well.

When both participants in an association are entirely dependent on each other the relationship is a symbiotic one. Often, however, both parties benefit from each other without being dependent in which case it is referred to as mutualism. Then, as with parasitism, one party may benefit to the disadvantage of the other. Alternatively, one party may not be affected at all. In addition, many relationships are not exclusive but involve several parties in a complex web of interactions which become increasingly fascinating as we discover more links.

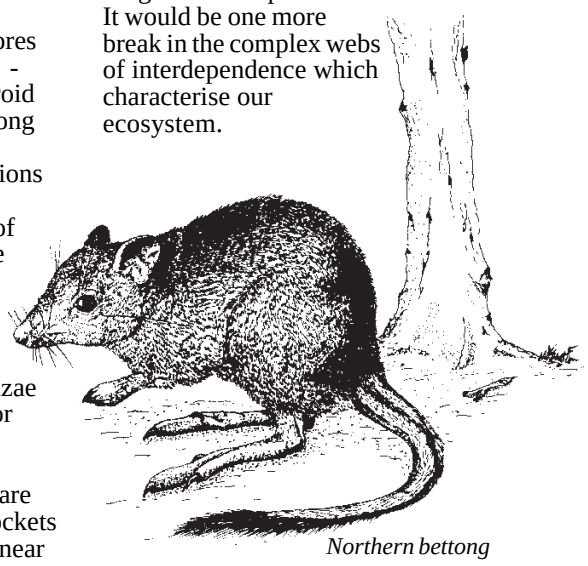
This topic of interrelationships turned out to be a massive subject. As more and more intriguing details came to light it seemed a pity to cram everything into one newsletter so this theme will be spread between two issues. This one deals with the a particularly strong relationship between plants and animals - pollination. Then the centre spread is devoted to ants, gregarious insects which get mixed up with their fellow flora and fauna in all sorts of ways. In a few months you will find Wet Tropic Webs II coming your way while next month's marine issue will tackle the same subject on the reef.

Truffles, treeroots, bettongs and foxes

Some fungi are parasitic on living wood and give no benefit to their hosts. However, there are a number of specialised fungi, called mycorrhizae, which form associations with plants which benefit them both. They wrap themselves around the roots, lightly penetrating them, and feed on sugars produced by the plants from photosynthesis. In return the fungi feed water and elements such as nitrogen and phosphorous into the roots. These associations are common and are important to plants in Australia where soils are relatively poor in nutrients. A plant may die when deprived of the benefits of this symbiotic relationship.

Some of these fungi send their fruiting bodies - familiar to us as toadstools or mushrooms - above the ground where wind and other forces disperse their spores. On the other hand, some mycorrhizae fruit below the ground. In rainforest the fruiting bodies tend to be small and close to the surface and can be dispersed by cassowaries or any foraging animals which pick up soil with their food. However, in drier areas mycorrhizae produce truffle-like fruiting bodies further below the ground. For dispersal of their spores they rely on the help of mammals - particularly members of the potoroid family, such as the northern bettong (*Bettongia tropica*). This little marsupial makes shallow excavations in the ground, feeding on bulbs, tubers, roots and large amounts of fungi. The spores of the fungi are not spoiled in the bettong's digestive tract; in fact the journey may enhance their germination prospects. It is the main disperser for these mycorrhizae and is therefore very important for maintaining healthy forests.

Enter the fox. Northern bettongs are not common and exist in small pockets but the recent sightings of foxes near Kuranda and not very far from a major bettong population concentration has alarmed researchers. Not only is another of our marsupials at risk from an introduced species (which is thought to have moved north, following an increase in rabbit populations on the Atherton Tableland) but its loss could deprive the mycorrhizae of their main disperser and the forests, in turn, of some of the fungi which help to feed them. It would be one more break in the complex webs of interdependence which characterise our ecosystem.



Northern bettong

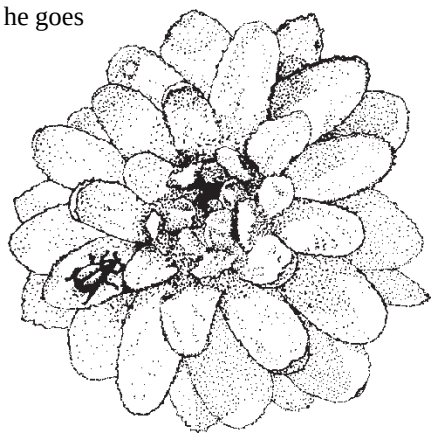
The Wet Tropics Management Authority and ANPWS are jointly funding a study of population numbers and distributions of the northern bettong. The study also looks at species of mycorrhizae eaten and dispersed, and the role of fire.

WET TROPICS
WORLD HERITAGE AREA

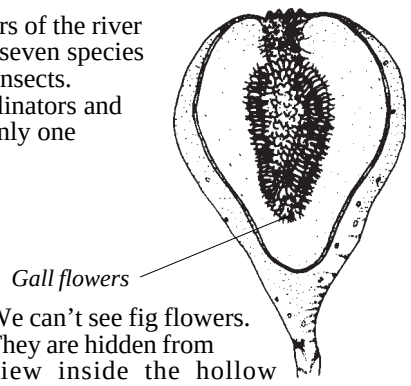
Go-betweens

Pollination is one of the tightest mutualisms between plants and animals. In Australian rainforests wasps, bees, ants, beetles, flies, butterflies, moths, thrips, cockroaches and other insects as well as birds, bats, possums, rats and marsupial mice are all potential pollinators.

Usually food is offered by the plant as a reward for pollination services but sometimes other appetites are appealed to. Orchids of the genus *Cryptostylis* have discovered how to make use of the sex drive of an ichneumonid wasp, *Lissopimpla excelsa*. The flower looks and smells like a female wasp to the extent that the male wasp tries to mate with it. In the process he becomes covered with pollen and then, not having learned from his mistake (or perhaps even noticed it) he goes off to repeat the experience with another flower! This is not a mutually beneficial relationship — the flower wins this one!



Despite this example and others below, it is fairly rare for plants and pollinators to have a one-to-one relationship. No fewer than 44 species have been recorded visiting the flowers of the river cherry (*Syzygium tierneyanum*) including a bat, seven species of birds, nine butterflies, 16 moths and 11 other insects. Probably most plants depend on a variety of pollinators and vice versa. To rely on only one food source or only one pollinator is a risky business.



The flower of the pipe vines, *Aristolochia* species, holds its pollinators captive. Tiny flies are attracted to the flower by its mousy smell. Following the odour they move further into the bulbous end of the flower but are unable to get out because of downward-pointing hairs which trap them. Inside, the female parts of the flower are active and receive pollen from any flies which have carried it in with them.

During the night the female parts of the flower become unreceptive and the male stamens become active, shedding pollen on the flies as they fly around trying to escape. In the morning the hairs have wilted and the flies are able to escape, bearing their load of pollen to the next flower where the process begins again.

The timing involved, with female parts ripening before male parts, is a common strategy to avoid self-pollination. If the pollinators have been doing their job, the female parts have been cross-fertilised by the time the stamens begin to produce pollen.

We can't see fig flowers. They are hidden from view inside the hollow rounded fruit and only tiny wasps of a particular kind (Agaonidae) ever visit them. Three types of flower line the inside of the fig — male, female and gall flowers. The female wasp flies in a small hole at the top of the fig and, before dying, lays her eggs in one of the special gall flowers at the bottom of the fig.

When the male wasps hatch, they seek out the females, mate with them (before they have emerged from the gall flowers) and die. The females then swarm around the inside of the fig, cross-pollinating the male and female flowers, before escaping through a hole chewed in the side and flying off to other figs to begin the process again.

Tropical figs tend to fruit all year so the wasps' reproductive cycle is not broken (and there is a permanent supply of food for birds, and so on.)

The details of pollination differ slightly from species to species, each fig being pollinated by its own particular wasp species, but in all cases neither wasp nor fig could reproduce without each other. It is a strictly symbiotic relationship.

The rainforest shrub bolwarra (*Eupomatia laurina*) is one of the primitive flowering plants of the Wet Tropics. Strangely, what appear to be creamy, heavily perfumed petals are, in fact, sterile stamens (the male pollen-producing parts of the flower) which are fused together. They resemble petals and have taken on the function of petals, attracting tiny weevils of two species which are the flower's only pollinators.

While climbing around and feeding on the 'petals' the weevils carry pollen from adjacent fertile stamens to the female stigmas. The weevils then mate and lay eggs on the 'petals'. After a day the spent flower falls to the ground where the eggs hatch, the larval weevils feeding on the stamens until they pupate and emerge as adults in 14-16 days.

What the weevils feed on until the bolwarra blossoms a year later is unknown, but wherever bolwarra flowers open, even when taken to forest areas where the plant does not exist, the weevils appear within an hour. No other insects are found on this flower so if the weevils were to become extinct the bolwarra would probably follow.

The first pollinators

Early plants relied on the wind to carry pollen but about one hundred million years ago some plants began to use flying insects as pollen couriers. Beetles had fed on the pollen of the early cycads and were the first to be used by flowering plants before the evolution of nectar involved bees, flies, butterflies and birds. By 40-50 million years ago flowering plants had overtaken more primitive forms of vegetation.

Birds, not bees

Birds, like bats, are important pollinators in the tropics. Worldwide there are said to be 2000 bird species of 50 families which visit flowers regularly, two-thirds relying largely on them for food.

This relationship is of particular significance in Australia where more than 70 different honeyeater and lorikeet species are nectar-feeders and over 1000 plant species are bird-pollinated. By comparison, there are no bird-pollinated flowers in Europe.

Bird-pollination involves our major plant families (eucalypts, grevilleas, banksias and melaleucas) and our two major bird families (honeyeaters and parrots). Possibly a lack of large social bees in the distant past led to this close dependence. In any case, it has played a central role in the evolution of Australia's distinct flora; Australia (and neighbouring islands) is the only place where the dominant trees are bird-pollinated.

Our bird pollinators are also particularly large — Africa's largest sugarbird is one-third the weight of our rainbow lorikeet.

Since birds cannot smell, these flowers are frequently brightly coloured and produce copious quantities of thin nectar. They are also sturdy enough to hold a bird's weight and are often produced on main branches and trunks. Some pollination may also take place incidentally as birds visit flowers to feed on insects.

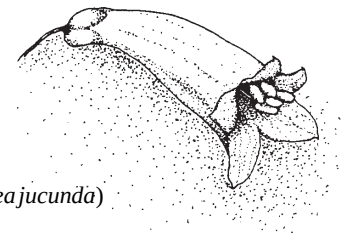
*Scarlet satinash (*Syzygium erythrocalyx*) and bumpy satinash (*S. cormiflorum*) are trunk-flowering trees of the Wet Tropics. Their flowers are pollinated by blossom bats, birds and insects.*

Persuasive plants

Tropical forests are famous for the diversity of species but how, when trees of the same species generally occur too far apart for reliable wind pollination, do they manage to persuade animals to carry the pollen from one to another? Large animals, such as bats and birds, are very important but scientists have discovered strategies which may also encourage insects to make the journeys.

Stonewood (*Backhousia hughesii*)

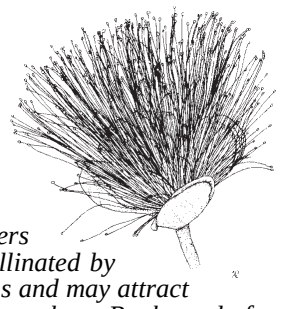
- Some trees produce masses of blossom, attracting a large number of pollinators. Aggression between competing visitors may provoke some to move to the next tree. Alternatively, most of the pollination may take place towards the end of the flowering period when the insects run out of food and are forced to move on. Relatively few seeds are produced by these types of trees.
- Small, inconspicuous flowers produced over a longer period of time may attract certain insects (moths and bees) which fly along the same route each day often covering quite large distances. Seed production in these species is high.
- Some species have male and female trees. The male trees flower first so when the female trees are ready, 1-4 days later, there are plenty of insects covered with pollen.
- Female flowers, without nectar, can mimic male flowers, encouraging the foragers to move between them.
- Many trees synchronise their flowering but some species may produce flowers or nectar at slightly different times to encourage movement of insects.



Jungle vine (*Neosepicaea jucunda*)

Age brings wisdom

Why do some flowers change colour as they get older? It is thought that by retaining old flowers the plant increases its long-range attractiveness to pollinators. At closer range, young butterflies have been observed to visit all flowers while older butterflies visit only the younger, sexually viable flowers. Presumably these insects learn from experience.



*Flowers of the box fruit (*Barringtonia asiatica*) blooms only in the late afternoon or evening. Its flowers are probably pollinated by large hawk moths and may attract lightly-built blossom bats. By the end of the night the petals and the mass of stamens have fallen to the ground.*

*The scarlet flowers of the coral tree (*Erythrina variegata*) welcome pollinators with generous amounts of nectar.*

Flower strategies

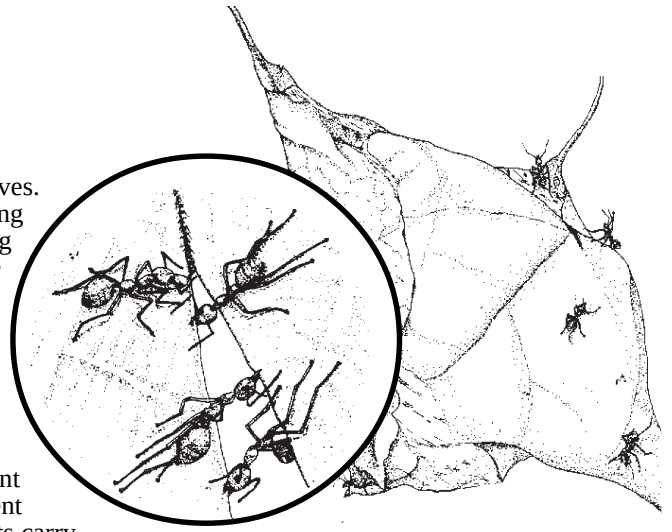
To avoid pollen being wasted on the wrong species of plant as the pollinators move around, many flowers have developed characteristics which appeal to certain types of pollinators. Strategies include:

- producing yellow, blue and purple flowers which can be seen by bees as well as special markings which indicate the location of the nectar. These are visible to us only under ultra-violet light.
- producing abundant pollen instead of nectar to attract bees and certain beetles.
- keeping the nectar at the end of long tubes where it can be reached only by birds or insects with long tongues (smaller insects being excluded by hairs). Others can be opened only by heavier animals.
- producing a strong scent at night to attract moths and bats. These flowers are usually pale-coloured.
- imitating the smell of rotting meat, to attract fly pollinators.
- flower construction designed so that the visiting insect first encounters the female part which receives any pollen being carried. The insect then moves further into the flower where it encounters the stamens and collects another load of pollen while attempting to reach the nectar.

Witches tongues (*Clerodendrum tracyanum*)

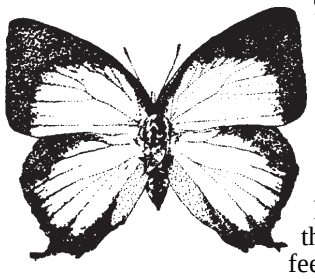
Ants in the plants

Ants are great mixers

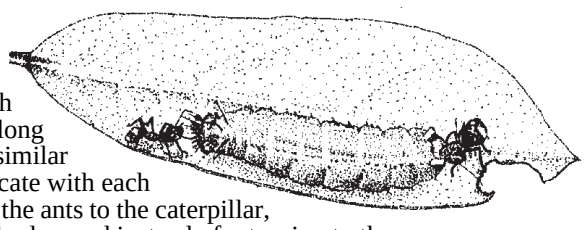


Green tree ants (*Oecophylla smaragdina*) build their nests from leaves. Working as a team they bridge the gap between leaves — sometimes forming chains to do so. They draw the edges of the leaves together and then, using their own larvae as 'glue-sticks', join the leaves with silk produced by the grubs. The ants benefit by having a home but the tree also benefits because its branches and leaves are swarming with aggressive defenders ready to attack most leaf-eaters which approach their home.

The ants, however, are willing to share their home with another creature — the caterpillars of some butterflies in the Lycaenidae family (which includes the 'blues' such as the common oakblue, below). When laying eggs the female butterflies often search not only for the correct food plant but also for the presence of ants (different species associate with different species of ants). When the eggs of some butterfly species hatch, the ants carry the little larvae into their nest. As they grow they are attended by the ants which clean them and probably protect them from predators and parasites. (The skin of caterpillars attended by ants is thicker than the skin of other caterpillars.) The ants also guide the caterpillars when they emerge from the nest to feed on leaves at night.



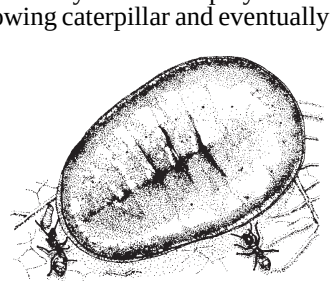
The ants' reward is a sweet substance, referred to as honeydew, a mixture of sugars and amino acids produced by the caterpillars. It is thought that this substance, apart from feeding the ants, may also reduce their aggression towards the caterpillars. It has also been observed that some caterpillars, when disturbed, perform jerky movements which, although driving away some attackers, often provokes aggression in ants. This behaviour, however, is not found in lycaenid larvae and may be a further adaptation to their association with ants.



These caterpillars may also actively attract ants by calling! Some have been recorded producing a vibratory sound which carries for up to five centimetres along stems and leaves. This may mimic similar calls used by the ants to communicate with each other. Certainly it seems to attract the ants to the caterpillar, keeping them with it to provide a bodyguard instead of returning to the nest after feeding on its honeydew. When the vibratory papillae used to make the call were experimentally removed from some caterpillars, they did not receive such good protection against enemies.

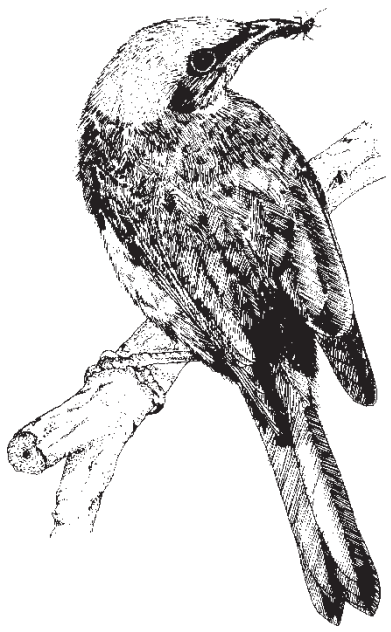
While some of these caterpillars can survive without the ants, others cannot. When separated, experimentally, some species refused to eat while others became mouldy and died.

In spite of their bodyguards, however, the caterpillars are not completely safe from parasitic wasps and flies. An adult fly may lay her eggs on the leaf of the food plant where they are eaten up by the caterpillar. The eggs then hatch and develop inside the growing caterpillar and eventually emerge from it or from the pupa.



Not all caterpillars have such a mutually beneficial relationship with ants. Some, instead of providing food for the ants, feed on their unwilling hosts' larvae. Notable among these are the larvae of the ant butterfly (*Liphyra brassolis*) which find their way into green tree ant nests from eggs laid nearby. They are protected by a very tough, flat, shield-like skin and, when hungry, drag ant larvae underneath it for a meal (above right). Unlike other butterflies these caterpillars produce their soft pupae inside the protection of their final larval skin. When they emerge as butterflies they are covered with loose scales which stick to the antennae and mouths of attacking green ants, allowing them to make their escape from the nest.

Other insects such as aphids, scale insects and leaf hoppers also produce honeydew and are also herded by ants.



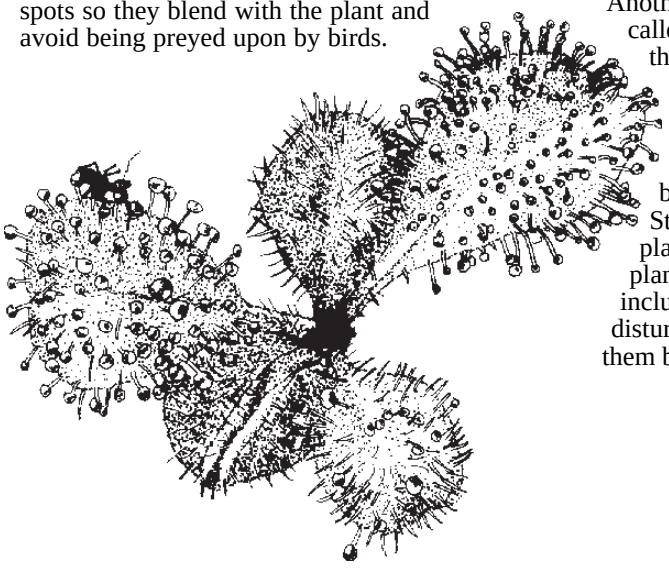
Various bird species are able to make good use of the defensive fluid, formic acid, which ants produce, to kill ectoparasites such as lice and ticks as well as fungi in their feathers. They do so by picking up an ant in their beak and running it over their plumage, particularly the inside of their wing feathers. Another strategy is to squat over an ants' nest with wings spread and passively 'bathe' in ants by letting them run all over it. 'Anting' has been reported in various species including satin bowerbirds, currawongs and many honeyeaters, particularly eastern spinebills.

The aggressive green tree ants themselves are not immune from attack. A spider (*Amyciaea albomaculata*) mimics the body shape and colour of the green ants. From behind, its abdomen resembles an ant's head with two black spots for eyes. At the other end it raises its long front legs in imitation of an ant's antennae so it looks like the front of an ant at both ends! It is thought that when the spider hangs from its silken thread it resembles an ant in trouble but when the unsuspecting companions come to help it they are ambushed instead!

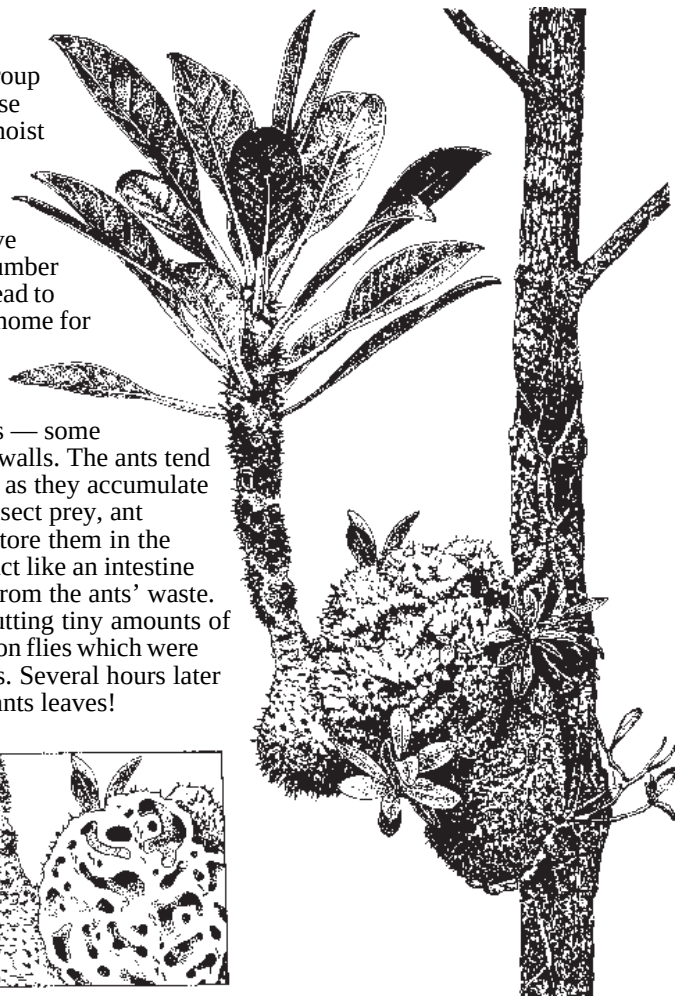
Spiders are not the only enemies in disguise. An appropriately named assassin bug also closely resembles a green tree ant and joins their trails, pouncing on its unsuspecting prey. One of its relatives in the Reduvid family (subfamily Holoptilinae) has another strategy for capturing ants. From a gland on its abdomen it secretes a substance which they find irresistible. It is, however, a narcotic which makes the ants, once under the influence, very easy prey!

Ants do not have it all their own way. They are a favourite prey of insectivorous plants — those plants which live in areas of poor soil nutrients and rely on insects as an additional source of food. The most common of these insectivorous plants in our area are the various drosera, or sundews. When ants and other insects wander on to a leaf they are trapped by the long hairs and sticky droplets which cover the surface. Over a few days the leaf slowly closes, the sticky droplets gradually digesting the trapped insects.

But living on the sundew are predators which beat the plant at its own game! Tiny bugs, of the genus *Setocoris*, are adapted to avoid the sticky droplets and can move about extracting juices from snared insects. They are coloured green with red spots so they blend with the plant and avoid being preyed upon by birds.



One particularly interesting group of epiphytic plants not only use trees, such as paperbarks, to hoist them closer to the light but also depend on certain ants (of the genus *Iridomyrmex*) for food. These ant-plants have short bulb-like stems with a number of small natural holes which lead to tunnels. This makes a perfect home for ants — and they invariably move in.



There are two types of tunnels — some smooth and some with rough walls. The ants tend to live in the smooth ones but as they accumulate rubbish, such as remains of insect prey, ant corpses and droppings, they store them in the rough-walled tunnels. These act like an intestine absorbing valuable nutrients from the ants' waste. Researchers proved this by putting tiny amounts of a harmless radioactive 'label' on flies which were captured and eaten by the ants. Several hours later the 'label' turned up in the plants leaves!

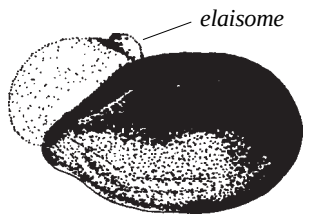
The ants are not the only residents of the ant-plant. Another member of the Lycaenidae butterfly family, the Apollo jewel, spends its larval stage inside the plant too, feeding honeydew to the ants which tend it and eating the ant-plant tissue and leaves. Thus there is a mutually beneficial relationship between the ants and the plant as well as between the ants and the butterfly, the butterfly depending on the plant for food while all of them ultimately rely on the tree which hosts the ant-plant.

Unfortunately ant-plants are being taken over by colonies of ants which have been introduced to Australia. They do not appear to take care of the butterfly larvae and the seeds of ant-plants in which they live do not set well.

To prevent disease breaking out in their colonies, many ants smear themselves with a substance which is a powerful antibiotic. A pollen grain which comes into contact with it dies within minutes so ants are not good pollinators (although there are exceptions). Possibly because of this, the small white flowers of the ant-plant are designed to prevent ants from reaching them.

Ants are major predators of many seeds, especially eucalypts. Plants in dry areas therefore benefit from fire. Apart from opening the seed cases, fire produces an ash bed which discourages ant mobility, and allows the seeds to escape predation.

Another strategy for plants is to attach a food parcel, a nutrient-rich structure called an elaiosome, which encourages the ants to carry the seeds back to their nests. The ants then eat the elaiosome and discard the seed. In return for providing food, the seeds are carried away from the competition of their parent tree, they are planted in a nutrient-rich environment (the ants' waste heap) where they may be hidden from bush fires, and are protected by the aggressive ants from other seed-predators. Some may be scarred in the process, but this may actually enhance germination. Studies have found that seeds in ants' nests produced more successful plants than those in other places. It is estimated that about 1500 Australian plant species have seeds with elaiosomes. These include wattles and acacias growing in disturbed rainforest areas. No eucalypts have them but most acacias do.



Questions & Answers

Q Does a parrotfish produce only one mucous cocoon a night and if it is ruptured does it suffer any adverse affects? While the fish is in the cocoon how does oxygen transfer take place?

A It is not certain whether one cocoon is formed. The most detailed observations have been on four Atlantic species and where cocoon formation was timed, it took between half an hour and an hour to be completed. This time varied according to species. It has also been observed that certain individuals formed a cocoon on some nights but not on others.

In all of the species observed, the cocoon started as a fold at the mouth and continued back over the body. However, it was not sealed. There was a flap with a hole in the centre which covered the mouth, allowing the fish to draw in water. This flap could be seen to move in and out as the fish breathed. The cocoon was also open behind the tail fin, providing an exit point for water passed over the gills. The cocoon is probably open in parrotfish on the Great Barrier Reef - otherwise as the fish expelled water from the gill cavity the cocoon would keep growing bigger.

The species which have been observed slow down their breathing rate - to about 40-60% of the active swimming rate but do not shut it down. Parrotfish may secrete the mucous under stress, including oxygen deficient conditions (eg. after being kept in a bucket or in an aquarium where the water wasn't being changed). One of the reasons proposed for cocoon formation is to isolate the parrotfish from hunters such as moray eels which may rely on smell to locate prey. This may be so, but cocoon formation occurs also in species of wrasses, including the cleanerfish (*Labroides dimidiatus*) some of which bury themselves in the sand.

Q Do drongos fly south in the winter?

A No, they fly north! Birds from southern Queensland come north to us while some north Queensland drongos may migrate to Papua New Guinea.

Q Lately birds like starlings and parrots have been flying into my windows at home. Why?

A They often see trees reflected in the glass and believe they can fly through them. The casualties are mainly young ones - you will notice that the starlings invariably have the spotted breasts of immature birds. Many, happily, recover after a rest (some cold water on their heads is said to help them come to their senses) and presumably learn from the experience.

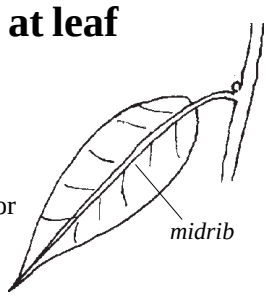
Q What causes the bumps on green snakes - ticks or a growth of some kind?

A They are caused by parasites below the skin.

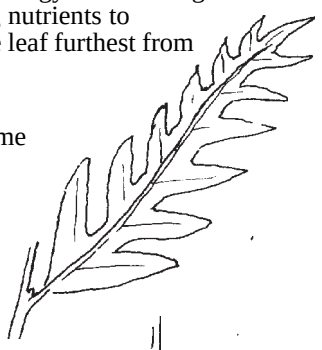
Q What is the most dangerous predator faced by newborn estuarine crocodiles?

A Other crocodiles!

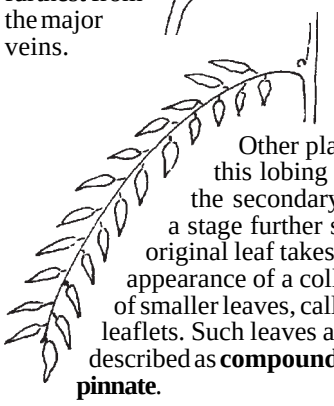
Looking at leaf shapes



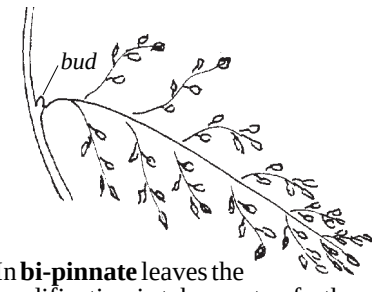
Most **simple leaves** have a central 'vein' or midrib from which secondary veins branch off. These veins serve to carry nutrients to and from the tissue of the leaf. Some plants have found it expedient to alter their leaf shapes in order to save energy in collecting and/or distributing nutrients to sections of the leaf furthest from a major vein.



To do this, some leaves have a deeply **lobed** shape, dispensing with tissue furthest from the major veins.



Other plants take this lobing around the secondary veins a stage further so the original leaf takes on the appearance of a collection of smaller leaves, called leaflets. Such leaves are described as **compound** or **pinnate**.



In **bi-pinnate** leaves the modification is taken a step further, with leaflets formed around tertiary, rather than secondary, veins. Consequently, what may look like a considerable number of small leaves may in fact be leaflets, all parts of just one compound leaf.

One way to distinguish a leaflet from a simple leaf is to look at the junction between the leaf-bearing twig and the stalk of the leaf itself. With a simple leaf it may be possible to see a bud at this junction, while a bud will never be present at the junction between a leaflet and its stalk, which is in fact a primary or secondary vein.

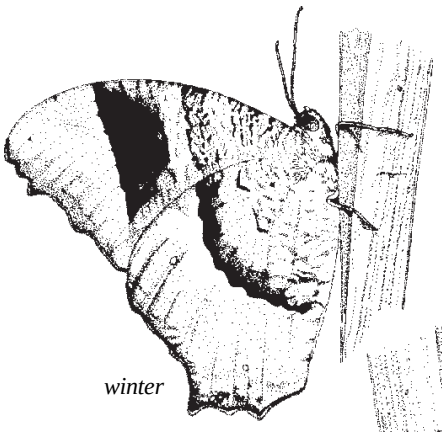
Tourist talk

ENGLISH	GERMAN	JAPANESE	
symbiotic	symbiotisch	kyo sei no	共生の
interaction	Wechselwirkung	sogo sayo	相互作用
web	Netz	kumo no su jyo no	くもの巣状の
ant	Ameise	a ri	蟻
caterpillar	Raupe	ke mushi	毛虫
butterfly	Schmetterling	chor	蝶
fungus	Pilz (Schimmel)	kin rui	菌類
pollination	Befruchtung	jufun	授粉
nectar	Nektar	hana no mitsu	花の蜜
reward	Beloynung	ho shu	報酬

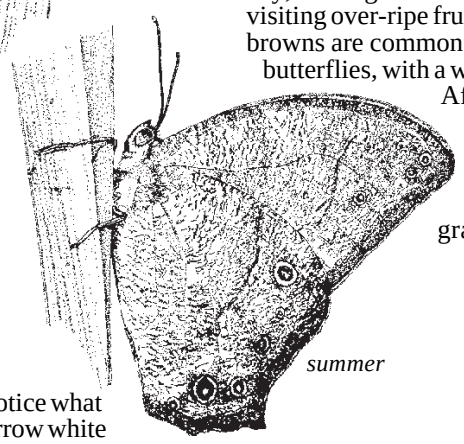
Nature notes

A diary of natural events creates a pleasing journal which grows richer with the passage of time. Watching for the recurrence of an event after noting it in a previous year, and trying to understand what could have caused changes in timing, is intriguing.

These notes are from the author's own notebook, or were offered by researchers and fellow naturalists. Readers will, inevitably, note variations between their observations and those appearing here. If you do not keep a nature diary perhaps this will inspire you to begin one.



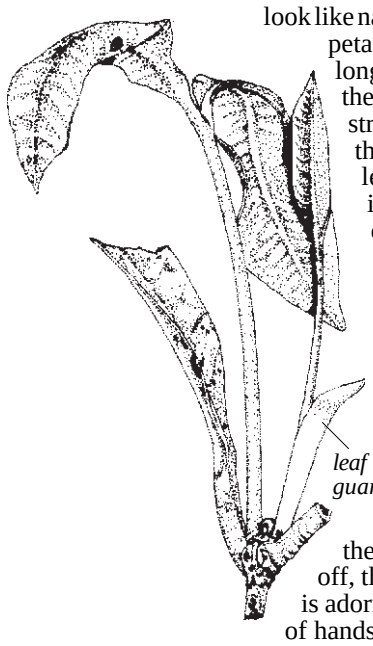
winter



summer

The attractive **evening brown butterfly** (*Melanitis leda*) is now in its winter colours. In the cool months the undersides of the wings are a pattern of dark browns and russets, while the summer version is much paler, with several 'eye' spots. These elegant well-camouflaged butterflies tend to rest quietly on leaf litter during the day, waiting until evening to fly, often visiting over-ripe fruit. Evening browns are common open-forest butterflies, with a wide range (from Africa to the Pacific Islands) including the Wet Tropics. Larvae feed on several types of grass.

Visitors to the Mossman Gorge section of Daintree National Park will notice what look like narrow white petals - each about 4cm long - scattered beside the paths. These structures are in fact the cast-off guards for leaves of an interesting plant called *Bosistoa brassii*. For eleven months of the year these leaf guards are inconspicuous covers on small green buds. But in winter the buds swell and elongate in a very short space of time. When the guards are thrown off, the end of each twig is adorned with a new pair of handsome leaves, between which nestles another set of buds ready for action twelve months hence.

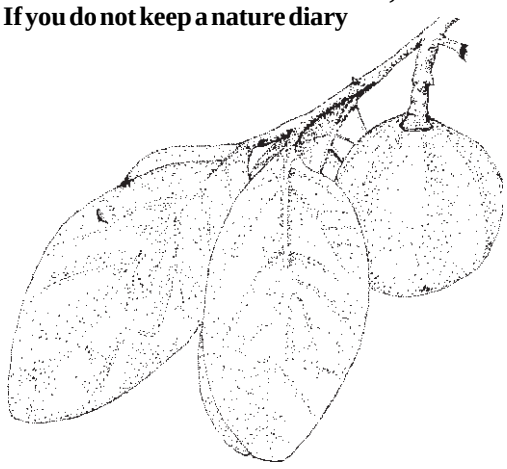


leaf guard

The plant, which grows into a small tree, has not been given a common name, but Bosisto was the 19th century discoverer of the antiseptic qualities of eucalyptus oil and Brass probably refers to Len Brass, a notable naturalist who collected widely in Cape York and further afield.

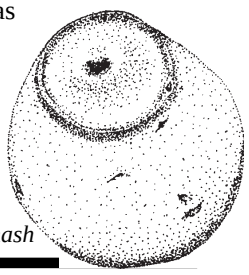
Purple-blue fruit of the **silver quandong** will begin ripening in June-July. The flesh of this tree, also called blue quandong (*Elaeocarpus angustifolius*) is quite pleasant to taste when slightly over-ripe, as many a bushwalker who has sucked the fruit can confirm. However, if eaten before it is soft, the astringent flesh will induce an uncomfortable feeling in the throat. The fruit are an important food for many forest inhabitants including spectacled flying foxes, cassowaries and the colourful wompoo pigeon, all of which use the flesh without harming the germinating ability of the seed. Distinctively sculpted seeds of silver quandong are often used in necklaces and similar adornments.

Humpback whales were sighted at Agincourt Reef, east of Cape Tribulation, in June last year. These wonderful mammals come to Australian waters in the winter months, when their calves are born and mating takes place. Humpbacks are believed to be capable of annual mating, following courtship described as 'often playful and splashy' by Lyall Watson in *Whales of the World.*



A showy fruit, 'almost like a small rosy apple', will be ripening about now. This is produced by a Wet Tropics member of the avocado family, the **hairy**, or **rusty walnut** (*Endiandra pubens*). The bright red, glossy exterior darkens rapidly with time and bruising so a fruit which has been lying on the ground for a day or so will look less inviting. The flesh of this walnut is not edible for humans. The large seed has a lightly pitted exterior and a distinct point at one end. It is believed to have been a 'favourite with the Aborigines of Bellenden Ker', eaten after roasting, pounding and steeping. It is also enjoyed by native rodents which can manage the chemicals without any preparatory work. Quotes are from *Wild Food in Australia* by A.B. and J.W. Cribb.

Big fruit set by three of the Myrtaceae family will be prominent this month. One is the pink, gravel-fleshed fruit of **cassowary satinash**, another is the (usually) green skinned fruit of **grey satinash,** while the third is the pale brown fruit of **Kuranda satinash**. Both cassowary satinash (*Acmena graveolens*) and grey satinash (*Syzygium gustavioides*) have a ring-shaped scar on the top of the fruit, which represents the site at which the sepals were attached to the flower. Cassowary satinash and Kuranda satinash (*Syzygium kuranda*) are listed as fruit swallowed by cassowaries, and the large fruit of grey satinash may also be dependent on the big bird for uphill transport.



grey satinash

Bookshelf

Australian Tropical Rainforests Science - Values - Meaning
L.J. Webb and J. Kikkawa (eds)
CSIRO (1990)
Chapter 7: *The Biological Web - Plant/animal Interactions in the Rainforest*
R.E. Jones and F. H. Crome
Chapter 8: *Plant/insect Interactions - Food Webs and Breeding Systems*
D. Sands and S. House

Both these chapters are very interesting. The first has a good section on pollination and also looks at animals as fruit and leaf-eaters. The second chapter looks specifically at insects as leaf eaters and their interactions with plants, particularly as pollinators.

The Insects of Australia
CSIRO Division of Entomology
Melbourne University Press (1991)
Chapter 3: *General Biology*
K.R. Norris

The latest edition of this book is in two massive volumes. Chapter 3 is to be found in Volume I and has an excellent section on insect relationships with plants.

Associations between Insects and Plants
T.R. New
New South Wales University Press (1989)

The emphasis of this book is on insects as predators of plants. It contains a wealth of information with Australian examples given wherever possible.

Australian Tropical Butterflies
Peter Valentine and Clifford and Dawn Frith
Tropical Australia Graphics (1988)

Excellent photographs are accompanied by small segments of information on each species with information on many of the Lycaenidae which involve themselves with ants.

Butterflies of Australia
I.F.B. Common and D.F. Waterhouse
Angus and Robertson Pty Ltd (1972)

A comprehensive textbook with a good section on biology which includes ant-associations.

Articles:

Wildlife Australia Vol 27 No4 Summer 1990
When the ants get home, they feed their plants
Andrew Beattie and Geoff Monteith

Scientific American Vol 263 No 2 August 1990
Seed Dispersal by Ants
S.N. Handel and A. J. Beattie

Ecos No. 53 Spring 1987
Ants and plants - mutualism in action
J. van Schagen

Nature Australia Vol. 25 No 5 Winter 1996
Land of nectar
Tim Low

Bird-pollinated plants and nectar-feeding birds in Australia.

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.

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 infomation 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

WET TROPICS MANAGEMENT AUTHORITY

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service