Tropical Topics

An interpretive newsletter for the tourism industry

Uplands of the Wet Tropics No. 74 June 2002

Notes from the Editor

To mark International Year of Mountains, this issue of *Tropical Topics* looks at the uplands of the wet tropics roughly between about 400m and 1622m – the top of Queensland's highest mountain, Bartle Frere.

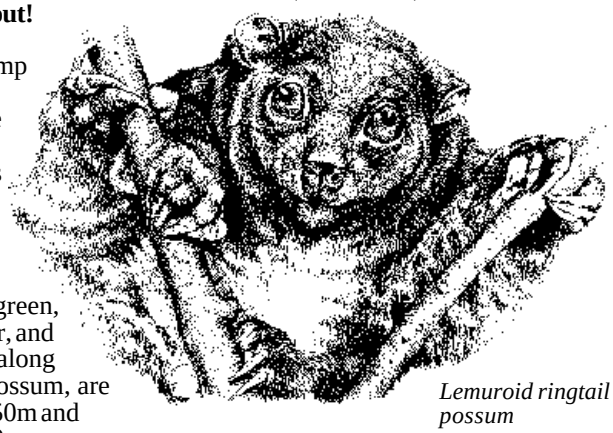
These upland areas are home to a large proportion of endemic plants and animals. Found nowhere else in the world, some of these are restricted to very small areas within the wet tropics. Their distribution is largely a result of continental movements and climate changes of past millennia which have led to their survival in their present form in the wet tropics of today. The big question is how they will survive the rapid climate change predicted for just the next one hundred years – and beyond.

I would like to thank Geoff Monteith, Queensland Museum, David Westcott, David Hilbert, Paul Reddell and David McJannet, CSIRO, Andrew Krokenberger and Nigel Weston, James Cook University, Brad Pusey and John Kanowski, Griffith University, and Mike Trenerry, QPWS, for their help with this issue.

Possums keep cool

Perhaps it is understandable that an animal with a thick furry coat would prefer life in the upland rainforests of north Queensland to the humid heat of the coast. Indeed, any of us who suffered the heat of last summer (2001-2002) on the coast dreamed of a mountain hideout!

However, scientists don't jump to conclusions. When faced with the question of why the majority of leaf-eating marsupials of the wet tropics prefer elevated forests, they looked at a range of possibilities.



Lemuroid ringtail possum

Four ringtail possums – the green, Herbert River, Daintree River, and lemuroid ringtail possums – along with the coppery brushtail possum, are normally found above 300-450m and are most abundant above 700m.

John Kanowski of Cooperative Rainforest Centre (CRC) Rainforest tested out a number of theories. He wondered if possums at lower elevations were simply being picked off by predators – but ascertained that rufous owls, their main predator, are just as common at high altitudes. He also failed to find any relationship between abundance of suitable den sites and possum distribution.

John then studied food sources. He found that leaf quality is better, and the animals correspondingly more abundant, on soils derived from basalt rather than from granite or metamorphic rock. Nonetheless, the possums are not found on lowland basalt. Each of these animals has a diet of preferred plants. Botanical searches, however, found that while some of the plants on the menu were more abundant in the highlands, many were also found in places which the possums avoided. In other words, there was no close correlation between plants and possums.

Perhaps, after all, leaf-eating possums simply don't like the heat, preferring the high forests where abundant water in the form of condensed mist and dew – unavailable in lowland forests – helps to keep them cool. Some are more adaptable than others – green possums are not uncommon at 350m (Kuranda) and sometimes venture below 200m but lemuroid possums never do.

Following on from this research, Dr Andrew Krokenberger of James Cook University, carried out some tests on green possums, demonstrating that they were very sensitive to air temperatures above 30deg. Indeed, their body temperatures rose to the point where he calculated that they would have died within a few hours, had the stress continued. Not wanting to harm the animals, he obviously did not continue the experiments to their logical conclusion. However, there is concern among scientists that global warming may push these animals beyond their limits.

WET TROPICS MANAGEMENT AUTHORITY

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Climate change and the uplands

Until 25 million years ago, rainforests covered much of Australia, but as continental plates shifted and ice ages came and went, this distribution fluctuated dramatically.

Grey-headed robin

At the height of the last ice age, about 18 000 years ago, temperatures were, on average, 3 to 5 deg. lower in the wet tropics than today. Australia was also a much drier place with our region receiving about half the rainfall of today. Rainforest mostly contracted to the misty mountain tops. Then, as the planet warmed and rainfall increased, this rainforest expanded. About 7000 years ago, it even extended beyond the area potentially occupied by it now.

So what impact will global warming have? It is anticipated that temperatures in coastal north-east Queensland will rise by between 1.4 and 5.8deg. by the end of this century. Dry seasons are likely to become longer. Water availability is predicted to decrease, particularly in upland forests, not only because of reduced winter rain, but also because clouds will be higher (see Cloud-strippers, below).

While remaining lowland forests may not be greatly affected, upland forests are likely to suffer a major decline. For each degree of increased temperature, the cool climate zone in the wet tropics is likely to be pushed about 200m higher. A 1-2deg increase may result in the loss of three-quarters (70 000ha) of Queensland's upland forests.

Cloud-strippers

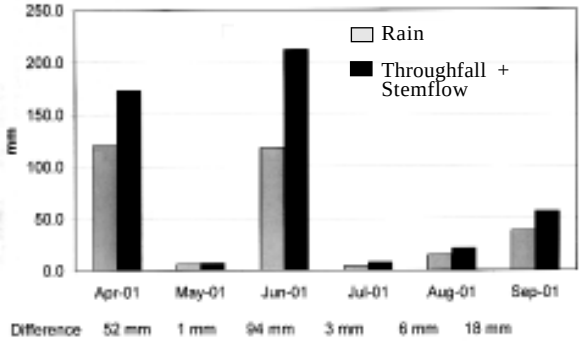
How often we climb to the top of a mountain anticipating a spectacular view only to find ourselves looking at the inside of a cloud instead. Indeed, how often do we look up and find the peaks – Mt Bartle Frere, Bellenden Ker, Thornton Peak and so on – obscured by mist?

Anyone who has stood inside one of those clouds, knows that it is a moist place; water condenses on hair, clothes and vegetation. Recently, CRC Rainforest researchers decided to measure the amount of water which is obtained by upland forests through 'cloud-stripping', as the process is known, compared with that obtained directly from rainfall.

By putting collars around the stems and trunks of trees, and placing troughs below the canopy, they were able to measure the total amount of water reaching the ground. By comparing that total with the amount collected in a rain gauge, they were able to calculate how much extra water had been stripped from the clouds. They also measured it directly with an instrument composed of a mesh attached to a rain gauge which they set up under a roof to keep out the rain. Cloud moisture condensed on the mesh and dripped into the rain gauge.

Astonishingly, it was discovered that as much as 40 percent more water was harvested from the clouds than was measured, as rain, in the standard rain gauge (see graph). This has important implications for not only the upland forests but also for forests at lower altitudes – and for the people who inhabit the area. The upland forests use very little of the water they harvest. The leaves are almost constantly wet and clouds block off sunlight which would otherwise drive the transpiration process. However, these forests act as a reservoir, storing huge volumes of water which are released gradually, keeping our creeks and rivers flowing through the dry season.

In countries where upland forests have been cleared, the loss of this water-harvesting and storage service has led to water shortages in the dry season. In the wet tropics, the cloud forests are largely protected from clearing – but not from global warming. It is predicted that increases in temperatures of just 1-2deg. will cause the cloud base to rise in altitude, leading to extensive loss of upland forests and thus depriving the whole area of a vital source of water.



Graph courtesy CSIRO

Global warming and upland animals

While global warming is expected to eventually reduce the extent of upland forests, it is also likely to change the chemistry of the leaves. Plants grown in an atmosphere with high levels of carbon dioxide (the main gas associated with global warming) produce leaves with lower concentrations of protein but with more tannins and other toxins. They will therefore be much less nutritious for leaf-eating animals such as the ringtail possums and tree-kangaroos so these animals are going to have their habitat reduced not only in quantity but also in quality.

Not only leaf-eating animals will be affected. A longer dry season will mean more sunshine and could improve flowering – a benefit for nectar-eating animals such as birds, insects and bats (although species may vary as tolerance levels are exceeded). However, fruit-eaters may miss out since the decrease in rainfall may mean that good flowering doesn't automatically result in more fruit. Also, the increase in carbon dioxide is likely to affect the nutritional value of the fruit, though it is not certain whether this will be for the better or not.

Animals living in the lowlands will have the option of moving upwards but those already dependent on upland forests could find themselves with nowhere to go – except extinction. Those with small populations, especially if living in fragmented habitat, are most at risk. Preliminary work on some endemic birds suggests that an increase in temperatures of just one degree will considerably diminish their habitat, while greater increases will lead to serious losses.

Endemics in the uplands

It is a significant feature of the wet tropics that although the greatest density of species is found in the lowlands, it is the higher elevations which are home to the majority of endemic species (in other words, those found nowhere else in the world).

The explanation for this is believed to lie in past climate changes. During the driest part of the last ice age, about 26 000 – 10 000 years ago, there was little warm lowland rainforest in Australia. Animals depending on it simply died out. Papua New Guinea, by contrast, which became wetter as Australia dried up, retained many of its animals and now has, for example, approximately twice as many lowland bird species as the Australian wet tropics. It is in the uplands, where cool adapted rainforest species were able to cling on in the rainforest refuges, that the uniquely Australian species tended to survive.

Patterns in the uplands

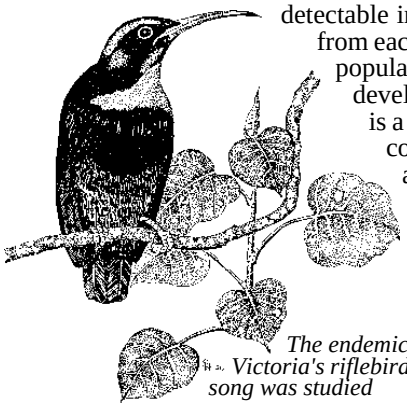
Over time, rainforest has expanded and contracted in Australia, affecting the animals which depend on it. Some have adapted and evolved to live in drier habitat, some have become extinct whilst others have confined themselves to whatever suitable habitat is available.

Genetic studies have demonstrated interesting patterns which reflect the effects of climate change. During drier, cooler times, rainforest contracted to two main areas – one centred on the Atherton Tableland and the other in the Thornton Peak/Carbine Tableland area. Between them, to the north of Cairns, lies a gap of drier forest, described by scientists as the Black Mountain Corridor. For hundreds of thousands of years this formed a barrier between the two rainforest refuges. Populations of animals became isolated from each other and began to evolve separately. Usually there is no difference in outward appearance, but genetic analysis has demonstrated quite distinct differences in skinks, birds, frogs, geckos, insects and snails as well as in some mammals.

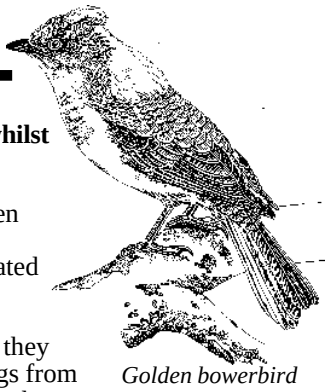
Birds in isolation

Researchers studying endemic birds discovered that genetic differences were most pronounced in grey-headed robins and chowchillas. It is thought that, as rainforest specialists, these species would be particularly slow to move across a dry barrier, even when it became narrower as conditions improved and rainforest areas expanded again.

They also discovered that isolation not only led to genetic differences, but differences in behaviour as well. This was detectable in the birds' songs. Isolated from each other, the different populations of the same species had developed regional dialects. Song is a tremendously important communication tool for birds. It allows them to recognise each other as members of the same species and also as individuals. It is very important for assessing and attracting mates and for detecting and challenging rivals for territory and mates.



The endemic Victoria's riflebird song was studied



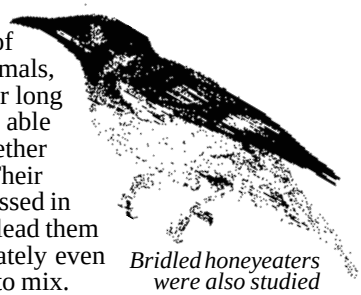
Golden bowerbird

The importance of song has been demonstrated in finches in the Galapagos which had been isolated on different islands and had developed completely different songs. When brought together they did not breed – until the nestlings from one group were induced to learn the 'wrong' song. The result was successful cross-breeding, which the birds would not have attempted if not singing the same 'language'.

Researchers found a similar response among golden bowerbirds – a species whose tendency to live at the highest altitudes (mostly above 900m) has caused different populations to become particularly isolated on various mountain tops. When played recordings of the songs of golden bowerbirds from the neighbouring mountain tops, they tended to ignore them, but when they heard recordings of songs in their own dialect they became aggressive.

Fourteen birds were studied altogether, including seven endemic birds which live mainly in the uplands and seven species with a more widespread distribution. Results showed that while there were local and regional variations in the dialects of all birds, they were much more pronounced in upland birds with restricted habitat and irregular distribution.

The implications of this study are that populations of birds, and perhaps other animals, which have been isolated for long enough may, technically, be able to interbreed if brought together but are unwilling to do so. Their 'cultural' isolation, as expressed in different 'languages' could lead them to continue to evolve separately even if they have an opportunity to mix.



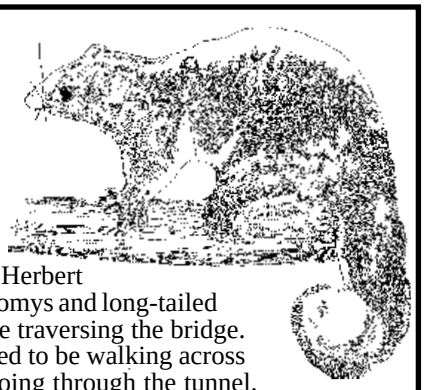
Bridled honeyeaters were also studied

Bridging the canopy

The wet tropics rainforest, although protected, is bisected by roads and powerlines. Twenty percent of roads (568km) cut through the 14 percent of rainforest which occurs above 800m – the main habitat of our tree-dwelling mammals.

Fragmentation of forests causes problems for these tree-dwellers, particularly the ringtail possums. Their ability to cope varies according to species. It has been shown that while green ringtails will come to the ground to cross gaps, lemuroid ringtails rarely leave the trees. Herbert River and Daintree River ringtails, though reluctant, will come to the ground if necessary. Those which will not come to the ground, tend to disappear over time from small areas of forest while those which venture to earth run the very real risk of becoming part of the road toll.

In order to give the possums a helping hand across the road, a bridge was built over a disused logging track near Lake Tinaroo in 1995. A rope tunnel, it was designed to protect the animals from aerial predators such as rufous owls. In early 2000, CRC Rainforest researcher, Nigel Weston, decided to monitor the bridge to see how much it was being used. Using scat nets, infrared cameras, spotlighting and data loggers, he established that the three local ringtails (green, lemuroid and Herbert River) as well as melomys and long-tailed pygmy possums were traversing the bridge. However, they seemed to be walking across the top rather than going through the tunnel.



Herbert River ringtail possum

Nigel then set up two more simple, rope-ladder type bridges, one near Millaa Millaa and the other across the Old Palmerston Highway. The former, erected in a well-forested area where there were plenty of natural connections across the road, was used relatively little. However, the latter, a 15m bridge crossing a road with no natural connections, was used regularly by lemuroid and Herbert River ringtails as well as coppery brushtail possums. This sort of bridge should perhaps be an essential part of all our upland rainforest roads.

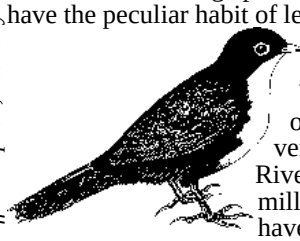
Endemics of the uplands

The wet tropics boasts a high number of endemic species – those found nowhere else in the world. The majority are confined to the cool, wet rainforest of the uplands and many of these are considered relicts from ancient times when temperate rainforest was more widespread. Now they inhabit upland areas which function as cool islands isolated from each other in a 'sea' of warm lowland forest.

Thirteen **bird species** are endemic to the wet tropics. Eight of them are generally found in the cool, moist, upland rainforests above 600m – although some of these may move to lower altitudes in winter. This tends to happen where rainfall is high and/or where mountains drop off steeply to the sea

The **Atherton scrubwren** is a small, inconspicuous, brown bird which flits around the forest floor feeding on insects and small snails. It is moderately common – but only in wet tropics rainforests above 700m. Until 1964 it was thought to be a race of the slightly smaller and slightly paler, more communal large-billed scrubwren.

The **chowchilla** is more common in upland rainforests but is found also in some lowland areas. Like related logrunners, in New South Wales, chowchillas have tails consisting of 10 feathers, rather than the 12 feathers found in all other songbirds. These feathers form strong spines, used to support the birds which have the peculiar habit of leaning back on their tails as they scratch in the leaf litter with their feet, looking for food. This behaviour has led to the development of characteristic leg bones. Smaller versions of these bones, found at the Riversleigh fossil site, date back 15-25 million years and show that these birds have an ancient Gondwanan heritage.

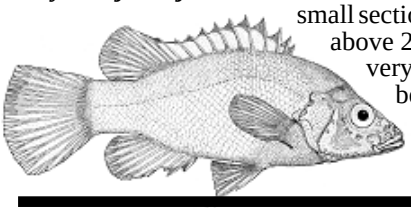


There is a high level of biodiversity among **freshwater fishes** in the wet tropics and so far nine endemic species have been identified with, no doubt, many more waiting to be discovered. Most of these live in upstream tributaries of eastern flowing rivers, preferring riffle habitats where shallow water flows brokenly. However, few fish, apart from eels, purple spotted gudgeons and rainbowfishes, are naturally present in the higher catchments.

Using genetic sampling, researchers have discovered some interesting patterns among fishes in wet tropics rivers. Huge genetic variations were found within the same species in the same rivers, those in the upland sections, on the Atherton Tableland, proving to be quite different from those in the lowland sections. Presumably the development of waterfalls in these rivers in the distant past prevented the fishes from mixing for a very long time. On the other hand, fishes living in different lowland rivers are quite similar, showing more recent mixing. Differences between the same species in upland streams on the Atherton Tableland showed two distinct populations with connections to fish in the Barron River and Herbert River catchments respectively, indicating a long-standing separation.

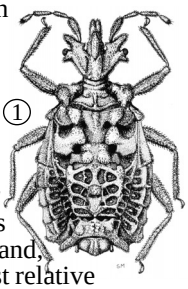
By contrast, genetic testing has shown that the **Lake Eacham rainbowfish**, far from being extinct in the wild following its disappearance from the lake, is alive and well and living in disguise in many streams and rivers. Despite looking different, DNA tests showed that the fishes were in fact all the same species.

Guyu wujalwujalensis is an interesting fish. It is found only in a small section of the Bloomfield River, above 200m, and is thought to be very ancient, possibly having been around at the time of the dinosaurs.



There is a high level of endemism among the **invertebrates** of the wet tropics uplands with many species restricted to specific mountain tops. The closest relatives of a number of these are to be found far away on other continents – strong evidence for common origins on the ancient Gondwanan land mass, before it split into current land masses.

Many species of bizarre-looking bark bugs live on the forest floor of mountain rainforest in the wet tropics. Strange, knobbly beasts with hairy legs and stalked eyes, their good looks are concealed under a layer of dirt which camouflages them well as they rest motionless on the surface of dead wood, sucking juices from wood-rotting fungi. This species, ***Drakiessa glaebula***, is found only above 500m in rainforests around the southern edge of the Atherton Tableland, from Bellenden Ker to near Ravenshoe. Its nearest relative lives 1500km further south, on the Queensland-New South Wales border.



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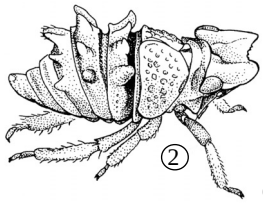

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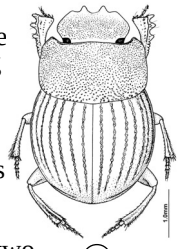
This flightless leafhopper, ***Myerslopella spinata***, occurs only on the mountains immediately west of Mossman on the eastern edge of the Carbine Tableland. Its closest relatives are on the ancient landmasses of New Caledonia and Madagascar, evidence that it has survived on the old mountains of the wet tropics for more than 50 million years – since before the break up of Gondwana. It is one of six known species of flightless leafhoppers, each restricted to the summits of just a couple of adjacent mountains where they probably feed on the sap of moss or fungi.

A large number of endemic dung beetles live on we tropics mountain summits, most of them belonging to a tribe with relatives in other southern continents. Almost 2000km separates these tropical species from their nearest relatives in New South Wales. This one, ***Aptenocanthon kabura***, is known only from the 1100m summit plateau of Mt Finnigan, the highest point in the Bloomfield wilderness. Named within the last two years, only two specimens have been found so far.



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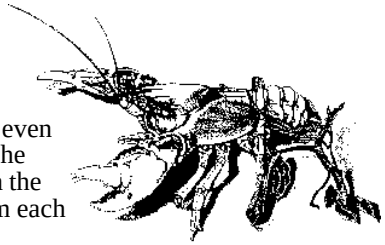
Fifteen species of **spiny mountain crayfish** have been identified in Queensland, living in cold fast-flowing streams. In south-east Queensland, suitably cold habitat is found as low as 250m but the further north they are found, the higher their lower limits, until they are found only above 900m in north Queensland. Each mountain range has its own species of spiny crayfish. Genetic samples have confirmed that they all have a common ancestor. It is believed that this ancestral crayfish expanded its range into Queensland over 5 million years ago, when temperatures were cooler and rainforest more extensive. As climate changes caused a contraction and fragmentation of suitable cool forest habitat, different populations, separated from each other on various mountain tops, evolved into different species. Crayfish do not move far from their own streams and it is thought that even those in different streams on the same mountaintop might be in the process of evolving away from each other as they fail to mix.



Insect illustrations ① Sybil Monteith, ② Andrew Hamilton and ③ Geoff Thompson, courtesy Queensland Museum

Illustration of Guyu wujalwujalensis *courtesy Brad Pusey from his forthcoming book on Queensland fishes.*

The wet tropics has the highest number of endemic rainforest **mammals** (11) of any region in Australia, most of them living entirely or largely in the uplands.

Two mammals have particularly restricted ranges within the wet tropics uplands. The **masked white-tailed rat** (formerly known as the Thornton Peak melomys) is the only wet tropics endemic rat. It is found above 550m on Thornton Peak, Mt Carbine, Mt Lewis and Lamins Hill. The **Atherton antechinus** lives in cool wet rainforests above 600m between the Lamb and Cardwell Ranges. It forages on the forest floor feeding on insects and other vertebrates, as large as itself. It is thought to rely on hearing and smell rather than vision.

The **lemuroid ringtail possum** (right) is the most strictly upland-dwelling of the ringtail possums and is particularly abundant between 900m and 1200m. It is also the most reluctant to come to the ground, preferring to leap between branches. Whereas the other ringtails might use their tails to swing, the lemuroid possum jumps like a glider and, indeed, has a rudimentary skin flap on the sides of the body. Forward-facing eyes, which give it the necessary stereoscopic vision for such leaps, earned these animals their common name, since they reminded early naturalists of the lemurs in Madagascar.

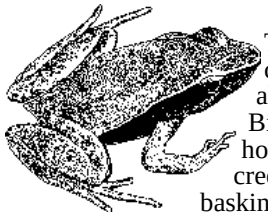
Most of these possums are a charcoal grey to brown colour with a yellowish tinge below. Within the northern population, above 1100m on the Carbine Tableland, however, 30 percent of the animals have white coats. These beautiful animals are not a different species, but the equivalent of the blondes among the brunettes.

About 53 species of **frogs** are found in the wet tropics – the highest diversity in Australia – of which 21 are endemic. All but one of these are rainforest-dependent.

However, the number of endemic frogs is falling, as species disappear. Part of a worldwide phenomenon, six of the wet tropics endemic species have either vanished completely or have disappeared from their upland habitat, above 450m. A fungal disease, chytrid fungus, has been widely blamed for frog losses around the world and has been found in the wet tropics. Scientists remain baffled though, because it is in the pristine upland streams, largely unaffected by pollution or habitat loss, that the frog declines have been most marked. How is it that populations of the three species which have disappeared from the uplands are living happily in the lowlands?

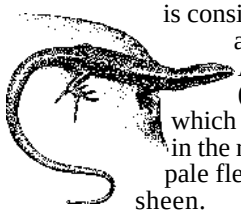
The **northern barred frog** is a common frog, found throughout the wet tropics at both high and low altitudes. However, its tadpoles come in several forms, those in the uplands growing to gigantic sizes. Measuring up to 16cm in length – longer than the average ball point pen – the largest live in the streams of the Mt Windsor Tablelands. In the cold water, they take over a year, and possibly two, to metamorphose into frogs. In spite of developing from probably the largest tadpoles in Australia, the adults, at an average 9cm in length, are not particularly big. These large upland tadpoles are steel-grey in colour with a translucent tail but those found elsewhere are not only smaller but also brown and mottled.

No longer than 2.9cm, the small, dark **Bellenden Ker frog** is found only at the summits of Bartle Frere and Bellenden Ker.



The **sharp-snouted torrent frog** was once commonly found along rainforest streams above 300m from the Herbert Valley to the Big Tableland, south of Cooktown. It hopped about during the day, foraging in creeks and forest vegetation and sometimes basking on riverside rocks. In wet weather, individuals might venture quite far from water. Tadpoles had sucker-like mouths to help them hold on in fast-flowing streams. This frog went into a sudden decline between 1988 and 1993 and was feared extinct. For three years none were seen following the 'last' sighting in early 1994 – until a Griffith University researcher stumbled on one calling in the South Johnstone River in November 1996. This sighting has raised hope, but none have been seen since.

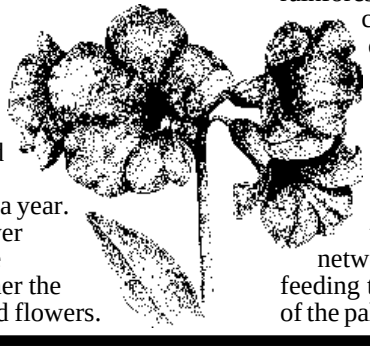
Over 60 percent of **rainforest reptiles** in the wet tropics are endemic. Sixteen of the 22 endemic reptiles are skinks, most of them rainforest dwellers.



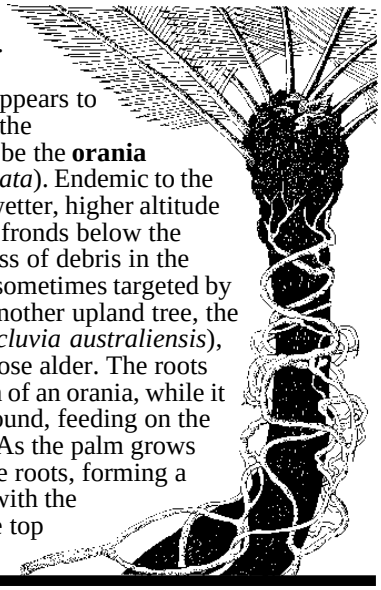
Discovered in 1981, the **Bartle Frere skink** is found only above 1400m among the granite boulders on the cloud-draped summit of Mt Bartle Frere. Living in a cool climate zone within the tropics, it is considered a temperate rainforest relict – its closest relatives are in temperate zones, such as Tasmania, southern Australia and New Zealand. This medium-sized skink (up to 7cm in length) is an energetic and agile animal which is out and about during the day but retreats to cracks in the rocks at night. Light brown, with numerous dark and pale flecks and streaks, it has a smooth body and a rainbow sheen.

A large number of **plants** are endemic. As altitude increases, both tree and leaf sizes decrease. Towards the mountain tops the forest canopy tends to be low and dense, moulded by strong winds.

The **mountain teatree** (*Leptospermum wooroonooran*), forms much of the forest canopy on wet tropics peaks above 1100m. A sturdy tree, it sometimes grows with its trunk almost parallel to the ground where winds are strong. Some individual trees are thought to be at least a thousand years old. In summer it is covered with white flowers.



Of about 600 species of **rhododendron** found throughout the world, just one is native to Australia, growing only above 1000m in the wet tropics. *Rhododendron lochae* is a tough plant, thriving in exposed positions on mountain tops where dense mist is the norm and rainfall can exceed 4m a year. It grows as a straggly shrub, scrambling over rocks or as an epiphyte. Its thick leaves are arranged in whorls and in spring and summer the plant is covered with bright red, bell-shaped flowers.



The surprising sight of what appears to be a coconut palm growing in the rainforest usually turns out to be the **orania palm**, (*Oraniopsis appendiculata*). Endemic to the wet tropics, it is found in the wetter, higher altitude rainforests, spreading its long fronds below the canopy. The dense mass of debris in the crown of this palm is sometimes targeted by the surface roots of another upland tree, the feathertop tree (*Caldcluvia australiensis*), otherwise known as rose alder. The roots intrude into the crown of an orania, while it is still close to the ground, feeding on the decomposing debris. As the palm grows upwards, so too do the roots, forming a network around the trunk with the feeding tips buried deep in the top of the palm.

Questions & Answers

Q We have heard why the scientists think coral bleaches but why does some go the brilliant colours and why different colours? Around Great Keppel Island, what used to look like a single plate now has two colour zones. Is this two different species of coral butting against each other without the usually visible 'war zone'?

A Certainly the coral bleaching episode earlier this year resulted in some spectacular underwater scenes with coral colonies glowing not just white, but also blue, purple, pink and yellow. (Bleached anemones were also quite spectacular.) Scientists studying coral bleaching refer to this as the coral 'fluorescing'. We are in fact seeing the true colours of the corals, which are normally hidden by the brown-green algal cells (zooxanthellae). When conditions become too hot, the algal cells begin to poison the corals instead of feeding them and the corals respond by spitting them out. In most species this allows us to see right through the transparent tissue to the white skeleton below. However, some corals have colours in their tissues (not the skeleton) which become apparent when the zooxanthellae leave.

Corals in inshore areas tend to have larger numbers of zooxanthellae, needed to photosynthesise in the darker, murkier waters. They thus appear fairly dark brown under normal circumstances. Corals in the clear waters of the outer reef, however, do not need as many, so tend, under normal conditions, to be more brightly coloured. When they bleach, however, the colours become brilliantly apparent.

It's hard to tell what the plate coral is up to. It is not unusual for the upper side of a coral, in direct sunlight, to bleach and die, while other parts are okay. It has also become apparent to researchers that some corals are able to move their zooxanthellae around, putting them out of danger in a shady underside during adverse conditions and moving them back into position when conditions improve. Perhaps part of the colony has died and is being covered with algae, or perhaps the change in colour has nothing to do with bleaching at all!

Recent alarming media reports of coral bleaching indicated that two-thirds of the Great Barrier Reef has been damaged. In actual fact, the report released by scientists (from GBRMPA, CRC Reef and AIMS) stated that they had found bleaching on 60 percent of the reefs covered by their aerial surveys. In some of these reefs the bleaching amounted to just 5 percent. Underwater surveys by the team indicated that most bleached coral on most reefs will recover (although the stress can continue to have negative effects on the corals, particularly their reproduction, for some time).

However, some reefs have been devastated by the bleaching event. Between 50 and 90 percent of the corals on some inshore reefs between Bowen and Mackay – the worst affected area found – have died. This comes as yet another warning of the likely effects of global warming as bleaching events become more frequent and severe in the future.

Q Can you tell me the name of the yellow flowering plant, like a sunflower, growing along the slopes above Redlynch, next to the Kuranda train track?

A It is Japanese sunflower (*Tithonia diversifolia*), also known as Mexican sunflower and tree marigold. A native of Central America, it has become a common weed of roadsides and embankments in coastal Queensland and northern New South Wales. It is also a weed in Hawaii and other tropical areas. Farmers in Kenya have discovered that a solution made from this plant, combined with others, is an effective termite control.

Tourist talk

ENGLISH	GERMAN	JAPANESE
endemic	einheimisch	koyu no 固有の
uplands	Hochland	kouchi 高地
summit	Gipfel	chojou 頂上
to retreat	sich zurückziehen	taikyaku suru 退却する
cloud	wolke	kumo 雲
to harvest	ernten	shukaku suru 収穫する
to store	speichern, einlagern	takuwa eru 蓄える
global warming	Erwärmung der Erdatmosphäre	chikyu ondanka genshou 地球温暖化現象
populations	Bevölkerung	kotaisu 固体数
temperate	gemäßigtes Klima	ondan 温暖

Facts and stats

The seven species of leaf-eating marsupials which are endemic to the Wet Tropics (four species of ringtail possums, one brush-tailed possum and two tree-kangaroos) represent nearly half of the leaf-eating marsupials in all of Australia. They have close relatives in the mountain rainforests of Papua New Guinea.

The wet tropics region has the highest reptile and frog species endemism known for any part of Australia. Of about 162 reptiles recorded in the wet tropics, 22 are endemic. Thirty of the reptiles are rainforest species, of which 20 are endemic. Fifty are snakes, but only one, the northern dwarf crowned snake, is endemic. It is found from Thornton Peak to Mt Spec. About 10 percent of all Australian frogs are found only in the wet tropics.

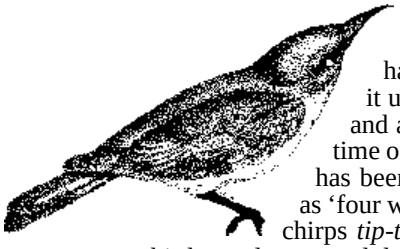
Bartle Frere, at 1622m, is the highest mountain in Queensland. Bellenden Ker is a close second at 1592m.

Rainfall intensities recorded at the weather station at the top of Bellenden Ker are among the highest in the world. This mountain top receives an average of over 8000mm (eight metres) of rain a year with a total of 11 850mm falling in 1999. In just 24 hours it received 1140mm.

Endemic birds found only above 600m are the mountain thornbill, golden bowerbird and Atherton scrubwren. The fernwren, tooth-billed bowerbird, Bower's shrike-thrush, bridled honeyeater and grey-headed robin are much more abundant in the uplands but do stray lower. The chowchilla, although more common in the uplands, is present at some lowland areas at all times of year, while Victoria's riflebird, the lesser sooty owl, Macleay's honeyeater and pied monarch are found at all altitudes, the last of these preferring the lowlands.

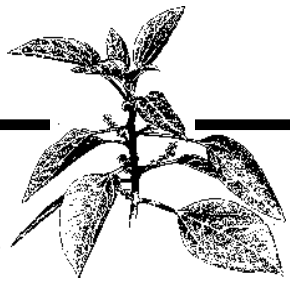
Changes in bird behaviour in the northern hemisphere has been attributed to the effects of global warming. Certain species have been shifting north and some are breeding earlier in the year. Instead of all migratory birds leaving each winter, a proportion has been staying put. Those which do migrate and rely on daylight lengths to trigger their return are in danger of arriving at breeding grounds too late for food resource peaks as flowers and insects respond to temperature, not daylight.

Out and about



The **dusky honeyeater** has a call which it uses at dawn and at no other time of the day. This has been described as 'four whistled chirps *tip-tip-eee-chip*, third note longer and descending, repeated from perches' (*Reader's Digest Complete Book of Australian Birds*) but dialects vary. Birds in Cairns have been heard repeating *ch-ch-cheee, ch-ch-cheee* loudly and persistently with an emphasis on the *cheee*, punctuated irregularly with a snigger. Starting up at first light, the bird continues energetically for five to 10 minutes before falling silent. For the rest of the day, dusky honeyeaters produce simple whistles, squeaks and chattering as they flit around feeding on nectar and catching insects.

Thank you to the many readers who have taken the trouble to fill in and send back survey sheets and for the overwhelmingly positive and useful feedback provided.



The **native mulberry** (*Pipturus argenteus*) has a long fruiting period from about June to January. Male and female plants are separate, the small white flowers developing into white, slightly spiky, fleshy fruits arranged along the thin stems of the female tree.

Sweet and edible, like tiny, pale mulberries, they attract a number of birds, including mistletoe birds which seem to enjoy them as a change to their staple diet of mistletoe berries. The leaves are the main food plant for caterpillars of the white nymph butterfly and are also popular with at least three large stick insects, including the giant spiny stick insect.

A fast-growing shrub or small tree, this plant is related to nettles and stinging trees. However, although it is also known as white nettle, it has no sting. It grows in highland and lowland rainforest, south to Lismore and also throughout the Pacific and south-east Asia. It is a useful tree for revegetation because it attracts birds carrying other seeds.

June and July are peak times for **dwarf minke whales** to visit our region. These whales are particularly curious and are attracted to boats and people, especially in the vicinity of the Ribbon Reefs, north of Port Douglas. Vessels are forbidden from approaching closer than 100m to any whale but if the whale is the one to make the approach, motors must be put into neutral immediately or the engines cut, where safe to do so.

An encounter with these whales, in the water, is a rewarding experience as long as it is managed well. People must not enter the water if a whale is within 30m. When it is safe to enter, this should be done with minimal disturbance. By far the best way of getting a close look at the whales is to don snorkel and mask and hang on to a rope attached to the back of an anchored or drifting vessel. If you swim towards or try to touch the animals, they will almost certainly take fright and disappear. If you are in a fixed and predictable position, however, they will come to look at you.

Clearance Offer!!

As a result of a move to new premises (address on p.8), archived copies of back issues of *Tropical Topics* are being made available to readers. If you would like to receive back issues, please send a stamped, self-addressed A4 envelope to the editor, address on p.8, stating clearly which issues (**by number** – see below) you would like to receive. Postage will depend on weight: for 1 – 4 newsletters you will need a 98ct stamp, 5 – 8 copies = $1.47, 9 – 17 copies = $2.45 and for 18 or more copies, please send a 3kg Prepaid Parcel Post Satchel, available from post offices. Offer applies to Australia only.

Please note that some copies may be 'returned as undeliverable' ones. Also please note that the theme-based material from the first 24 issues has been updated and presented in two compilation booklets, available for sale. Numbers of many issues are limited, so first come first served. All must go by 17 July.

Topics covered over the 10 years are:

1. The Gondwana connection
2. Coral growth (unavailable)
3. Frogs
4. Crown-of-thorns starfish
5. Light in the rainforest
6. Spawning
7. Rainforest possums
8. Cyclones
9. Cassowaries
10. Fish colours and patterns
11. Bats
12. Sharks
13. Wet Tropic webs
14. Reef relationships
15. Fire
16. Seagrasses, dugongs and turtles
17. Wet Tropic webs II
18. Intriguing invertebrates I – echinoderms
19. Mangroves I – the plants
20. Whales and dolphins
21. Mangroves II – the animals
22. Water quality
23. Caring for country
24. Marine hazards
25. Feral and introduced animals
26. Where land meets sea – on the beach
27. Weeds in the Wet Tropics
28. Where land meets sea – islands, cays and seabirds
29. Crocodiles
30. Intriguing invertebrates II – marine molluscs
31. Hazards in the Wet Tropics
32. Intriguing invertebrates III – the cnidarians
33. Wet Tropics lizards
34. Fishy forms and functions
35. Forest fruit dispersal
36. Intriguing invertebrates IV – marine crustaceans
37. Rainforest invertebrates
38. Migratory waders and other shorebirds
39. Plants on the Reef
40. Intriguing invertebrates V – sponges, ascidians & bryozoans
41. The geological framework of the Reef
42. Macropods of the Wet Tropics
43. Night on the Reef
44. Freshwater
45. Intriguing invertebrates VI – marine worms
46. Rodents of the Wet Tropics
47. The ocean
48. Night in the forest
49. Sex and parenting in reef fishes
50. Dasyurid marsupial carnivores of the Wet Tropics
51. Humans and the Reef, part I
52. Birds breeding
53. Humans and the Reef, part II
54. Butterflies and moths
55. Monitoring the Reef
56. Bird call and songs
57. Beetles
58. Identifying corals
59. Plants before flowers: focus on cycads
60. Fish behaving fishily
61. Plants without flowers: lichens, mosses, ferns and conifers
62. In the lagoon
63. Wet Tropics geology
64. Termites
65. Bird body language
66. Biodiversity in the GBR
67. Spiders
68. Wetlands in the Dry
69. Wet Sclerophyll forests
70. Challenges facing the GBR
71. Woodlands of the savanna lands
72. Fungi
73. Birds of the savannas
74. Uplands of the Wet Tropics

Bookshelf

Wet Tropics in Profile
A reference guide to the Wet Tropics of Queensland World Heritage Area
Cassowary Publication

Rainforest animals
Atlas of vertebrates endemic to Australia's wet tropics
Kowari 1
H.A. Nix and M.A. Switzer
Australian National Parks and Wildlife Service Publication (1991)

Although a bit out of date now since more endemic species have been discovered, this book is very useful guide to patterns of distributions.

Birds of Queensland's Wet Tropics and Great Barrier Reef, Australia
Lloyd Nielsen
Gerard Industries Proprietary Limited (1996)

This book is good for pinpointing distribution on the local scale. It also has a unique format for identification, based on main features.

Using Rainforest Research
CRC Rainforest leaflets
Marsupials in the mist, a home with a view, or declining mountain-top refuge?
February 1999
Where earth meets sky: cloud forests of the Wet Tropics
April 2002
Why did the ringtail cross the road?
April 2002
Birds sing the history of the rainforest
September 2001
Fishy genes tell us about the past
August 1999
The new and the known: describing freshwater fish species
September 2001
Fishes in the forest: high biodiversity and endemism
September 2001
Spiny mountain crayfish, an evolutionary tale
August 1999
Checking out frog declines with NASA
October 1998
Getting the jump on frog disease!
May 2001

For information on climate change see the Climate Action Network Australia website: www.climateaustralia.org

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Ph: (07) 4052 0555

Please report **sick, injured or orphaned wildlife** as soon as possible.
Cairns: 4053 4467 Townsville: 0414 717 374 or 0412 123 783
These wildlife care groups can direct you to your nearest carer.

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