

Tropical Topics

An interpretive newsletter for the tourism industry



Frogs

Vol 1 No. 3 July 1992

Notes from the Editor

The Wet Tropics is a very special area for frogs. Representatives of all five Australian frog families are found in the area (including the introduced cane toad as the only, but numerous, example of the *Bufo* family). Many are endemic to the region - about 20 species are found in the rainforests of the Wet Tropics and nowhere else. Of those, many are limited to very small areas. The Thornton Peak tree frog (*Litoria lorica*) apparently occurs only between 640-690m on Thornton Peak.

Our knowledge of rainforest frogs is very recent. About half of them have been studied and given scientific names since 1970 and more are being found. However, faster than they are being discovered, the frogs seem to be disappearing.

Frogs are important. In areas of the world where frog numbers have been seriously depleted, people have discovered, too late, the value of their free insect-control service. Rainforest frogs are an important part of the ecosystem. Tadpoles, in particular, feed on leaves and convert them into protein (themselves) forming a vital link in the food chain. Frogs are eaten by a wide range of other animals.

Frogs have been around much longer than us. They were tough enough to survive the dinosaurs so what is happening to them now?

Frogs croak

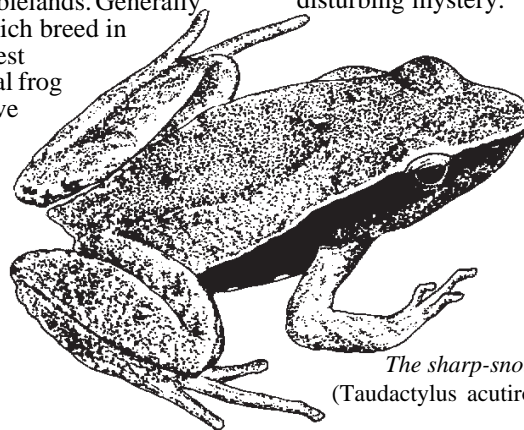
In 1991 the streams on the Mount Carbine Tablelands were quiet. In previous seasons they had resounded to the calls of frogs but in the space of one year, researchers discovered, five species of frogs had apparently disappeared. For example, the sharp-snouted torrent frog (*Taudactylus acutirostris*) previously found at densities of up to 100 in 100m of stream, had completely vanished. It is now known that between 1989 and 1994 six stream-dwelling frog species disappeared from the Wet Tropics uplands. What happened? Where did they go?

Those questions are being asked worldwide. In many countries the reasons are obvious — pollution (especially acid rain), insecticides, herbicides (frogs are especially vulnerable because they absorb moisture through their skin), land clearance and channelisation of rivers not to mention the catching of large numbers of frogs for the dinner table. But what about amphibians vanishing from apparently pristine environments — the high mountain lakes in North America, the forests of Costa Rica and the tablelands of the Wet Tropics?

The Australian wave of disappearances was first detected in southern Queensland in the late 1970s and has been working its way north. It devastated frogs of the Atherton Tablelands a year before moving on to the Carbine Tablelands. Generally those frogs which breed in upland rainforest streams — ideal frog habitats — have been affected. Interestingly, some species which also occur in lowland areas have vanished only in their upland habitats.

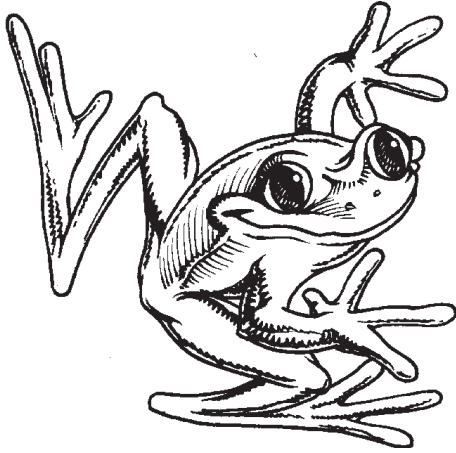
Is the frogs' disappearance an early warning of environmental degradation? It has been suggested that they may be victims of ozone depletion over Australia, although it seems unlikely that nocturnal forest dwellers would be the first to suffer. Is a disease responsible? Perhaps the disappearances are a natural part of frogs' life cycles and they will just as suddenly reappear — although rainforest creatures don't normally go through boom-bust cycles common in other less 'stable' habitats.

We need to know. Researchers from Department of Environment, James Cook University, and Cooperative Research Centre for Tropical Rainforest Ecology and Management are trying to come up with answers. Hopefully they can shed light on this disturbing mystery.



The sharp-snouted torrent frog (*Taudactylus acutirostris*)

W E T T R O P I C S
W O R L D H E R I T A G E A R E A



Froggy facts

Australia's mini-frog

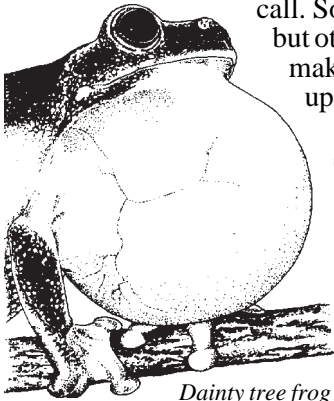
Cophixalus hosmeri is the smallest frog in Australia. The adult male frog is a mere 11-14mm in length — half the length of a standard paperclip — and the newly hatched froglets are even tinier. It lives in a small area, in the cool wet rainforests of the Carbine Tablelands above 940m.

Little *C. hosmeri* is commonly known as the fast-rattling frog because of the short, fast, rattling call of the males heard on moist summer nights. There is also a slow-rattling frog. As no two frog species' calls are alike scientists who use the calls to locate and identify them sometimes name the frogs after their calls.

These frogs, like others in the same microhylid group, don't spawn in water and there are no free-swimming tadpoles! The female lays her eggs in a shallow burrow beneath logs or fallen epiphyte clumps. She produces only seven to 11 eggs (compared with up to 30 000 for the cane toad) but they are relatively big because each has a large yolk to supply the developing frog with plenty of food. The parents stay close to the eggs and may even spread an anti-bacterial and anti-fungal substance on them. The embryo does become a tadpole — but safely inside the egg. It doesn't hatch until it is a fully-developed, but tiny frog.

Loudmouths

Only male frogs can call. They have an inflatable vocal sac below their lower jaw. This does not make the sound, but acts as a resonance chamber to increase the volume of the frog's call. Some sacs inflate externally but others inflate internally making the whole frog blow up.



Dainty tree frog

Some frogs have two-part calls which, roughly translated, mean, 'Come here female' and 'Get lost other males'.



These tiny, newly-hatched froglets, beside a one cent coin, belong to the same Microhylid family as the fast-rattling frogs. They could well be the smallest fully-formed frogs in the world.

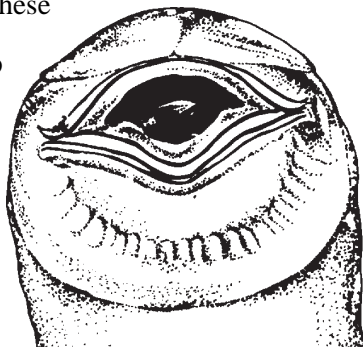
Foam beds

About 25 of Australia's frog species (the dainty tree frog, *Litoria gracilentia*, is a Wet Tropics example) make foam rafts for their eggs. While mating, the female paddles with her front feet and pushes air bubbles under her body where they mix with spawn. This raft keeps the eggs at the surface of the water where it is warmest. Higher temperatures lead to faster development so the raft may enable those eggs to hatch and the tadpoles to get to the food faster than other species which spawn at the same time.

Sweetlips

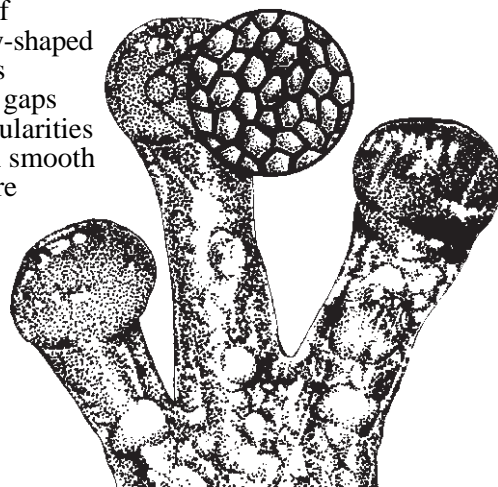
Some tadpoles which live in fast-flowing water have suckers around their mouths to help them hang on to rocks. Within the suckers there are two parts to the mouth. Thin black lines (there can be up to 15) are rows of fine teeth which scrape algae off rocks. Inside these is a thick black horny beak which can chop up large items.

This tadpole, of Nyctimytes dayi, lives in upland and lowland rainforest streams between Cooktown and Townsville



Sticky toes

Why do tree frogs not fall off? Climbing frogs have large flat discs on the tips of their toes and fingers. A close look, with electron microscopes, shows that the skin on the bottom of these pads consists of a pattern of interlocking irregularly-shaped cells with narrow gaps between them. These gaps can catch on tiny irregularities on rough surfaces. On smooth surfaces extra moisture drains away into the gaps leaving a thin even film which allows the pad to stick. Similar skin on the lower side of many frogs enables them to hang on with their stomachs too.



Building a frog pond

A good way to help frogs is to build a breeding pond in your garden. Anything, from a garden pond to a broccoli box, is suitable as long as it is shaded and the froglets can eventually climb out.

Your pond should be filled with rainwater or pondwater and, if possible, be above ground level to prevent cane toads from breeding in it. Otherwise, surround it with a 50cm high bird-wire fence with 1cm holes. Put the fence as far away from the pond as practical.

Cane toads are a risk to tadpoles and mature frogs. Whether or not you have a pond, it is a good idea to collect them at night and freeze them in a plastic bag. Beware the poison glands on their backs. Another humane method for killing them (there is no reason to be cruel — they didn't ask to come here) is to squirt them with Dettol or Toadex — but *not* salt. The bodies can be composted.

Toad eggs should be removed from your pond, or they will poison your water and the 'toadpoles' will eat your tadpoles. It is easy to distinguish frogs' eggs and tadpoles from those of toads. Toad eggs are the only ones laid in long clear strands, the eggs appearing as a row of little black dots. They can be destroyed by being taken out of the water and left to dry.

Toad tadpoles are the only pure black ones in Australia — native frog tadpoles have light-coloured undersides. Surprisingly, toad tadpoles tend to be smaller and are usually found in dense swarms.



Mosquito larvae can be controlled by introducing suitable fish. Be careful, however, as some species also eat tadpoles and young frogs. Suitable native fish for the job are McCulloch's rainbowfish, splendid rainbowfish, Pacific blue eye, fly speckled hardyhead and fire-tail gudgeon. Exotic white cloud mountain minnows can be bought at pet shops.

Given the correct environment, the tadpoles more or less look after themselves, although they do like a feed of boiled lettuce and fish food.

For more information find details in an excellent and inexpensive booklet, 'Raising Native Frogs' by Alastair Bax, in the Bookshelf section at the end of this chapter.

Readers might be interested in joining the **Tablelands Frog Club**. More information from The Secretary, Tablelands Frog Club, Mail Bag 71, Yungaburra, Qld 4872.

Weedkillers can be frog killers

Children in a Cairns pre-school were upset one morning to find 'their' green tree frogs dead. Gardeners had recently been spraying with a glyphosate weedkiller and this was thought to have caused the casualties. Frog skin is permeable. It allows water and oxygen as well as less benign substances to penetrate.

Weedkillers containing glyphosate are used widely in agriculture, industrial situations and in home gardens. They break down quickly after application and are considered relatively environmentally friendly. However, the surfactant, or wetting agent, used in them (not the actual glyphosate itself) can be fatal to frogs and tadpoles.

Please avoid using these products in or near aquatic environments or in other areas frequented by frogs. Cool, dry weather is the safest (and most effective) time to use them but be careful — a warm damp night in winter may entice frogs to leave their hiding spots and make contact with the sprayed vegetation.

It is possible to produce glyphosate weedkillers without the toxic surfactants. These are now being manufactured so, when buying a herbicide, ask for them if intending to use them in areas frequented by frogs.

Frog spotting

Frog fauna in rainforests on a warm, wet night can be the subject of a fascinating spotlighting walk. As frogs' eyes are not particularly reflective, the best way to find them is by careful searching in undergrowth along tracks (especially on lawyer cane leaves) and along streams and by listening for calls.

With the onset of the wet season rains, the frog chorus provides an excellent opportunity to track down the callers. However, you don't have to wait until then to see frogs on a night walk as some can be found in cooler months, especially on the lowlands. Some of the larger species of tree frogs, such as the giant green tree frog (*Litoria infrafronata*) with its prominent white lower lip, and the green-eyed tree frog (*Litoria genimaculata*) with its fringed back legs, are still active at night along creeks, tracks and roadsides. During

the day, frogs can also be found under rocks and logs, where they will remain until the weather warms up. (Don't forget to replace their shelter after you've looked at them).

One of the most common frogs found between Mt Spec and the Carbine Tablelands, the ornate litter frog (*Cophixalus ornatus*), has a call like a 'squeaky wheel bearing'. Calling frogs can be found anywhere from the leaf litter on the forest floor to perches 2m above the ground, on tree trunks or leaf blades. While they are commonly found in the same spot every night, finding them can be difficult as they seem to throw their voices. The easiest way to locate this frog is to triangulate its position using two people with torches standing a few metres apart.

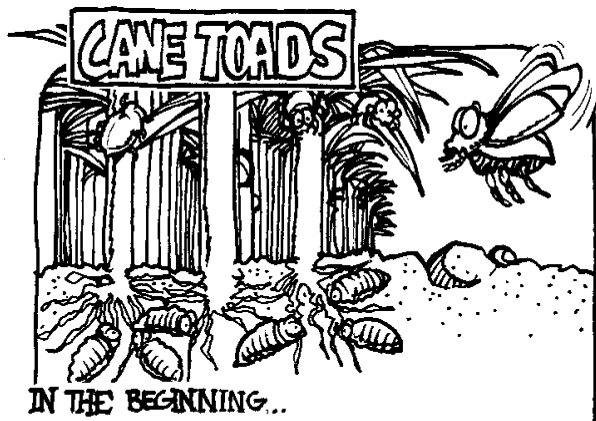


When the frog calls, both people should shine their torches at the position from which they think the frog is calling. A thorough search of the area where the torch beams intersect will usually find the animal — a small, pale blotched frog less than 3cm long.

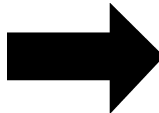
Another frog commonly found calling on warm nights by streams is the northern barred frog (*Mixophyes schevilli*). Again this



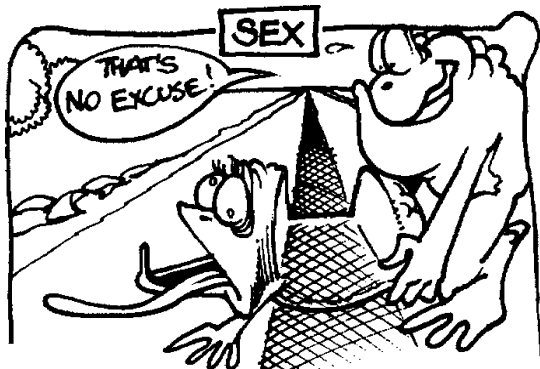
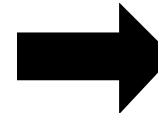
species is almost impossible to find unless it is calling as it blends well with the leaf litter on the forest floor. With its guttural 'warrk' call, prominent barred thighs and large size (up to 13cm in length) this frog is easy to identify.



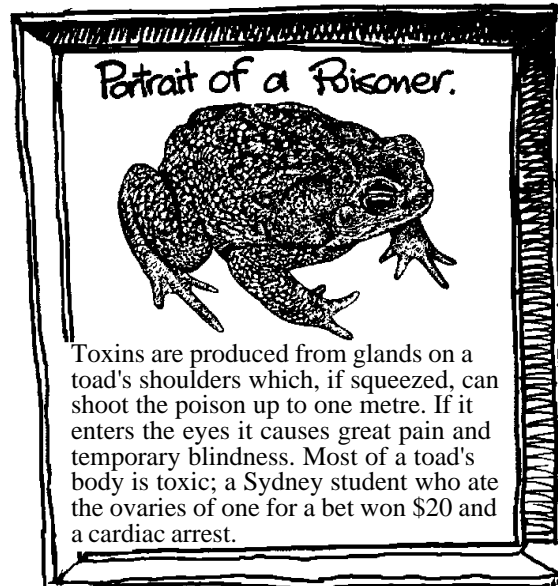
The farmers were desperate. Along the Queensland coast clouds of grey-backed and frenchi beetles were feasting on sugar cane. Native to the area, when their rainforest home was destroyed, they switched to sugar — and there was plenty of it. They dropped their eggs into the soil where the developing larvae feasted on the roots.



Then, in 1932, Australian farmers heard of a South American toad, *Bufo marinus*, eating sugar cane pests in Puerto Rico. In 1935, 102 toads were imported. Within six days they had laid eggs and by March 1937, 62 000 toadlets had been released into the cane fields.



Cane toads breed at every opportunity. Males have attempted to mate with dead (squashed-on-the-road) females, human feet and goldfish. Females lay up to 90 000 eggs a year, in 20m long strands. Eggs hatch in about 48 hours and tadpoles develop into toadlets in about one month. Only one in 200 of the eggs will survive to maturity but individual toads can live up to 16 years.



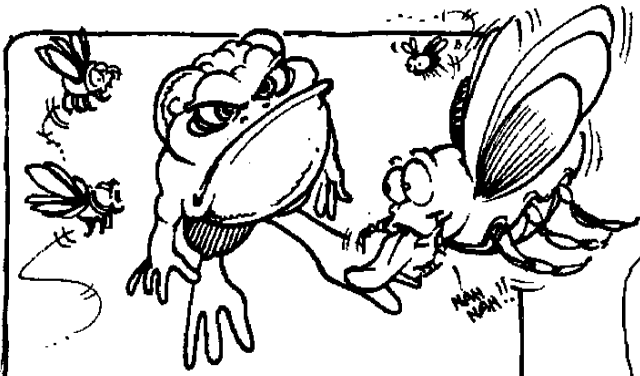
Cane toads have colonised much of Queensland and are marching into the Northern Territory at the rate of 40km a year. Their natural habitat is fairly dry so they move through dry areas more easily than through rainforest. The biggest toads and largest numbers are found on the invasion fronts where they gorge on new food sources. There are actually fewer toads in the areas where they were originally released because populations there have stabilised.



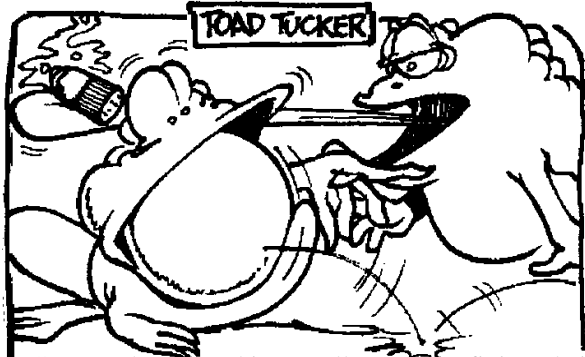
Cane toads are a menace to the environment. They gobble up insects, small snakes and small mammals and also poison animals — birds, snakes, lizards and mammals, including cats and dogs — which try to eat them. But the greatest damage may be done by the toad's poisonous tadpoles and eggs which kill aquatic creatures.



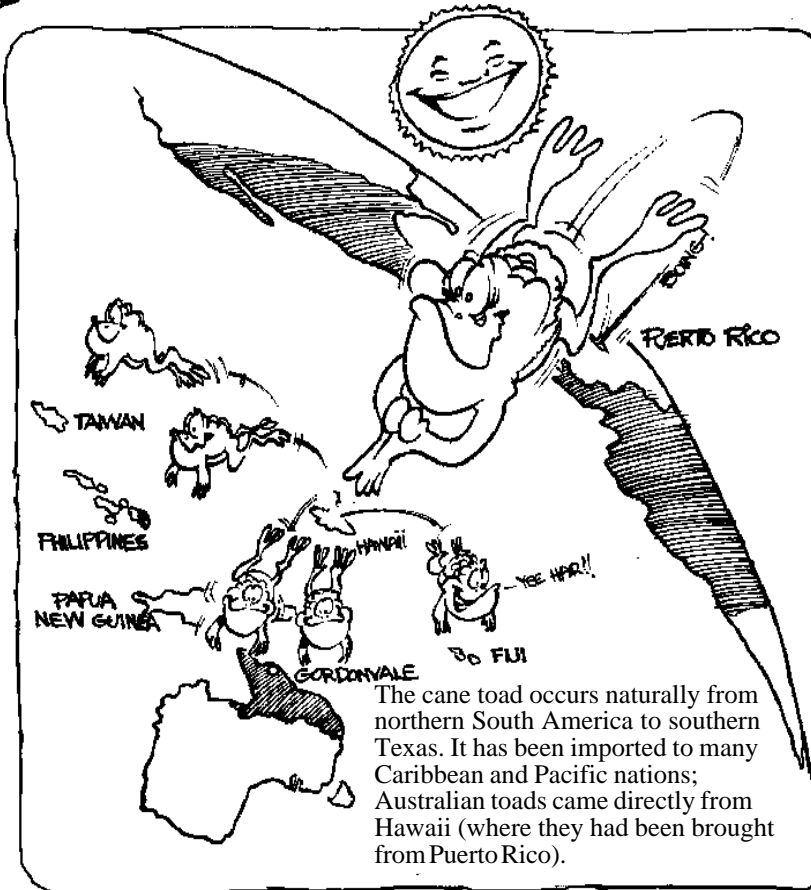
When cane toads first arrive in an area, populations of goannas and brown snakes, in particular, are devastated. Then numbers recover. Possibly these animals develop an immunity to the poison or learn not to eat them. Scientists have discovered that goannas from Townsville will refuse to eat toads offered to them while goannas from the Northern Territory, which have not encountered them in the past, will snap them up.



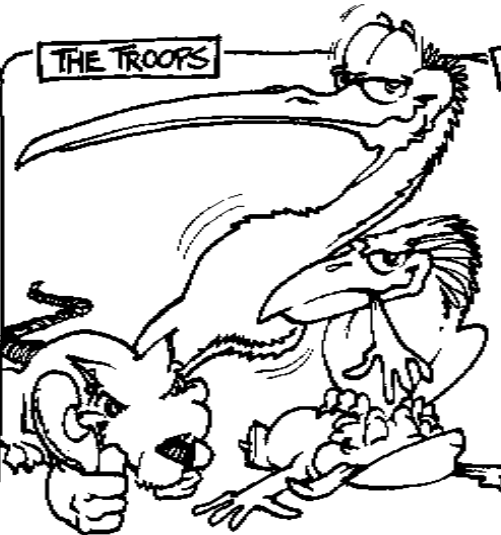
The cane toads did not live up to expectations. Scientists had overlooked one small detail; cane beetles can fly but cane toads can't. Neither were they inclined to try when all they needed to do was sit under a street lamp and scoop up the mouthfuls of insects which fell at their feet. It wasn't until 1947, when the chemical BHC was introduced, that the beetles were finally beaten.



Cane toads eat anything small enough to fit into their mouths. Like other frogs they are attracted by moving objects and snap up insects, lighted cigarette butts, table tennis balls, mouthfuls of bees as they land at the entrance to hives and even their own young. They also eat food which doesn't move, such as dog food and kitchen scraps. Some of the largest toads come from chicken farms where they gorge on chicken droppings.



The cane toad occurs naturally from northern South America to southern Texas. It has been imported to many Caribbean and Pacific nations; Australian toads came directly from Hawaii (where they had been brought from Puerto Rico).



Some animals have learned to eat toads safely. Water rats, kookaburras and crows turn toads on their backs and eat poison-free parts such as the legs. Ibis seem to be unaffected by the poison and can eat the whole animal. Keelback snakes, freshwater turtles and crayfish can eat large numbers of toadlets.



Researchers have found a potentially deadly virus but fears of its effect on native frogs prevent its use. Another possibility is a very powerful dung beetle which, when swallowed whole, would then burst out of the toad's body. However, scientists will think twice before letting another exotic creature loose in Australia.



Prince Charles and Princess Diana were officially delighted to receive a book bound in cane toad leather as a wedding present. The Japanese use the poison as an aphrodisiac and hair restorer, the Chinese are said to use it in heart operations and it could become a dental anaesthetic.

Questions & Answers

Q Are there any videos of rainforest which I can show to my customers while they are waiting to go on my tour?

A There is no perfect video for this purpose but here are details on a number which you might find useful. Bear in mind that copyright laws prohibit showing videos without the permission of copyright holders.

Daintree - Pure Rainforest Ambience (30mins)

GGL Entertainment
Tel/Fax: (070) 55 0541

This video shows Daintree River between dawn and dusk. The only commentary is the birdsong. Although a bit dark at times there is some lovely footage of riverscapes. There are no animals and it is not an informative film but it would make an excellent and appropriate background video.

***Daintree: The Vanishing Rainforest** (47mins)

Kestrel Film Production Pty Ltd
Tel: (03) 429 1688 Fax: (03) 428 6202
A young girl, in a concrete-bound future, is transported to present-day Daintree. Alarmed at first, she soon learns to appreciate the beauty and value of this wilderness as various local scientists and residents appear to impart their wisdom. Then she encounters the Bloomfield Road, and destruction of Paradise. Although containing beautiful footage of the Daintree and Cape Tribulation areas, the sentimentality of the film would not appeal to everyone. The storyline would make it unsuitable for random viewing by passing tourists.

Great National Parks of Australia (60mins)

Film Australia
Tel: (02) 413 8777 Fax: (02) 416 5672
This film looks at six of Australia's most famous parks beginning with Daintree (followed by the Great Barrier Reef). The Daintree section shows some good wildlife footage interspersed with old film illustrating the history of human interaction, Aboriginal and European, with the park. Sadly, the commentary is rather dull.



***Earth First** (45mins)
GAIA Films Australia
Tel: (066) 89 7236 Fax: (066) 89 7287
This starts with an excellent and informative 10-15 minute introduction to Australian rainforests, followed by a look at campaigns against destruction of forests in northern New South Wales, Tasmania and at Cape Tribulation for the construction of the Bloomfield Road. Finally conservationists emphasise the importance of rainforests. The introduction on its own is worth showing to tourists.

Nature of Australia (total length, 5 hours)

ABC Production on two videos:
Episodes 1-3 and Episodes 4-6
Unfortunately only 10 minutes of this excellent production, at the beginning of Episode 3, deals with Australian rainforests. (The final 15 minutes of episode 2 deal with the reef.)

Rainforest: The Amazing World Within (45mins)

Australian Film Institute
Tel: (03) 696 1844 Fax: (03) 696 7972
Unfortunately this beautiful film focusses on an area outside the Wet Tropics, Lamington National Park, in southern Queensland. The many similarities make this film worth watching but the focus on particular species which are restricted to that area makes the film, as a whole, inappropriate for tourists in this region.

* Distributed by The Wilderness Society
Tel: (03) 670 5229 Fax: (03) 670 1040

Q What is the best way to repel leeches?

A Try covering your feet and legs with soap lather. Then put on your socks and cover them with the lather too. Finally cover your boots. Mix in some insect repellent if you like and that'll keep them away - but watch your footing!

Facts and stats on frogs



Frogs appeared on Earth about 200 million years ago. (We arrived about two million years ago.) There are over 4000 species in the world and over 200 species in Australia.



The tadpole of the northern barred frog (*Mixophyes schevilli*) is the largest in Australia growing up to 16cm long (longer than a standard ball-point pen). Adults are 8-13cm long and are widely distributed throughout the Wet Tropics. These tadpoles are particularly important in the forest because they eat, and recycle, very large quantities of leaves.



The frog with the longest leap in Australia lives in the Wet Tropics. The wood frog (*Rana daemeli*), a frog of 75mm, can cover a distance of about 2.5m in a single bound.



The time taken for tadpoles to change into mature frogs varies from one week, for those in arid zones which have to take advantage of water quickly when it is available, to over one year for some in rainforest streams.



All eggs laid in open ponds have a black patch at the top. This is a filter which cuts out the harmful ultraviolet rays in sunlight which would harm the developing frogs.



Frogs' eyes bulge out giving them all round vision. They also may help the frog swallow. When the frog has caught a mouthful of food the eyes sink through an opening in the skull and probably force food down its throat.



Many frogs produce chemicals on their skin which seem to protect them from bacteria and fungi. Frogs have been used in traditional folk medicine all round the world and now modern scientists are using them to develop medicines. A chemical compound which comes from the skin of green tree frogs is used as a gut stimulant after abdominal surgery and also to block schizophrenia symptoms. One Ecuadorian frog produces a painkiller 200 times more powerful than morphine while other frog compounds contract and dilate blood vessels, make hearts beat more strongly, aid food absorption, combat viruses and may eventually be used to repel mosquitoes and act as sunscreen.

Tourist talk

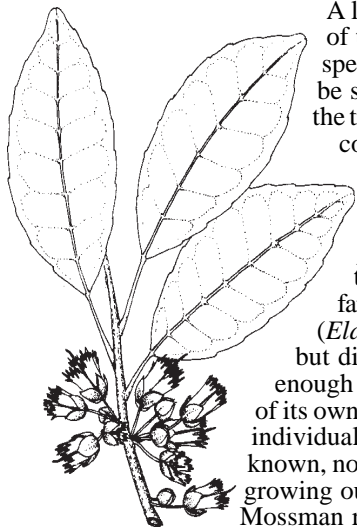
ENGLISH	GERMAN	JAPANESE
frog	Frosch	kaeru 蛙
tadpole	Kaulquappe	otamajakushi おたまじゃくし
eggs	Eier	tamago 卵
disappear	verschwinden	shometsu suru 消滅する
toad	Kröte	hikigaeru ひき蛙
beetle	Käfer	kochurui 甲虫類
larvae	Larven	yochu 幼虫
sugarcane	Zuckerrohr	satokibi 砂糖きび
poison	Gift	doku 毒
skin	Haut	hifu 皮膚

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.

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.

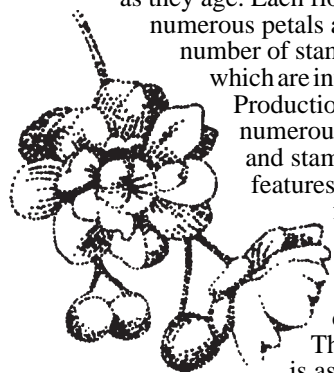
Honeyeaters will feed and squabble around the white flowers of a rare tree known as the **Mossman quandong** which can be expected to bloom in July. Spent flowers, the petals of which have serrated edges, will litter the road to Mossman Gorge.



A large tree of this species can be seen near the traffic counter in the national park. This tree (*Peripentadenia phelpsii*) is in the quandong family (*Elaeocarpaceae*) but distinctive enough to rate a genus of its own. Fewer than 50 individual trees are known, none of them growing outside the Mossman region. About

December, green-shelled fruits will split open to reveal one or more nuts concealed within bright red, deliciously acid flesh. The sweet-tasting kernels within the nuts are eaten by native rodents.

Another tree in bloom during July is *Idiospermum australiense*, sometimes called **ribbonwood**. The red flowers - close to 2cm in diameter - fade to white as they age. Each flower has numerous petals and a large number of stamens, some of which are infertile.

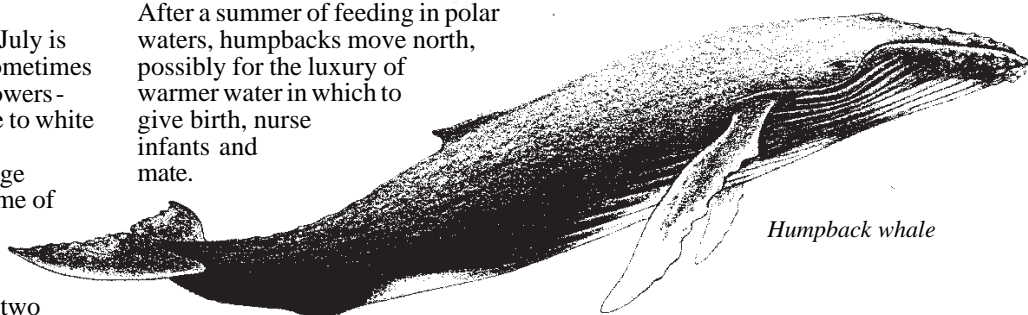
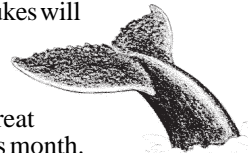


Production of numerous petals and stamens are two features commonly found in flowers classified as having 'primitive' characteristics. The fruit, which is as big as a billiard ball, matures in about nine months. No modern animal is known to eat *Idiospermum* fruit which suggests that, whatever agent helped spread the seed in pre-history, dispersal now depends on gravity, water and luck.



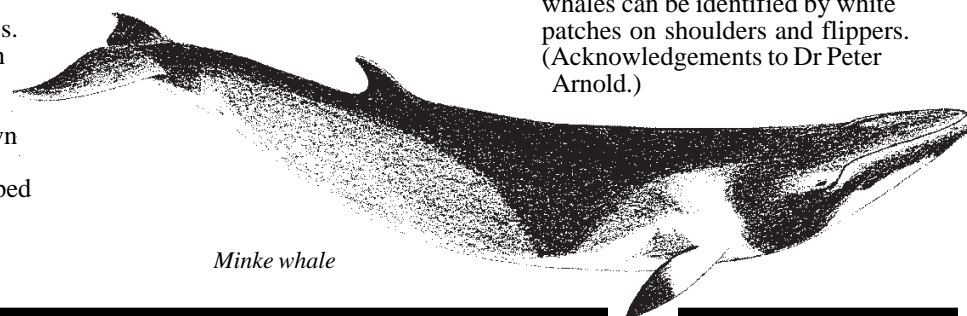
During early mornings in the cool months **day-flying** or **zodiac moths** can be seen fluttering southward from the Daintree region. These moths are heading back to the Bartle Frere - Johnstone River region where they will mate and lay eggs on a vine, *Omphalea queenslandiae*. This host plant will be eaten by the caterpillars. In summer the nectar-feeding adults will disperse widely. (Acknowledgments to Garry Sankowski.)

Powerful tail-flukes will be steering **humpback whales** into the waters of the Great Barrier Reef this month. After a summer of feeding in polar waters, humpbacks move north, possibly for the luxury of warmer water in which to give birth, nurse infants and mate.



Humpback whale

Also in Barrier Reef waters from now until about September are **minke whales**, smaller than humpbacks and without the massive flippers. Minke whales can be identified by white patches on shoulders and flippers. (Acknowledgments to Dr Peter Arnold.)



Minke whale

Winter and early spring may be the mating season for **tube-nosed bats**. These small fruit-eating bats are usually solitary when roosting, but last year there were several occasions when two animals of apparently equal size spent the day hanging upside down in close company, their bodies occasionally in contact. These intriguing bats, which resemble dry, curled leaves when roosting, have been recorded with new-born young from October to December.



Bookshelf

Australian Frogs Michael J. Tyler Reed Books (1994)

This book includes chapters on general topics such as frog origins, fauna, classification, feeding, communication and development as well as specific subjects such as life above the ground, the cane toad and gastric brooding frogs.

A Field Guide to Frogs of Australia Martyn Robinson Reed Books (1995)

A Field Guide to Australian Frogs J Barker, G.C. Grigg & M.J. Tyler. Surrey Beatty and Sons (1995)

A Guide to the Stream-dwelling Frogs of the Wet Tropics Rainforests Department of Zoology, James Cook University (1994)

Printed on waterproof material, this booklet includes colour photos and descriptions of 12 species, including those which have disappeared.

Video: Cane Toads — An Unnatural History (46mins) Mark Lewis Film Australia, Eton Rd, Lindfield, N.S.W. 2070. (1987)

Entertaining and informative, this is a wonderful film of 'a bizarre, biological blunder'.

Cane Toads — An Unnatural History Stephanie Lewis Dolphin/Doubleday (1989)

The book of the film. Well-illustrated, informative and entertaining.

Raising Native Frogs Alastair Bax Queensland Conservation Council PO Box 12046, Brisbane, Q 4002 (1995)

In addition to giving construction methods for small 'instant' as well as conventional garden ponds, this booklet contains information on raising tadpoles and making frog houses and fly traps (for food).



Attracting Frogs to your Garden

Kevin Casey
Kimberley Publications,
PO Box 6095 Upper Mt Gravatt, QLD 4122 (1996)

In addition to information on promoting frogs in the garden, this book has general information on frogs.

Australian Natural History Vol 24 No 5, Winter 1993 *Frogwatch: To shun a silent Spring* Michael J. Tyler

Report on a survey of declining frogs Australia-wide.

Australian Natural History Vol 24 No 12, Autumn 1995 *Frogs and drugs* Michael J. Tyler

A look at frogs as 'mobile pharmacies'.

Australian Geographic No 48 Oct. 1997 *Spawn of an era* Matthew Cawood

A general article on Australian frogs.

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