

Tropical Topics

An interpretive newsletter for the tourism industry



Fire

Vol 1 No. 15 September 1993

Notes from the Editor

It is the fire season again. The subject raises considerable controversy usually because fire is seen simply as a destructive force. It is superficially difficult to distinguish between wildfire and deliberate burning but the effects are very different.

At the time of European settlement the environment had been influenced by Aboriginal burning practices. Since these have largely ceased in the Wet Tropics, some natural vegetation (outside those areas totally transformed by European farming practices) has been changing. At the moment hazard-reduction burning is taking place to minimise the impact of wildfires but managers of the Wet Tropics are faced with an important decision. Current objectives are to maintain existing habitat diversity. Should they reintroduce the fire regimes of the Aborigines to maintain existing vegetation and to recover previous environmental diversity - thus leaving options for the future open - or should they allow nature to take its course at the risk of permanently reducing diversity in the area?

This Tropical Topics presents different approaches to fire management and focuses on flora and fauna, outside the rainforest, which stands to gain from deliberate, positive use of fire.

Rainforest invasion

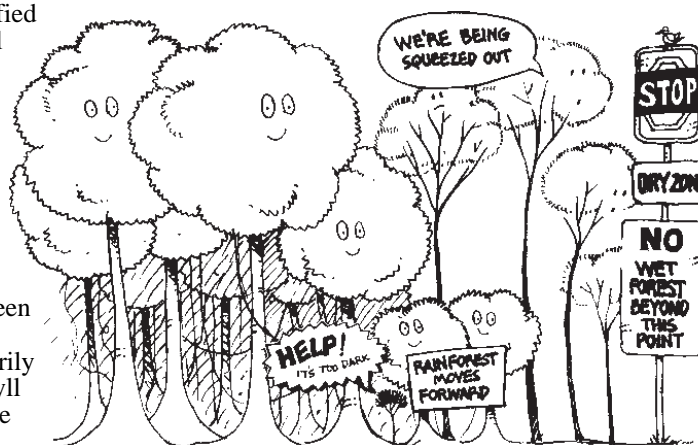
Recently one of our rangers discovered a dragon on the Cape Tribulation headland. It was not a fire-breathing monster but nonetheless it gave him quite a shock because it was a species, the two-lined dragon (*Diporiphora bilineata*), which is common in dry areas, particularly around Mt Carbine and Mt Molloy, but not at Cape Tribulation! Found in a patch of heathland, this little reptile is probably a relict left over from a time when, due to Aboriginal burning, the area had more sclerophyll woodland. Well within living memory goats grazed on Cape Tribulation. Areas north of Emmagen Creek are marked on an 1890 survey map as 'magnificently grassed flat'.

It has been estimated that rainforest, in some areas, is expanding at the rate of 1.25m per year. This sounds like good news until we look at some of the habitats it is taking over. Wet sclerophyll forest has similar requirements to rainforest, particularly with regard to rainfall. It is generally found on the western margins of rainforest and in isolated pockets such as hill tops but cannot exist on drier areas where dry sclerophyll forest takes over. Unlike rainforest, however, trees of the wet sclerophyll, such as flooded gum (*Eucalyptus grandis*), need open well-lit conditions to germinate and develop. Where rainforest species are moving in and forming a dense cover, shady conditions mean that eucalypt seedlings cannot establish themselves. An area where invasion is in progress is typified by a canopy of tall eucalypts with an understorey of rainforest - but no eucalypt saplings. So why is this happening?

It is likely that the rainforest margin has, in the past, been controlled by disturbance, primarily fire. Wet sclerophyll and rainforest have

very different reactions to fire. Rainforest (although it does not normally burn) cannot survive repeated fires, whereas sclerophyll plants can tolerate and even require it. In a marginal area, therefore, fires will kill young rainforest species allowing sclerophyll species to remain.

The Wet Tropics is a diverse area. While its rainforests are its most celebrated feature they are by no means the only vegetation communities. Once an area has been taken over by rainforest, however, the change is irreversible because it does not burn easily. Therefore, it seems that fire is necessary, in certain circumstances, to limit rainforest in the Wet Tropics so that diversity can be maintained.



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

Managing fire

Present burning practices

Prescribed burning

This refers to fire deliberately used by a land manager to achieve a specified goal. There are two main aims. The goal of **hazard reduction** fires is to pre-empt wildfires by burning off fuel loads (such as dead plant matter) under controlled conditions at the most appropriate times for the vegetation involved. Cool, calm days when soils and fuels are moist create slow-moving fires with low flames. These cause little damage to trees and give animals a chance to escape. The goal of **ecological** fires is to manipulate the vegetation structure. These may be of higher intensity to achieve maximum effect on unwanted plants (such as rainforest in wet sclerophyll), debris, etc.

Aboriginal burning practices

The first fire managers in Australia were the Aborigines. Early accounts refer frequently to their skillful use and control of burning. They used it in numerous ways. Fire was an early form of stock management, used to promote new growth which would attract animals for hunting or to drive game into an ambush. Undergrowth was burnt to provide easier passage — in some areas (notably Iron Range) corridors of sclerophyll forest mark old Aboriginal tracks through the rainforest. Smaller fires were used to fell dead trees for firewood by burning their bases, to flush out small mammals and reptiles from undergrowth or holes and to clear areas before digging for edible roots. Small controlled fires were set early in

the dry season to reduce the likelihood of later life-threatening wildfires and sometimes fire breaks were created to protect the rainforest or sacred sites.

Employing a sound appreciation of its behaviour, the Aborigines skillfully manipulated fire by timing it according to vegetation and weather conditions and by using their knowledge of landscape features which would act as natural breaks. The early inhabitants of Australia may not have had ploughs but in their hands fire was a useful and appropriate tool. 'Firestick farming' enabled them to lead what has been termed an 'affluent' hunter gatherers' lifestyle.

Three fire sites

Different sites have different requirements. Below are three examples in the Cairns area.

Cairns Hillslopes (fire exclusion)

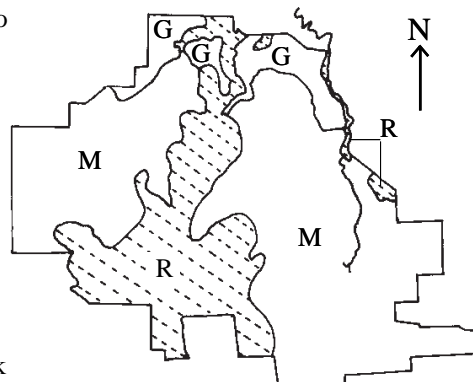
The rainforests of these hillslopes have suffered badly since European settlement. In the past fires frequently escaped from the cane fields or from along the Kuranda railway line when vegetation was burnt off to protect the tracks. Although rainforest does not burn easily it cannot withstand repeated high intensity fires. Increasingly large tongues of fire-induced grassland, composed mainly of tall, highly-inflammable non-native species such as guinea and molasses grass, carried fires progressively further up the hillsides into parts of the Barron Gorge National Park.

The hillslopes of Cairns are a top tourist asset so local government is keen to promote revegetation. In the Redlynch area a 3-5m wide bulldozed buffer strip has been constructed 20-200m uphill from and parallel to the railway line and the area between is burnt annually to provide a fuel-free strip. Then, 10m above this firebreak, a dense strip of native trees has been planted. For several years community volunteers took part in annual planting days. Fast-growing pioneer species were used and the result is a dense strip of vegetation which not only resists the spread of fire but also shades out the grass. It also attracts birds and other animals which do their bit by spreading the seeds to other degraded areas. These plantings have become substantially 'fire-safe' within six years and the scheme has been successful in its aim of excluding fire from those hillslopes.

Eubenangee Swamp (ecological fires)

Apart from reducing fuel loads, fire in melaleuca swamps (M) prevents invasion by non-native plants such as pond apple bush (*Annona glabra*). These areas are burnt every six to nine years but it has to be done while about 5cm of surface water remains. Fire in dry times could result in a very destructive burning in the peat layer. Two areas are burnt in different years.

The grasslands (G) begin to decline after



about three years without fire. Moderate to high intensity fires stimulate the revival of a number of species that have 'disappeared'. Ideally these areas are burnt every three years but at times when adjacent areas are still wet so the fire will not spread. Areas are burnt in different years.

Rainforest (R) is not burnt at all but protected from fire.

Captain Cook Highway north of Cairns (hazard-reduction fires)

Severe wildfires along the grassy coastal hills are almost an annual event due largely to arsonists. On the steep slopes these fires have tended to be of high intensity, difficult to control and a threat to buildings as well as a pocket of rare lowland rainforest. A plan is being implemented to control the situation with a series of hazard reduction fires. These are lit soon after the wet season when they can be controlled using natural barriers such as rocky gullies or greener vegetation.

The area has been divided up into zones to be burnt at different times. The aim is to produce a mosaic of burnt and unburnt areas which reduces the chances of subsequent wildfires sweeping through the whole area.

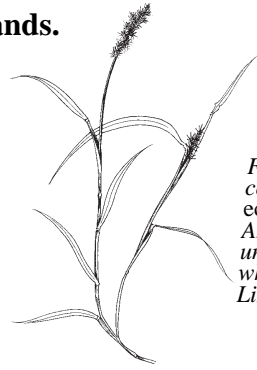
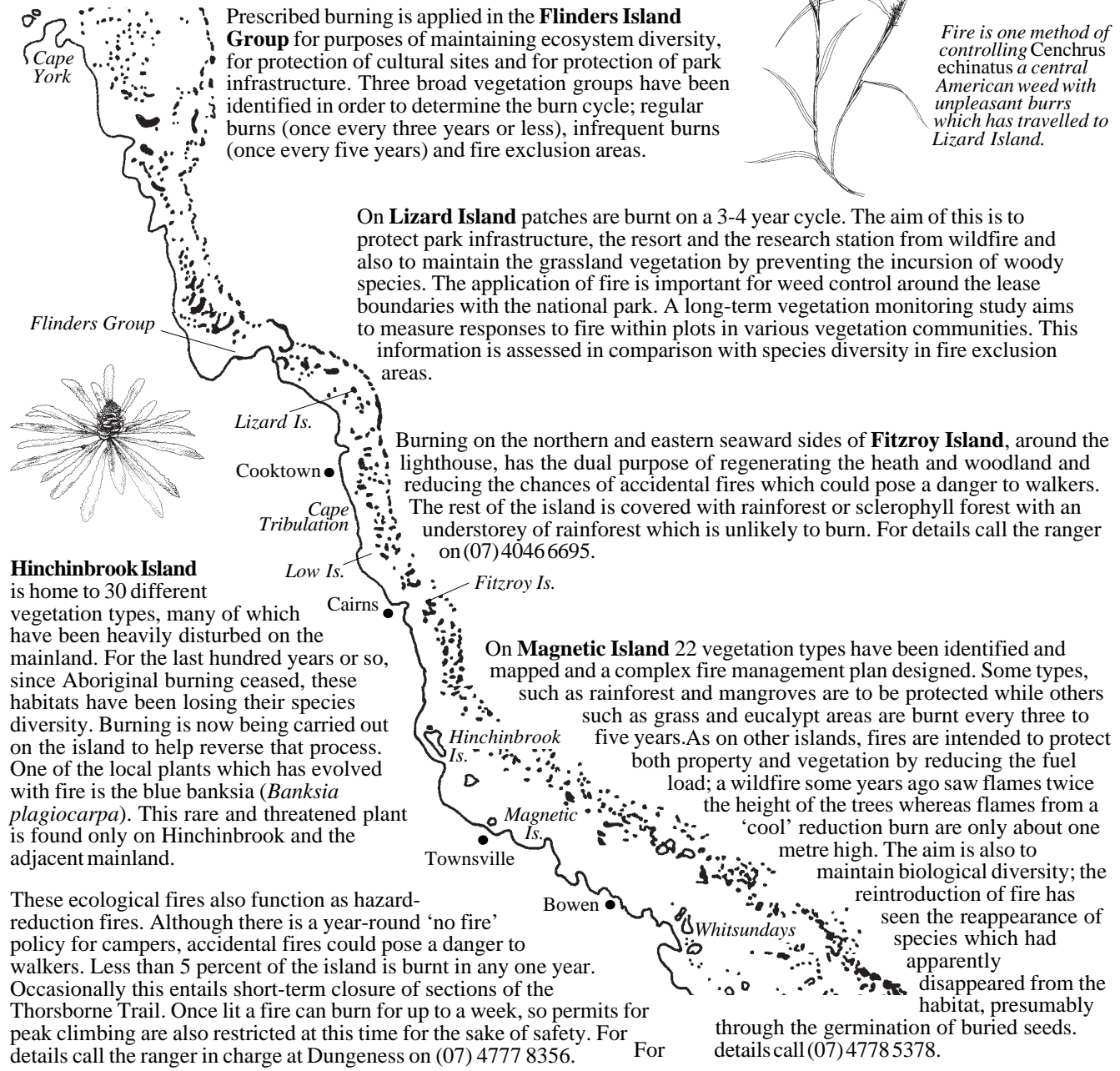
Since 1991, a community group, Treeforce, has been hard at work planting trees on the hillslopes above Aeroglen. A small forest now grows where the first plantings took place and the establishment of an irrigation system*, along with fire breaks, is helping more recently planted areas to survive the wildfire season.

For more information on Treeforce, call (07) 4053 7314 or (07) 4054 3304.

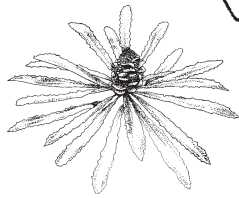
* Funded by DoE, Cairns City Council, Reef Casino Benefit Trust Fund and Port Authority.

Fire on islands

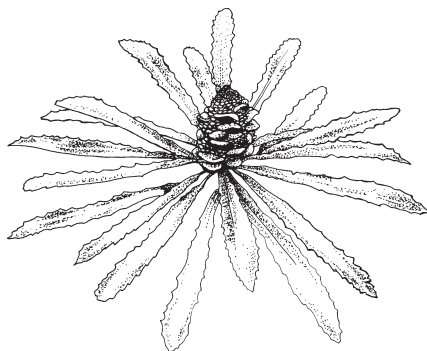
Prescribed burning is carried out on many of the national park islands.



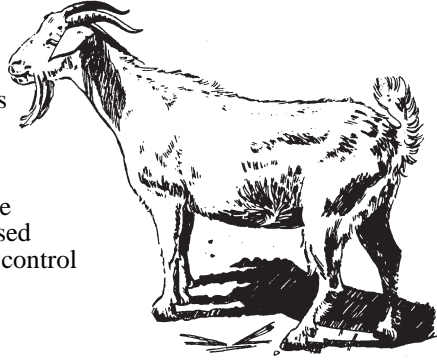
Fire is one method of controlling *Cenchrus echinatus* a central American weed with unpleasant burrs which has travelled to Lizard Island.



The blue banksia is benefiting from burning on Hinchinbrook Island.



The blue banksia is benefiting from burning on Hinchinbrook Island.

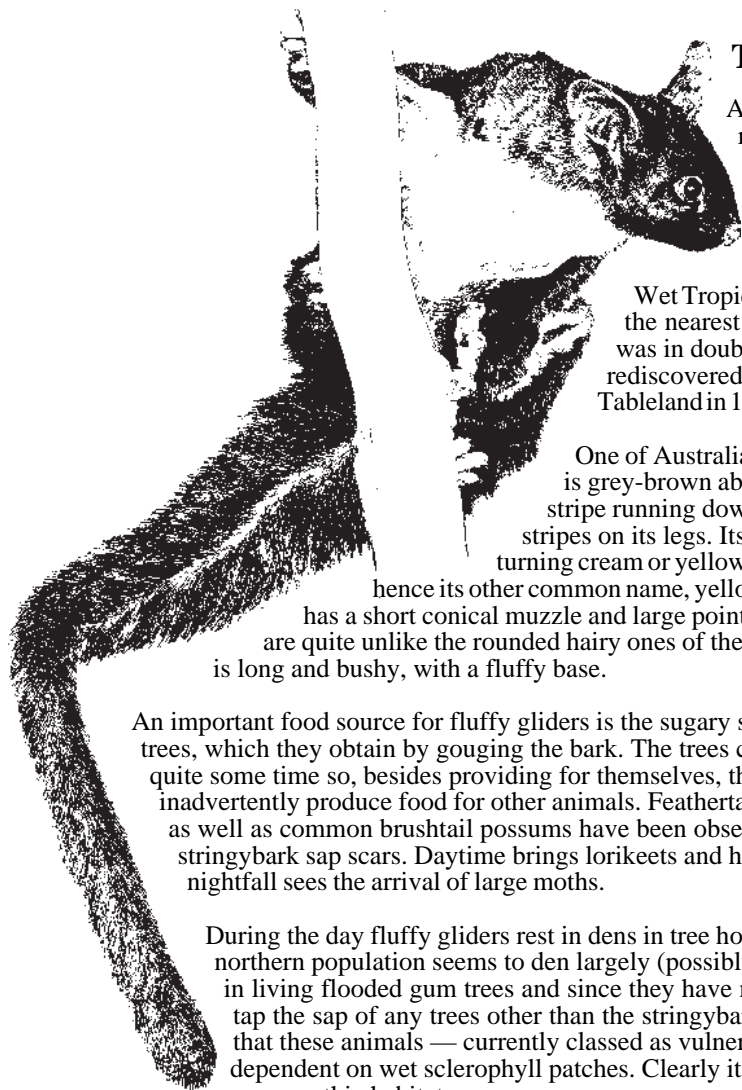


Fire has also been used in the elimination of populations of wild goats on Lindeman and South Molle Islands. The animals were removed easily after being attracted to fresh post-fire vegetation. Growth of lantana which the goats had been feeding on then increased sharply and was in turn brought under control by fire. For details call (07) 4946 7022.

Beyond the rainforests

Bordering on rainforest, with very similar requirements, wet sclerophyll woodland — also known as tall open forest — is characterised by trees such as flooded gum (*Eucalyptus grandis*), red stringybark (*Eucalyptus resinifera*), bloodwood (*Eucalyptus intermedia*) and turpentine (*Syncarpia gomulifera*).

Two rare mammal species in the Wet Tropics are associated with wet sclerophyll forests.



The fluffy glider

Although it had been reported from the Cairns area in the 1930s and Mt Spurgeon in 1954, the presence of the fluffy glider in the

Wet Tropics, some 600km from the nearest known population, was in doubt until it was rediscovered on the Atherton Tableland in 1977.

One of Australia's largest gliders, it is grey-brown above with a dark stripe running down its back and dark stripes on its legs. Its belly is white turning cream or yellow in older animals — hence its other common name, yellow-bellied glider. It has a short conical muzzle and large pointed naked ears which are quite unlike the rounded hairy ones of the greater glider. Its tail is long and bushy, with a fluffy base.

An important food source for fluffy gliders is the sugary sap of stringybark trees, which they obtain by gouging the bark. The trees continue to ooze for quite some time so, besides providing for themselves, these gliders also inadvertently produce food for other animals. Feathertail and sugar gliders as well as common brushtail possums have been observed lapping at the stringybark sap scars. Daytime brings lorikeets and honeyeaters while nightfall sees the arrival of large moths.

During the day fluffy gliders rest in dens in tree holes. Since the northern population seems to den largely (possibly even exclusively) in living flooded gum trees and since they have not been observed to tap the sap of any trees other than the stringybarks it would seem that these animals — currently classed as vulnerable — are highly dependent on wet sclerophyll patches. Clearly it is important to conserve this habitat.

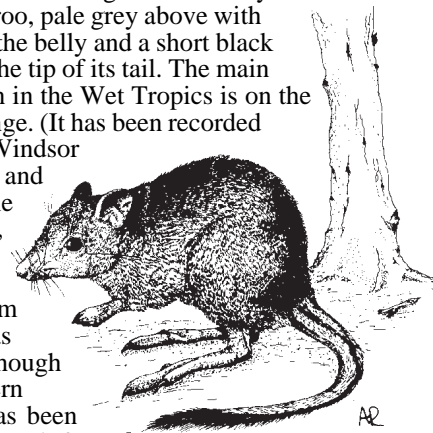
The northern bettong

The northern bettong (*Bettongia tropica*) is a relative of the brush-tailed bettong which was once widespread over much of southern Australia but is now confined to a few small pockets. Both are now endangered species.

The northern bettong is a delicately built rat-kangaroo, pale grey above with cream on the belly and a short black brush on the tip of its tail. The main population in the Wet Tropics is on the Lamb Range. (It has been recorded from the Windsor

Tableland and the Carbine Tableland, but is possibly absent from these areas now.) Although the northern bettong has been seen within rainforest margins and adjacent dry sclerophyll forests it tends to be found mainly in wet sclerophyll areas similar to those inhabited by the fluffy glider.

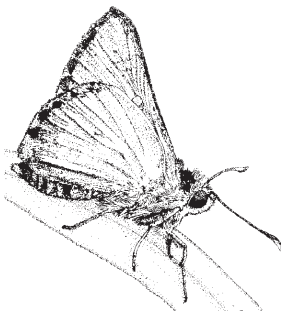
Studies on the closely related Tasmanian bettong indicate that this animal benefits from fire because it stimulates the fruiting of underground fungi, its main source of food. The best population numbers of the northern bettong are found at Lamb Range, an area which is burned every two years or so.



Living with fire



Many eucalypts possess epicormic buds which are hidden under, and protected by, the bark. After the leaves are removed by fire (or insects) the plant uses energy stored in the stem and roots to produce clumps of shoots — which give the trees a strange fuzzy look.



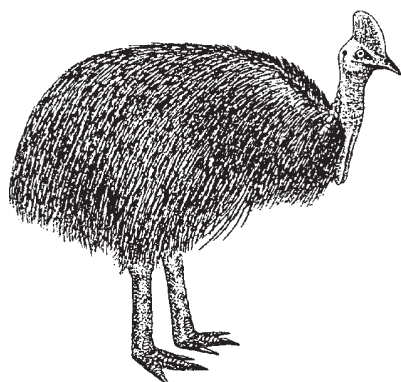
One particular skipper butterfly, *Neohesperilla senta*, lays its eggs on new grass produced after fire. The larvae can only eat young shoots — then the new adults must find more recently burned patches for further generations. The lifecycle of this butterfly clearly depends on patch burning which allows the new adults to move on as the grass becomes too tough.



Fire stimulates production of flowers and large numbers of starchy seeds in cycads. Many species can only grow where there is enough light and benefitted from Aboriginal burning. Groves, used in the past for food, can be seen at Cedar Bay and at Jourama Falls.

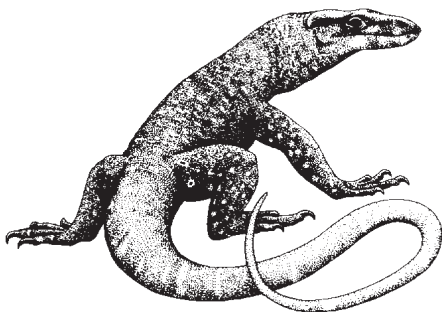
Fire also splits seed capsules of fire-adapted plants such as acacias, banksias and eucalypts.

Cassowary mosaics



Cape Tribulation was known by the local Aborigines as Kurangee, 'The place of many cassowaries'. Now the area supports only a few cassowaries, largely a reflection of the change in vegetation from fire-maintained sclerophyll forest to rainforest. This may seem like a contradiction — the cassowary is known as a rainforest inhabitant. However, although cassowaries do spend much of their time feeding on rainforest fruits, at certain periods in the year this supply dries up. Then the birds need to move out in search of alternative food in nearby sclerophyll forests or swamplands. To preserve only rainforest is not necessarily in the interest of this endangered bird which depends on a mosaic of vegetation types.

The border between two habitats is termed the 'ecotone'. Attracting creatures from both communities, this zone often has a greater variety of animals than either of the overlapping habitats. The areas between wet sclerophyll forests and rainforests are therefore likely to be species-rich.



Fire brings times of plenty for many birds of prey and scavenging animals such as this monitor lizard which feed on animals burnt or exposed by fires.

Fires and forests

Rainforest and sclerophyll forests have very different reactions to fire.

Sclerophyll forest burns easily because

- it is dry, at certain times of year
- the grassy understorey carries fire
- there are flammable oils in leaves and twigs
- leaves do not break down quickly and, combined with fallen bark strips and branches, provide abundant flammable fuel
- open crowns encourage updraughts

Sclerophyll forest survives fire because

- thick bark protects the trunk
- in many species swellings under the ground (lignotubers) or buds under the bark (epicormic buds) will shoot if the tree is badly damaged
- seeds may need fire for dispersal or for germination
- a nutrient-rich ash bed and sterilised soil, free of disease, fungi and seed-thieving ants, is ideal for growing seedlings

Rainforest does not burn easily because

- the high mineral and moisture composition and low oil content of the leaves makes them relatively inflammable
- leaves break down quickly so there is not much dry leaf litter for fuel
- lack of light on the forest floor suppresses grasses which would carry fire

Fires in rainforest are usually a result of severe drought combined with disturbance such as cyclones or logging. Fire may also burn the margins of rainforests on steep slopes with adjacent grassland.

Rainforest suffers from fire because

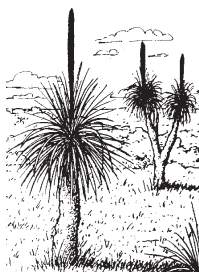
- thin bark of the trees offers no protection
- fire in the leaf litter destroys roots close to the surface

*However, some rainforest species, such as the narrow-leaved lilly pilly (*Acmena smithii*) will coppice from the base as eucalypts do and may be able to survive some fire.*

Wet sclerophyll forest and fire

The relationship between fire and wet sclerophyll is not yet fully understood. There seems to be a paradox involved. Studies of the flooded gum (*Eucalyptus grandis*) show that fire is needed to establish new generations. It clears away the undergrowth to provide the correct light conditions and produces an ash bed which promotes germination. On the other hand the young trees do not have barks thick enough to withstand fire. Flooded gums also lack lignotubers so cannot sprout from the base after they have been burnt.

It would seem that while fire is necessary for the production of new generations of this type of forest, frequent fires would destroy the saplings. Intervals of 40 years, however, may allow a rainforest understorey to establish to the extent that the forest will not burn. Natural drought cycles of 20 years or so may create conditions for the rainforest to be burnt back but research is required to determine the necessary regime.



Grass trees (*Xanthorrhoea*) flower prolifically after being burnt, providing, in turn, nectar for birds and insects. Other plants, including certain ground orchids also flower after fire. This is probably because extra nutrients are provided by the ash but may also enhance the chances of pollination with a large show of visible flowers. Of course if seeds are produced quickly they will drop on the nutrient-rich ash bed.



Many animals, notably kangaroos and wallabies, enjoy the fresh shoots of grass (known as 'pick') which spring up after fire.

Questions & Answers

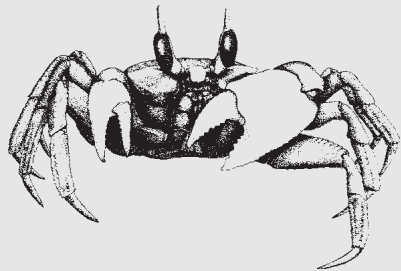
Q Why are licensed pig hunters not allowed in national parks to eradicate wild pigs?

A We will never totally eradicate pigs - by any means. There will only be a reduction of numbers in areas of concentrated management. Investigations have shown that shooting and dog hunting move a pig population from one location to another but do not significantly lower it. In addition, there is concern that hunting dogs which are not under their owner's total control may chase cassowaries, wallabies, etc. Even scent left behind can be enough to disturb wildlife. Pig hunting also raises concerns about public safety and about public perception of appropriate uses for national parks. Accreditation of pig hunters is a potential problem and there is the danger of creating a bureaucracy around their control where energy invested does not merit the return.

However, the problem is not being ignored. Work on pig traps, which was initiated by the Consultative Committee for Cassowary Conservation (C4), is being supported by the Wet Tropics Management Authority. Traps are potentially a positive, environmentally friendly, option.

Q How do crabs breathe, both under water and on land?

A Crabs breathe with gills located



inside their external skeleton, at the base of each leg. These gills are soft respiratory organs which need to be 'floated' in water to function - i.e., to take oxygen from water and give off carbon dioxide. When the crab is in air it utilises reserves of water inside its body, but time is limited and it can eventually dry out. Intertidal crabs, therefore, don't sit in full sunlight during low tide but find a crevice or pool to shelter in. Mud flat species retreat from time to time to dip in the reserves of water at the bottom of their burrows.

Q When is it appropriate to feed animals and with what?

A Basically, it is not appropriate except in the case of catastrophic events (such as after a cyclone) when we are looking at species or population survival. Much of our human food is as unsuitable for wild animals as a diet of grass would be for us and can cause illness or nutrition deficiencies. Turtles fed bread can become unbalanced in the water, causing them to drown while fish can develop unhealthy livers. Feeding of native animals can also create an imbalance in populations. This is in danger of happening at Hypipamee Crater where the bolder coppery brushtail possums are increasing in numbers due to illegal feeding at the carpark and may displace other shy possum species. It also makes the animals vulnerable to cars, dogs and humans with less than affectionate attitudes towards them.

Q What snakes are we likely to see in the Cairns area?

A An excellent brochure on exactly this subject, and what to do if you encounter one (leave it alone and don't panic) is available from DEH offices.

Facts and stats on fire



Fire is a chemical reaction during which hydrocarbon fuel combines with oxygen to form carbon dioxide (Co2) and water vapour. Complex organic substances (plants) are reduced to simpler inorganic compounds such as ash and charcoal (carbon). Fire releases, in the form of heat, large amounts of energy, which have been stored through photosynthesis. In a dry forest each kilo of burning fuel releases about 18 000 kilojoules of energy. A 100 watt electric light bulb takes 50 hours to use this much energy.



Burning of sugar cane fields began in the 1930s to cut down on the incidence of the potentially fatal Weil's disease. The organism causing this is present in rat's urine and was picked up by cane cutters during harvesting. The first mechanical harvesters, introduced in the 1960s, were designed to deal with burnt cane. A reduction of world sugar prices in the early 1980s encouraged farmers to adopt the newly developed and more economical green harvesting machinery.



It is now thought that smoke, rather than heat, is responsible for germination in some Australian plant seeds. Researchers subjected the seeds of 94 Western Australian plants which normally have low germination rates to cold smoke and to water through which smoke had been passed. Germination rates increased significantly. It is thought that ammonia in the smoke may be important.



Control over the lighting of fires comes under the Queensland Fire Service Act of 1990. The lighting of a fire bigger than two metres in any direction requires a permit from your local Fire Warden.



Rainforest has a canopy which is over 70 percent closed (that is, if you look up, 70-100 percent of the sky is obscured by branches). Wet sclerophyll forest is 30-70 percent closed.



Of the 400 or so eucalypt species of Australia only 12-15 lack lignotubers which enable the trees to sprout from the ground (coppice) after fire or other destruction of the upper part.

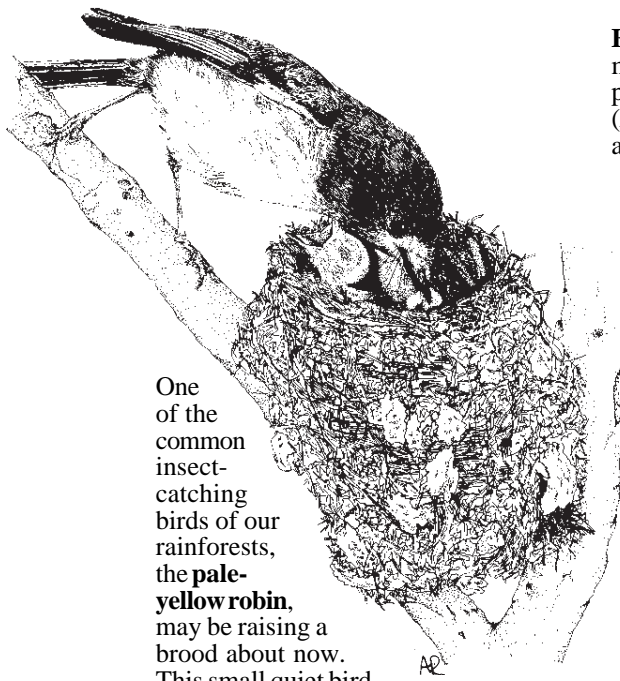
Tourist talk

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Nature notes

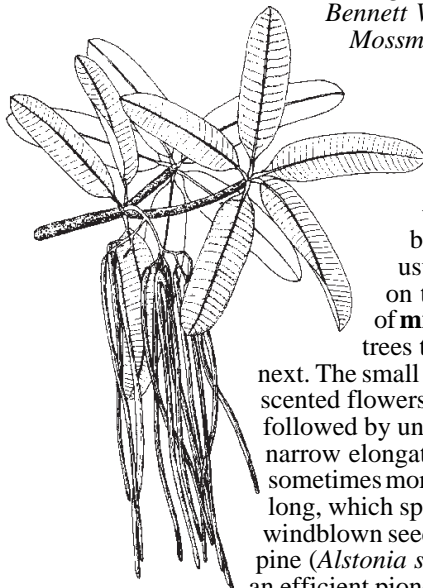
A diary of natural events creates a pleasing journal which grows richer with the passage of time. Watching for the recurrence of an event after noting it in a previous year, and trying to understand what could have caused changes in timing, is intriguing.

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.



One of the common insect-catching birds of our rainforests, the **pale-yellow robin**, may be raising a brood about now. This small quiet bird makes a neat cup nest decorated with lichen and moss. Last year one pair of nestlings was successfully raised although the nest was located well within the view of a sizeable Boyd's dragon which was undoubtedly aware of the youngsters' progress from egg-pipping to fledgling.

Acknowledgments to Bennett Walker, Mossman.



Masses of white blossom usually appear on the crowns of **milky pine** trees this month or next. The small strongly scented flowers are followed by unusually narrow elongated capsules, sometimes more than 30cm long, which split to release windblown seeds. Milky pine (*Alstonia scholaris*) is an efficient pioneer but is believed to live for as much as 300 years, during which time it can become a very handsome tree. The foliage is an important food for Lumholtz tree-kangaroo.

Fragrant boxwood (below) is one of the most sweetly scented flowers to perfume the spring. This tree (*Xanthophyllum fragrans*) is classified as rare because it occurs only as scattered individuals in the Mossman to Cape Tribulation coastal rainforests. The creamy-yellow petals, 5-6cm long, have distinctive purple flecking on the inner surfaces. Leaves of this boxwood and its relative McIntyre's boxwood (see May/June issue) are often yellowish green - hence the name *Xanthophyllum*. Most leaves in both boxwoods show a pair of small 'glands' near the stem end, which may secrete sugar.



Another lovely and delightfully scented spring blossom is that of **white cedar**, common across much of the Wet Tropics. Inspection of the sprays of mauve blossom show that each flower is quite intricately shaped and coloured, suggestive of a tiny orchid. White cedar (*Melia azedarach*) grows as a rainforest pioneer in disturbed sites in relatively good soil, as a tree on vegetated sand dunes and in many a garden from the coast to Mt Isa.



Fig-parrots, so noticeable when they streak across the sky emitting high pitched cheeps, will be rearing nestlings about now. Their eggs are laid in holes in dead, sometimes perilously shaky, trees. The presence of nestlings is easily detected should a parent bird visit, for the occupants immediately begin a shrill commotion. Unlike many larger parrots, fig parrots feed very quietly, chiefly on the kernels of many tiny seeds, including those of figs, buttonwood (*Glochidion*) and ironwood (*Rhodomyrtus trineura*). Feeding birds are usually discovered due to the faint noise of seeds being husked or the patter of discarded portions of fruit.

Lesley Williams of Down Under Dive has contributed this observation: A couple of weeks ago (July) we were visited by a **minke whale** which slowly circled the boat while anchored at Saxon Reef. It did this three times, the third time surfacing to wink and then spit water at us before disappearing back into the sea. Recently, while at Norman Reef, we spotted **humpback whales** about 100-150m off the rear of the boat slowly moving in a southerly direction.

Bookshelf

Fire and the Australian Biota

A.M. Gill, R.H. Groves and I.R. Noble (eds)
Australian Academy of Science
(1981)

A comprehensive look at the subject, this book is divided up into sections on *Fire History*, *Physical Phenomenon of Fire*, *Responses of the Australian Biota*, *Responses of Selected Ecosystems* and *The Role of Fire in Ecosystem Management*. Since the book deals with the whole of Australia not all of the information is relevant to the Wet Tropics but there is plenty of interest.

Fire Management

Brochure produced by Department of Environment
Available at DoE offices

One of the few publications relevant to the Far North this brochure looks at the historical and ecological role of fire as well as fire management in national parks.

Fire Management Strategies

Brochure produced by the Wet Tropics Management Authority and the Rural Fire Division of the Queensland Fire Service
Available at DoE offices

This looks at fire management in different vegetation types in the World Heritage Area and the relevant legislation.

Bush Regeneration Recovering Australian Landscapes

Robin A. Buchanan
TAFE Student Learning Publications
(1991)

Although dealing with general techniques and strategies for recovering degraded landscapes, this attractive and readable book necessarily considers the role of fire in the equation. Types of fires are analysed at the end of Chapter 5 (*Regeneration Techniques*) and Chapter 6, *Regeneration of Plant Communities*, considers the effect of fire on everything from mangrove swamps and sand-dunes to rainforests, including a section on wet sclerophyll forests. Unfortunately much of the information is more relevant to southern parts of Australian than to northern regions.

Trees and Natural Resources
December 1992

Fire: An Ecological Catalyst

Kevin Tolhurst

Nature Australia Vol. 25 No. 7
Summer 1996/97 page 10

Smoking or non-smoking?

A short article describing research which showed that it is smoke, rather than heat, which appears to stimulate germination in some Australian plants.

Australian Rainforests

Paul Adam
Oxford Monographs on
Biogeography No. 6
Oxford University Press (1992)

While of general interest to readers concerned with rainforest, Chapter 4 on *Rainforest Boundaries and the Problem of Mixed Forests* and Chapter 5 on *Regeneration and Response to Disturbance* take fire into account.



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