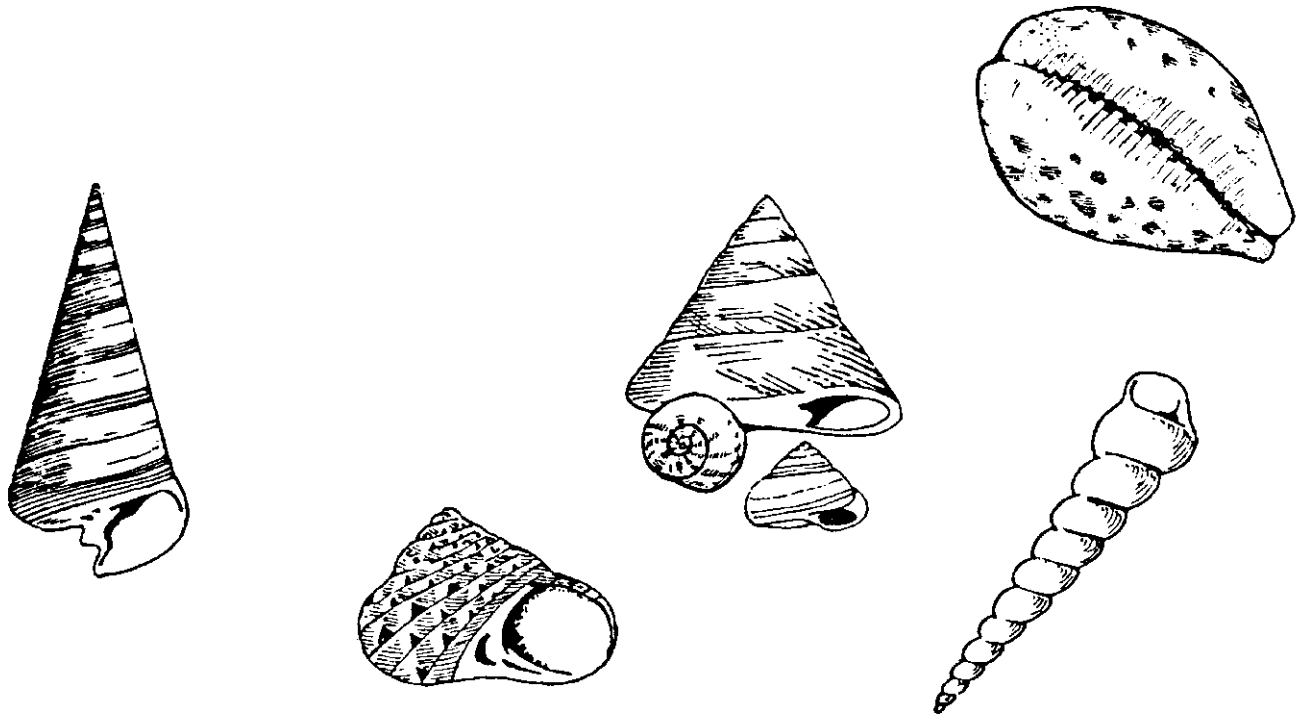




Casuarina Coastal Reserve

Teachers Handbook



Written by Stuart Traynor Illustrated by Bob Whiteford



Northern Territory Government

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FOREWORD

This TEACHER'S HANDBOOK and the accompanying STUDENT ACTIVITY DO SHEETS are resource materials for school excursions. While written for the Casuarina Coastal Reserve, they could be used in similar localities throughout the Top End.

The DO SHEETS are in the form of black line masters for school reproduction. DO stands for Discovering Outdoors. We have, in the Northern Territory, a climate that is ideally suited for outdoor learning. It is hoped that this publication will lead to an increased amount of outdoor education, promote greater awareness of our natural environment and foster a concern for its preservation and improvement.

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CASUARINA COASTAL RESERVE

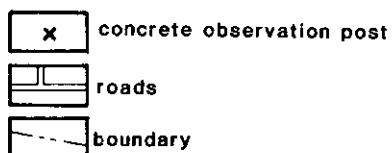
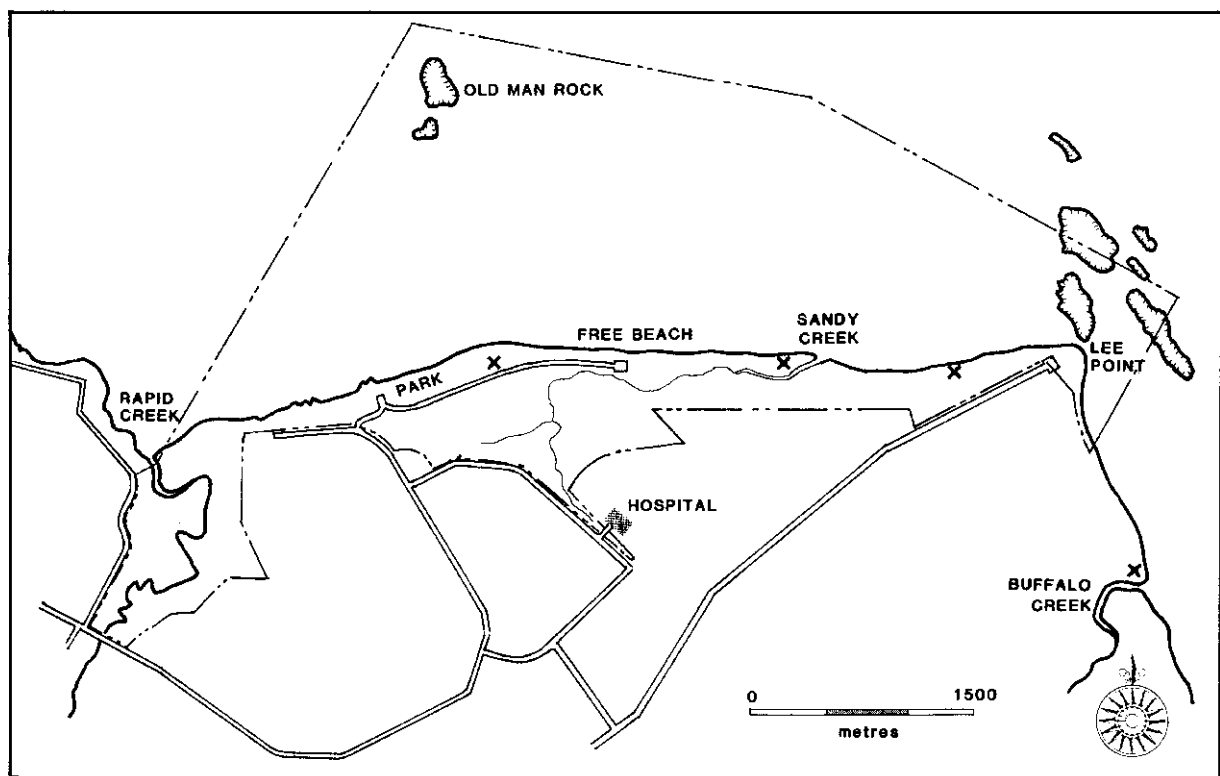
Casuarina Coastal Reserve is an irregular strip of 1180 ha along the coast of Darwin's northern suburbs. It contains a very attractive semi-natural beach and cliff face, both of which are scarce within the region.

The reserve contains a range of coastal habitats in a relatively natural state:

- * off-shore dugong habitats
- * sandy beach
- * dune system requiring stabilization
- * mangroves
- * dry lateritic rainforest (or deciduous vine thicket)

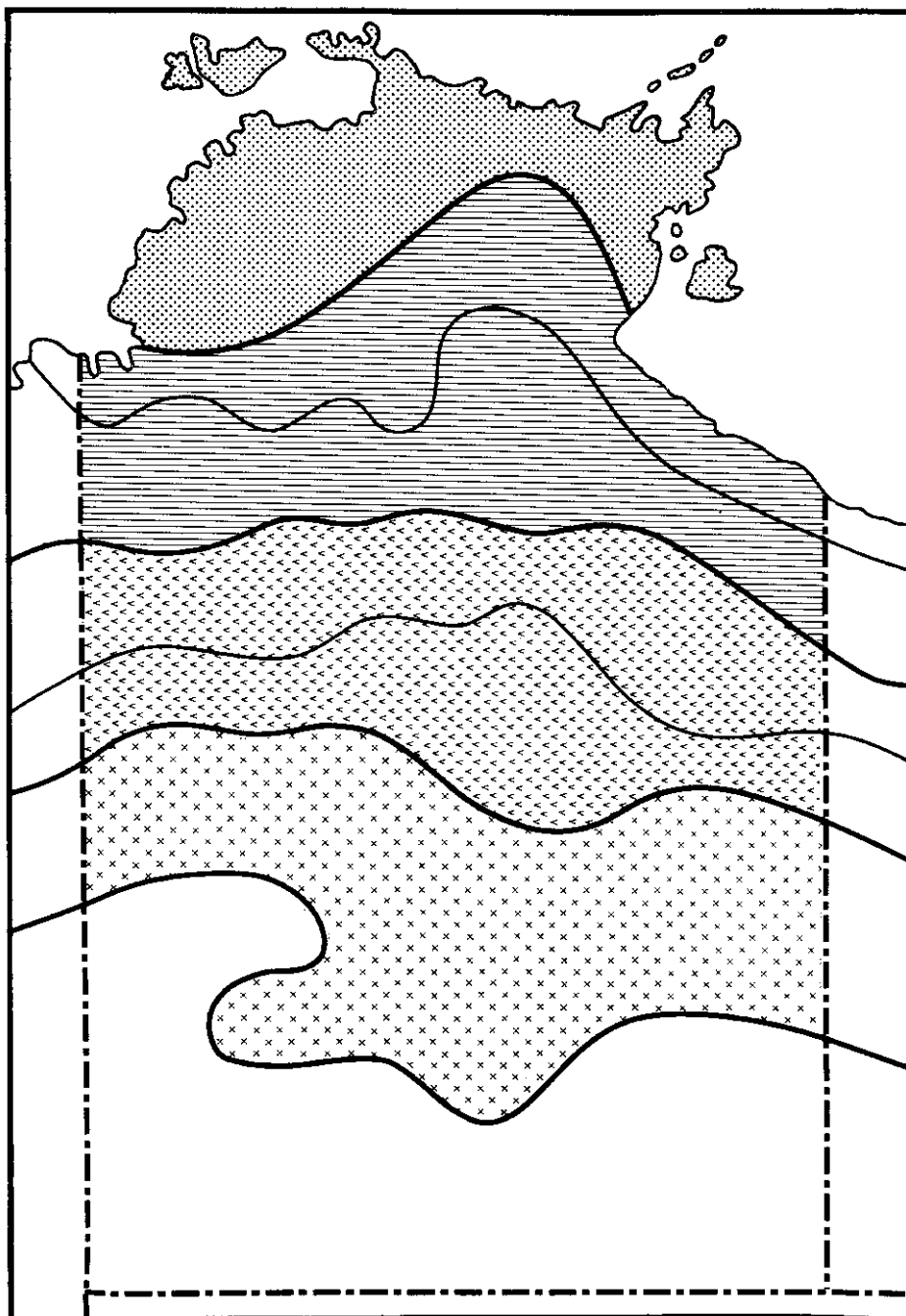
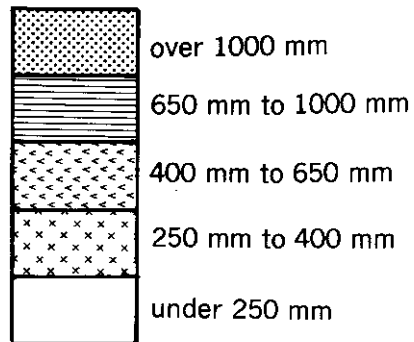
The reserve also contains areas of significance to Aboriginal people including a registered sacred site, and World War II artillery observation posts.

Because the area is very accessible to the population of Darwin, the reserve provides a range of recreational and educational opportunities.



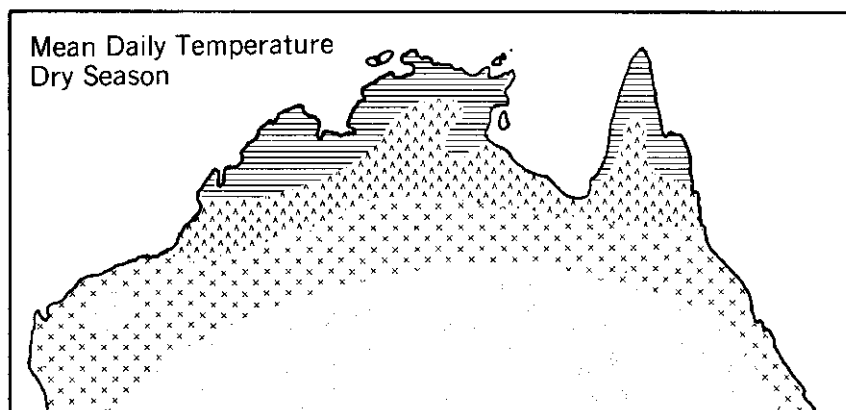
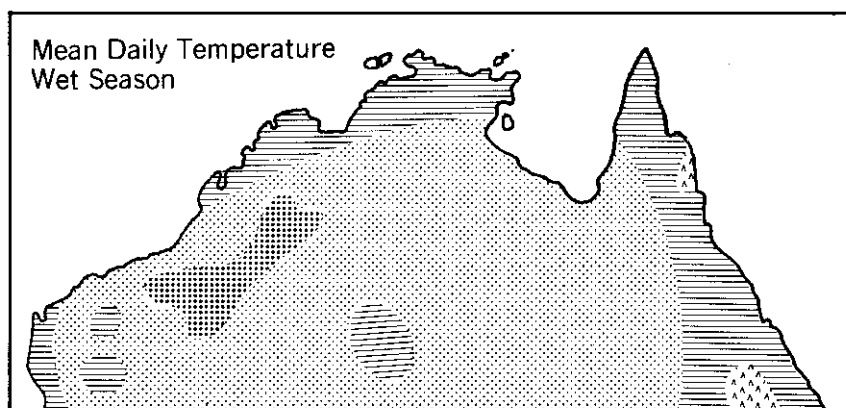
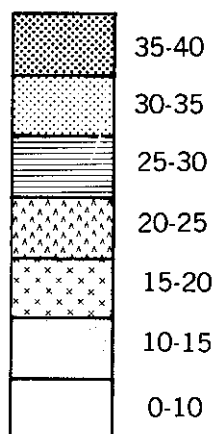
CLIMATE

1. Rainfall



2. Temperature (°C)

Month	Mean Daily	Mean Maximum	Mean Minimum
January	28	32	25
February	28	32	25
March	28	32	25
April	28	33	24
May	27	32	22
June	25	31	20
July	25	30	19
August	26	29	20
September	28	32	23
October	29	33	25
November	29	34	25
December	29	33	25



3. Relative Humidity

Humidity ranges from around 54% in July to around 82% in the wet season.

4. Sunshine

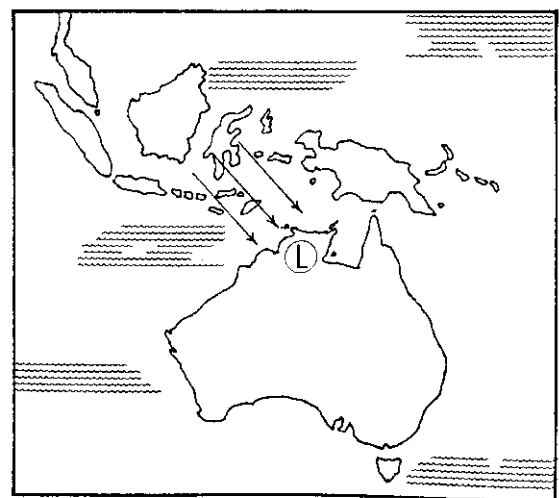
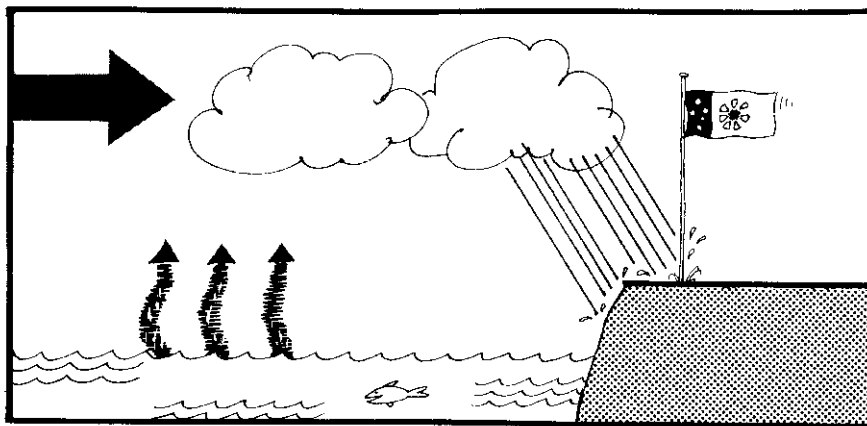
Darwin has an average of 8.4 hours of sunshine per day. (It ranges between 10 hours per day during the dry and 5 to 6 hours per day during the wet.)

5. The Monsoons

The Top End climate is related to the annual monsoons, (seasonally reversing winds that blow from the north-west for approximately six months and from the south-east for the other six months).

South East Asia and Northern Australia are linked in the one seasonal system because of the symmetrical distribution of land masses on either side of the equator.

From November to April radiant energy from the sun heats the land surfaces of the Top End more than it does the neighbouring sea surfaces. The air over the land rises and is replaced by a north-westerly flow of moisture laden air from over ocean. The result is a season of heavy rain and storms.

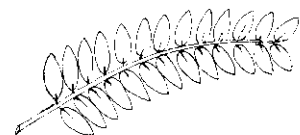
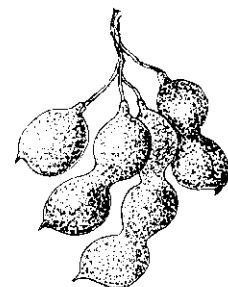
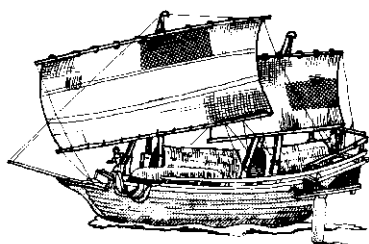


Between May and October the reverse situation occurs. The Australian land mass is cooled relative to the sea to the north-west and a south-easterly airflow prevails over Northern Australia.



A number of factors complicate this pattern of Wet Season and Dry Season. One is that the rain bearing north westerly monsoon is often held offshore causing variation in the time of onset of the wet season. Cyclones, which form over the warm tropical seas, also cause variations in weather and wind patterns during the wet season. There are also differences between the weather and wind patterns on the north-west and north-east coasts of the Top End.

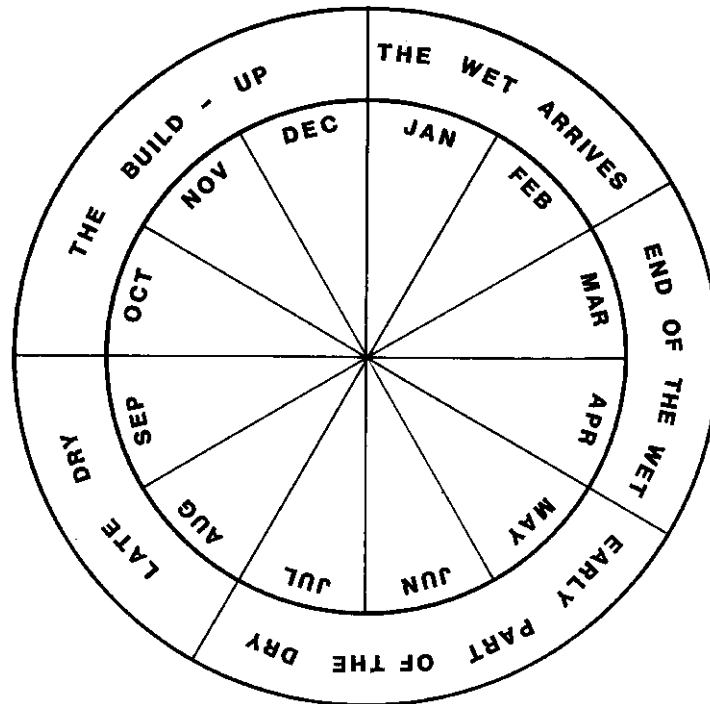
For 250 years until 1907, Macassan sailors from Indonesia visited the Top End coast to collect trepang (sea slugs). Their sailing vessels, called praus, were carried by the northwest monsoonal winds. When the prevailing wind changed to a southeasterly at the beginning of the dry season, they returned to their home ports.



Large tamarind trees, which have sprouted from fruit the Macassans brought with them as a food supplement, mark their campsites along the coast of Arnhem Land.

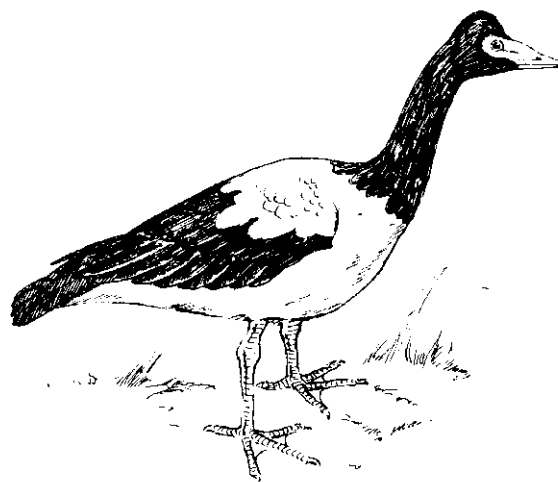
TOP END SEASONS

It is over-simplistic to think of the Top End climate in terms of only two seasons: the Wet and the Dry. A number of different seasons can be recognised throughout the year and their approximate timing is depicted in the following diagram.



The Build-up (October, November, December)

This period could be regarded as the beginning of a new year as the seasonal cycle starts all over again. The days get hotter and more humid as clouds progressively build up each day. Thunder and lightning are a feature of this time of year. The first storms come and the parched earth soaks up the early rain. New grass then sprouts and the brolas, jabirus and waterfowl prepare to nest.



The wind is very variable at this time of the year and may blow from different directions at different times of the day. (It is a time of change because the prevailing south easterly wind of the dry season is swinging around to become the prevailing north westerly of the wet.)

The Wet Arrives (January, February)

The arrival of the north west monsoon results in heavy rains everyday and rough, dirty seas. Everywhere plants are growing and soon the bush will be overgrown. The shoot systems of the yams climb up the trees though the tubers will not be ready for eating until the dry season.

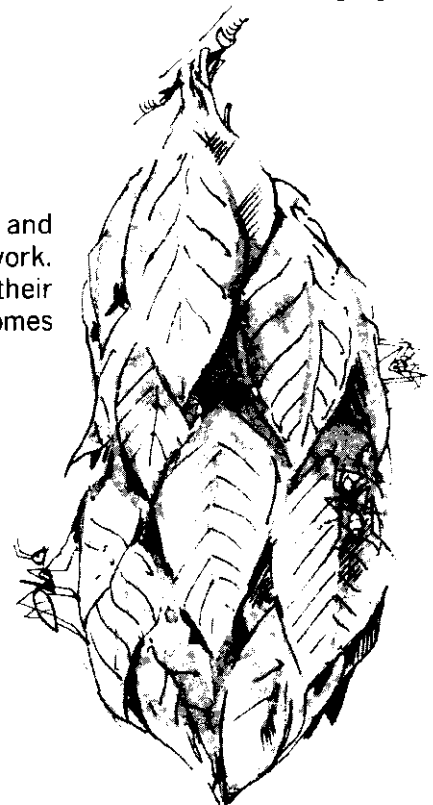
As the waterholes, billabongs, paperbark swamps and flood plains fill up magpie geese, ducks and other waterfowl lay their eggs. These eggs will hatch when the waterholes are full and there is lots of food. Crocodiles also lay their eggs at this time.



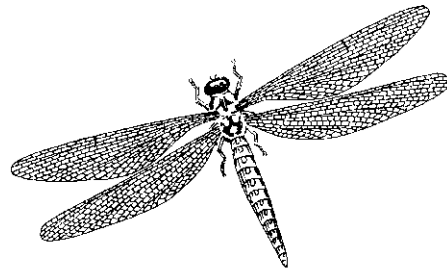
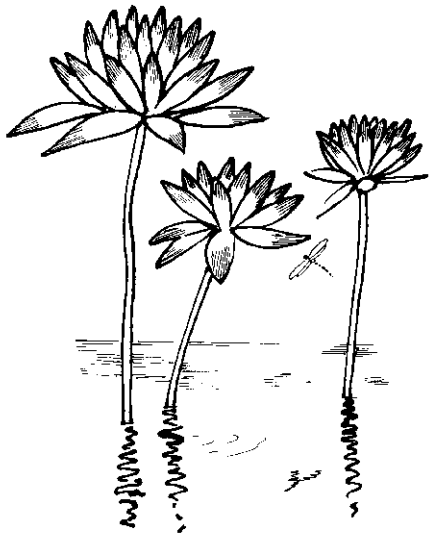
The abundance of water also brings new populations of mosquitos. Geckoes and other lizards gorge themselves on these mosquitos and other insects.

End of the Wet (March, April)

Towards the end of the wet the heavy storms become less frequent and sunny days are common. With the break in the rain, insects set to work. Ants rebuild nests in the soft soil while mud wasps collect mud for their nests. Newly developed green ant workers set about making new homes from leaves bound with silk.



Many plants flower and fruit at this time. Waterlilies flower and cover the billabongs with a carpet of colour. At the same time the tall grasses are seeding and bend over under the weight of their seeds. Grasshoppers and dragonflies are abundant.

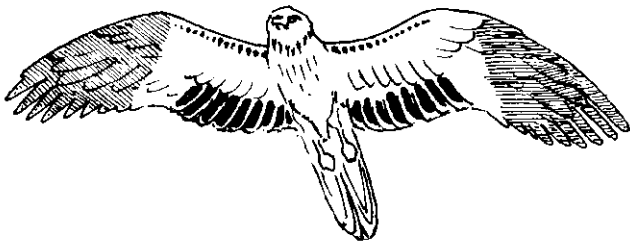


At the end of the wet the wind swings around to become a southeasterly - the main dry season wind.

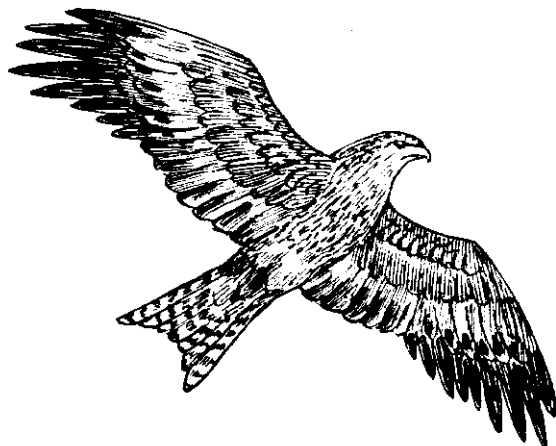
Early Part of the Dry (May, June, July)

At the conclusion of the wet season strong south easterly winds called the knock-em-downs flatten the tall grasses and signal the beginning of the dry. The early dry season nights are cooler as the humidity falls and temperatures become more pleasant.

Bushfires become a common sight as the country dries out. The Whistling Kite (*Haliastur sphenurus*) and the Black Kite (*Milvus migrans*) can be seen riding the thermals created by the fires as they look for small mammals or reptiles escaping from the fires.

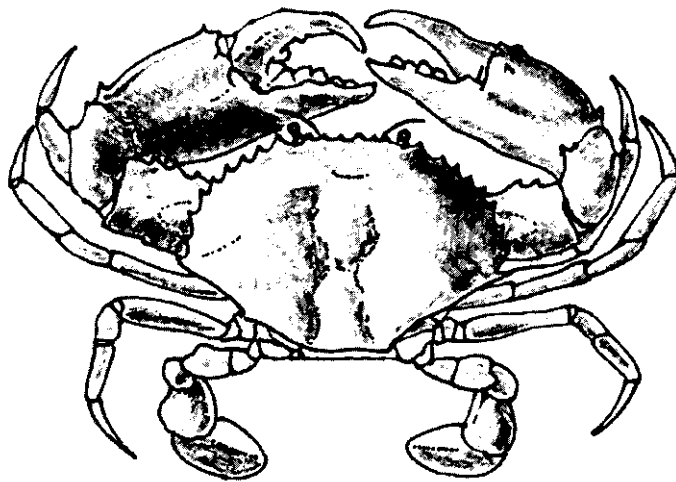
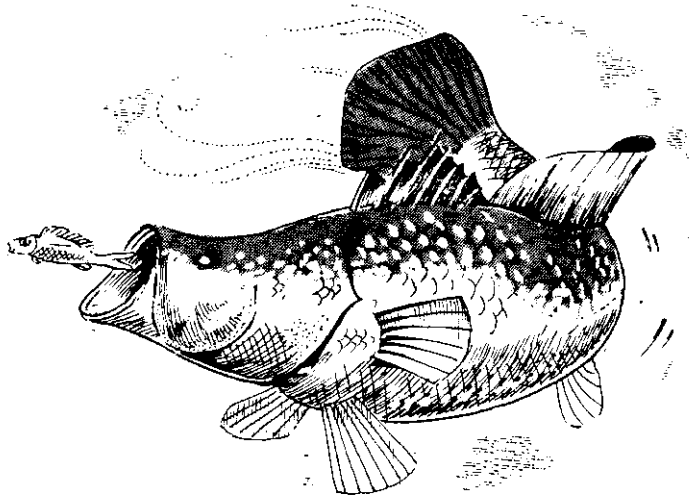


Whistling Kite

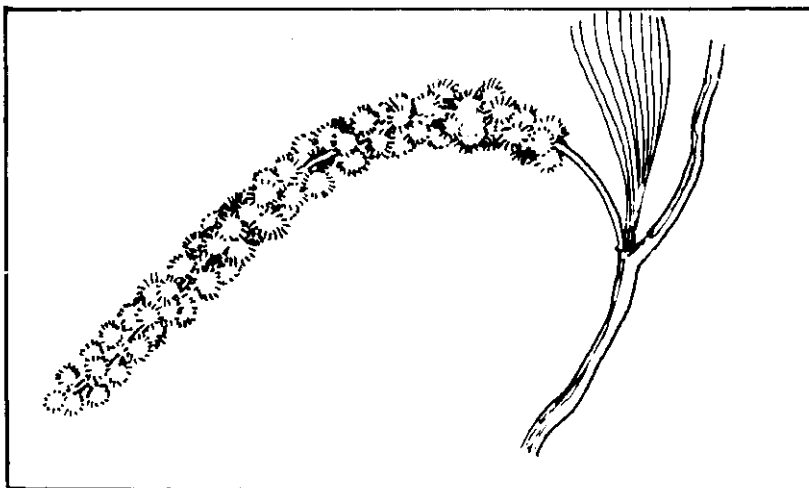


Black Kite

As the country dries out barramundi move downstream from the floodplains towards the mangroves and estuaries where they are eagerly sought by fishermen. Mud crabs are also in their prime at this time of year.

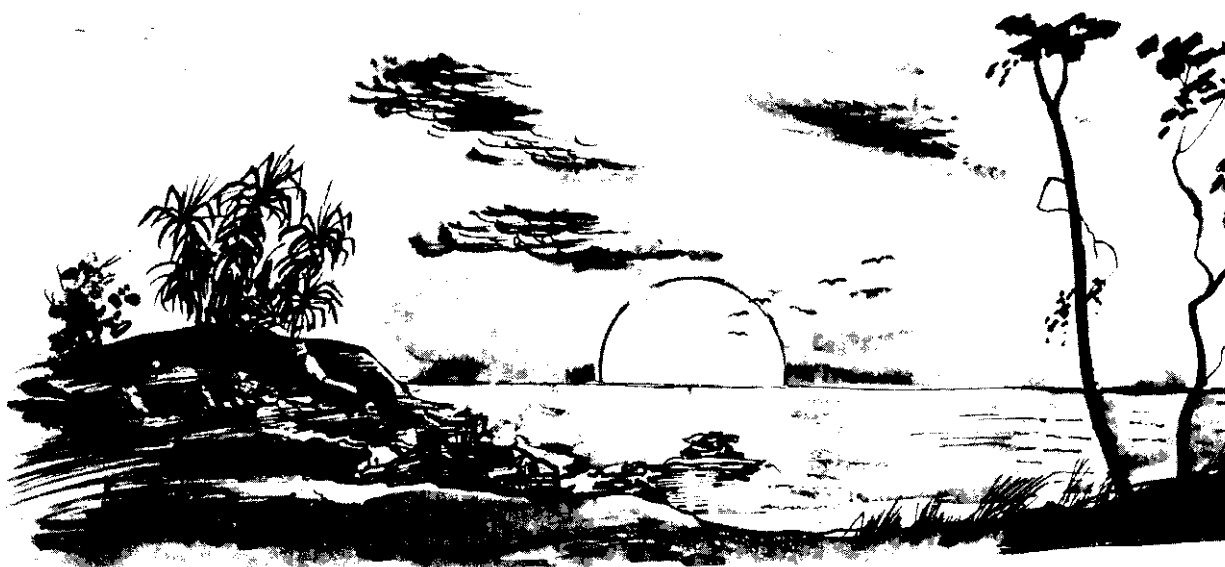


Plants that flower in the early to middle dry include the Darwin black wattle (*Acacia auriculiformis*), turkey bush (*Calytrix exstipulata*), kapok bush (*Cochlospermum fraseri*), woolly butt (*Eucalyptus miniata*) and stringybark (*Eucalyptus tetradonta*). These flowers provide a rich source of nectar which native bees convert into bush honey.



Flowers and seed pod of the Darwin black wattle

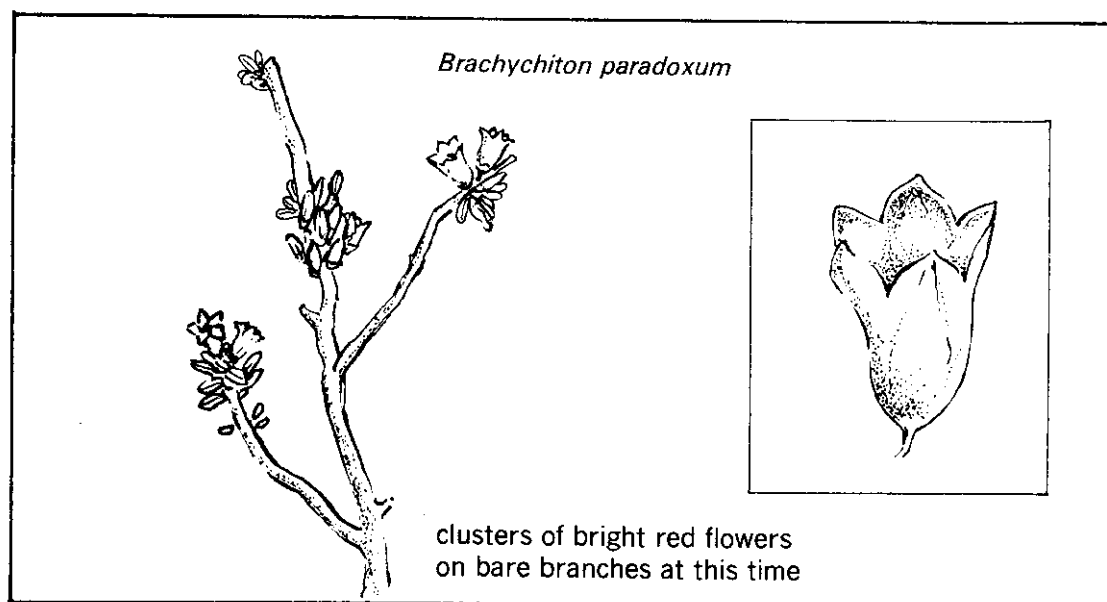
The absence of the deadly box jellyfish (*Chironex fleckeri*) during the dry season attracts swimmers to the beaches to enjoy the warm waters of the Top End coast. The climate at this time of year is invariably delightful with warm, dry days, cloudless skies and cool nights. At the end of the day spectacular red sunsets are a memorable sight.



Late Dry (August, September)

Two events signal the beginning of this new season: the red-flowering kurrajong (*Brachychiton paradoxum*) comes in to bloom and the nuts of the pandanus, which have changed colour from green to orange, fall to the ground.

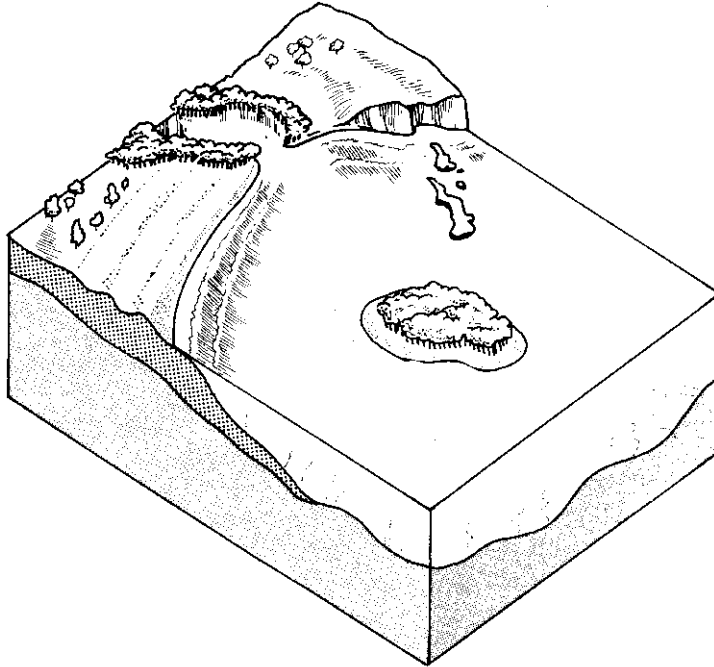
It is around this time that turtles begin laying their eggs high up on the beaches.



The days are warmer at this time than in the early part of the dry and the nights are not as cool. The ground becomes very hot to walk on and surface water becomes scarce as many waterholes and paperbark swamps dry up. At the end of the dry season many species of wading birds return to the wetlands on the annual migration from Asia. They will remain throughout the wet season and then migrate back to the northern hemisphere.

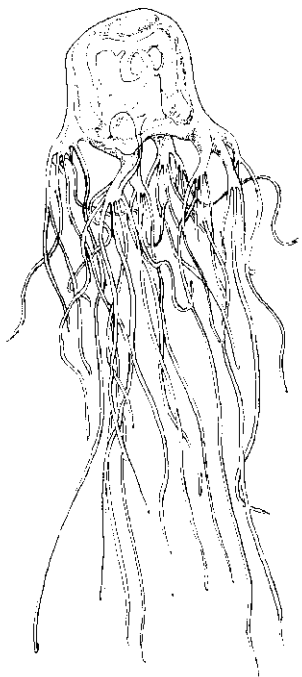
CASUARINA HABITATS: SHORELINES

The warm tropical waters of the Top End coast are rich in marine life.



A large variety of soft and hard corals grow on the shallow off-shore reefs and islands, away from the muddy waters of the river mouths which block out the sunlight that the coral needs.

The top End coastline has its share of dangerous sea creatures including sea snakes, crocodiles and the sea wasp (or box jellyfish).



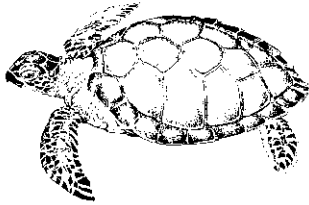
The sea wasp is in fact a large jellyfish. The main part of its body is a box-shaped bell which is sometimes as big as an upside-down bucket. Four bundles of long tentacles hang down. Each of these tentacles is covered with millions of stinging cells. It uses the venom from these cells to kill small fish or prawns which are then pulled inside the bell and digested.

During the wet season the sea wasp moves from the open sea into the shallow waters around the coast. They are difficult to see because the water is more muddy than during the dry season.

If a person gets stung by a sea wasp the sudden agonizing pain usually makes the victim jump and try to move away. This results in the tentacles being torn from the jellyfish and wrapping itself around the victim.

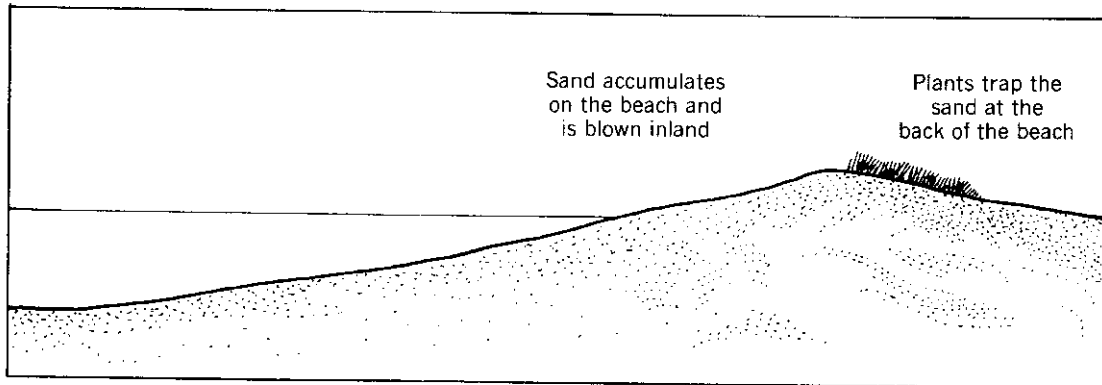
Other dangerous sea animals are the beautifully camouflaged but highly poisonous stone fish, armed with thirteen deadly spines along its back, and the tiny blue ringed octopus whose poisonous bite can be fatal.

Long white sandy beaches line the shorelines in most places. The sand is a mixture of mineral grains and the remains of marine organisms. The sand was probably placed there between 3000 and 6000 years ago after the last Ice Age. At the end of the Ice Age the sea level rose covering large areas of land. This new sea floor was gradually eroded by waves and currents and the eroded material then swept to the shoreline. Over time the sea level has reached equilibrium and there is no longer a supply of sand from under the sea that can be naturally added to our beaches. Sandy beaches and sand dunes are, in general, not being naturally replenished as most people imagine. It is important that we therefore manage and conserve the limited sandy beaches and dunes of our coastline.

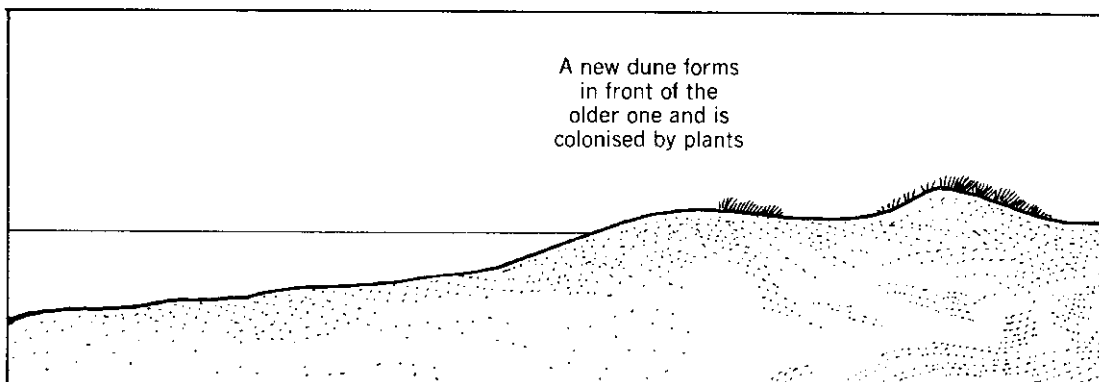


During the dry season large turtles drag themselves up the sandy beaches at night, when the tide is high, to lay their soft white eggs in deep holes scooped out with the back flippers. Several weeks later the young turtles tunnel out of their nest and have to face many enemies in their short journey to the water's edge.

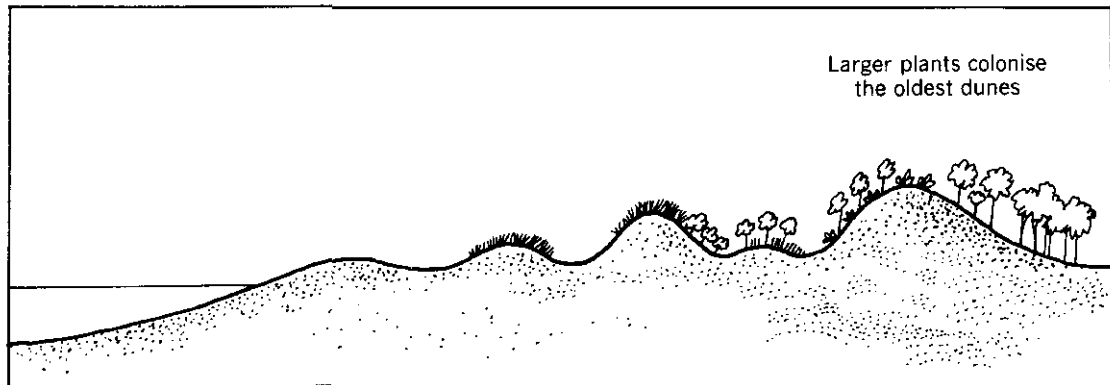
Behind the beaches sand dunes are often found. The dunes are formed by the removal of sand from the beach and its accumulation around obstacles. Wet sand that has been thrown onto the beach will dry out and can then be picked up and blown inland. They drop to the ground when obstacles such as stones slow down the wind. Later more sand collects there and a small dune begins to form. The sand dune will grow larger if the rate of accumulation is greater than the rate of removal of the sand. Growth of plants prevents the sand from being removed. Their fibrous roots bind the sand together and their leaves act as windbreaks, slowing down the wind blowing over the sand's surface, thereby trapping more sand. Plants must be tolerant of salt spray to be able to survive on the front of a dune. Plants which are less tolerant of wind and salt spray establish themselves on the back of the dune.



If the process of dune building continues, a new dune may form in front of the first one. The original dune will then be in the second dune from the sea and partly protected from the wind and salt spray. As a result the vegetation changes. New plants will germinate on the dune in response to the improved conditions.



Over a long period of time a series of sand dunes may form. The oldest dunes, found furthest from the sea, are well sheltered and provide well developed soils capable of supporting stable, land plant communities.



Two agile lizards commonly encountered in the vegetations on the dunes behind Casuarina Beach are the Northern Water Dragon (*Lophognathus temporalis*) and Gilbert's Dragon (*Lophognathus gilberti*). Both are arboreal lizards common along the Top End Coast. They feed on a variety of insects which they have little difficulty catching because of their speed and climbing ability.

CASUARINA HABITATS: MANGROVES

Where a river or creek joins the sea, mangrove trees can be seen growing along the shorelines in the thick blue-grey mud carried down by the river or creek in past floods.

Mangroves are amazing plants that live halfway between the sea and the land. They vary in size from large trees to small plants less than a metre high. Generally they prefer places with warm, stable temperatures and a heavy rainfall for at least part of the year. They also need protection from strong wave action.

The soils in which they grow are fine grained and semi fluid mud. Only the top few centimetres are well oxygenated though this zone may be extended downwards by the activity of burrowing animals. In the absence of oxygen at deeper levels, sulphur-reducing bacteria thrive. The hydrogen sulphide gas produced by these bacteria give the soil its characteristic rotten egg smell. The combination of the hydrogen sulphide with iron compounds forms hydrated iron sulphides which give the soil its characteristic dark colour.

One of the most striking features of mangroves is the difference between their roots and those of normal land plants. Exposed at low tide and flooded at high tide, some mangroves have special "breathers" called pneumatophores growing from their roots. At low tide these are exposed and soak up the oxygen that the plant cannot get from the mud. The air enters the pneumatophores through the soft, spongy tissue and passes down to those roots which are buried deep in the mud. Other mangroves have prop roots which, like the pneumatophores, act as breathing roots. They are similar in structure to pneumatophores but, instead of growing up from an underground root system, they grow down from the trunk or lower branches. Those mangroves having prop roots are normally the outer, more seaward trees.

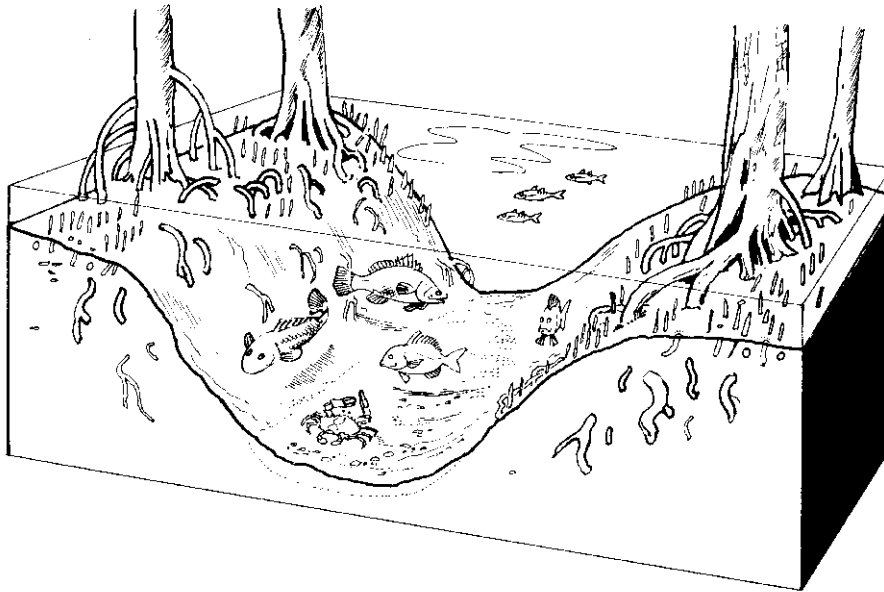


Mangroves at Buffalo Creek boat ramp.

The prop roots of *Rhizophora stylosa* can be seen alongside the creek while the pneumatophores of *Avicennia marina* are visible closer to the artist's viewpoint.

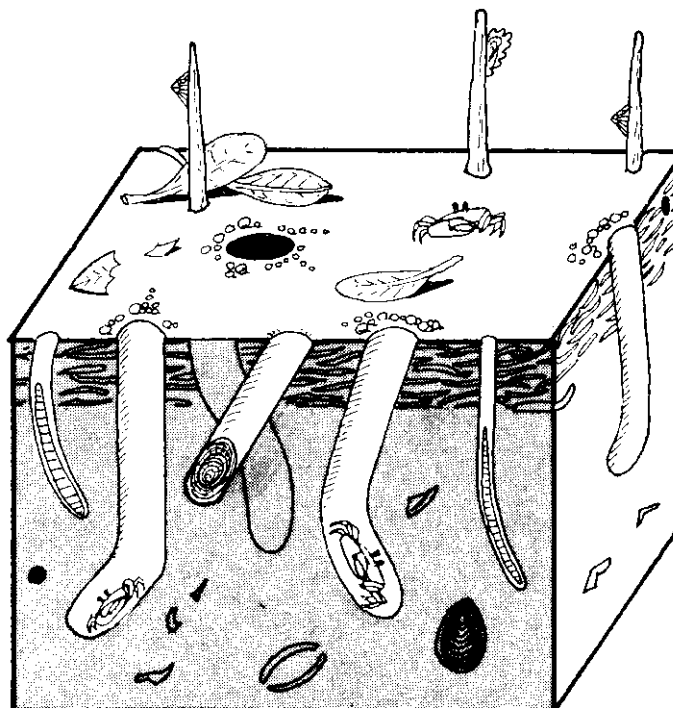
All mangrove seeds float and distribution by the tides is their main method of dispersal. Some mangroves have an unusual adaptation, known as viviparity, to assist germination. The seeds germinate while still inside the fruit attached to the tree. When the seedling eventually falls to the ground it has a well developed root system and so can quickly become established in the mud. If the tide should wash the seedling away before it becomes established then it can float for days without suffering any problems.

Coping with salty water is a problem to which mangroves have had to adapt. They have developed several solutions to the salt problem. Firstly the roots are able to allow freshwater and essential minerals in, while excluding most of the salt. Secondly they can tolerate an internal salt concentration many times that of normal land plants. Thirdly many have special salt secreting glands on their leaves which actually pump salt out of the plant. (Other mangroves store salt in their leaves and then drop the leaves when they are full of salt.)

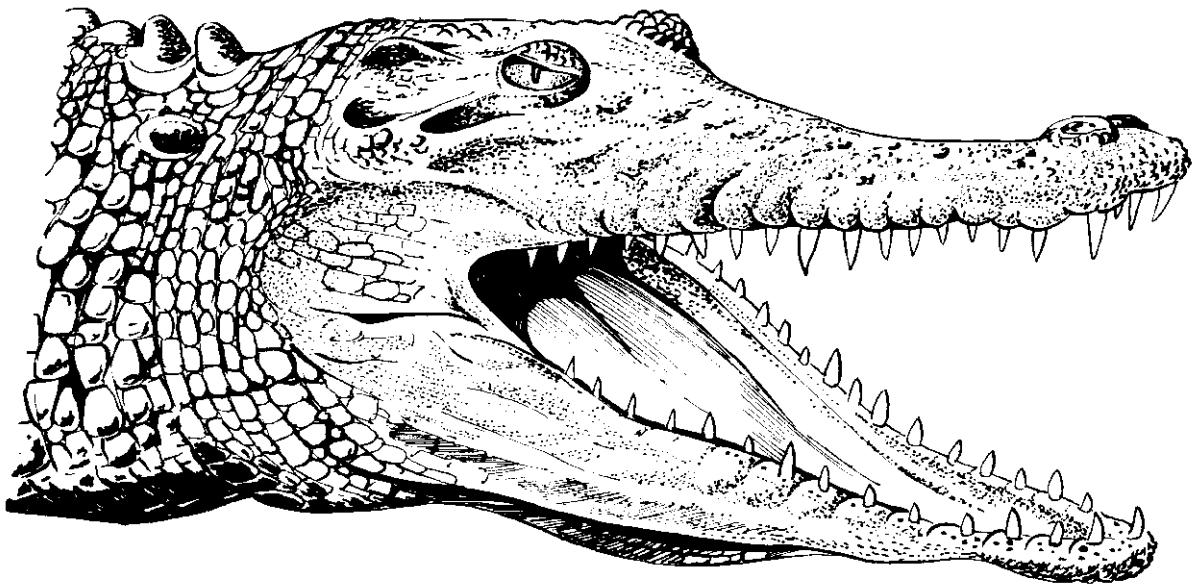


Mangroves are a rich habitat upon which many living things depend for at least some part of their lives. The barramundi spends much of its life lurking in the shady waters of estuaries beneath log and overhanging mangrove branches. When the wet season begins they move from the mangroves to take advantage of the flooded countryside.

A number of burrowing animals thrive in the mud, including crabs, shellfish and worms.



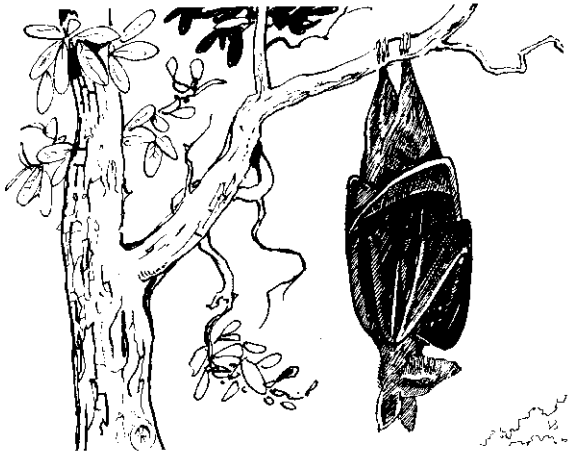
Two large reptiles found in mangroves are the mangrove monitor (*Varanus indicus*) and the saltwater crocodile (*Crocodylus porosus*).



Crocodiles often shelter under the cover of mangrove trees by day or sunbake on the mud while thousands of flying foxes roost in the overhead branches until nightfall. (Flying foxes are a favourite food of the saltwater crocodile.)

Black Flying-fox (*Pteropus alecto*)

Flying-foxes are large bats that eat nectar, pollen and fruit. Their big eyes and long nose give them a head that looks a bit like a fox or dog.



During the daytime they rest upside down in mangroves or paperbark swamps. There may be many thousand animals in a single camp. They roost high up in the trees amid dense growth.

At dusk the flying foxes leave their camp to look for food. They prefer the blossoms of eucalypts or paperbarks but also eat other blossoms and household fruits such as mangoes.

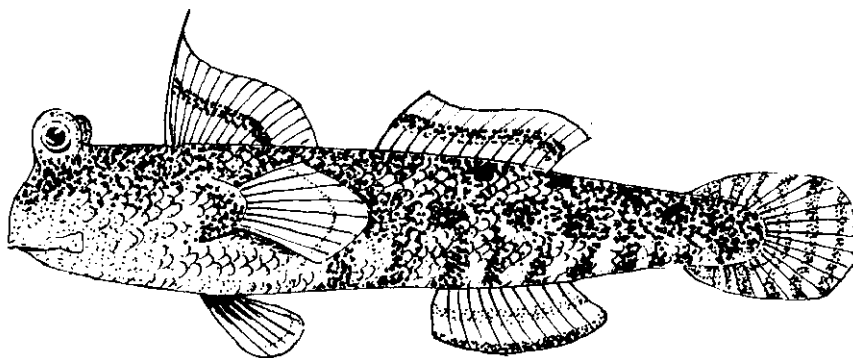
They can fly at speeds of up to 35 kph with an average wing beat of 120 per minute.

The Black Flying-fox mates from March to April. The females give birth to a single young in October. The newborn animal cannot fly and its mother carries it for the first month or so. It feeds on milk from its mother's nipples which are located near her armpits. The young Flying-foxes can fly at about 2 months of age and leave their mother when they are three months old.

Distribution of the Black Flying-fox.



Mud skippers are also a common sight. These small fish, usually about 10cm long, are able to leave the water and skip along the mud using their fins like the oars of a row boat. They can absorb oxygen through the blood vessels in their tail and so can survive while only partly submerged.



CASUARINA HABITATS: DECIDUOUS VINE THICKETS

Unlike Queensland, the Top End has no true rainforests. This is because there are no mountain ranges to provide regular rain from the passing clouds and generate the constant humidity that a true rainforest needs. Instead the Top End has much smaller patches of "dry rainforest" which are known by a variety of names including monsoon forest, closed forests, dry jungle and deciduous vine thicket. The last term is probably the most appropriate because these forests lose much of their foliage in the dry season.



Like a true rainforest these areas have a canopy or roof of tangled branches and vines during the wet season which stops much of the sunlight from reaching the forest floor. This is because the trees grow very close together and are all about the same height. There is always a thick carpet of leaves or humus since bushfires generally don't burn through the forest but stop at the edge. (The absence of eucalypts reduces the likelihood of fires.) Because of the humus the soils are rich and dark when compared with the poorer, light coloured soils of open woodland areas.

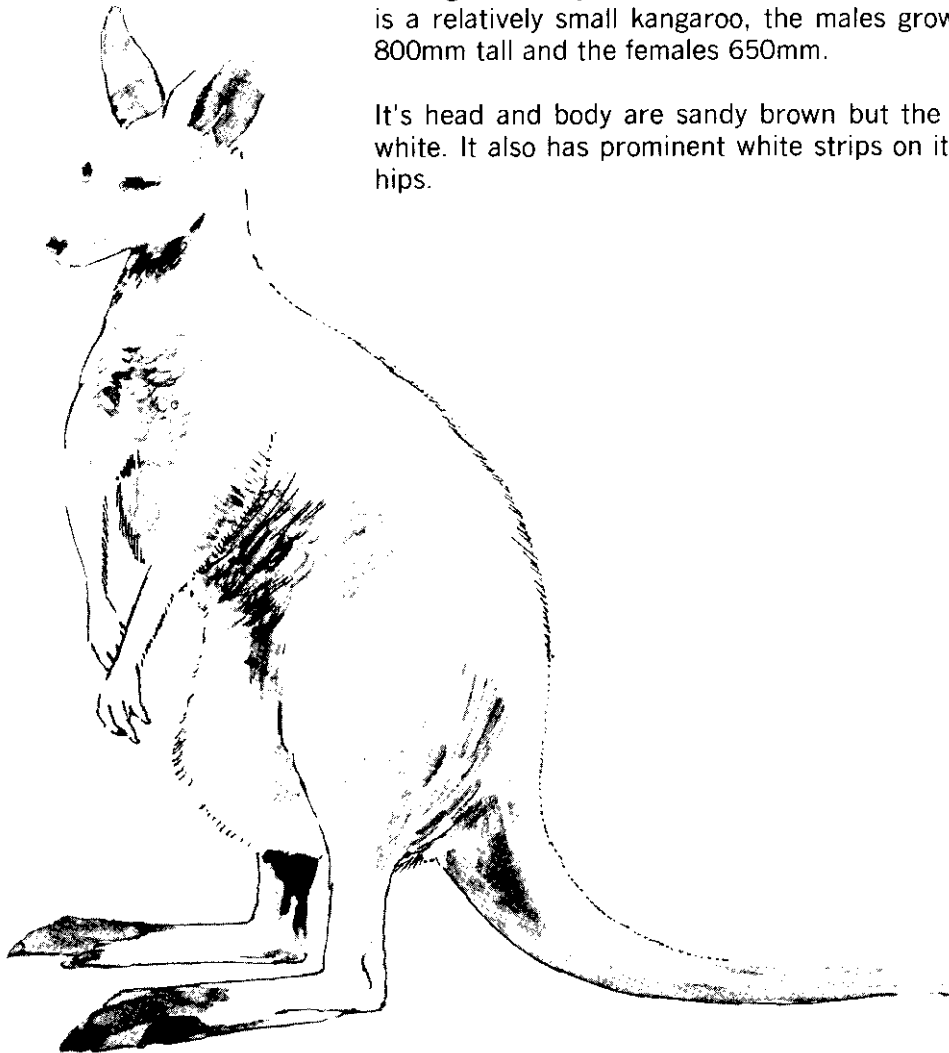
Many animals enjoy the peaceful shadows of this habitat. Two such animals are the Agile Wallaby and the Orange-footed Scrubfowl. The rustling of leaf litter as the Agile Wallaby scurries through the trees is a common sound in the deciduous vine thicket, especially in the mornings and around dusk. Orange-footed Scrubfowls, the northern cousins of the Malleefowl, are not often seen but their distinctive breeding mounds are a common sight.

Agile Wallaby

Macropus agilis

The Agile Wallaby is the most common Top End Kangaroo. It is a relatively small kangaroo, the males growing to about 800mm tall and the females 650mm.

It's head and body are sandy brown but the belly is grey-white. It also has prominent white strips on its cheeks and hips.

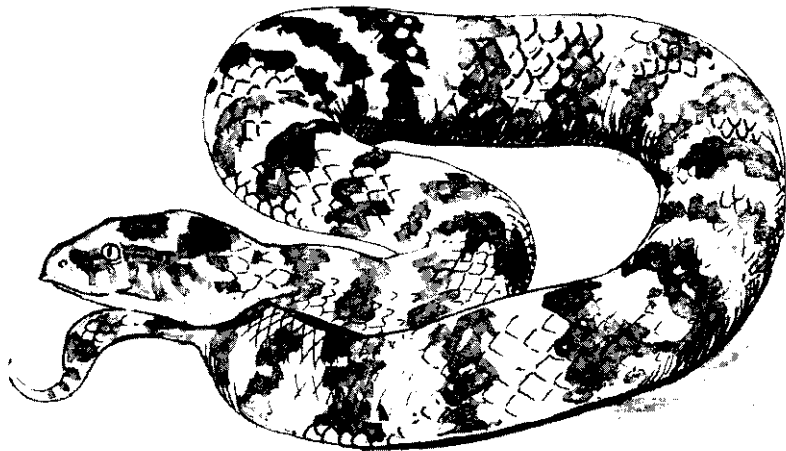


Agile Wallabies usually live in groups of up to 10 animals. They breed throughout the year. The tiny joey develops inside its mother's body for about 30 days and spends 7-8 months in the pouch after birth. After leaving the pouch it continues to suckle at its mother's feet until it is 10-12 months old.

Distribution of the Agile Wallaby.



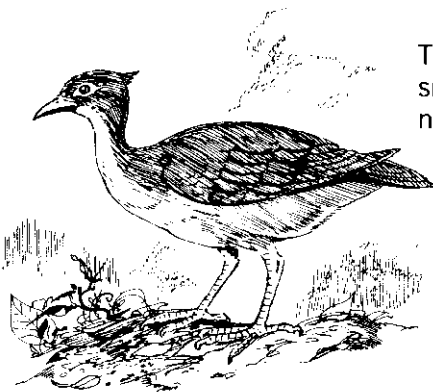
Hidden among the dead leaves of the forest floor the Northern Death Adder waits quietly for small lizards, mammals and birds to move close enough for a lightning fast strike. It uses clever tail movements to lure its prey into striking distance. A passing lizard or bird is attracted by what looks like a wriggling worm in the leaves and moves in for a closer look.



One bird which is not easily tricked is the Orange-footed Scrubfowl.

Orange-footed Scrubfowl

(Megapodius reinwardt)



This bird is a little bigger than a domestic chook but has a smaller head with a crest at the back. It gets its common name from its powerful, orange legs and feet.

Scrubfowls are ground dwelling birds but they can fly short distances when necessary. They are most active and noisy at dusk, dawn and during the night. They eat seeds, fruits and new shoots.

Scrubfowls hatch their eggs inside giant mounds of dead leaves and soil. They spend many hours each day raking up new leaves to maintain the mound and keep the buried eggs at just the right temperature. The mound may be hundreds of years old, being renovated and added to by different birds over that time.

When the eggs hatch the chicks dig their way to the surface. They are immediately able to run swiftly. Within a few hours they can make short flights like their parents.

Distribution of the Orange-footed Scrubfowl.



CASUARINA HABITATS: OPEN WOODLANDS

Of the major habitats that comprise the Top End environment open woodland is the most extensive, taking up about 85% of the land.

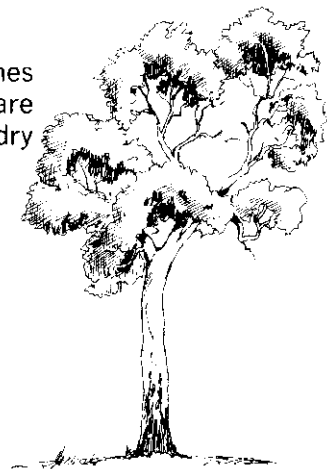
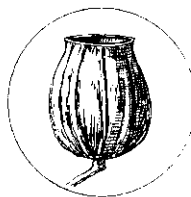


As the name suggests, the trees in the habitat are spaced well apart, allowing plenty of sunlight to reach the smaller shrubs and grasses below. The dominant trees are woollybutts (*Eucalyptus miniata*) and stringybarks (*Eucalyptus tetradonta*). The understorey varies but usually includes *Pandanus*, the fan palm (*Livistona humilis*) and the cycad (*Cycas media*). Tall stands of speargrass (*Heteropogon contortus*) form a dense ground cover in many places during the wet season.

Woollybutt (*Eucalyptus miniata*)

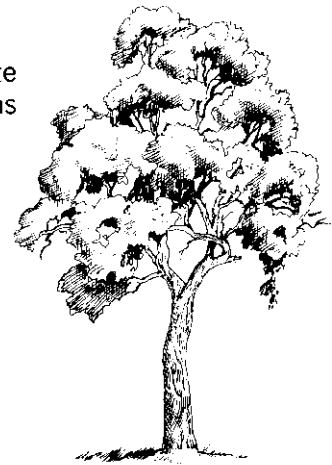
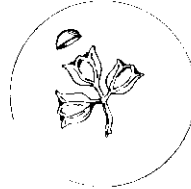
The bark is smooth, powdery white on the upper trunk and branches but the bark on the lower trunk is brown and netting-like. The leaves are large and leathery. Bright orange flowers appear in the early dry season.

seed capsules



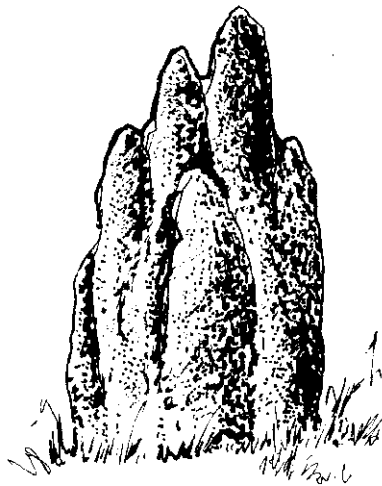
Stringybark (*Eucalyptus tetradonta*)

This tree has rough, grey, fibrous bark covering the whole tree. White flowers appear in the dry season. The name *tetradonta* literally means "four teeth" and refers to the distinctive seed capsules.



Bushfire is a regular feature of the Top End dry season which affects the open woodland habitat. Fire is undoubtedly a natural phenomenon in this environment but its incidence increased remarkably with the arrival of Aboriginal people some 30,000 years ago. Each year Aboriginal people systematically burn areas of open woodland to allow them to catch animals for food and promote new shoot growth in many plants. European settlers have continued the practice to clear out the speargrass which grows during the wet season. The fires, however, also remove any humus that might have built up on the ground. Consequently, the soil in this habitat is poor.

Because the soil is poor it does not hold moisture. Even though it becomes waterlogged in the wet season when there is constant rain, it quickly dries out and goes hard when the rain stops.



Tall mounds built by colonies of grass-eating termites are common in the open woodlands throughout the Top End. These mounds have strong outer walls of hardened clay but inside lies a vast honeycomb of rooms where the humidity and temperature are kept constant. These rooms house blind, sterile workers and soldiers, winged males and females, and, in the centre, the huge queen termite. Like ant colonies, termite colonies are large and the workers are energetic and well organized.

One particularly interesting species, *Amitermes meridionalis*, builds tall narrow mounds, often two metres high, which always point north/south.

Green Tree Ants *Oecophylla smaragdina*

Green tree ants are common in the open woodland. These aggressive ants build nests from leaves tied together with silk. Each green ant colony contains a queen who is the largest of all the ants. She lays thousands of eggs, most of which hatch into small wingless females called workers.

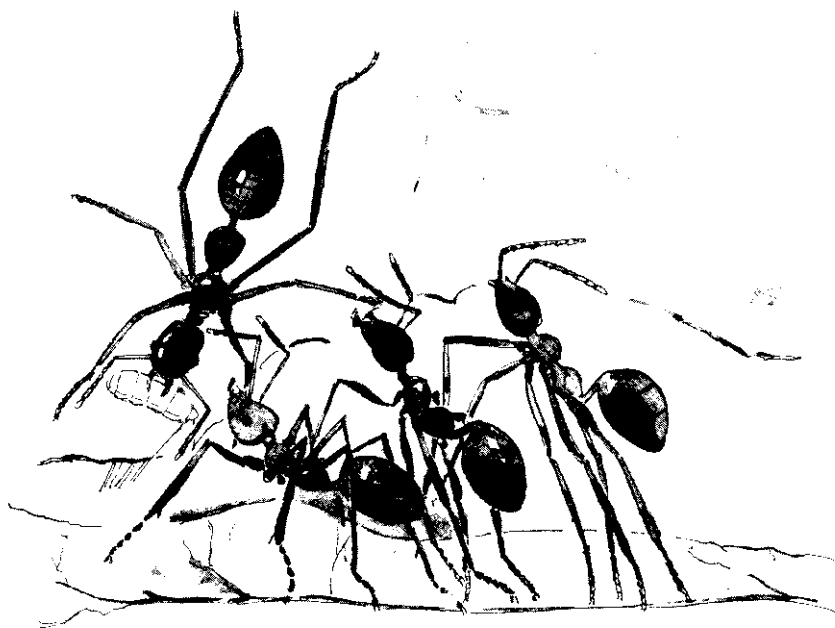


The workers do all the hard labour in the colony, toiling for long hours. Some feed and care for the queen. Some gather food. Others act as nursery maids, cleaners or builders.

The queen leads a life of luxury but things were not so easy for her when she founded her colony.

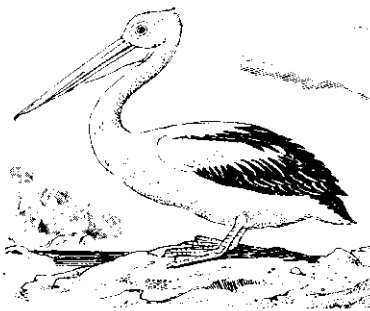
Once a year, before the wet season, the colony erupts into feverish activity. In the preceding weeks winged males and females have hatched and developed and are now anxious to get outside the nest. At an unknown signal these young winged ants will fly from the nest together and join male and females from other colonies in a huge marriage flight. After mating with the young queens, the young males die. Each fertilized queen looks for a site to start her own colony. With only her green camouflage to protect her from enemies, she must lay her eggs and look after them until they hatch into workers.

With the emergence of the first workers, her lonely, dangerous wait ends. They build her a nest in which she will lead a pampered life for the rest of her days.



In building the nest, the workers form chains to drag leaves long distances. They use silk made by the larvae to tie the leaves together.

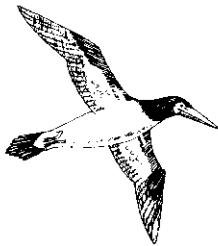
SEABIRDS OF THE TOP END COAST



Australian Pelican

Pelecanus conspicillatus

Pelicans are very large fishing birds with enormous bills. They catch fish and crustaceans by dipping their bills in the water and withdrawing them slightly open to allow water to drain out. They waddle on land because their legs are set far apart and to the animal's rear for efficient paddling.



Brown Booby

Sula leucogaster

The Brown Booby is the Top End relative of the gannets of the Southern Australian coasts. It is a very large seabird with pointed wings and tail. It nests on islands off the coast but may enter harbours or river mouths in search of fish or squid. When fishing it makes spectacular dives, submerging under the water.



Little Pied Cormorant
Pied Cormorant
Great Cormorant
Little Black Cormorant

Phalacrocorax melanoleucos

Phalacrocorax varius

Phalacrocorax carbo

Phalacrocorax sulcirostris

Cormorants are large water birds with long necks, long tails and short legs. They are common along the coast and around inland waters and rarely go far out to sea. They catch fish by diving under the water and are excellent underwater swimmers. Cormorants are usually seen in groups.



Greater Frigatebird
Least Frigatebird

Fregata minor

Fregata ariel

Frigatebirds are outstanding fliers but incapable of walking or swimming. They spend hours on end soaring in the air but never far out to sea. They nest on offshore islands. They have very long wings and a forked tail, though in flight the forks are often closed like a pair of scissors. In breeding plumage the male Greater Frigatebirds develop a crimson throat sack which inflates like a balloon. Frigatebirds don't submerge when snatching fish from the water.



Great-billed Heron
White-faced Heron
Pied Heron
Striated Heron

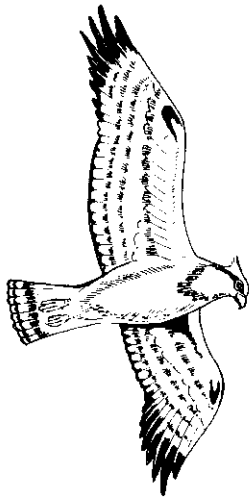
Ardea sumatrana
Ardea novaehollandiae
Ardea pictata
Butorides striatus



Great Egret
Eastern Reef Egret

Egretta alba
Egretta sacra

Egrets are very close relatives of the herons. They are normally a white colour but have similar appearance, habits and diet.



Osprey

Pandion haliaetus

Ospreys are found along the coast throughout Northern Australia. They are usually seen singly or in pairs flying about 30 metres above the water in search of fish. Their white head has a distinctive brown eye stripe extending to the back of the neck. The bird's underparts are white but the upper parts of the wings are brown.



Brahminy Kite

Haliastur indus

The Brahminy Kite is a slow soaring coastal hawk which scavenges for food along tide lines. It is a deep chestnut colour with a white head.

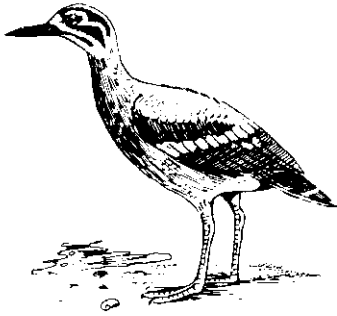


White-bellied Sea Eagle

Haliaeetus leucogaster

Adult eagles are white with grey wings but immatures are a dark brown colour. It nests on off-shore islands or remote cliffs.

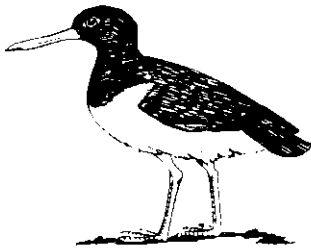
It is a skilled hunter, eating fish, reptiles, birds and mammals.



Beach Thick-knee

Burhinus neglectus

Beach Thick-knees live in pairs on Top End beaches but are not often seen because they are most active at night. They nest in hollows, scratched out of the sand above the high tide mark. During the day they hide among trees along the foreshore. They eat crustaceans such as crabs.

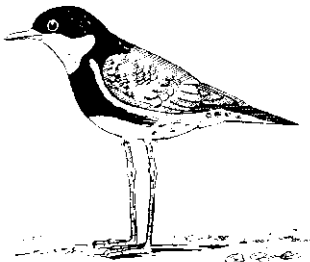


**Sooty Oystercatcher
Pied Oystercatcher**

Haematopus fuliginosus

Haematopus longirostris

Oystercatchers are heavily built shore birds with red legs and long, red, straight bills. They usually occur in pairs or small flocks. They eat shellfish. They are permanent residents of the shorelines.



**Grey Plover
Lesser Golden Plover
Mongolian Plover
Large Sand Plover
Red-capped Plover
Oriental Plover
Black-fronted Plover
Red-kneed Dotterel**

Pluvialis squatarola

Pluvialis dominica

Charadrius mongolus

Charadrius leschenaultii

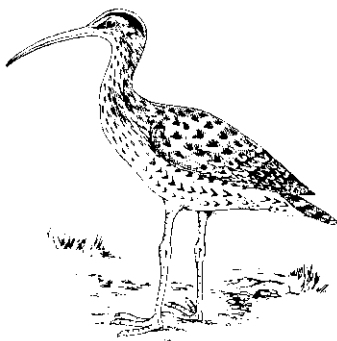
Charadrius ruficapillus

Charadrius veredus

Charadrius melanops

Erythrogonys cinctus

These small wading birds have rounded bodies, large heads and short necks. They generally have short bills and eat small invertebrates.

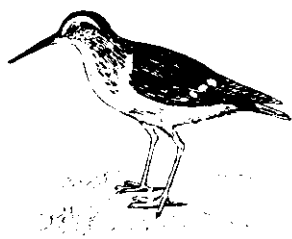


**Whimbrel
Little Curlew**

Numenius phaeopus

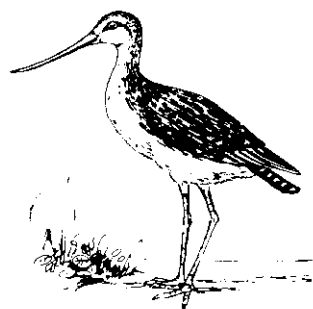
Numenius minutus

Whimbrels migrate to Australia from Siberia each year spending the Wet Season in the Top End. They feed on small invertebrates and berries. They have a distinctive down-curved beak which is quite long.



Wood Sandpiper
Grey-tailed Tattler
Greenshank
Common Sandpiper
Marsh Sandpiper
Terek Sandpiper
Swinhoe's Snipe
Bar-tailed Godwit
Black-tailed Godwit
Red Knot
Great Knot
Sharp-tailed Sandpiper
Red-necked Stint
Curlew Sandpiper
Sanderling
Broad-billed Sandpiper

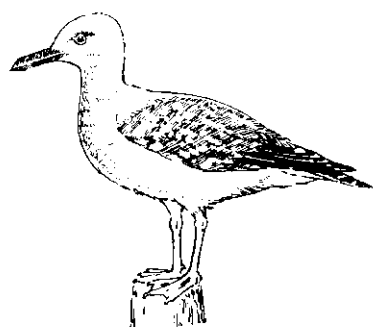
Tringa glareola
Tringa brevipes
Tringa nebularia
Tringa hypoleucos
Tringa stagnatilis
Tringa terek
Gallinago megala
Limosa lapponica
Limosa limosa
Calidris canutus
Calidris tenuirostris
Calidris acuminata
Calidris ruficollis
Calidris ferruginea
Calidris alba
Limicola falcinellus



These small shore birds vary somewhat in size and beak shape. Their bills are generally longer and more slender than those of dotterels and plovers. They are also smaller headed and have longer necks.

Like the whimbrels these birds are migrants, breeding in northern Asia and spending the Wet Season in the Top End.

They feed on a variety of small animals and some vegetable material.



Silver Gull

Larus novaehollandiae

The Silver Gull is the common seagull of Australian coasts, seldom venturing far out to sea. They are less common in the Top End than in Southern Australia but isolated colonies of them do occur.



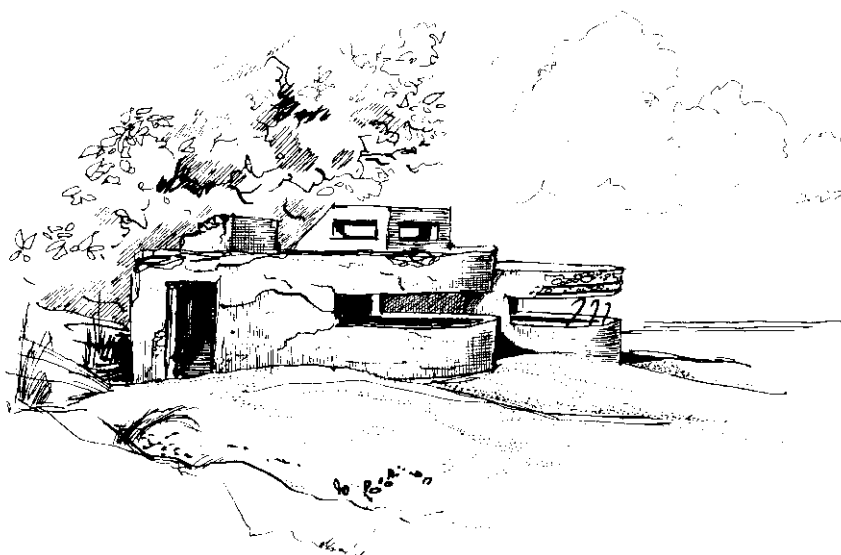
Caspian Tern
Gull-billed Tern
Whiskered Tern
White-winged Tern
Common Tern
Black-naped Tern
Roseate Tern
Crested Tern
Little Tern
Lesser Crested Tern

Hydroprogne caspia
Gelochelidon nilotica
Chlidonias hybrida
Chlidonias leucoptera
Sterna hirundo
Sterna sumatrana
Sterna dougallii
Sterna bergii
Sterna albifrons
Sterna bengalensis

Terns are not as heavily built as their cousins the gulls. They have long narrow wings, pointed beaks, short legs and forked tails. During flight the bill is pointed downwards. They usually also have a black cap.

WORLD WAR II OBSERVATION POSTS

Just north of the main swimming beach at Casuarina there is a World War II concrete bunker lying on the sand. There are three other identical bunkers in the Casuarina Coastal Reserve. Two are further up the beach towards Lee Point and the other is at the entrance to Buffalo Creek.

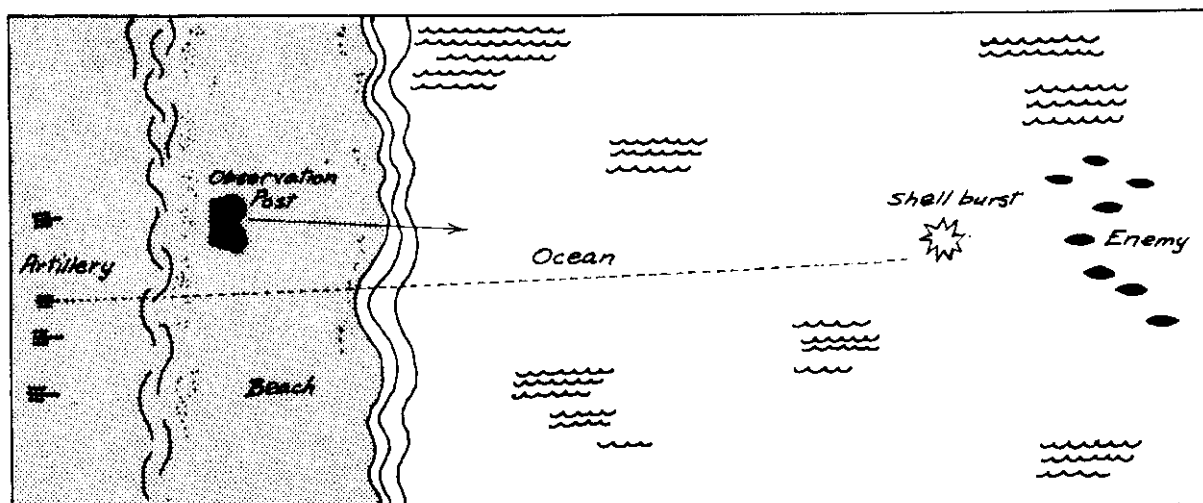


They were not, as their appearance suggests, miniature fortresses built as strong-points to repel invasion. That role would have been left to:

- * dug-outs, trenches and sandbagged positions protected by barbed wire;
- * mobile forces such as bren gun carriers moving behind the dunes.

The observation posts existed to direct artillery fire. This involved two functions:

- * locating and giving the positions of enemy targets;
- * giving corrections to the gunners.



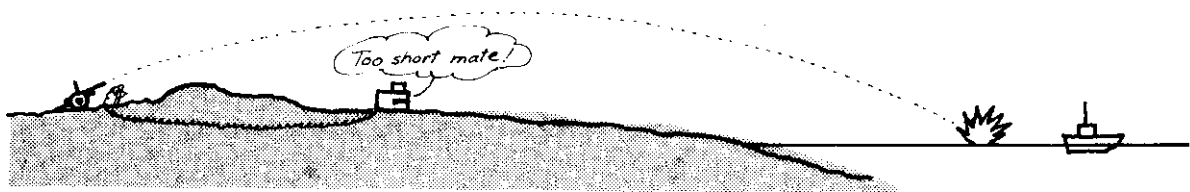
When an enemy target was located the director inside the observation post would find out three bits of information:

- * the map (grid) reference of the target;
- * its compass bearing;
- * its distance (given by an optical instrument called range finder)

The battery of field guns (most likely 25 pounders) behind the observation post would then be pointed in the direction described by the director. It was then the job of the gun "layer" to elevate the barrel of the gun to the right position. One, two or three charges could be put in the gun depending on the distance to be covered. A brass cone on the side of the gun was covered with figures giving various ranges (depending on the number of charges). As the barrel was raised by the gun layer, a pointer on the cone gave the range reading and the layer stopped at his selected range.

When the gun had fired it was up to the observation post to correct the fire. A 25 pounder gun could fire a shell 9 kilometres and the crew often had no idea of the accuracy of fire.

The observation post would observe fire and send a message back indicating how far short or over the target the first shells were. The gun crews would adjust the settings on the guns accordingly.



There is some talk that the observation posts were once built on solid land but that the beach has since been eroded back around them. However, this does not seem to be the case. The available evidence points to them having been deliberately placed out on the sand so that the men inside could get a clear view.

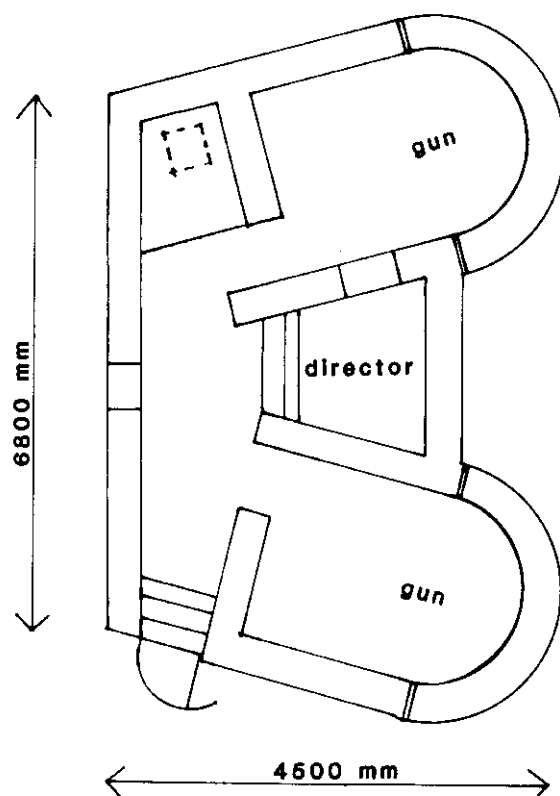
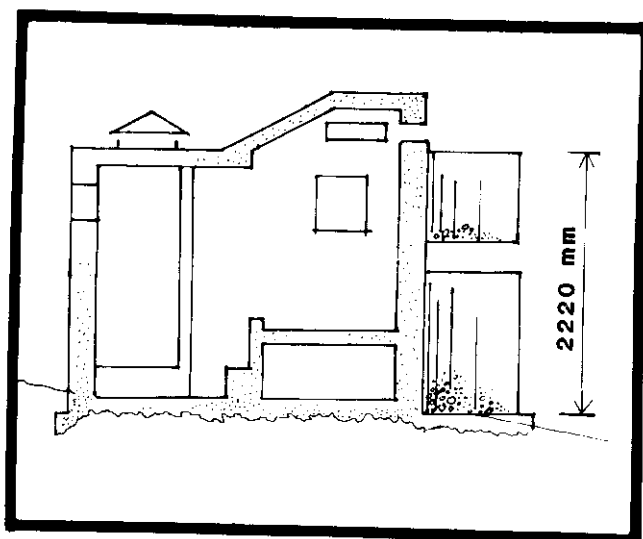
The construction of the observation posts came at a time when World War II had just commenced. However, building them was not a direct response to the war, but part of a program that had commenced with the need to protect Darwin as a refuelling base for the oil burning ships of the Royal Australian Navy and Royal Navy. This program began in 1932 with the arrival of a detachment of the Royal Australian Artillery (RAA) and the Royal Australian Engineers (RAE) to build four emplacements for six inch (Mark VII) gun batteries at East Point and Emery Point.

The following year the Darwin Garrison arrived to man local defences.

The 6 inch guns were first fired on 18 May 1934. Searchlights were installed and also tested in 1934.

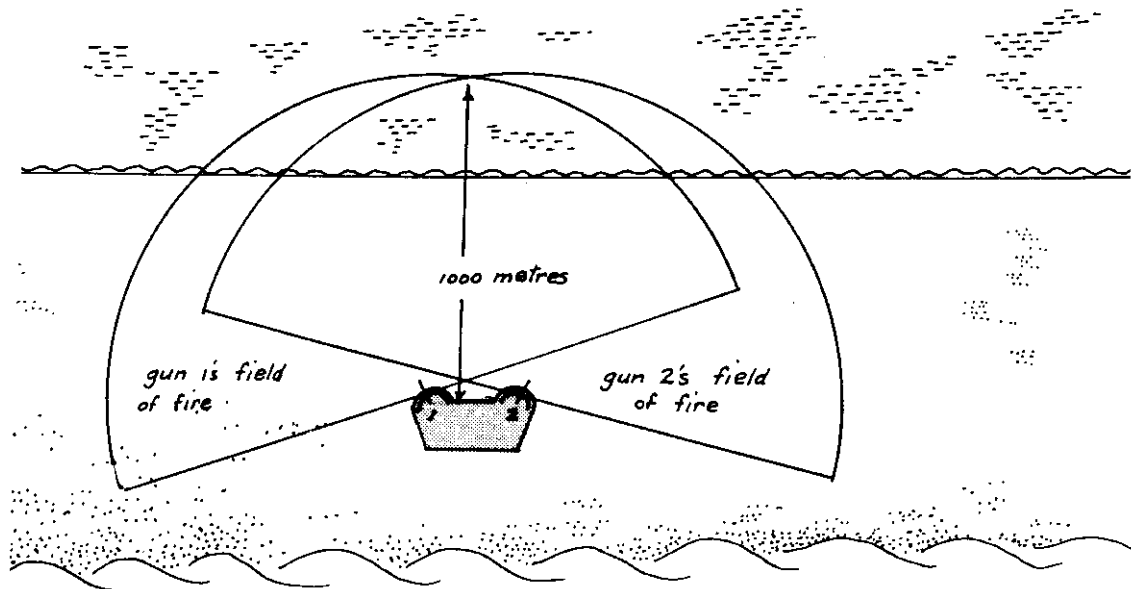
In 1936 the Larrakeyah barracks were established. (Previously Vestey's abandoned meatworks had been used to house troops.) The original garrison was relieved that year and an anti-aircraft battery installed.

On 3 November 1939 tenders were called for the construction of six observation posts. (Apart from the four still surviving in the Casuarina Coastal Reserve there were others at Dripstone Caves and East Point.) They were finished by 15 February 1940 having been built from reinforced concrete sections which were subsequently cemented together. The stone aggregate most likely came from a quarry at the "2-1/2 mile" (4 kilometres) and the sand used came from the beach. The result was a very coarse and rough mix. The concrete walls were designed to be thick enough to withstand all but a direct hit from enemy guns.

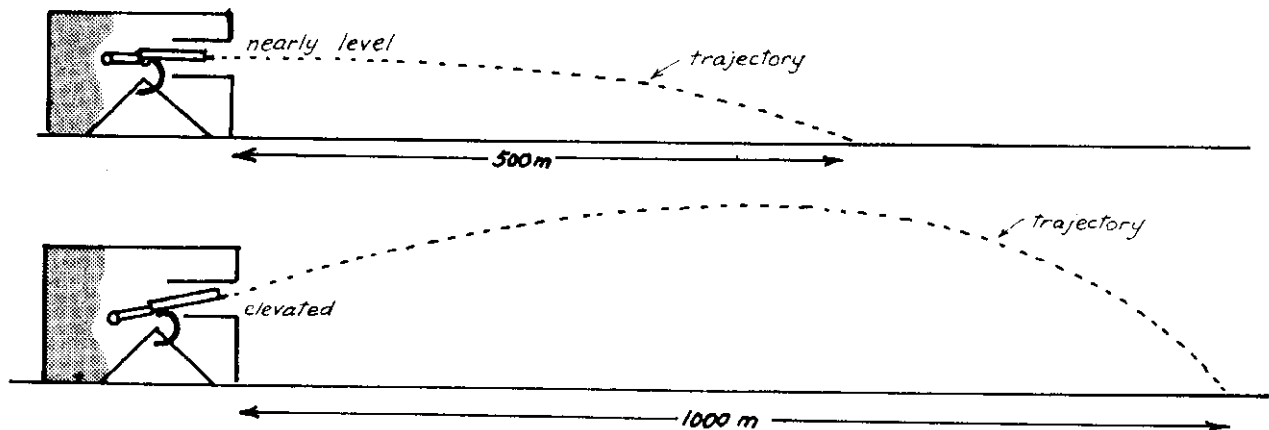


(Adapted from two original drawings by Peter Dermoudy).

The actual design and shape of the observation posts was based on military experience. The most important aspect of their design is the angle of side walls to back wall. This is because each of the two circular turrets housed a Vickers machine gun which was mounted so that it could fire through the slits in front (embrasures). The side walls of the observation post were set at an angle so that both guns did not look directly forward but could be trained slightly to the rear.



These vickers machine guns had an accurate range of 1000 metres though their maximum range was much greater. (The range of a gun is increased by elevating the barrel).

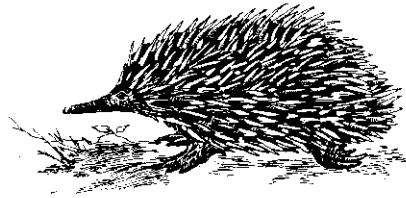


The Vickers machine gun had been used in World War I. It was .303 calibre and used British MkVII .303 ammunition which was fed on a fabric belt holding 250 rounds.

The gun had a water cooling jacket and an outlet tube leading to a condenser - simply a canister in which steam from the water around the hot barrel would return to a liquid state. Its rate of fire was 500 rounds per minute. Quite a dependable old killing machine.

MAMMALS OF THE TOP END

Echidna Tachyglossus aculeatus



The echidna is one of only two egg laying mammals, the other being the platypus which is not found in the Northern Territory. During the breeding season the female develops a pouch where she lays a soft egg with a leathery shell. The baby hatches from its egg after 10 days but stays in the pouch for about two months until its spines grow. It feeds on milk.

Echidnas are found in hollows among rocks or under tree roots in a wide range of habitats. They eat ants which they catch with their long snout and long sticky tongue.

Marsupial Mice

As the name implies, marsupial mice have a pouch in which the young develop after birth. (Latin "marsupium" - pouch). Being insect eaters they lack the prominent front cutting teeth of the house mouse and other rodents.

The marsupial mice found in the Top End are:

Fawn Antechinus
Sandstone Antechinus
Common Planigale
Red-cheeked Dunnart

Antechinus bellus
Antechinus bilarni
Planigale maculata
Sminthopsis virginiae



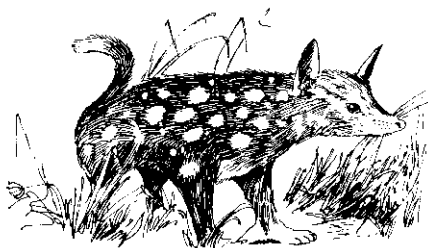
Brush-tailed Phascogale *Phasogale tapoatafa*

This bushy tailed tree living marsupial was mistaken for a squirrel by early white settlers. It is about the size of a rat and is found in forests and woodlands. It is a nocturnal animal, hunting insects, small birds and mice.



Northern Quoll *Dasyurus hallucatus*

Sometimes called a native cat, this nocturnal marsupial is a ferocious hunter. It is most common in rocky country where it sleeps in small caves, crevices or hollow logs. It is an excellent climber.



Northern Brown Bandicoot *Isodon macrourus*

A nocturnal marsupial, this short nosed bandicoot is often seen at night hunting for grubs, beetles and spiders but it also eats seeds and fruits. It spends its days sleeping in a well concealed depression in the ground covered with ground litter.

Like many other burrowing marsupials the mother's pouch opens backwards. This prevents the babies becoming covered with dirt as the mother scratches for food.

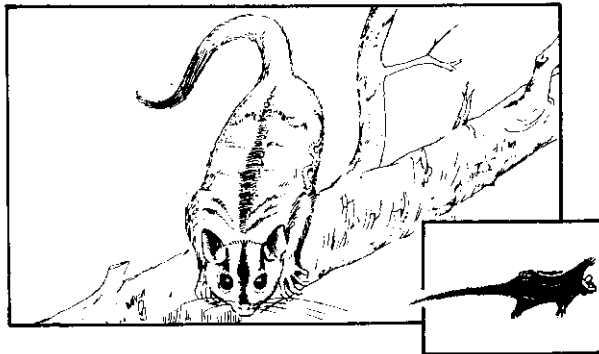


Possums

Sugar Glider *Petaurus breviceps*

This small possum can glide as far as 45m in a single leap by spreading the skin between its fore and hind legs. Its diet consists of sugar from blossoms, buds, native fruits and the sap from wattle trees. However, it will also eat insects.

It is a nocturnal marsupial found in forests where it nests in hollow tree trunks.



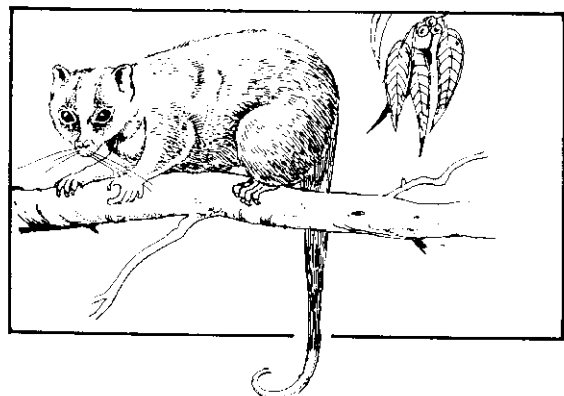
Northern Brushtail Possum *Trichosurus arnhemensis*

This nocturnal marsupial makes its nest in tree hollows but spends a lot of time on the ground. It is found in woodland areas particularly where the dominant eucalypts are Darwin woollybutts. Its diet includes leaves, buds, shoots and fruits.



Rock Ringtail Possum *Pseudocheirus dahli*

Unlike most other possums this marsupial has adapted to terrestrial living in rocky country. At night it leaves its daytime resting place to climb trees and feed on flowers, fruits and leaves. It is an expert climber and has a naked strip on the lower surface of its ringed tail to allow it to get a firm grip on tree branches.



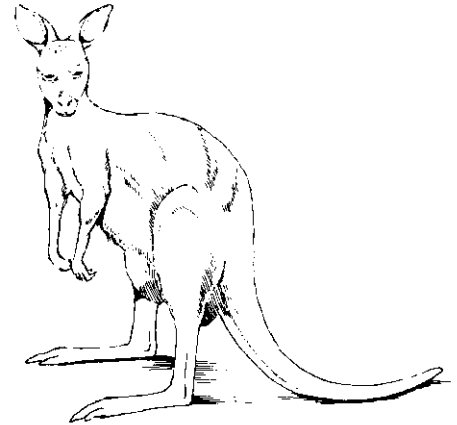
Kangaroos and Wallabies

Kangaroos and wallabies are Australia's best known marsupials. The difference between a kangaroo and a wallaby is just size. They are all herbivorous animals.

Antilopine Wallaroo *Macropus antilopinus*

This Top End kangaroo of woodland areas is similar to the red kangaroo of the arid centre and the grey kangaroo of the woodlands of eastern and southern Australia. It prefers to live in small groups rather than on its own.

In hot weather it rests during the daytime, usually close to a waterhole, becoming active later in the afternoon. On overcast or rainy days during the wet season it may be active at any time of day.



Euro *Macropus robustus*

Euros are kangaroos of rocky, hill country. They are not as tall as antilopine walleroos but are more solidly built and have longer hair. They are excellent climbers and rest among rocks during the hot parts of the day. They generally live alone, and are very shy and hop away quickly if disturbed.

Black Wallaroo *Macropus bernardus*

This is a black form of the euro and is found in rocky country in the Alligator Rivers region along the Arnhem Land Escarpment.



Agile Wallaby *Macropus agilis*

The agile wallaby is the most common kangaroo of the Top End. It has a sandy brown body with grey-white belly and prominent white stripes on its cheeks and hips. It prefers to live in small groups close to water but is found in a wide range of habitats from coastal sand dunes to rocky hills. They seem particularly attracted to areas regenerating after bushfires.



Northern Nailtail Wallaby

Onychogalea unguifera

This wallaby is smaller than the agile wallaby. It has a horny spur at the end of its tail, the purpose of which is unknown. It prefers lightly wooded floodplains. It is a solitary animal active between dusk and dawn.



Short-eared Rock-Wallaby

Petrogale brachyotis

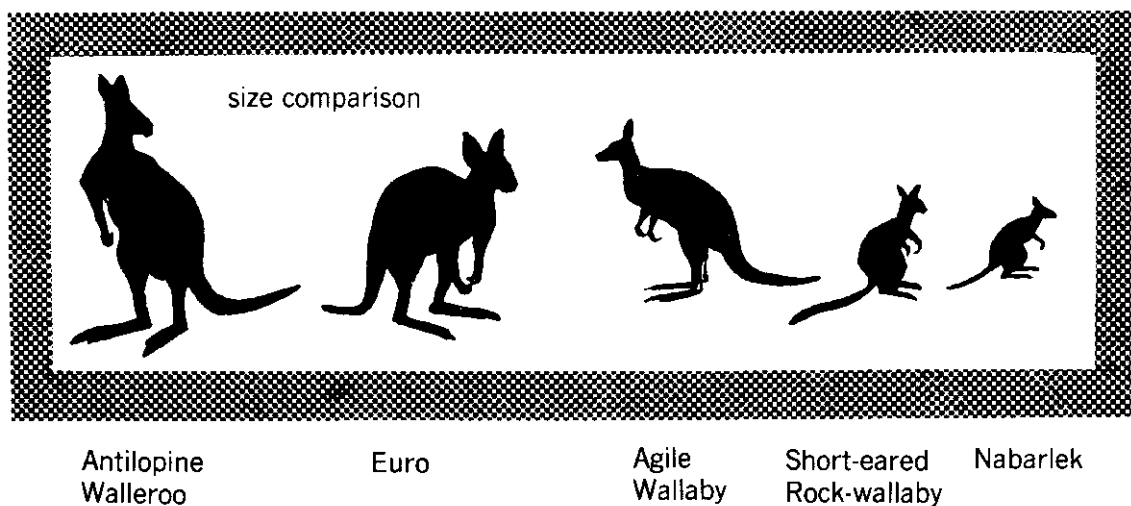
These small, grey, round headed animals live in small groups on rocky slopes. Their powerful hind legs, long tail and thick non-skid pads on their feet make them excellent climbers. Their preferred food is grass but herbs, some leaves and fruits are also eaten.



Nabarlek *Peradorcas concinna*

This animal is the smallest of the kangaroos and wallabies, being about the size of a domestic cat. Its back is a brilliant rusty-red colour. It is unique among Australian marsupials in being able to produce an unlimited number of molar teeth to replace ones which fall out.

During the day it rests among rocky crevices emerging at night to forage around billabongs and floodplains.



Bats

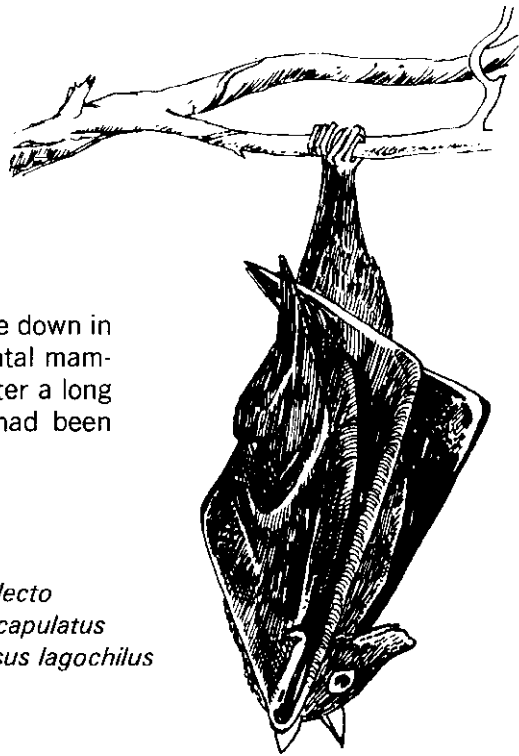
Flying-foxes

Flying-foxes are large fruit eating bats which hang upside down in trees during the day and feed at night. They are placental mammals. This means the young are born well developed after a long gestation period in the mother's uterus where they had been nourished by the placenta.

The Top End has three species:-

Black Flying-fox
Little Red Flying-fox
Northern Blossom Bat

Pteropus alecto
Pteropus scapulatus
Macroglossus lagochilus



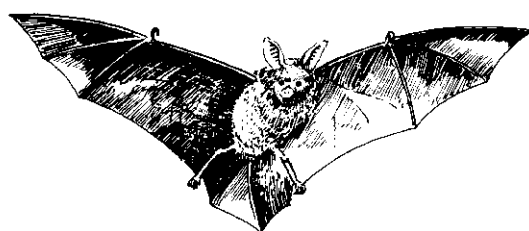
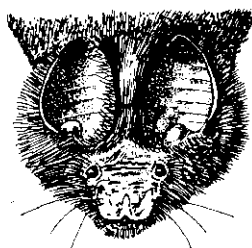
Ghost Bat *Macroderma gigas*

This is Australia's only carnivorous bat and is sometimes called a vampire bat. It preys on large insects, frogs, lizards, birds, small mammals and even other bats. It is easily recognised by its large ears. During the day it rests in caves or old mines. Like all other bats it is a placental mammal.



Insectivorous Bats

There are approximately 24 species of small, insect eating bat in the Top End. Distributed in a wide range of habitats, they spend the day resting in caves, hollow trees or under bark, becoming active at night.



Rats and Mice

There are 16 species of placental rats and mice in the Top End, including two introduced species, the European Black Rat and the House Mouse. All are rodents which means they have two prominent incisor teeth in each jaw separated from the other teeth. These large incisors permit them to gnaw tough, woody, plant material.

Because of their size and nocturnal habits the rodents are the least known of Australian mammals. Classifying them is difficult because they are very similar in appearance. However, we can divide them into a number of broad groups:

Water-rats

The True Water-rat (*Hydromys chrysogaster*) is one of only two Australian mammals specially adapted for life in freshwater. (The other is the platypus which is not found in the Top End.) It has a long, streamlined, flattened head and grows to 60cm long. The nostrils are located on the tip of the snout and its eyes are placed high on its head so that it can see and breathe while swimming. It has partially webbed hind feet. A nocturnal animal, it rests during the daytime in burrows under tree roots or in the banks of water holes. It eats mussels, snails, yabbies and fish.



The False Water-rat (*Xeromys myoides*) is an extremely rare rat which lacks the webbed feet of the true Water-rat and is smaller. It feeds in the water but spends most of its time on land.

Tree-rats

Tree-rats are larger than the average rat and have long ears and a long brush tail. They shelter in trees during the daytime but search for food on the ground at night. There are three Top End species:

Brush-tailed Rabbit-rat
Black-footed Tree-rat
Golden-backed Tree-rat

Conilurus penicillatus
Mesembriomys gouldii
Mesembriomys macrurus



Rock-rats

These rats inhabit rocky outcrops of the Top End. The tail is their most distinctive feature, being thick and swollen, especially towards the base. There are two Top End species:

Common Rock-rat	<i>Zyzomys argurus</i>
Large Rock-rat	<i>Zyzomys woodwardi</i>

'Typical' Rats

There are three species of 'typical' rats in the Top End, two native and one introduced from Europe. All have long body hair and stout, sparsely haired tails with overlapping rings of scales around them.

Dusky Rat	<i>Rattus colletti</i>
Pale Field-rat	<i>Rattus tunneyi</i>
European Black Rat	<i>Rattus rattus</i>

Native Mice

The generic name *Pseudomys* literally means 'false mouse.' It is an untidy grouping of native mice that scientists have been unable to fit into other distinctive groups. The two Top End species are:

Western Chestnut Mouse	<i>Pseudomys nanus</i>
Delicate Mouse	<i>Pseudomys delicatulus</i>

House Mouse

The European House Mouse (*Mus musculus*) originated in Central Asia but has accompanied humans wherever they have gone and now has a worldwide distribution.

Hopping-mice

These rodents have long hind feet and enlarged hindquarters which give them a kangaroo-like appearance and enable them to hop rapidly like a kangaroo. The sole Top End species is very rare.

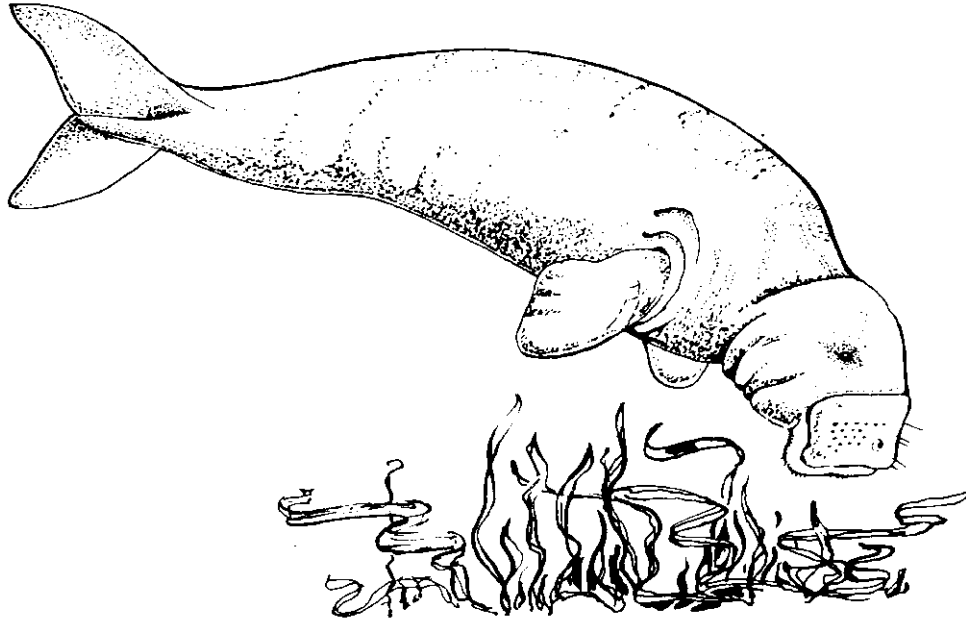
Northern Hopping-mouse *Notomys aquilo*



Dugong *Dugong dugon*

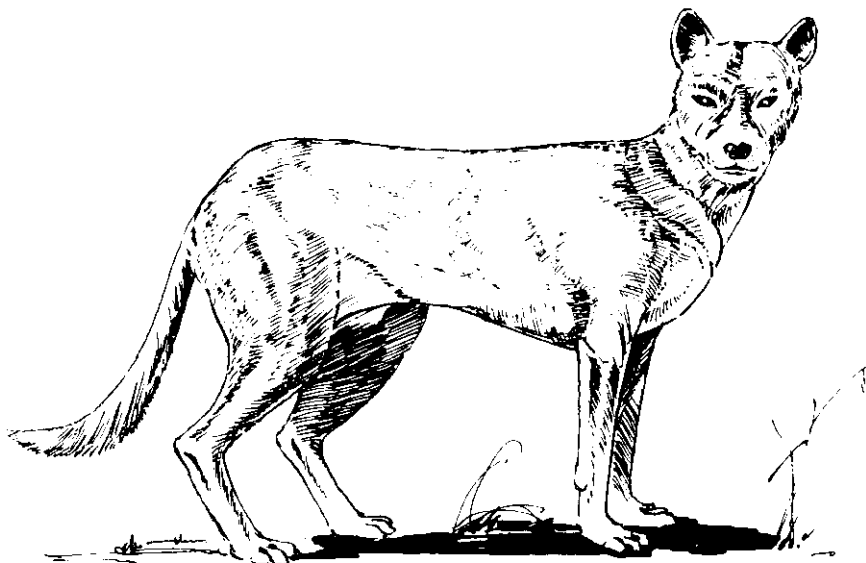
The dugong is the only living herbivorous animal that is completely marine. It grazes on sea-grasses in shallow coastal waters. When the dugong is in a horizontal position its mouth faces the sea bed making feeding easy.

It is a placental, air breathing mammal, about two metres long.



Dingo *Canis familiaris*

Australia's only native dog, the dingo is a placental mammal found in a range of habitats. Dingos eat other mammals but also birds and reptiles.



SOME THOUGHTS ON OUTDOOR TEACHING

Ultimately the success of any outdoor education program will depend upon the teacher's personal approach and attitudes.

- 1 At all times **be enthusiastic**. Your enthusiasm, or lack of it, is bound to rub off onto the students.
- 2 **Make the excursions fun**. If students have happy and memorable encounters with nature then they are more likely to become protective of it. Always aim for a healthy blend of structured academic exercises and more light hearted activities. (Included in this Teacher Handbook are descriptions of 17 **environmental games** to get you started.)
- 3 **Be flexible** during the excursions. Plan your excursions carefully beforehand and prepare worksheets so that the outings have structure and the students see that they have purpose. However, be prepared to make adjustments when the students come across something unexpected that interests them. Similarly, if an activity is not working or the students are losing interest, be prepared to switch to something new so that their enthusiasm is maintained.
- 4 **Be sensitive** to what is happening around you. Don't let your lesson plans and excursion worksheets prevent you from noticing the things that nature is doing. Also be aware that children may not be used to taking much notice of all things that are happening around them. You may need to teach them how to look, to listen, to feel and to smell.
- 5 **Be brave** and prepared to experiment. Don't be put off if your excursions are not always 100% successful. Similarly don't be discouraged if you appear to know little more about the natural environment than your students. Don't feel bad if you don't know the names of the various plants and animals. The names are not important. What is more important is becoming aware of all the things that these plants and animals are doing around us.

Conducting successful outdoor education programs often requires different management techniques to those that you would use inside a classroom. Before undertaking any excursions it is worthwhile to involve the students in drawing up their own **code of behaviour**. They are more likely to adopt one which they helped prepare than one which is externally imposed. Some examples of rules that might be adopted are:

- * Move quietly and slowly so that you know what's happening around you;
- * Talk softly to avoid scaring off birds and other animals;
- * Avoid stepping on plants or animals;
- * Avoid damaging the countryside, particularly delicate areas such as slopes or the banks of creeks;
- * Turn back logs and rocks after searching;
- * If collecting is essential for the work, take only just enough for the purpose;
- * Don't throw or kick sticks or stones;
- * Leave nothing behind you except your footprints;
- * Take a bag with you and pick up any litter you may find along your way;
- * Create as little disturbance as possible to other people in the area.

ENVIRONMENTAL GAMES

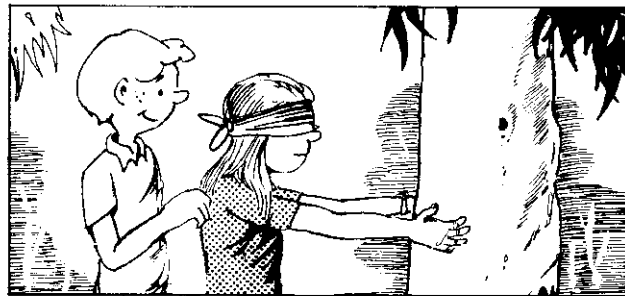
Children are more likely to develop good attitudes towards the environment if their educational experiences have been enjoyable. Environmental games are a way of ensuring that the student's outdoor education experiences are enjoyable and memorable. Below is a selection of games that can be played in the picnic area or on the beach.

1 Meet a Tree

Choose an area where there are several trees growing close together.

Divide the students into pairs and supply one blindfold per pair. One member of each pair is blindfolded and the other member of the pair leads him or her to an interesting tree.

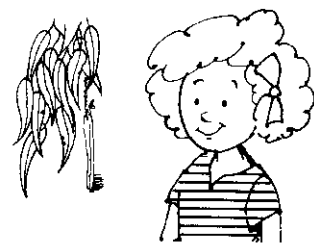
The idea is to help the blind person explore the tree and get to know it.



Some things for the blind person to do are:

- * Feel the tree's bark
- * Put his/her arms around its trunk to feel how big it is
- * Smell the tree
- * Feel the ground at the base of the trunk
- * Find out how far up the trunk the first branch appears
- * Find out if the trunk is upright or leaning

When the blind person has finished exploring the tree he/she is led back to the starting point and then must find the tree again with the blindfold off.



2 Unnature Trail

This game is an exercise in camouflage. A track through a forest area is needed for best results. The walking track through the deciduous vine thicket between Casuarina Hospital and the Free Beach is ideal.

Choose a short length of the path (50 metre) and place a marker at the beginning and end.

Camouflage 10-15 man-made objects along the trail. (For example a ring pull, pen, knitting needle, etc.) The students must be able to see the objects without leaving the path. Also they should not be hidden underneath other objects.

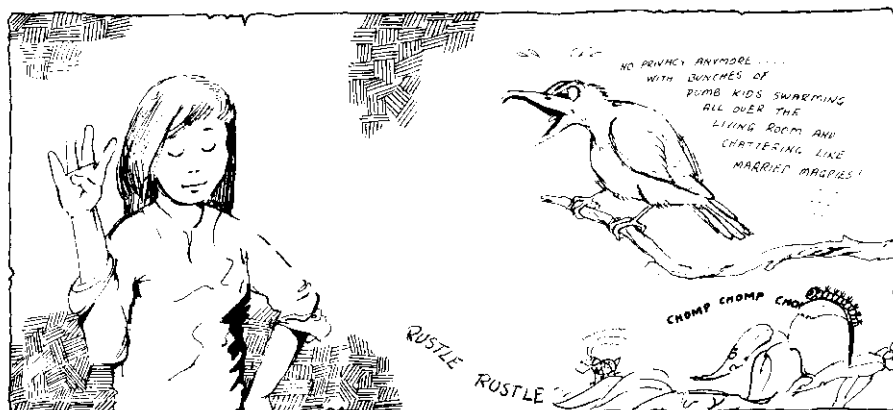
The students are to walk quietly along the path and write down the names of the objects as they find them. (It is important that they don't remove any of the objects and don't tell anyone when they've spotted one.)

If a student hasn't spotted all the objects by the end of the trail then he/she must go back to the start and begin again.

3 Sounds of the Bush

The students sit very quietly in a circle with their eyes shut. They clench their fists and hold them up in the air.

When the teacher tells them to start the students are to count the number of different sounds they can hear in a set period of time. (The students mustn't say a word but lift a finger every time they hear a new sound.)



When the time is up the students can open their eyes and compare their number with the sounds heard by others.

It is important that the students discuss the different sounds they heard.

4 Noah's Ark

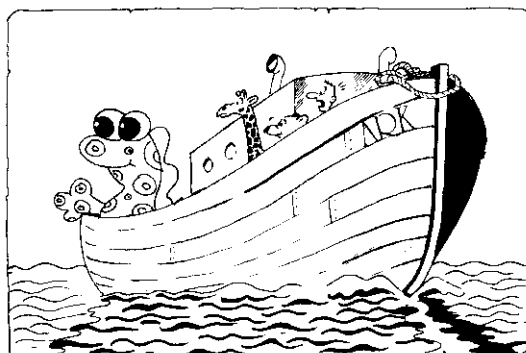
An even number of students is needed.

Make up a set of cards with the name of an animal on each. (One card per student is needed but the name of each animal must be on two cards.)

Shuffle the cards and give one to each student.

The student's mustn't show their card to anyone else.

On signal the students all begin acting out the movements, shape and sound of their animal. The aim is for each student to find his/her mate among all the other animals on the ark. The students can make as much noise as they want but they mustn't talk.



5 Tree Silhouettes

Choose a place where several different kinds of trees are growing. One student shapes his/her body to look like a particular tree and the others must guess which tree it is. (Alternately a couple of students can combine to portray a tree.)

6 What Animal Am I?

Pin a picture of a local animal on the back of one of the students. He/she must not know the identity of the animal but must show everyone else.

The student then asks questions to discover his/her identity. The others can only answer yes or no to the questions.

This game is a good way of teaching the various animals which live in a particular habitat.

7 Identification Game

This game can help students remember the names of trees and shrubs in an area.

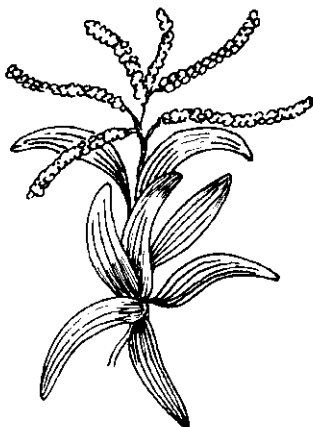
As you explore an area with your class and collect a small sample of leaves, flowers or fruits of each plant.

Form two equal teams and line them up facing each other about 10 metres apart.

Number the members of each team 1,2,3 etc... Put the plant specimens on the ground between the two teams.

Call out the name of one of the plants and then a number. ("The next plant is a wattle and the number is ...3".) As soon as the "threes" hear their number called, they race to the specimens trying to be the first to find it and give it to the teacher. Every successful player earns a point for his/her team.

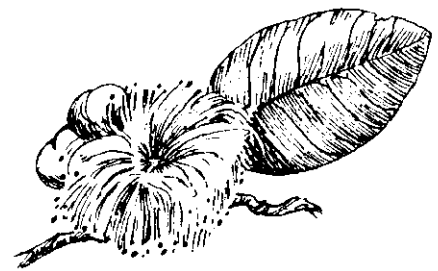
Picking up the wrong specimen results in the loss of a point.



Acacia latifolia



Ficus racemosa



Eugenia suborbicularis

8 Duplication

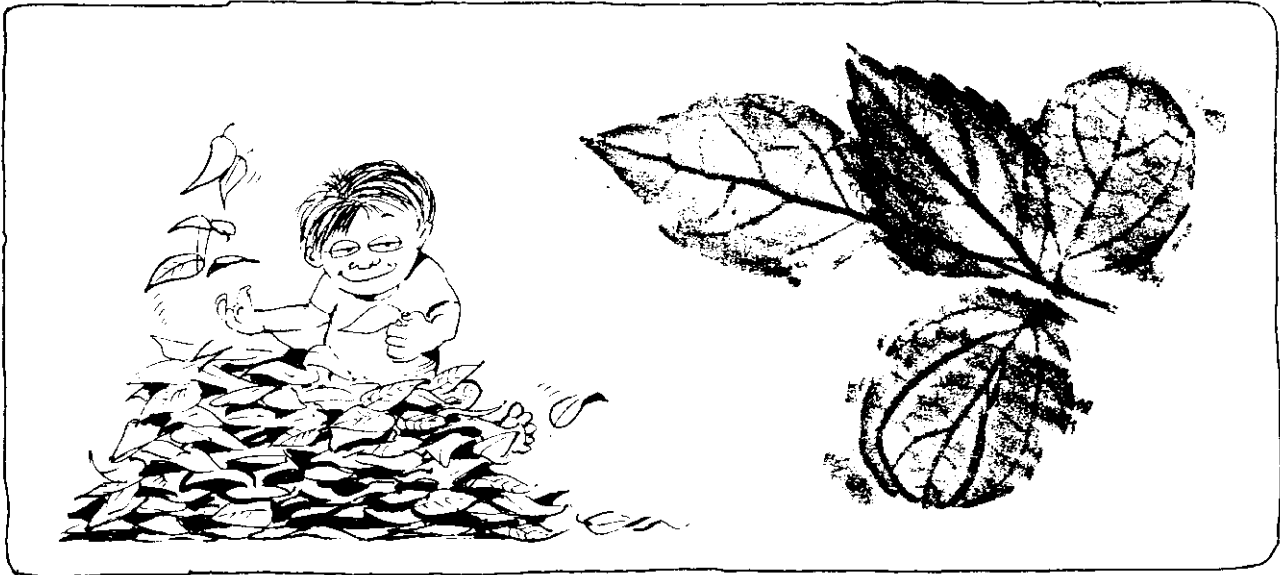
The students sit in a circle. In the centre there is a cloth under which the teacher has hidden 10 natural objects from the surrounding area.

The teacher removes the cloth and slowly counts to 10. The students must try to remember all the objects. The objects are then covered again and the students go off to find identical objects. The students shouldn't collect the objects but write down their names and where they saw them.

9 Getting to Know a Leaf

Each student finds a dead leaf from a particular tree. They study it closely and memorise as many features of it as they can.

All the leaves are then mixed up in a pile together. Each student must find their leaf again.

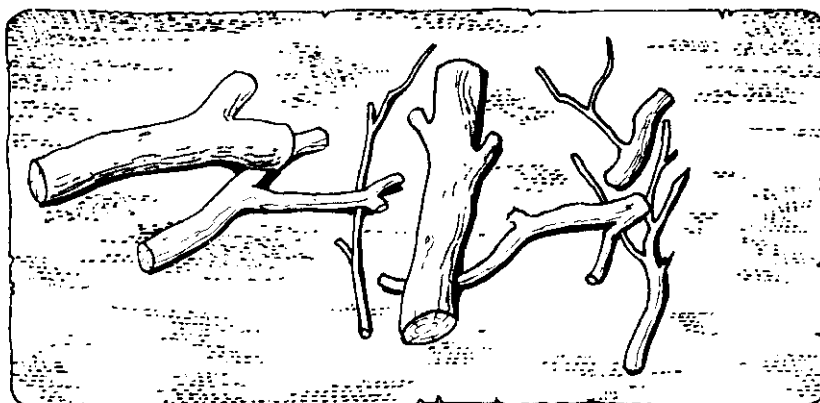


10 Match a Leaf

Collect a number of characteristic leaves from different trees. Divide the class into small groups with a leaf for each group. On the word "go" the groups must match their leaf to the kind of tree from which it came.

11 Tree Jigsaw

Saw an interesting dead branch into a variety of pieces. Working together, the students have to put the pieces together again.

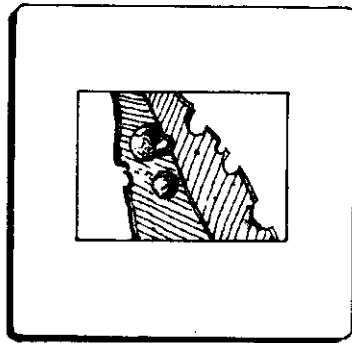


12 What Branch Am I Thinking Of?

Choose a big tree with lots of interesting branches. Ask one student to choose a particular branch and describe it to the others, concentrating on its special features. The other students must work out which branch it is.

13 Slide Show

Give each student an empty slide mount and ask them to find an interesting flat object that will fit inside. (For example: leaf, cobweb, grass flower head, feather, etc.)



When each student has sandwiched his/her object in their slide mount, they form a circle.

On a signal from the teacher everyone passes their slide to the person on their left. Each student holds the slide up to the light and studies it.

On the next signal from the teacher the students pass on the slides again and study their new slide.

The slide show continues until the students get their original slide back again.

14 Unnatural Nature

Mark out a short walk through an interesting area where there are lots of different trees and shrubs. Change a few natural things. (For example: gum leaves tied to a wattle tree, grass "growing" out of the fork of a branch, etc.)

Lead the students along the path and get them to write down the unnatural nature they see.

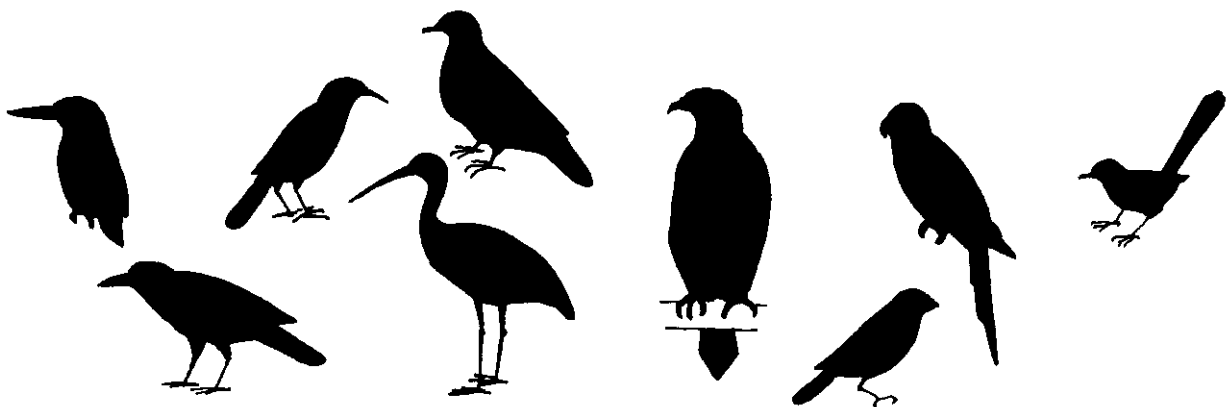
15 Birdspotting

This game will help students learn the shapes of various kinds of birds. (See also Do Sheet 15.) Prepare cards showing silhouettes of various common bird types. (One bird per card.)

Divide the students into teams of 2-3 students and get them to sit quietly in their teams.

When a bird is spotted the students must find the correct card from their set. Award points for the first team to hold up the correct card.

(For this game to be a success the students must be as quiet and still as possible otherwise the birds will be scared away.)

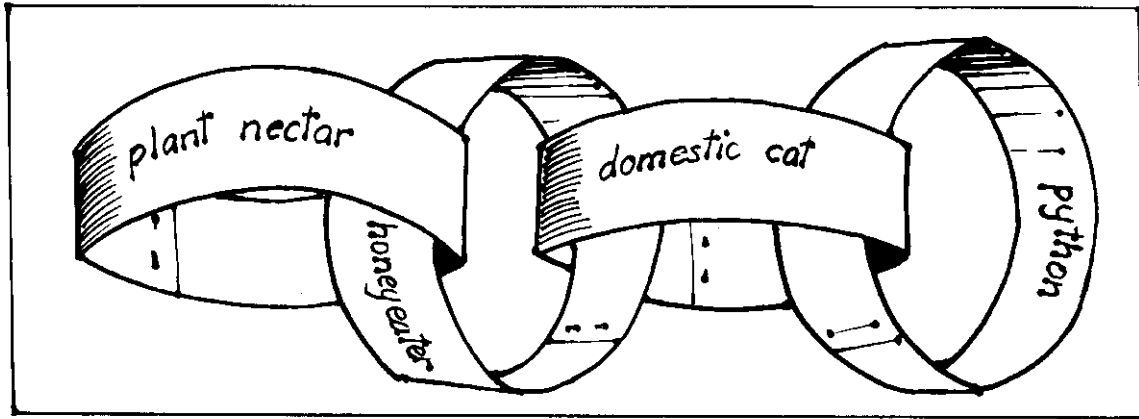


16 Food Chains

For this game the students will need strips of paper (20cm x 2cm), glue and pens.

The teacher leads the students in a discussion of what animals live in a particular habitat and what they eat. The students can then make food chains to show the relationships.

(Remember that all food chains start with plants.)



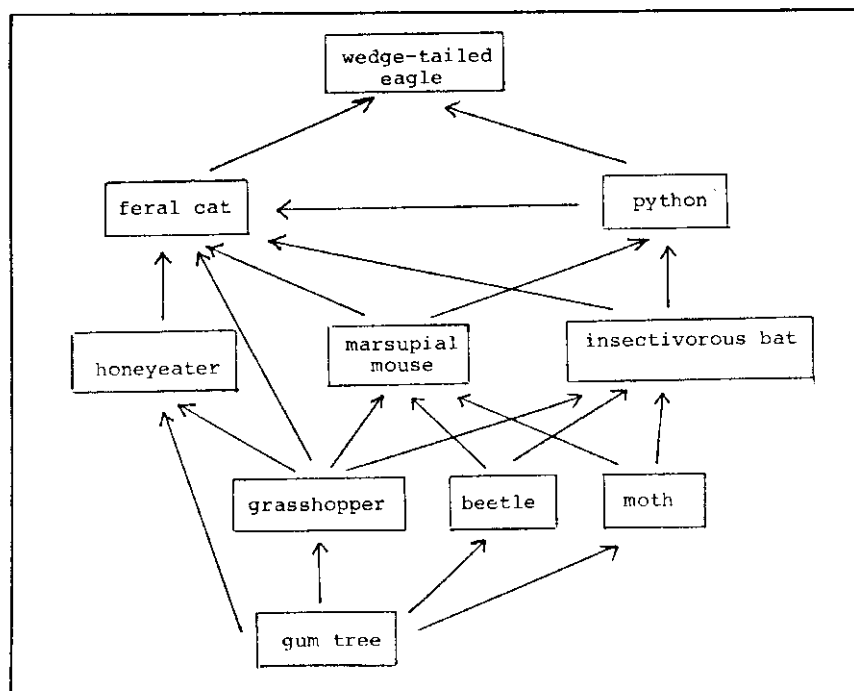
17 Food Webs

This game is an extension of the previous game and intended to get students thinking about the interdependence of living things. Twenty lengths of string are needed and 10 pieces of cardboard, each one bearing one of the following names:

gum tree
grasshopper
beetle
moth
honeyeater

marsupial mouse
insectivorous bat
feral cat
python
wedge-tailed eagle

Ten students are given a card each and the strings are used to connect students between whom there is a feeding relationship.



Recommended Further Reading

The first eight games described here are adapted from the book

Cornell, J. (1979) *Sharing Nature with Children*, Ananda Publications

This excellent and inexpensive paperback describes 42 environmental games and is available from the:

Gould League of New South Wales
P.O. Box 150
Beecroft NSW 2119