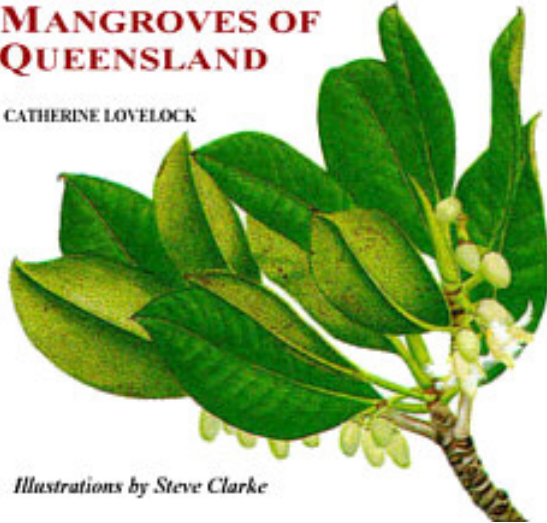

FIELD GUIDE TO THE MANGROVES OF QUEENSLAND

CATHERINE LOVELOCK



Illustrations by Steve Clarke

The Field Guide to the Mangroves of Queensland is intended for people who wish to identify the plants they encounter in their coastal environment. Twenty-two of the most commonly occurring mangrove forest plants - both true mangroves and mangrove plant associates - are illustrated here.

Detailed information about mangrove ecosystems and about plant species not illustrated here can be found in books listed at the end of the Guide.

With knowledge of, and experience in, mangrove forest ecosystems we hope you will gain a greater understanding of the significance of our mangrove forests.

This book was first published by the Australian Institute of Marine Science 1993, and is available from the AIMS bookshop.

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Preface

Mangrove forests are one of our most important and widespread coastal ecosystems. In Australia, mangrove forests occupy approximately 11,600 square kilometres of coastal foreshore and estuary areas, of which 4,600 square kilometres are in Queensland. These forests are vital to the biological productivity of Australia's coastal waters.

In recent years mangrove environments all around the world have come under increasing pressure from coastal development. Fortunately, Australia is one of the few countries with large areas of mangrove forests which have not yet been overexploited.

This guide describes the structure and function of mangrove communities, their value and the need for conservation of this often underestimated resource.

The Field Guide to the Mangroves of Queensland is intended for people who wish to identify the plants they encounter in their coastal environment.

Twenty-two of the most commonly occurring mangrove forest plants - both true mangroves and mangrove plant associates - are illustrated here.

A comprehensive listing of mangrove species occurring in Queensland mangrove forests can be found in the section on [The Mangrove Plants of Queensland](#). Detailed information about mangrove ecosystems and about plant species not illustrated here can be found in books listed at the end of the Guide.

With knowledge of, and experience in, mangrove forest ecosystems we hope you will gain a greater understanding of the significance of our mangrove forests.

The mangrove environment

The term mangrove may be used to refer to both an individual mangrove plant and to the habitat in which it lives. Worldwide there are 69 recognised species of mangrove plants belonging to 20 families - 34 mangrove species and 3 hybrids are known to occur in Queensland.

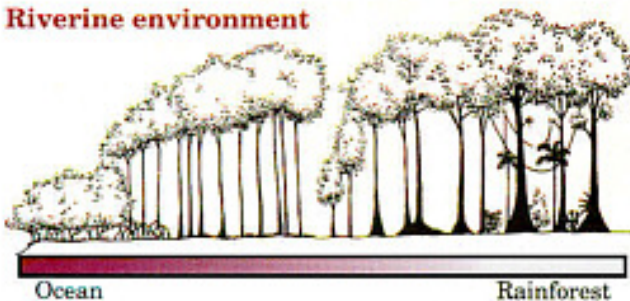
Mangrove forests are diverse communities growing in the intertidal zone (between the average sea level and the high tide mark) of tropical to subtropical coastal rivers, estuaries and bays. In north Queensland the coast is sheltered from high energy wave action by the Great Barrier Reef, while the southern coast is protected by an extensive chain of sand islands. The large amount of silt deposited by coastal rivers along this protected shoreline has produced an environment suitable for the growth of extensive mangrove forests. Mangrove plants can also be found growing on the carbonate sediments deposited around reef associated islands.

Plants growing in the intertidal zone are subjected to large fluctuations in salinity - they are inundated by seawater (high salinity) during high tides, whilst at low tide, or during heavy rains or floods, they can be exposed to fresh water (low salinity). Tidal ebb and flow, together with changes in river flow rate, can alter water temperature and the supply of nutrients and oxygen to the plant's root systems. Soils of the intertidal zone are usually soft and muddy and are often anaerobic (low in oxygen). Mangrove plants are unique in their ability to grow in such a dynamic environment.

The occurrence of individual mangrove species within the forest is reliant on environmental factors such as salinity, nutrient availability, oxygen level in the soil and wave energy. As mangrove species are variable in their tolerance of these factors, a pattern of species distribution known as zonation occurs. For example, less salt tolerant species often occur high in the intertidal zone (landward edge of the mangroves), or only in places where there is some freshwater input. Those species that are most tolerant of salty conditions generally occur low in the intertidal zone (seaward edge of the mangroves) where they are exposed to seawater at high tide. Some of the most salt tolerant species are found in environments where tidal influence is minimal but evaporation of water from the soil surface is high. In these areas the concentration of salt in the soil rises to such an extent that it becomes hypersaline (more salty than seawater).

Two general types of mangrove environment are shown in the illustrations.

Riverine environment



The riverine environment occurs along freshwater rivers and creeks, such as the Daintree River and Noah's Creek near Cape Tribulation (there is a boardwalk for viewing the mangroves at Noah's Creek). Note how the forest structure is dominated by mangrove plants near the coast and how it gradually changes to a rainforest community further upstream. The river provides freshwater and nutrient inputs into the mangroves.

Marine environment



In the marine environment, most of the water in the mangroves comes from the ocean, with only a little



fresh- water input from rainfall. Here the forest structure is dominated by mangrove plants near the coast and changes to woodland as you move inland, often passing through a hypersaline area where few plants can grow. Mangroves like this can be seen at the Mangrove Boardwalk near the Cairns airport, at the Townsville Town Common, Hinchinbrook Island, in

the Gladstone region and in Moreton Bay.

Often, marine environments can be found associated with riverine environments, particularly in tributaries at river mouths. The coloured bars below the illustrations show changes in soil salinity. The soil is saltiest where the colour is darkest.

How mangroves tolerate their environment

Mangrove plants have special adaptations that allow them to grow in soft, salty, oxygen-deficient soils - something most other plants cannot do.

A supply of oxygen to the roots is vital for plant growth and nutrient uptake. Because mangrove soils are often anaerobic some mangrove plants have developed specialised structures called pneumatophores. These above-ground roots are filled with spongy tissue and have numerous small holes in the bark which allow oxygen to be transferred to the below-ground root system. They can also provide structural support for trees in the soft, muddy mangrove soils. There are four types of pneumatophore - stilt or prop type, snorkel or peg type, knee type and ribbon or plank type (see [How To Use This Guide](#)). Knee and ribbon types may be combined with buttress roots at the base of the tree.

The water supply available to plants in mangrove forests is often saline. This water needs to be desalinated before it can be used. Membranes in cells at the root surface exclude most of the salt. Some salt, however, still enters the root system. This passes through the plant and is stored within the plant in its leaves, stems and roots. Consequently, there are often very high concentrations of salt in mangrove plant leaves. In some species salt is secreted from special leaf glands (e.g. *Grey Mangrove*), while in others the salt is stored until the leaf dies and is shed.

Because of the limited availability of freshwater in the salty soils of the intertidal zone, mangrove plants have developed ways of limiting the amount of water that they lose through their leaves. They can restrict the opening of their stomata (small pores on their leaf surfaces which exchange carbon dioxide gas and water vapour during photosynthesis) and also have the ability to vary the orientation of their leaves. By orientating their leaves to avoid the harsh midday sun, mangrove plants can reduce evaporation from their leaf surfaces.

Mangroves also have buoyant seeds that are suited to dispersal in water. Unlike most plants, whose seeds germinate in the soil, many mangrove plants are viviparous i.e. their seeds germinate while still attached to the parent tree. Once germinated the seedling grows either within the fruit (eg. *Aegialitis*, *Acanthus*, *Avicennia* and *Aegiceras*), or out through the fruit (eg. *Rhizophora*, *Ceriops*, *Bruguiera* and *Nypa*) to form what is called a propagule (a seedling ready to go). When the propagule is mature it drops into the water and remains dormant while it disperses until it lodges safely in the soil, sprouts roots and begins to grow. The development of a propagule of the Red Mangrove is illustrated in [Propagule Formation](#). Other species within the same group of plants, called the Rhizophoraceae family, reproduce in a similar way. Plants that belong to the Rhizophoraceae family are *Ceriops* species, *Bruguiera* species, and *Rhizophora* species. However, many of the mangrove species growing in the intertidal zone eg. *Xylocarpus* species, *Heritiera littoralis* and *Lumnitzera* species reproduce in the conventional manner.

Propagule formation

Propagule formation



Mangrove ecosystems

Mangrove forests are part of a productive ecosystem that supports abundant life through a food chain that starts with the trees. The leaves of mangrove plants, like all green plants, use sunlight to convert carbon dioxide gas to organic compounds in a process called photosynthesis. The carbon absorbed by plants during photosynthesis, together with nutrients taken up by plants from the soil, provide the raw materials for tree growth. Tree growth is essential in sustaining the life of all other organisms that live in the mangroves. Live and decaying mangrove leaves and roots provide carbon and nutrients that are used by other organisms in the mangrove ecosystem.

Nothing is wasted in a mangrove forest. Mangrove plants shed large numbers of nutrient-rich leaves which are either broken down by fungi and bacteria or are eaten by small crabs that live on the forest floor. Decaying organic material breaks down into small particles (detritus) which are covered with a protein-rich bacterial film. Detritus is the food source for many species of molluscs (snails), crustaceans (crabs, shrimps and prawns) and fish, which in turn are the food source for larger animals. Nutrients released into the water through the breakdown of leaves, wood and roots also feed the plankton and algae that form part of the mangrove ecosystem.

Animals of the mangroves

Mangrove forests form the interface between marine and terrestrial environments. Consequently, animals from both these environments can be found in the mangroves. Few animals use mangroves as their only habitat. Some live primarily in the mangroves, while others move in and out of the mangroves seasonally, at different stages of their life cycle or even depending on the tide.

Saltwater crocodiles are one of the most infamous inhabitants of mangrove areas. They do not generally nest in mangroves but are found nesting in vegetation fringing mangrove areas and vegetation where rivers adjoin coastal flood plains. On the rising tide these reptiles come into the mangroves to feed. Juvenile crocodiles feed on crabs, prawns, mudskippers and other small fish. As they mature their diet changes to include large mud crabs, birds and mammals.

Sea snakes are common visitors to mangrove forests as are terrestrial snakes. Pythons tend to be occasional visitors to the mangroves, while the Little File Snake, the Mangrove Snake and the White-bellied Mangrove Snake tend to use the mangroves as their primary habitat. The Mangrove Monitor and the Rusty Monitor, which feed on insects, fish, crabs and sometimes birds, also use the mangroves as their primary habitat.

Mudskippers are one of the few animals which are restricted to mangrove environments. They burrow into the soil and can swim like fish, but, using their pectoral fins, can also climb tree roots and move across the soil. In contrast, most other fish species which inhabit mangrove creeks are also found in the coastal seas, entering the mangroves during a particular stage of their life cycle. For example, Barramundi spawn and spend their juvenile phase in mangrove creeks. Sea Mullet also inhabit the mangroves as juveniles. The availability of food and protection from predation are important factors influencing fish migration into, and out of, mangrove environments.

Crustaceans (sea lice, barnacles, shrimps, prawns and crabs) are abundant in mangrove forests. One of the most distinctive crustaceans is the Mud Lobster which builds large mud towers at the entrance to its burrow. Pistol Shrimps are responsible for the loud clicks you can often hear in mangrove forests. There are also around 60 species of crabs which inhabit the mangroves. Some crabs are predominantly leaf eaters while others feed mainly on algae and detritus on the soil surface, scooping the material into their mouthparts and discarding the inedible material as round pellets. One of the most conspicuous species is the Fiddler Crab which has an enlarged orange claw. Molluscs, like the Common Mud Whelk and the Mangrove Oyster, are often visible on the muddy soil around the base of mangrove trees. In addition to these largely surface dwellers is a fauna associated with rotting wood such as Shipworms, which are not really worms but highly adapted bivalve molluscs.

Many species of birds also depend seasonally on mangrove environments for food and shelter. Honeyeaters and lorikeets visit the mangroves for nectar during the plant flowering season. Other species, such as the Torresian Imperial Pigeon, inhabit the mangroves during breeding. Mangroves are important habitats during annual migrations and can become important refuges during droughts and when adjacent terrestrial forest is destroyed. Water birds that visit the mangroves on a more regular basis include the Jabiru, egrets and the Mangrove Heron while the Mangrove Robin, White-breasted Whistler, Mangrove Honeyeater and Mangrove Kingfisher are woodland birds that are considered mangrove specialists.

Flying foxes (fruit bats) often form large colonies in the mangroves and can be seen roosting during the day. Other mammals are not often seen in mangroves, however, wallabies, rats, possums and bandicoots visit the mangroves, as do feral pigs, cattle and water buffalo.

Coastal protection

Mangroves play an important role in preventing coastal erosion. Throughout the world mangrove forests have been cleared leaving low-lying coastal areas more susceptible to damage from cyclones and storm surges.

By reducing current speed and trapping sediments, the tangled roots, pneumatophores and trunks of the mangroves help to reduce siltation in adjacent marine habitats. Similarly, river-borne nutrients (including the agricultural chemicals present in many Queensland rivers) are likely to be trapped and recycled within mangroves.

Links between mangroves, seagrass beds and coral reefs

Mangroves, seagrass beds and coral reefs are linked together by the water masses that move in and out with the tide, and by the animals that move between these habitats. Many fish and prawn species that are usually found offshore inhabit mangrove areas during part of their life cycle. Mangroves are important nursery grounds for commercial species such as king prawns, Barramundi, snapper, bream and mackerel. Some smaller, non-commercial species also spend their juvenile stages in the mangroves and become the food source of larger fish like billfish and marlin when they migrate to the open ocean.

Other species, such as mud crabs, spend most of their lives in the mangroves and move to the open sea to spawn. Coastal habitats are also linked by water flow. Tides and currents transport nutrients from the mangroves to seagrass beds and inshore coral reefs. These nutrients enrich the seagrass and reef environments which are important habitats for turtles, dugongs and fish. The degree of linkage between the mangroves and offshore habitats is dependent on the proximity of the habitats to one another.

Legislation

In Queensland all mangroves, and any part of a mangrove (seeds, propagules, leaves, stumps, etc.), are specifically protected under the Queensland Fisheries Act.

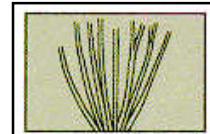
Any activity involving mangrove forests or plants requires a permit from the Queensland Department of Primary Industries

How to use this guide

The plants described in this Guide are grouped together according to the shape of their base and whether they have specialised above-ground roots. The type of plant is indicated by a coloured symbol shown on the right-hand edge of each illustration page.

Below is a description of what the symbols represent.

Not a tree, a plant that branches from the base. No above-ground roots



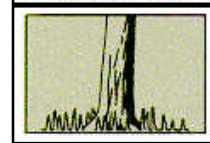
A tree or shrub with a single trunk but no above-ground roots



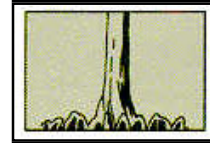
A tree with stilt or prop type above-ground roots



A tree with snorkel or peg type above-ground roots



A tree with a flared base or buttress and knee type above-ground roots



A tree with a flared base or buttress and plank type above-ground roots



To identify a plant:

- Decide what form the base of the plant takes and whether there are any above-ground roots. Locate the appropriate section of the Guide.
- Find the illustration that looks most like the plant or tree you are trying to identify.
- Look carefully at the shape of the leaves, the flowers or fruits, and the bark.
- Compare your observations with the notes describing the species. Look for any distinguishing feature that may be mentioned, for example the smell of a crushed leaf or the presence of salt on the leaf surface.

To further confirm your identification;

- Look at the whole tree and see if it corresponds to the tree shape illustrated below the text.
 - Check the guide to flowering and fruiting cycle if the plant you are identifying has flowers or fruit.
 - Look at the distribution map on the illustration page to see if you are within the normal distribution range for the species you are investigating, e.g. if you are in Brisbane you will not find the Cannonball Mangrove.
 - Look at the panels at the top and bottom of the illustration page. The shaded area indicates where the plant should occur in either a riverine or marine environment. Check whether you are in an appropriate environment to find this species.
-
- To identify a seed or propagule look at *Seeds and Propagules* where many of those that you may find are illustrated.
 - Remember that environmental conditions can change the way a plant looks. **Check ALL** the features noted here and you can be confident in your identification.

Tips for enjoying the mangroves

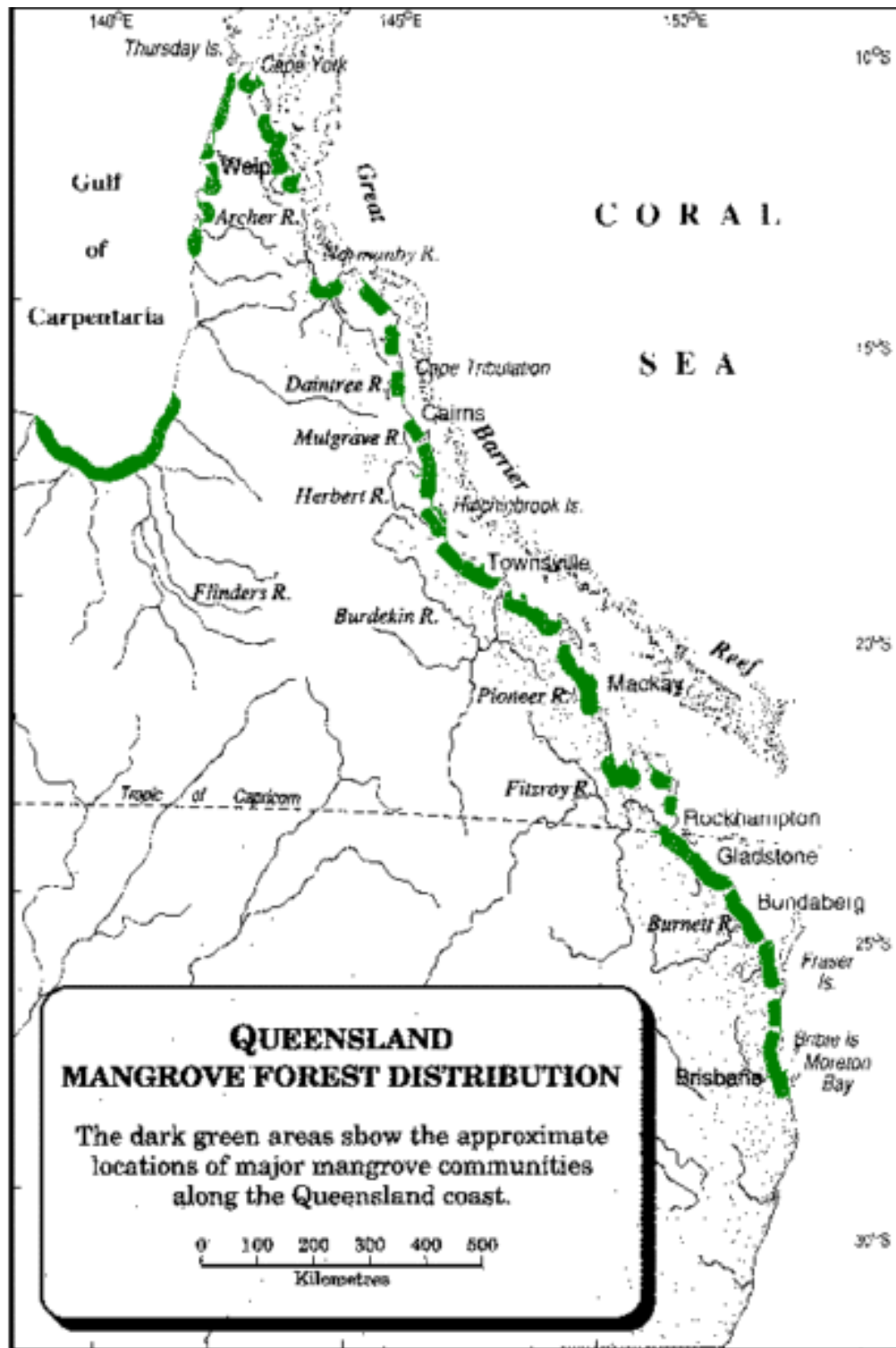
The mangroves are beautiful, quiet forests. However, in order to enjoy an outing you should be well prepared.

Keep in mind the following points:

- Cover-up. Wear strong shoes to protect your feet (a pair that you do not mind getting muddy) and a long-sleeved shirt and long pants to protect you from the sun, sandflies and mosquitoes. A bottle of insect repellent will also help make your visit more comfortable.
- Saltwater crocodiles inhabit estuarine areas in north Queensland so avoid wading in mangrove creeks.
- Make sure you know when high tide occurs so you do not get caught. In some parts of Queensland the tidal range can be up to 9 metres. The local newspaper or radio station can provide this information.

The Queensland National Parks and Wildlife Service can advise you about where to see and explore mangroves.

Mangrove distribution



Species index

- ▶ Black Mangrove (*Lumnitzera species*)
- ▶ Blind-Your-Eye Mangrove (*Excoecaria agallocha*)
- ▶ Cannonball Mangrove (*Xylocarpus granatum*)
- ▶ Cedar Mangrove (*Xylocarpus mekongensis*)
- ▶ Club Mangrove (*Aegialitis annulata*)
- ▶ Freshwater Mangrove (*Barringtonia racemosa*)
- ▶ Grey Mangrove (*Avicennia marina*)
- ▶ Holly Mangrove (*Acanthus ilicifolius*)
- ▶ Large-Leafed Orange Mangrove (*Bruguiera gymnorhiza*)
- ▶ Looking-Glass Mangrove (*Heritiera littoralis*)
- ▶ Mangrove Apple (*Sonneratia species*)
- ▶ Mangrove Fern (*Acrostichum speciosum*)
- ▶ Mangrove Lily (*Crinum pedunculatum*)
- ▶ Mangrove Palm (*Nypa fruticans*)
- ▶ Myrtle Mangrove (*Osbornia octodonta*)
- ▶ Native Hibiscus (*Hibiscus tiliaceus*)
- ▶ Red Mangrove (*Rhizophora stylosa*)
- ▶ River Mangrove (*Aegiceras corniculatum*)
- ▶ Small-Leafed Orange Mangrove (*Bruguiera parviflora*)
- ▶ Tall-Stilted Mangrove (*Rhizophora apiculata*)
- ▶ Wrinkle Pod Mangrove (*Cynometra iripa*)
- ▶ Yellow Mangrove (*Ceriops species*)

Black Mangrove

(*Lumnitzera species*)

There are two species of the Black Mangrove - they differ in the colour of their flowers and the shape and size of the mature tree. *Lumnitzera littorea* grows to 3 m tall while *Lumnitzera racemosa* grows to 6 m. A hybrid of these two species, called *Lumnitzera x rosea*, may also be found.

Roots: Above-ground roots are not usually present. However, in moist environments, small knee type above-ground roots may be present.

Leaves: Small (about 7 cm long) light green, fleshy leaves with an indentation at the end.

Flowers and Fruit: *Lumnitzera racemosa* has white flowers, while *Lumnitzera littorea* (illustrated) has red flowers. The hybrid plant has pink flowers. Fruits of both species are about 2 cm long, green and capsule-shaped.

Bark: Grey and fissured bark.

Similar species: You may mistake this tree for the River Mangrove (*Aegiceras corniculatum*) which has salt glands and lacks indentation at the leaf tip.

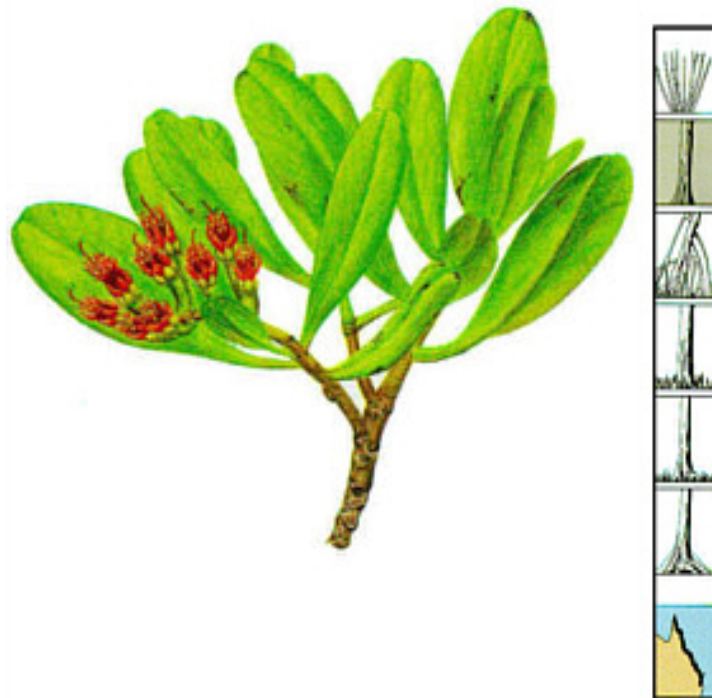
Location: Landward edge of the mangroves. The distribution of *L. racemosa* is shown on the map opposite. *L. littorea* can be found as far south as Hinchinbrook Island.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland

Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting



Blind-Your-Eye Mangrove

(*Excoecaria agallocha*)

The common name for this species refers to the damaging effect that its white milky sap can have on human eyes. This tree can grow to 14 m tall.

Roots: No above-ground roots, but can sometimes have spreading surface roots.

Leaves: Leaves are about 6 to 10 cm long and are arranged alternately up the stem. They may have slightly toothed edges and are pointed at the ends. The leaves exude white sap when broken. In years of severe drought this species may lose all its leaves.

Flowers and Fruit: Flowers arise at the point where the leaves are attached to the stem. Separate male and female flowers occur on the same tree. Only female flowers are shown in the illustration. Male flowers are longer with a furry appearance.

Bark: Rough, grey bark.

Similar species: None.

Location: This tree inhabits the landward edge of mangrove forests and can often be found at or just above the high tide mark.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland

Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting



Cannonball Mangrove

(*Xylocarpus granatum*)

The Cannonball Mangrove gets its name from its large cannonball-shaped fruit (sometimes known as monkey-puzzle nuts). These trees can grow to 25 m tall.

Roots: Buttresses at the base of the trunk and plank or ribbon type above-ground roots.

Leaves: Leaves are oval-shaped and thickened at the base where they meet the stem. This thickening allows the leaves to either face or avoid the sun.

Flowers and Fruit: Small pink flowers. The large, round fruit, containing 12 to 18 tightly packed seeds, ripens to a golden-brown colour. The seeds are often seen on the beaches of north Queensland.

Bark: Mottled pink-orange bark which is smooth but flakes off (see illustration opposite).

Similar species: The Cedar Mangrove (*Xylocarpus mekongensis*) has similar leaves but has snorkel-like roots, smaller fruit, and brown, fissured bark.

Location: Usually found in river systems of the wet tropics.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fructing

Cedar Mangrove

(*Xylocarpus mekongensis*)

The Cedar Mangrove is closely related to the Cannonball Mangrove and both are related to the Red Cedar tree of the tropical rainforest. The Cedar Mangrove can grow to about 20 m tall.

Roots: Thick, flat peg type above-ground roots.

Leaves: Dark green leaves which have a thickened base where they meet the stem. This thickening allows the leaves to move to either face or avoid the sun. Being deciduous, this species may appear to be dead or dying during the dry season.

Flowers and Fruit: Small, creamy-pink flowers. Fruits are rounded and approximately the size of an orange. They contain 8 to 16 tightly packed, irregularly-shaped seeds.

Bark: Brown bark with deep cracks (see illustration).

Similar species: The Cannonball Mangrove has similar leaves but it is buttressed at the base with ribbon or plank roots, its fruit is larger and its bark is smooth and pale.

Location: Found on river banks and on the landward edge of marine mangrove forests.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Club Mangrove

(Aegialitis annulata)

The Club Mangrove grows to about 2 m in height. The base of the trunk of this woody shrub is thickened making the plant look bottom heavy or club-like.

Roots: No substantial above-ground roots but sometimes has roots spreading on the surface of the soil.

Leaves: Leaves are heart shaped with the base of the leaf wrapped around the stem. This species has glands for secreting salt (try tasting for salt on the leaf).

Flowers and Fruit: Small, white flowers produced in bunches. The flowers are thought to be pollinated by visiting ants. The fruit are small, thin, cylindrical, red-brown, and about 4 cm in length.

Bark: Dark brown to black bark that has smooth patches separated by large cracks.

Similar species: None.

Location: It is often found in sandy or rocky environments, either at the seaward edge of the mangroves, or in very saline areas on the edge of salt marshes.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland

Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting



Freshwater Mangrove

(Barringtonia racemosa)

This tree, which is considered to be a mangrove associate, can also be found in tropical rainforest areas. They may grow to 20 m tall.

Roots: No above-ground roots, but may have spreading surface roots.

Leaves: The leaves can be up to 40 cm long and 15 cm wide. They are pointed at the tip, have slightly toothed edges and very pronounced veins.

Flowers and Fruit: Flowers, arranged in long spikes coming out of the centre of leaf groups, have four white petals surrounded by a profusion of white filaments. The fruit is egg shaped and about 9 cm long.

Bark: Grey bark that is generally smooth.

Similar species: *Barringtonia asiatica*, which can be found on the beaches of north Queensland. It has more rounded leaves, larger flowers that occur in small bunches and a larger fruit. Its fruit, is often found on Queensland beaches.

Location: Found on the landward edge of wet tropical mangrove forests, often growing upstream in rivers.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Grey Mangrove

(*Avicennia marina*)

The Grey Mangrove is the most widely distributed mangrove species in Australia mainly due to its tolerance of cool conditions. On the east coast of Australia it occurs as far south as Corner Inlet in Victoria, while on the west coast its most southerly occurrence is Bunbury. It grows to 10 m tall.

Roots: Pencil sized peg type above-ground roots.

Leaves: Light green leaves approximately 10 cm long with a silvery-grey undersurface. The underside of the leaf has special glands for secreting excess salt.

Flowers and Fruit: Small, pale orange flowers that are pollinated by bees and other insects. The fruits are almond sized, green and slightly furry. They mature in two months, ripening in summer.

Bark: Smooth, grey-white to green bark that is sometimes flaky (see illustration opposite).

Similar species: None in Queensland.

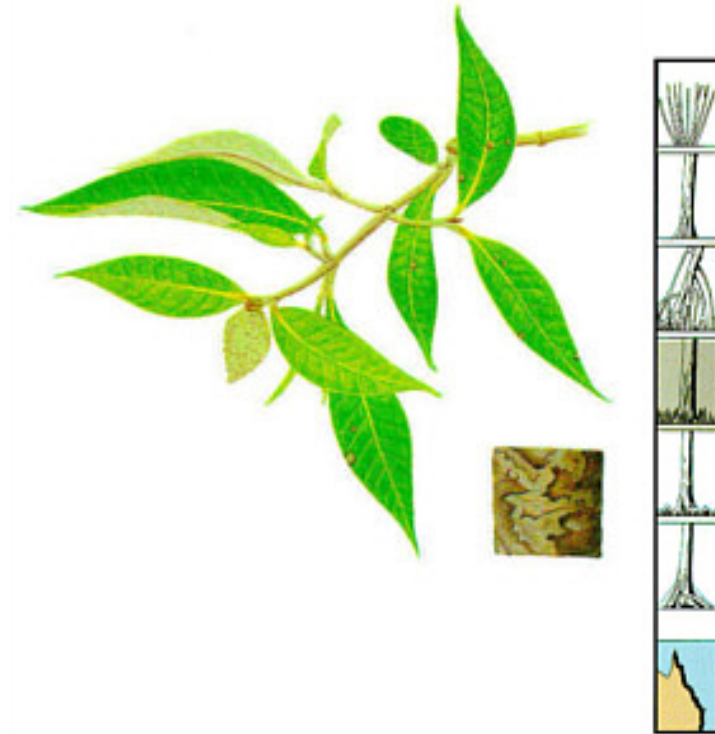
Location: Commonly found on the seaward edge of the mangroves in northern Australia but can be found in almost all mangrove environments.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Holly Mangrove

(Acanthus ilicifolius)

This prickly plant, which can grow to 2 m tall, often inhabits the soft, muddy soils of river banks. It can become dominant after clearing of mangrove forest areas.

Roots: Usually it has no above-ground roots but may have small prop roots.

Leaves: A small shrub with glossy green, prickly leaves (hence the name Holly Mangrove). When this plant is growing in deep shade the leaves tend to develop fewer prickles.

Flowers and Fruit: Purple or white flowers that are pollinated by bees or small birds. The seed pod is a shiny green, oval shaped capsule that propels the seeds away from the plant using a spring loading mechanism.

Bark: Smooth bark.

Similar species: None.

Location: Found in the rivers of tropical northern Australia, often forms thickets along river banks, especially in areas that are under freshwater influence.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Large-leafed Orange Mangrove

(*Bruguiera gymnorhiza*)

This species and other *Bruguiera* species are related to the Red Mangrove. They may grow to 25 m tall.

Roots: Buttresses at the base of the trunk and knee roots.

Leaves: This species has large (10-20 cm) leaves which occur in clumps at the end of branches.

Flowers and Fruit: The flowers are red and remain attached to the propagule when it falls. The propagules are green and cigar-shaped, between 10 and 20 cm long and can be found throughout the year.

Bark: Dark and rough bark (see illustration opposite).

Similar species: The Small-leafed Orange Mangrove has smaller leaves and a thinner propagule. *Bruguiera exaristata* and *Bruguiera sexangula* have smaller propagules with green caps.

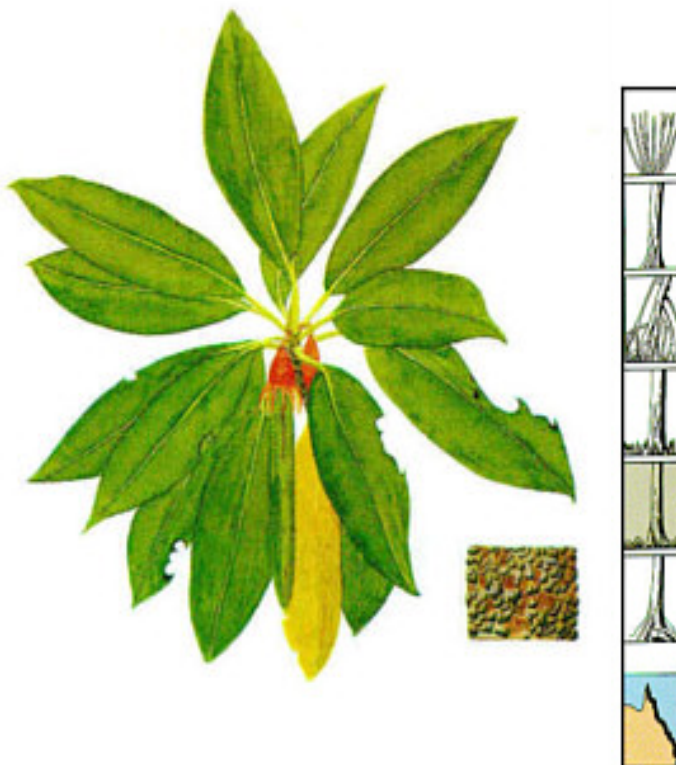
Location: This species often occurs with the Tall-stilted Mangrove (*Rhizophora apiculata*) and the Small-leafed Orange Mangrove (*Bruguiera parviflora*) in areas that have some freshwater input.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland

Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting



Looking-glass Mangrove

(*Heritiera littoralis*)

With its white-grey bark and shaggy appearance, this tree stands out in a forest. It can attain heights of up to 30 m.

Roots: Buttresses at the base of the trunk and plank or ribbon type roots.

Leaves: Large (up to 30 cm long), dark green leaves that have a silvery-white undersurface.

Flowers and Fruit: Flowers are small and green. The fruits are about 7 cm long and have a prominent ridge, or keel, on one side. When the seed is floating this keel acts as a sail, probably aiding dispersal.

Bark: White-grey, cracked bark (see illustration opposite).

Similar species: None.

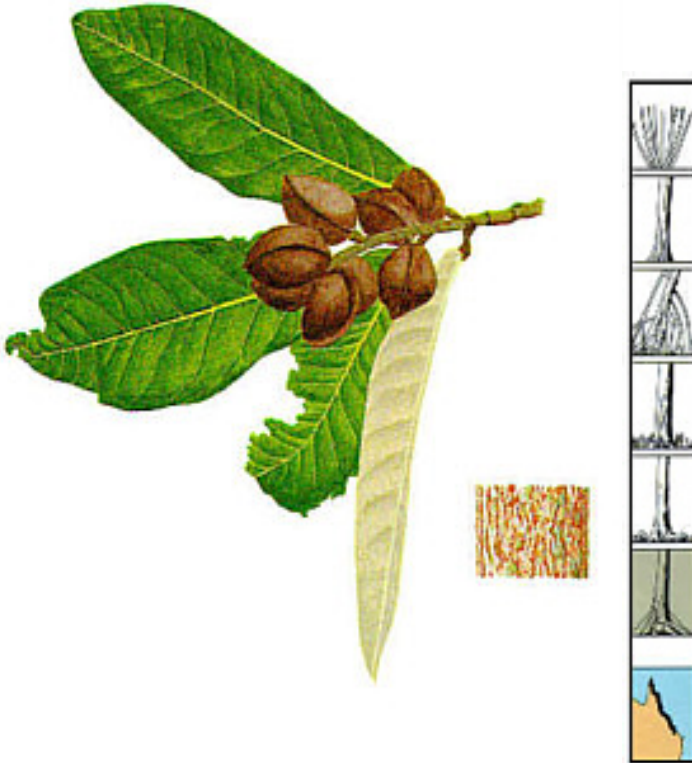
Location: This species is found at the landward edge of mangrove forests along rivers of the wet tropics where there is substantial freshwater influence.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Mangrove Apple

(*Sonneratia species*)

Three species of Mangrove Apple (and one hybrid) occur in Queensland, the most commonly occurring species being *Sonneratia alba* and *Sonneratia caseolaris*. They are difficult to tell apart except when there are flowers on the tree. These trees grow to 15 m tall.

Roots: Thick, tall peg type above-ground roots.

Leaves: Leaves are about 7 cm long, rounded and opposite each other on the branches. The tips of the leaves are slightly turned under.

Flowers and Fruit: *Sonneratia alba* has white flowers while *Sonneratia caseolaris* (illustrated) has red flowers. Flowers only open for one night. The fruit are large (4 cm wide) green, leathery berries with a star-shaped base.

Bark: Grey to brown bark that is slightly cracked.

Similar species: None.

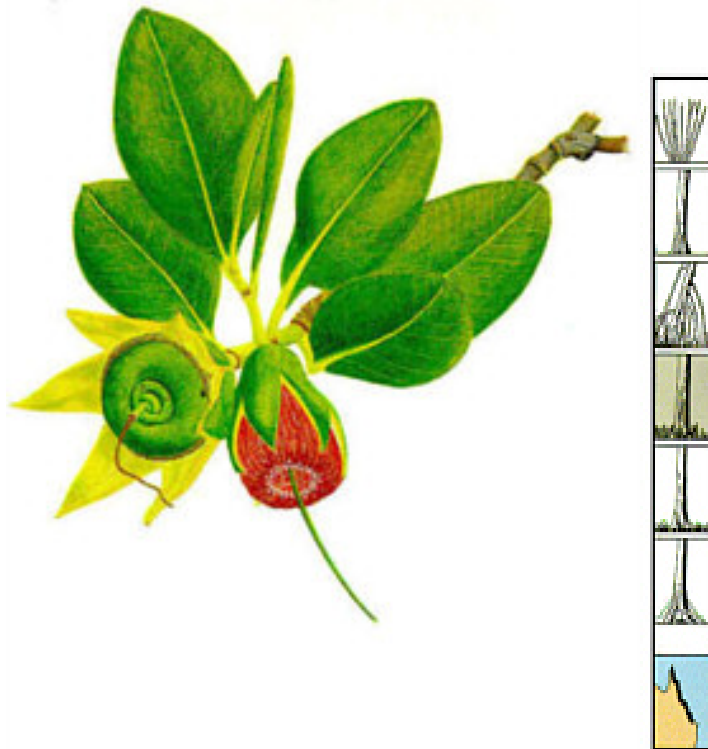
Location: These trees can tolerate a wide salinity range. *S. alba* generally occurs lower in the intertidal zone than *S. caseolaris*, and is often associated with the Grey and Red Mangroves. The distribution of *S. alba* is shown on the map opposite. *S. caseolaris* can be found as far south as Hinchinbrook Island.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland

Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting



Mangrove Fern

(Acrostichum speciosum)

This is the only fern that inhabits the mangrove forest floor. Other ferns in mangrove forests are epiphytic (growing by attaching themselves to the trunks and branches of trees).

Roots: No above-ground roots.

Leaves: Fronds can be up to 2 m long, made up of smaller leaflets (up to 15 cm long).

Flowers and Fruit: Ferns do not have flowers or fruit but produce spores on the backs of their leaves throughout the year.

Bark: None.

Similar species: None.

Location: Usually found on the landward edges of mangrove forests, high in the intertidal zone where there is a large freshwater input i.e. in wet, tropical river regions. The Mangrove Fern often dominates in areas that have been cleared or disturbed.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Mangrove Lily

(Crinum pedunculatum)

This lily is not considered a true mangrove but is often found closely associated with mangrove forests.

Roots: No above-ground roots.

Leaves: Leaves arise from the base of the plant and are about 1 m long.

Flowers and Fruit: White, spidery flowers occur on a flower stalk which grows from the base of the plant. The mature fruits are cream coloured, smooth and the size of a small onion.

Bark: None.

Similar species: None.

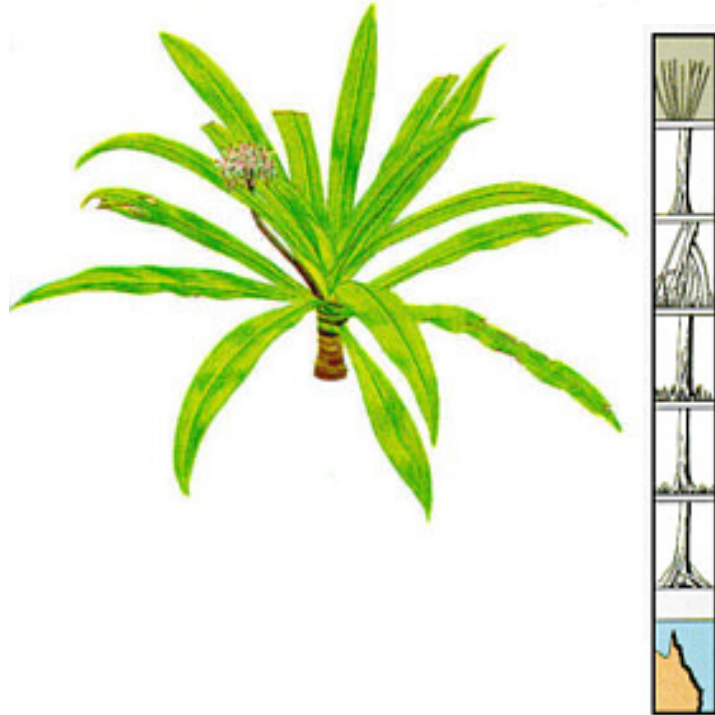
Location: Found on the landward edge of wet tropical mangrove forests, often growing along the high tide mark.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Mangrove Palm

(Nypa fruticans)

The *Nypa* palm is the only palm to be found in mangrove forests. Its fruit is in the form of an impressive spiky head, about the size of a soccer ball, which breaks up after it ripens.

Roots: No above-ground roots.

Leaves: A palm with large fronds that rise from the base of the plant and can be up to 9 m long.

Flowers and Fruit: Flowers are yellow and arranged in a clump on a stalk which rises from the base of the plant. The seeds which make up the buoyant fruit are often found on Queensland beaches.

Bark: None.

Similar species: None.

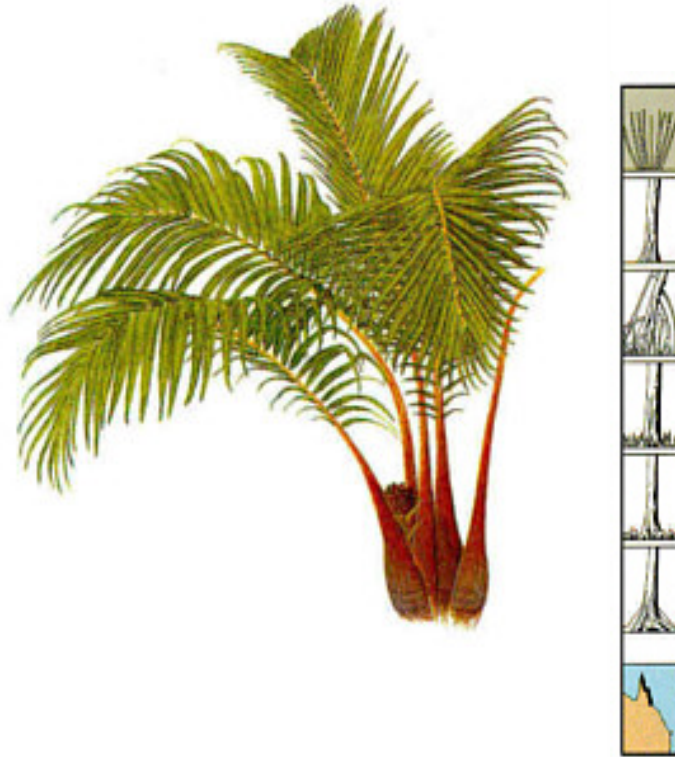
Location: Found upstream in rivers of the wet, tropical areas of north Queensland where there are low salinities and calm water.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Myrtle Mangrove

(Osbornia octodonta)

This tree belongs to the same family as the eucalypts (Myrtaceae) with its crushed leaves having the same distinctive smell. This smell is a good way to positively identify the species as it is the only mangrove having this characteristic. This species can grow to 5 m tall.

Roots: No above-ground roots, although it can often have roots spreading on the soil surface.

Leaves: Leaves about 3 cm long that are arranged opposite each other up the stem. There is often a red tinge to the base of the leaves.

Flowers and Fruit: Small (about 1 cm) white flowers. The fruit is not much larger than the flower and is a similar shape.

Bark: Grey and fibrous bark.

Similar species: You may mistake this tree for the Black Mangrove (*Lumnitzera* species). However, leaves of the Black Mangrove do not have the same distinctive eucalypt smell when crushed.

Location: Found on the landward edge of tidal mangroves where there is little fresh water available.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Native Hibiscus

(Hibiscus tiliaceus)

Although the Native Hibiscus (or Cottonwood) is not considered a true mangrove it is often found associated with mangroves. These trees may grow to 10 m tall.

Roots: No above-ground roots.

Leaves: Heart shaped leaves that are 10 to 15 cm across.

Flowers and Fruit: Yellow-orange flowers with five petals. Fruits have five lobes and are brown and woody when ripe. The flowers can be seen floating on the rivers of north Queensland.

Bark: Smooth, grey bark.

Similar species: *Thespesia populnea* is easily confused with the Native Hibiscus. However, *Thespesia* has thinner, more elongated heart-shaped leaves and five dark dots at the centre of its flowers.

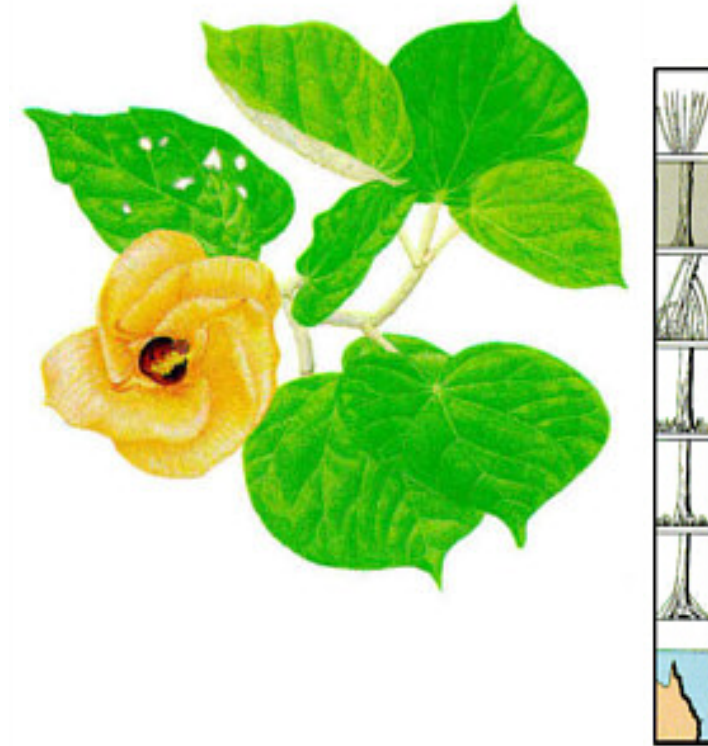
Location: Found on the landward edge of wet tropical mangrove forests, often growing along the high tide mark.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Red Mangrove

(Rhizophora stylosa)

This is probably the best known mangrove plant because of its distinctive root system and widespread distribution. It can grow to 20 m tall.

Roots: Prop roots.

Leaves: Leaves about 10 cm long which have a lighter green undersurface covered with brown speckles. Leaves are arranged in clumps at the end of branches.

Flowers and Fruit: Small, white flowers which are pollinated by wind or insects. The propagules are 1-2 cm in diameter, 20-40 cm long and tapered at one end.

Bark: Rough, brown to dark grey bark.

Similar species: The Tall-stilted Mangrove (*Rhizophora apiculata*) has more pointed leaves which lack the brown speckles. *Rhizophora mucronata* has larger leaves and a propagule about twice the length. *Rhizophora stylosa* and *Rhizophora apiculata* interbreed to produce a hybrid called *Rhizophora x lamarkii*.

Location: Occurs low in the intertidal zone, where its roots are submerged during high tides.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

River Mangrove

(Aegiceras corniculatum)

This is one of the most common mangrove plants. These plants often grow together to form a thicket that can be up to 4 m tall.

Roots: No obvious above-ground roots.

Leaves: The leaves are oval and about 7 cm long. There are glands on the leaves for secreting salt.

Flowers and Fruit: The flowers are small, white, arranged in bunches and smell like rotten bananas. The propagules are up to 5 cm long, pencil thick, slightly curved and have a pointed tip. The end of the fruit that is attached to the tree has a spiral patterned cap. The fruits are green, ripening to red in the summer months.

Bark: Smooth, grey bark.

Similar species: It is possible to confuse this species with the Black Mangrove (*Lumnitzera* species). Leaves of the River Mangrove do not have an indentation at their leaf tip and leaves of the Black Mangrove do not have salt glands.

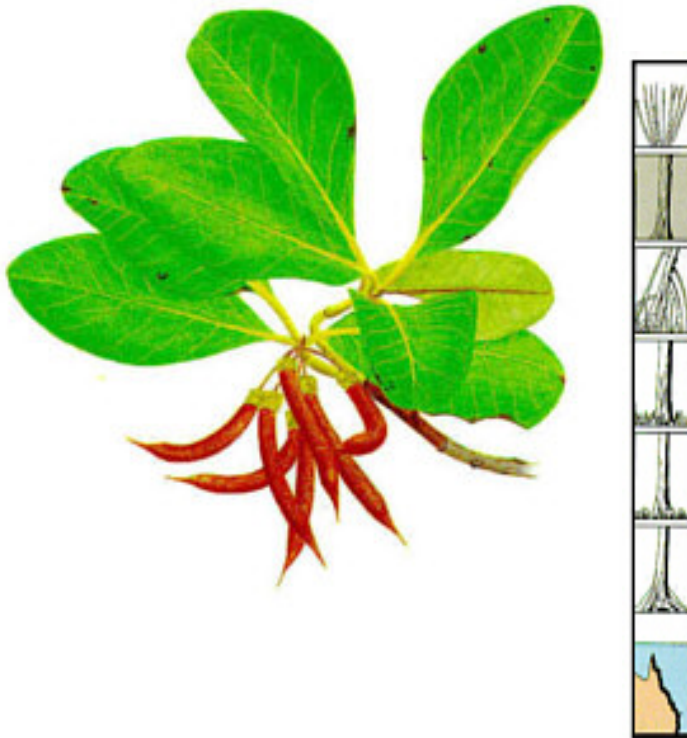
Location: Found on river banks over a wide range of salinities.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Small-leafed Orange Mangrove

(*Bruguiera parviflora*)

When viewing a mangrove forest from some distance, the Small-leafed Orange Mangrove stands out due to its yellow-green leaf colour. These trees can grow to 25 m tall.

Roots: Buttresses at the base of the trunk and knee roots.

Leaves: Small (5 to 10 cm long), yellow-green leaves occurring in clumps at the end of branches.

Flowers and Fruit: Flowers are small and yellow-green. The propagules are long and slender (like the tree itself), and fall from the tree with the green outer parts of the flower remaining attached like a cap.

Bark: Dark and rough bark.

Similar species: *Bruguiera cylindrica*, like *Bruguiera parviflora* has very small flowers compared to the large flowered *Bruguiera gymnorrhiza*, *Bruguiera exaristata* and *Bruguiera sexangula*.

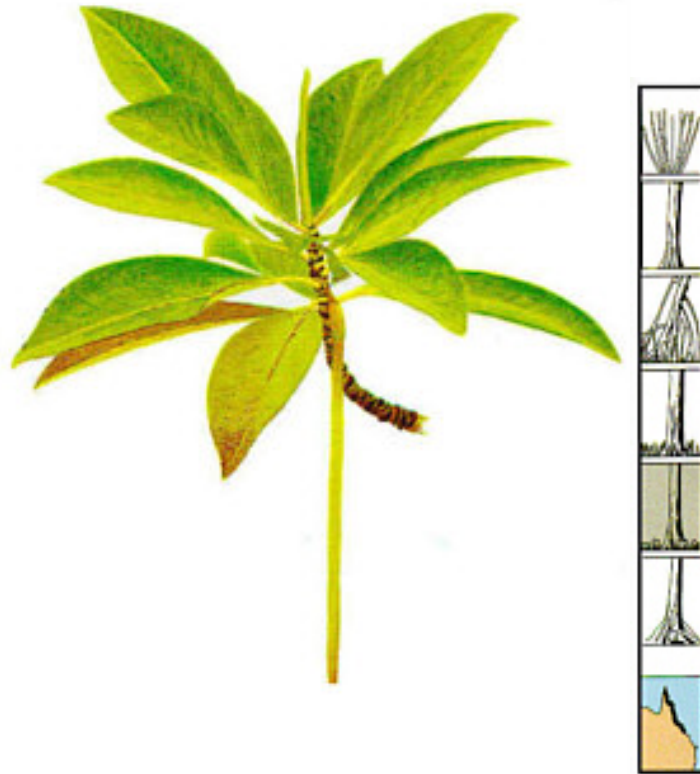
Location: This tree generally occurs with the Tall-stilted Mangrove (*Rhizophora apiculata*) and the Large-leafed Orange Mangrove (*Bruguiera gymnorrhiza*) in rivers of the wet tropics.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Tall-stilted Mangrove

(*Rhizophora apiculata*)

This species is very similar to the Red Mangrove but has a less extensive distribution. It grows to 25 m tall.

Roots: Prop roots. This species may form natural grafts where the roots of other trees of the same species touch.

Leaves: Leaves are similar to those of the Red Mangrove. However, the leaves are pointed, slightly longer and do not have brown speckles on the back.

Flowers and Fruit: Flowers are cream in colour. Propagules similar to those of the Red Mangrove.

Bark: Rough, brown to dark grey bark.

Similar species: The Red Mangrove (*Rhizophora stylosa*) and *Rhizophora mucronata*. The Red Mangrove has brown speckles on the back of its leaves. *Rhizophora mucronata* has larger leaves and much larger propagules (up to 60 cm long).

Location: This species is usually found low in the intertidal zone where its roots are periodically submerged. As it prefers less saline conditions than the Red Mangrove this species may be found further upstream in riverine environments.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Wrinkle Pod Mangrove (*Cynometra iripa*)

This small, slow growing tree only produces seeds in years of abundant rain. It can grow to 5 m tall.

Roots: No above-ground roots.

Leaves: A spreading shrub with glossy, dark green leaves which are about 5 cm long and arranged opposite each other. The most distinctive characteristic of the leaf is that the middle vein is slightly off-centre.

Flowers and Fruit: Flowers are small and white. The tree gets its name from its hard, wrinkly seed pods.

Bark: Smooth, mottled green and brown bark (see illustration opposite).

Similar species: None.

Location: Occurs high in the intertidal zone in places that have a high freshwater input. Often found in the shade of other trees.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

Fruiting

Yellow Mangrove

(*Ceriops species*)

Three species, *Ceriops tagal*, *Ceriops australis* and *Ceriops decandra* are commonly found in Queensland. They are difficult to tell apart except when flowering or fruiting. They grow to 5 m tall.

Roots: Buttresses at the base of the trunk and knee roots.

Leaves: Small (up to 7 cm long), yellow-green, oval-shaped leaves occurring in groups at the end of branches. The leaves are often orientated straight up in the air to avoid strong midday sunlight.

Flowers and Fruit: Small green-brown flower buds with pale orange petals. See propagules of the three *Ceriops* species.

Bark: Cream coloured bark with dark brown spots.

Similar species: Sometimes mistaken for *Bruguiera* species, the Yellow Mangrove has a comparatively blunt leaf tip and is generally a smaller tree.

Location: Often occurring as short, stunted trees (especially in very saline environments), they may grow to 5 m high in areas having some freshwater influence.

Riverine environment



Ocean

Rainforest



Marine environment



Ocean

Woodland



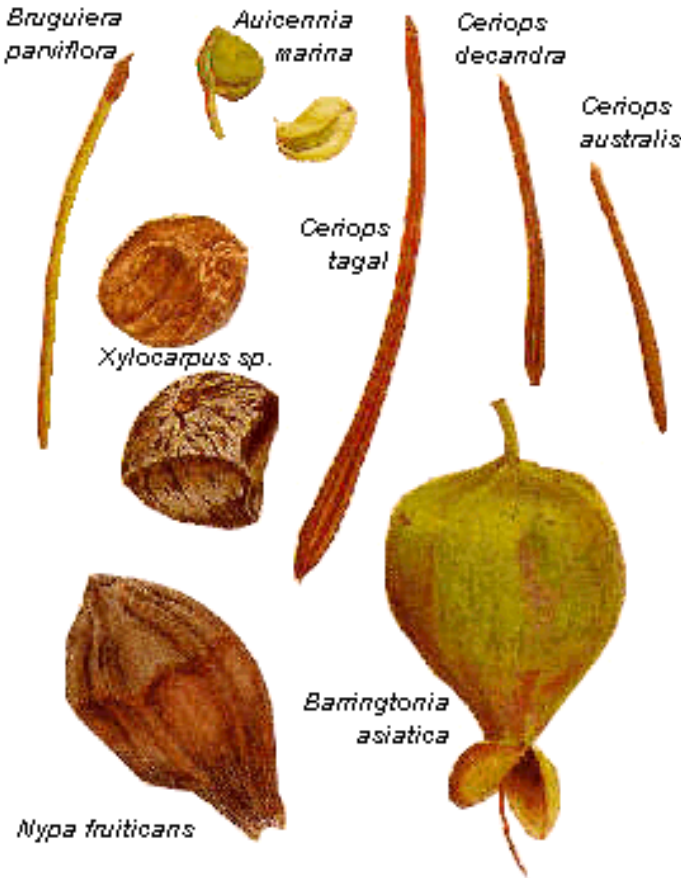
Flowering

J	F	M	A	M	J	J	A	S	O	N	D
J	F	M	A	M	J	J	A	S	O	N	D

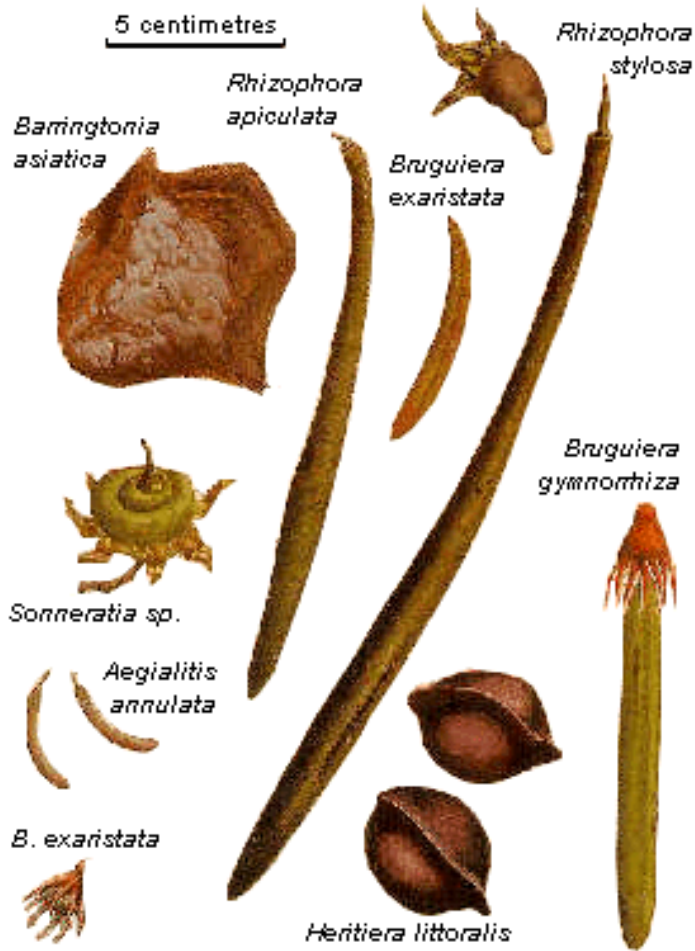
Fruiting

Seeds and propagules

Seeds and Propagules



5 centimetres



Baringtonia asiatica

Rhizophora apiculata

Rhizophora stylosa

Bruguiera exaristata

Bruguiera gymnorhiza

Sonneratia sp.

Aegialitis annulata

B. exaristata

Heritiera littoralis

The mangrove plants of Queensland

Listed below are the true mangrove species that grow in Queensland. Hybrid plants are indicated by the use of an x in the scientific name (e.g. *Lumnitzera x rosea*).

Family	Species
Acanthaceae	<i>Acanthus ebracteatus</i> <i>Acanthus ilicifolius</i>
Areaceae	<i>Nypa fruticans</i>
Avicenniaceae	<i>Avicennia marina</i>
Bignoniaceae	<i>Dolichandrone spathacea</i>
Bombaceae	<i>Camptostemum schultzii</i>
Caesalpiniaceae	<i>Cynometra iripa</i>
Combretaceae	<i>Lumnitzera racemosa</i> <i>Lumnitzera x rosea</i> <i>Lumnitzera littorea</i>
Ebenaceae	<i>Diospyros ferrea</i>
Euphorbiaceae	<i>Excoecaria agallocha</i>
Lythraceae	<i>Pemphis acidula</i>
Meliaceae	<i>Xylocarpus granatum</i>
Myrsinaceae	<i>Xylocarpus mekongensis</i> <i>Aegiceras corniculatum</i>
Myrtaceae	<i>Osbornia octodonta</i>
Plumbaginaceae	<i>Aegialitis annulata</i>
Pteridaceae	<i>Acrostichum speciosum</i>

Rhizophoraceae

Bruguiera gymnorrhiza

Bruguiera sexangula

Bruguiera exaristata

Bruguiera parviflora

Bruguiera cylindrica

Ceriops australis

Ceriops decandra

Ceriops tagal

Rhizophora apiculata

Rhizophora x lamarckii

Rhizophora stylosa

Rhizophora mucronata

Rubiaceae

Scyphiphora hydrophyllacea

Sonneratiaceae

Sonneratia alba

Sonneratia x gulngai

Sonneratia caseolaris

Sonneratia lanceolata

Sterculaceae

Heritiera littoralis

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- ▶ Holly Mangrove
- ▶ Large-leafed Orange Mangrove
- ▶ Looking-glass Mangrove
- ▶ Mangrove Apple
- ▶ Mangrove Fern
- ▶ Mangrove Lily
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- ▶ Myrtle Mangrove
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- ▶ Yellow Mangrove

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