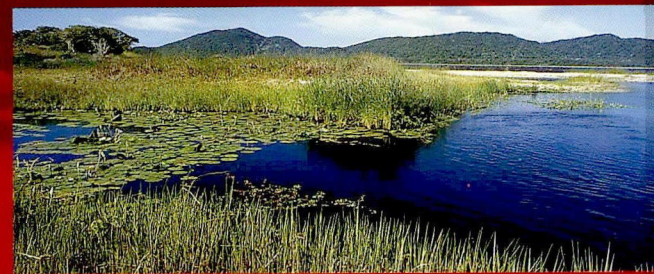




# THE GREATER ST LUCIA WETLAND PARK

*RICKY TAYLOR*



## ABOUT THE AUTHOR



RICKY TAYLOR is the estuarine ecologist for the Natal Parks Board and has been with the board since 1976. He provides scientific advice for all aspects of estuarine management. He also conducts monitoring programmes and co-ordinates research activities for the estuaries of the province which are managed by the Natal Parks Board.

The author's work has demanded that he become a general ecologist with a variety of interests, ranging from small invertebrates to the large hippos that inhabit the lake; as well as the botanical and physical aspects of the lake. Over the years, he has built up expertise in both the terrestrial and estuarine fields.

He has a deep love for St Lucia. His goal is to ensure that this park is recognised by all South Africans as part of their heritage - to be valued and conserved for future generations.

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Sunrise over Lake St Lucia  
(G. Thompson - SATOUR Collection)

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Diving over a reef in a sparkling sea  
(Natal Parks Board Collection)

Wild dagga, *Leonotis dysophylla*, on the  
Eastern shores (Trevor Wolf)

Pristine Lake Bhangazi (Nolly Zaloumis)

African spoonbills are commonly seen  
feeding and resting in the shallow margins of  
Lake St Lucia (Ricky Taylor)

An aerial view of the Muzi pan at the  
northern end of the Mkuze Swamps  
(Ricky Taylor)

Back cover:

The St Lucia mouth - where the lake and sea  
merge. The sand banks change constantly in  
response to wind, wave, currents, tides and  
lake levels  
(Ricky Taylor).

Opposite page:

A newly hatched crocodile floats in the water  
next to a water lily leaf (Rod Borland).

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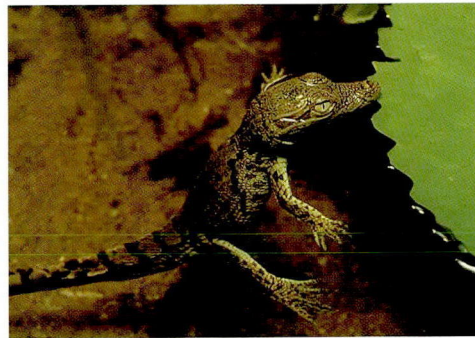
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T. Parker - Dance.

*Ricky Taylor*

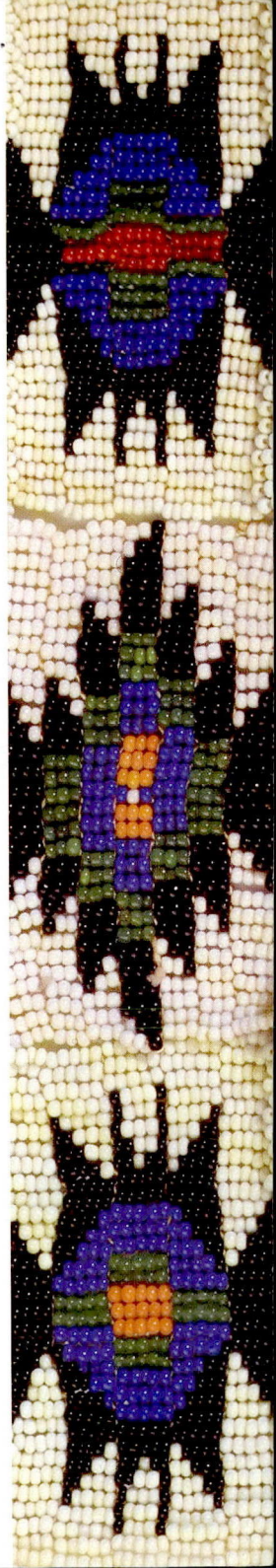
# THE GREATER ST LUCIA WETLAND PARK



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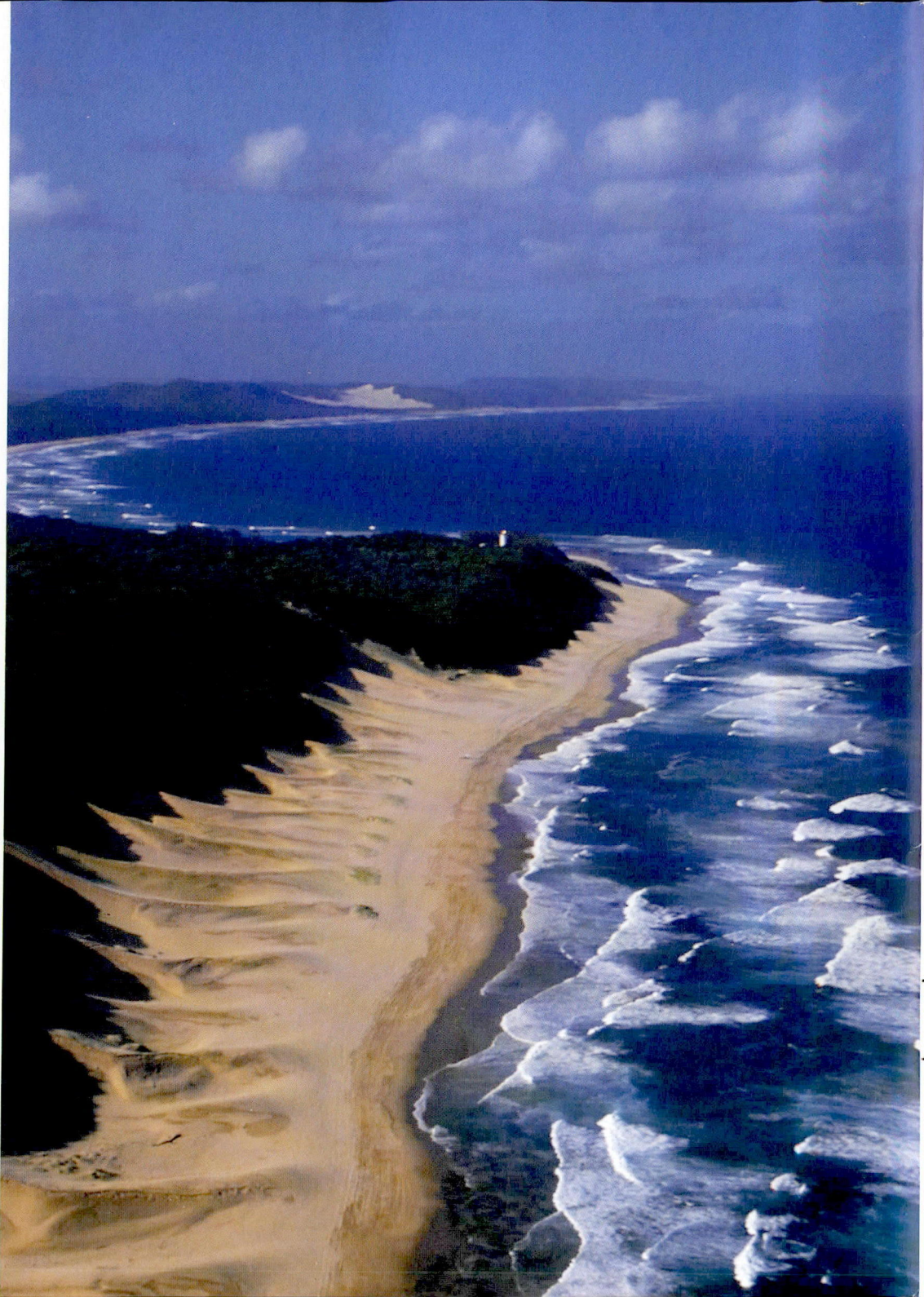


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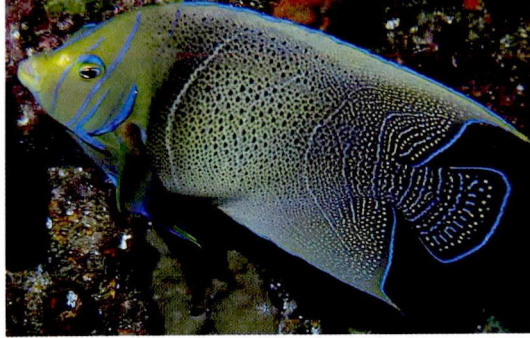
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*The curve of a half-beat bay - in this case Sotswana - is clearly visible from this aerial photograph.*

*Peter Ramsay*



# PREFACE



Dennis King

This adult semicircle angelfish, *Pomacanthus semicirculatus*.

*Parke-Davis, a leading manufacturer of pharmaceutical products and a division of Warner-Lambert SA (Pty) Ltd, has sponsored this publication to reinforce its commitment to the well-being of people and the natural environment. Bearing in mind the major impact corporations can have on the environment, we at Parke-Davis are proud to be part of this worthy contribution to the preservation of our heritage.*

*We believe that commerce and industry can make invaluable contributions to the new South Africa, help build the future and enhance the quality of life of all South Africans. As a health care company, we have identified not only the strategic upliftment of our people but also the enhancement of our environment as vital areas for concern.*

*Given our policy of interaction between business and the community, Parke-Davis displays a hands-on approach to its community. This approach is in keeping with our corporate creed which also states,*

*“We are committed to being good corporate citizens, actively initiating and supporting efforts concerned with the health of society”.*

*We at Parke-Davis are confident that the Natal Parks Board and the people of South Africa will reap the benefit of our contribution towards protecting this wetland of international significance.*

*It is of interest to know that South Africa is a founder member of the Ramsar Convention. The convention, which is named after an Iranian town on the Caspian Sea, was initially formed to protect wetlands of international importance, especially as waterfowl habitat, but, more recently, its terms have been expanded to protect wetlands in general. The convention came into force in 1971 and South Africa was the fifth country in the world to register some of its wetlands. To date, twelve of these sites have been registered, namely De Hoop Vlei near Bredasdorp, De Mond State Forest in the Southern Cape, Langebaan, the St Lucia System, the turtle beaches and coral reefs of*

*Tongaland, Barberspan and Blesbokspruit in the Transvaal, the Wilderness lakes, Verlorenvlei on the West Coast, the Orange River Mouth Wetland, the Kosi System and Lake Sibaya in KwaZulu, with the latter five being registered as wetlands of international importance in 1991.*

*We would like to thank Ricky Taylor, estuarine ecologist for the Natal Parks Board, for his unstinting co-operation and for a sterling effort in putting together this informative publication.*

*While intended to be of educational value and therefore suitable for school use, this book will also be of interest to the student environmentalist or ecologist and to those members of the general public who would like to know more about the nature and beauty of the Greater St Lucia Wetland Park.*



Ian Robertson  
Marketing Director  
Parke-Davis



## FOREWORD

A book of this nature is long overdue. It is obvious that deep thought and careful study have gone into producing this informative work which will benefit those who are dedicated to the preservation of St Lucia and now, with more recent devolution of State forest areas, of the Greater St Lucia Wetland Park.

The new developments on the Eastern Shores, the linking of Mkuzi Game Reserve to Sodwana Bay, the incorporation of a vast tract of State forest all joining up St Lucia Lake, will make this park the third largest protected area in South Africa.

I have been involved with the problems of St Lucia for well over twenty years; for twelve and a half years as the member of Natal's Executive Committee responsible for the Natal Parks Board and, more recently as Chairman of the Board. It was during those early years that I was appointed as Chairman of SCADCO (the Scientific Advisory Committee for St Lucia) by the then Administrator and Executive Committee, and had to look into the many problems

associated with St Lucia Lake.

From the first, it was obvious that most of the difficulties and problems that stood in the way of the 'survival' of the lake were, in fact, man-made.

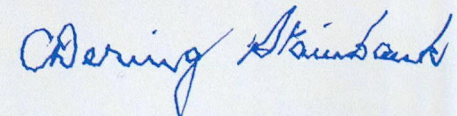
The ecological relationships of the lake - which are explained extremely well in this book - have been poorly understood by people in general and, indeed, even by the scientists who were so anxious to find the means to guarantee its continued survival.

The freshwater rivers and seeps which fed the lake have been damaged by man, resulting in siltation and, during periods of extremes, even the stopping of the natural flow of water into the lake.

The thought that we could divert fresh water from the Umfolozi River into a canal that would carry the water high up the estuary was worked out scientifically and the canal was built at great expense. Unfortunately, it was never put into operation. Similarly, much thought was given to pumping fresh water into the lake from Jozini Dam, but this idea has, so far, not been pursued.

Ricky Taylor's book brings us back to the simple facts of the situation by identifying clearly the origins of the lake and showing how the five ecosystems work. In explaining the links between these ecosystems, he also describes how the formation of the dunes came about during the last 25 000 years, and stresses the important part they play in the formation of the wetlands on the Eastern Shores. The information in this book is of great interest and I congratulate Ricky Taylor for his eloquent and clear description of this dune ecosystem and its functions.

This conservation area is indeed unique. What is more, the public at large have been given a memorable and invaluable guide to an area of international status and national pride ... the Greater St Lucia Wetland Park.



C. Dering Stainbank  
Chairman  
Natal Parks Board

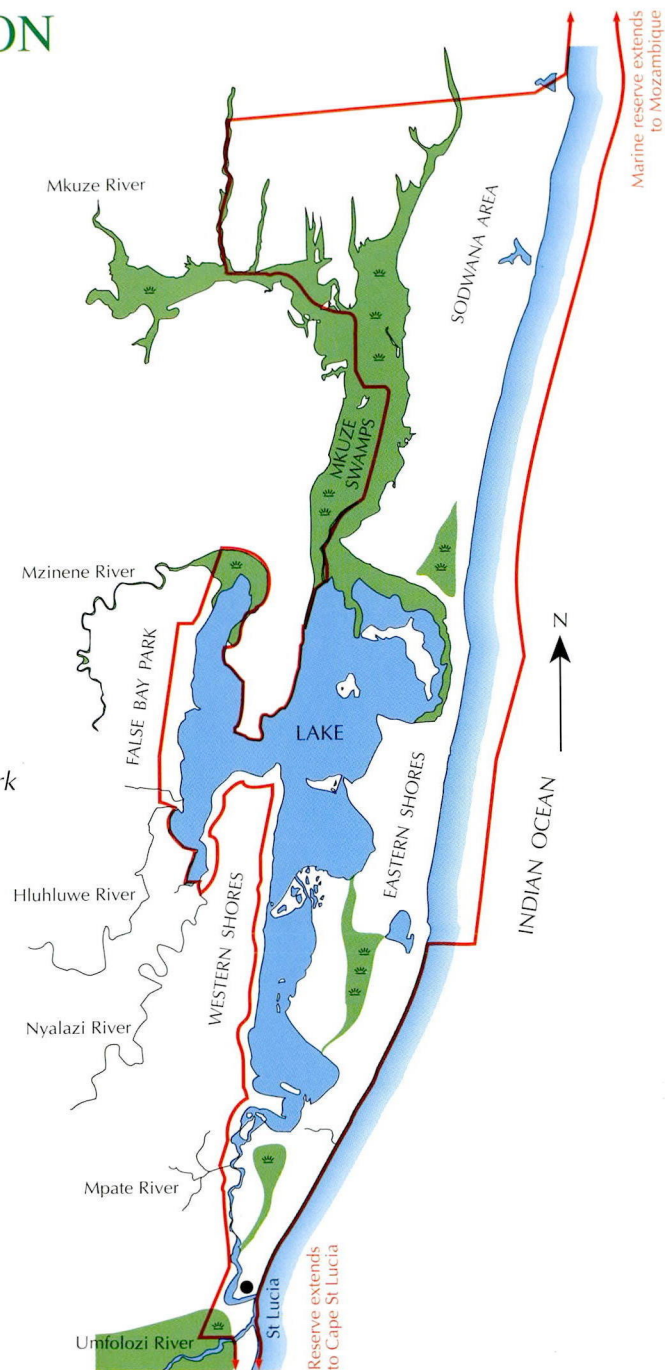
# INTRODUCTION

Map of the  
Greater St Lucia Wetland Park

Location of  
"The Greater St Lucia  
Wetland Park" within Natal.

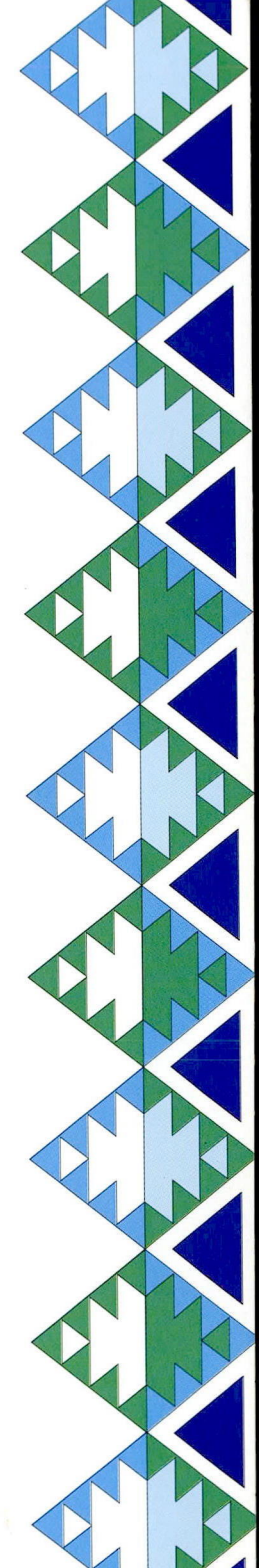


Scale of main map.



St Lucia is a protected natural area with five distinctive ecosystems, each of which has a diversity of scenery and an abundance of animal and plant life. The purpose of this book is to give you a feel for St Lucia; to pass on the 'spirit of the place' and to give you an understanding of the ecosystems so that your appreciation and enjoyment of the reserve may be enhanced.

The area described is shown on the map at the end of the book. It extends roughly from Sodwana Bay and the Lower Mkuze Road in the north to Mapelane in the south. The eastern boundary is the seaward edge of the Marine Reserve. From there the park extends westwards across sea and beach, over the tall coastal dunes and low-lying wetlands of the Eastern Shores, across Lake St Lucia, and into the drier thornveld and forest of the Western Shores. The Greater St Lucia Wetland Park is a jigsaw puzzle composed of many pieces: St Lucia Reserve, St Lucia Park, False Bay Park, the St Lucia Marine Reserve, the Sodwana Bay National Park, the Cape Vidal State Forest and several other interlinking pieces. Each has been separately proclaimed and has its own administrative history. The boundaries of these pieces are artificial but are now linked to form an integrated natural area. Thus, for the purposes of this book, the edges of these pieces are often ignored and the ecological boundaries are used.





An echinoderm fossil from the banks of the Umfolozi River.



As these pecten clams fossilised the calcium carbonate of their shells was transformed to stone.

## THE ORIGINS OF ST LUCIA - A STORY OF SEA-LEVEL CHANGES, FOSSILS AND FLOODS

Roger de la Harpe

exposed to form part of the ancient coastline and all the present-day features east of it did not exist. This drop in sea level caused the rivers to cut deep valleys. Then, with a subsequent rise in sea level, these valleys flooded to form a large marine embayment which we now know as False Bay. About 125 000 years ago the sea rose to more than two metres above that of the present level. False Bay was a clear-water tropical habitat directly connected to the sea. Again fossils tell us the story; under these conditions coral reefs grew at Lister's Point and Picnic Point. Tree trunks and other flood debris were washed up at the mouth of the Mzinene River where it entered this bay. These deposits were fossilised, turning logs to stone.



Fossil worm burrows from False Bay.



The Western Shores are particularly rich in fossil ammonites which may be up to 1.5 metres in diameter.

St Lucia originated in two stages. The first of these occurred in the Cretaceous era (about 140 million years ago) when what we now know as the Western Shores of St Lucia was a marine environment. This we have gleaned from careful study of the rich fossil deposits in the area which are all of marine animals. These include ammonites, clams and other sea shells, echinoderms and teeth of giant sharks. But these fossils are not to be found in the lake, the Mkuze Swamps, the Eastern Shores or the off-shore coral reefs; all of these areas have more recent origins. St Lucia as we now know it was formed during a second stage of development. This was a result of the changing sea levels, caused by the various ice ages and wet and dry periods of the past two million years.

Although the sea level was changing, at about 80 000 years ago there were periods of relative stability when there was little rise or fall. During these periods shell debris accumulated on the beaches, providing the calcium carbonate needed to fuse sand grains together into sandstone. This rock is in the present-day surf zone, and also forms the offshore reefs on which the coral grows.

The rock in the surf zone acted as a trap for sand carried by the coastal currents. Gradually this sand was deposited to form a barrier spit on which the coastal dunes grew. This barrier enclosed a lagoon - which was to become Lake St Lucia as we now know it. Two of the rivers entering the lake



A fossilised shark's tooth. Some of the fossil teeth are up to 16 cm in length.



The belemnites are straight ammonites. These show their characteristic suture patterns.

At the start of our story, the sea level dropped by some 150 metres. The present day Western Shores were

were powerful enough to force their way through this barrier to the sea - the Umfolozi in the region of the existing St Lucia mouth, and the Mkuze in the Selley's Lakes area to the north of the lake.

This occurred less than 25 000 years ago. The continual input of wind-blown sand from the sea and the river-borne sediments have, since then, built up the dunes and shallowed the lake. The northern portions of the lake silted up completely to form the Mkuze Swamps; the Mkuze River, no longer able to maintain its passage through the dunes to the sea, was diverted southwards into the lake. The river mouth at Selley's Lakes closed up, leaving only the submarine canyon off Leven Point as evidence of the old river course.

Since the floods caused by Cyclone Domoina in 1984, we have gained further insight into the development of St Lucia. These so-called "mega-floods" scour out the combined St Lucia-Umfolozi mouth area, removing the sediments which have accumulated since the previous large flood and appear to be essential for the long-term maintenance of the St Lucia estuarine system. Without them the estuary would surely choke up (even though nowadays we dredge to remove sediments) and without a link to the sea, St Lucia would lose its estuarine qualities and values. It would become an inland fresh-water lake.



Flood waters rage in the Umfolozi flood plain.



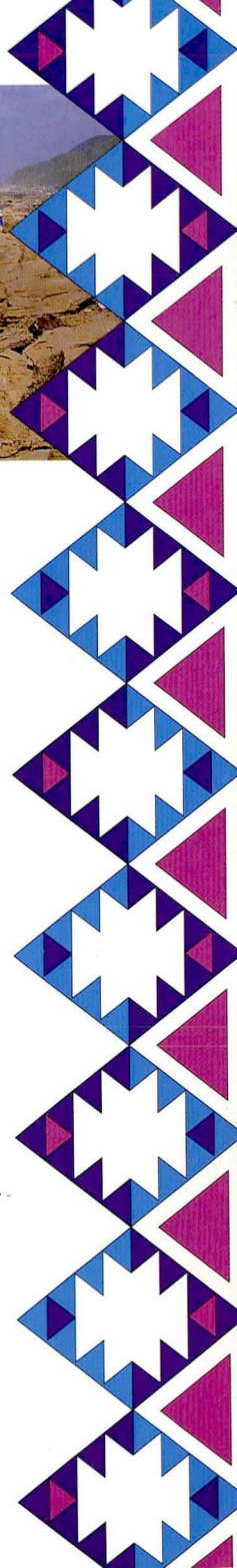
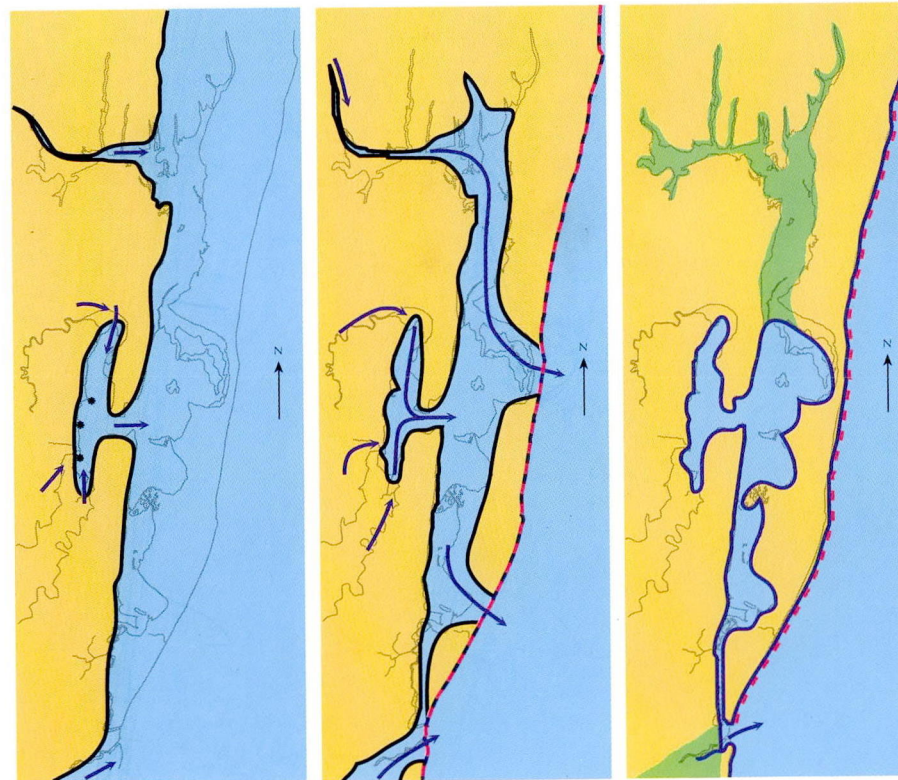
Mission Rocks, a former beach where sea sand has been cemented by minerals dissolved from shells.

### The formation of St Lucia.

150 000 years ago. The present day Western Shores was the marine shoreline. The coral reefs in False Bay were alive.

25 000 years ago. A barrier reef was forming along the present day sea shoreline. This enclosed the ancestral Lake St Lucia - which included the present day Mkuze Swamp.

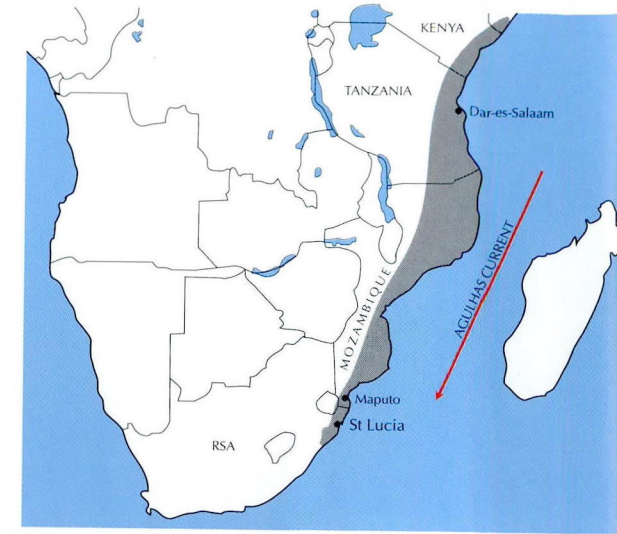
The current situation. Sediments have filled in the north area which is now the Mkuze Swamp. Wind-blown sand has formed the coastal dunes and the Eastern Shores.



# BIOGEOGRAPHY - HOW THE GEOGRAPHIC POSITION OF ST LUCIA RESULTS IN A DIVERSITY OF PLANTS AND ANIMALS

From a biological point of view the Greater St Lucia Wetland Park is interestingly placed. It is at the southernmost end of the Mozambique coastal plain - which stretches down the eastern side of Africa from Kenya to St Lucia. There are many species which, although found throughout this coastal plain, do not occur elsewhere. It is a place where inland plants and animals mix with those of the coastal areas. St Lucia, then, is the meeting place of tropical and temperate plants and animals. The intermingling of species gives the area characteristics similar to both regions, but at the same time provides a uniqueness and richness not found in either. And, most important, it is a park which has five ecosystems, which provide the habitats in which an impressive diversity of plants and animals can live.

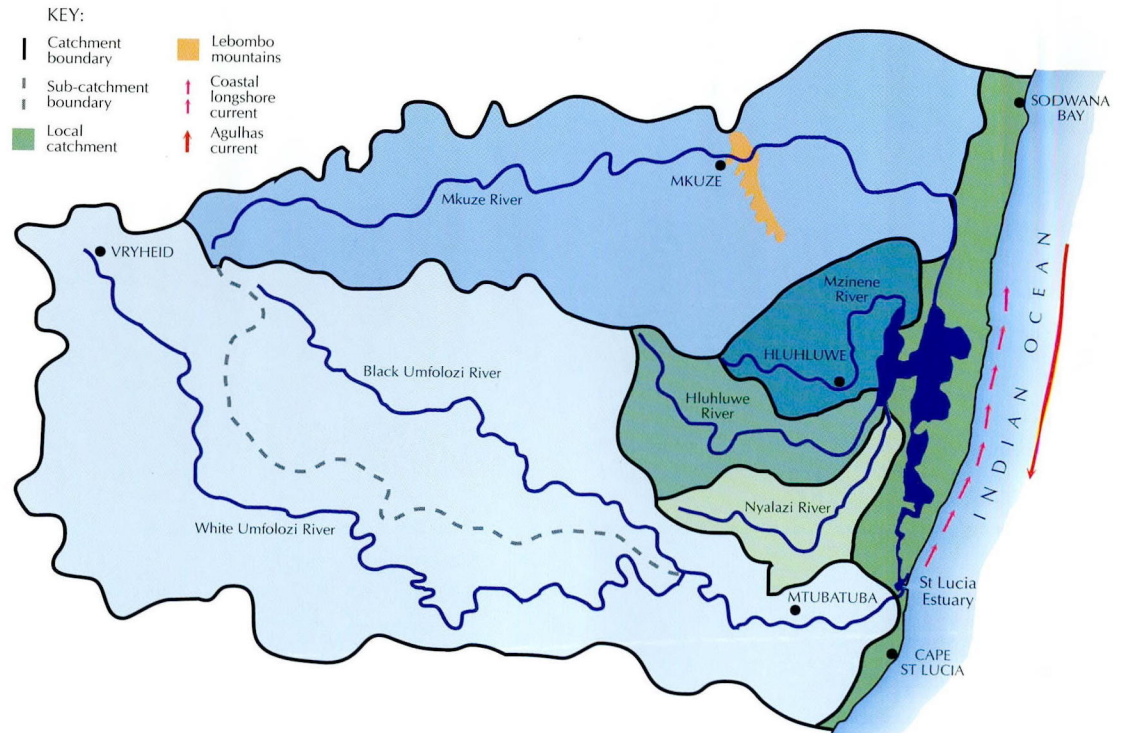
There are other geographical forces that affect the plants and animals of the area. The Agulhas Current, streaming southwards from the equator, warms up the sea allowing the formation of the southernmost coral reefs of Africa. The tall coastal dunes force the moist incoming sea winds upwards and cause them to drop rain. The result is that the coastal areas have a high rainfall which decreases rapidly inland, to the extent that it is halved in the 15 km between the sea and False Bay Park.



**The Mozambique coastal plain** - with St Lucia at the southern-most end. The warming caused by the Agulhas Current extends the tropical conditions southwards.

## The catchments of Lake St Lucia.

The well-being of the lake is influenced by the condition of the catchments. However, during extreme droughts the rivers all cease to flow and the only water entering the lake is that caught by the dunes to the east of the lake.



# THE CLIMATE OF ST LUCIA

The climate of St Lucia is sub-tropical. The summers are hot, especially from January to March, and the winters are mild but sometimes with surprisingly cold spells caused by the passage of cold fronts.

About 60% of the rain falls in the summer half of the year. The typical pattern is for spring rains to fall in September, followed by a dry period until December. It is wettest from January to March.

Most of the rain is associated with cold fronts which move northwards from the southern oceans. An approaching front can be tracked as it moves over the Western Cape and then up the coastline. The signs indicating an approaching front are strong north winds, a hazy south horizon and wispy high cirrus clouds. As the front passes over there is a south wind, often with rain. This is usually followed by a period of calm.

At times the dunes of the Eastern Shores deflect warm, moist air upwards causing condensation and rainfall. This effect is local and is the reason that Cape Vidal has a mean annual rainfall of 1 200 mm while Lister's Point in False Bay Park, a little more than 15 km to the west, has only 700 mm.

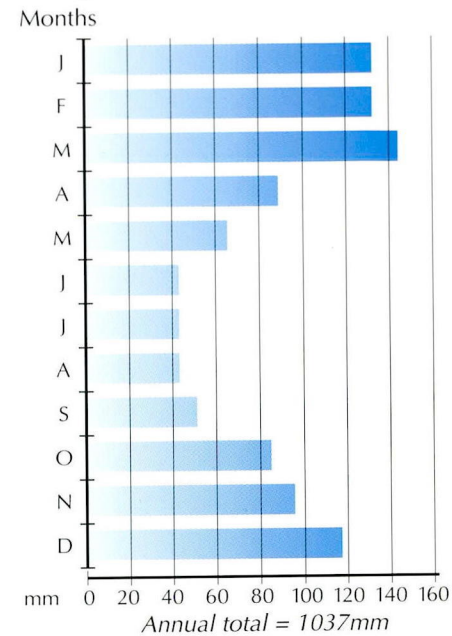
In this region, droughts occur about once every decade. The last severe droughts were in 1968 - 1972, and in 1981 - 1983. Extremes in rainfall also

occur. St Lucia falls in the southernmost region affected by tropical cyclones, which can bring vast quantities of rainfall. The most impressive was Cyclone Domoina in 1984, which deposited 600 mm of rain within 36 hours over much of the St Lucia catchment area, causing extensive flooding.

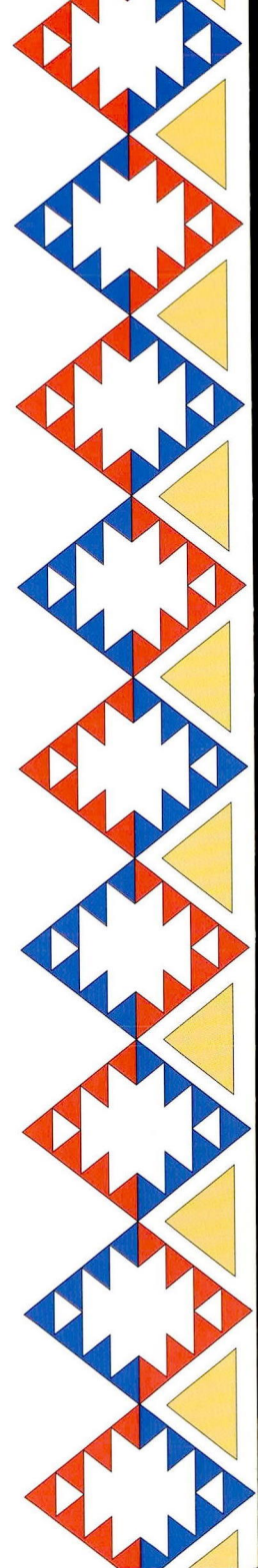
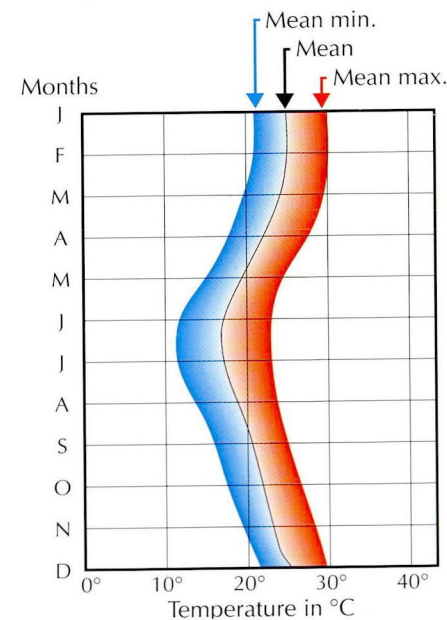
St Lucia has a high relative humidity which most of the time exceeds 90%. Being coastal, it also tends to be windy. The annual pattern is for the wind to build up in July to a maximum in August and September. It can still be extremely windy through into January. The autumn months, April to June, are usually calm. The prevailing wind is north-easterly and most of the wet weather is brought by south-westerly winds.

With the predicted global warming, caused by the excessive burning of fossil fuels resulting in the greenhouse effect, the climate of St Lucia is likely to change in the future. This may become evident over the next few decades. Likely changes are increased rainfall, alteration in the seasonality of the rain, higher temperatures, more extreme droughts and floods, and sea level rises which will result in more frequent storm-related damage caused by high seas. These changes will affect the plants and animals of St Lucia. Possibly some species will be unable to survive in the area, and there could be colonisation by other species which migrate southwards from the tropical areas.

Average annual rainfall for Charter's Creek.



Average annual temperatures for Charter's Creek.



# ST LUCIA - FIVE ECOSYSTEMS WITHIN ONE PARK

*The Greater St Lucia Wetland Park is made up of five discrete units or ecosystems, each with its own characteristic features. Each ecosystem functions relatively independently, yet on the large scale they are all interlinked.*

■ *The Marine ecosystem - characterised by a warm sea, coral reefs and long unspoilt sandy beaches.*

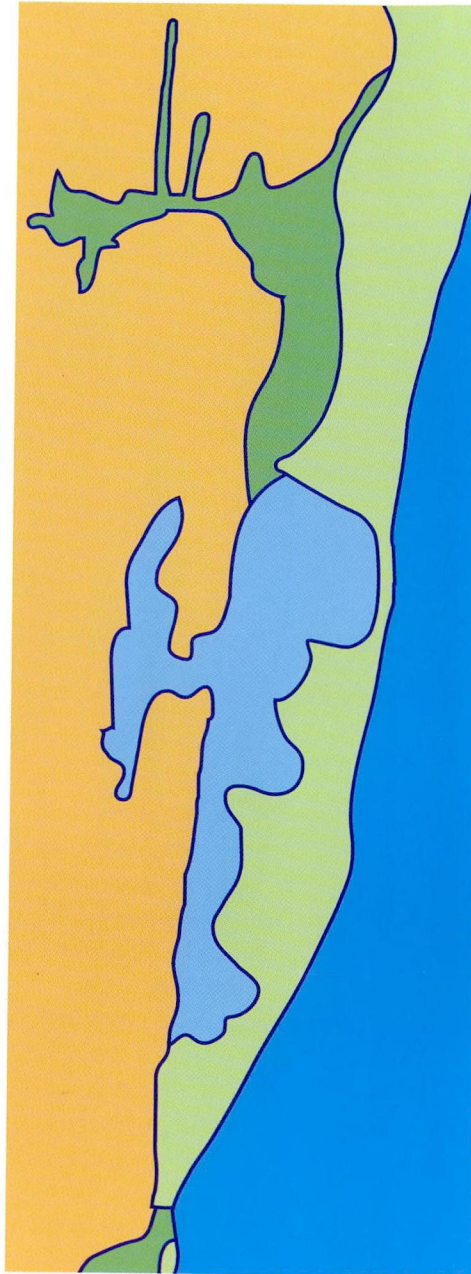
■ *The Eastern Shores ecosystem - with lush forest on tall dunes, grassy plains and a variety of wetlands.*

■ *Lake St Lucia - South Africa's largest natural water body.*

■ *The Mkuze Swamps - a huge reed and papyrus wetland.*

■ *The Western Shores - dry savanna and thornveld.*

*Each of these ecosystems warrants conserving in its own right, but the fact that they all occur in one area makes St Lucia a world-class park. You, the visitor, can experience this diversity; in the following pages you can find out about each of these ecosystems.*



**The five ecosystems of the Greater St Lucia Wetland Park**



Dennis King



Natal Parks Board Collection



Natal Parks Board Collection



Ricky Taylor



Alan Channing



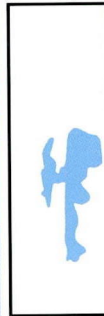
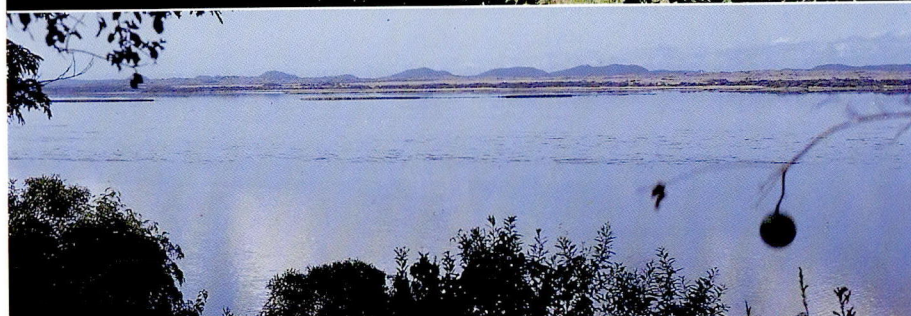
### **The Marine ecosystem.**

- ◀◀ A Chaetodon or butterfly fish.
- ◀ An angry sea breaks over the rocks at Cape Vidal.



### **The Eastern Shores ecosystem.**

- ◀◀ The forest tree frog.
- ◀ The forest, grassland and wetland mosaic of the Eastern Shores provides a diversity of habitats for many different species of plants and animals.



### **Lake St Lucia.**

- ◀◀ Much of the lake is fringed with reed beds. They are important producers of detritus which is the basis of the lake food web.
- ◀ The lake with the forest-clad dunes in the distance. This view is from Charter's Creek.



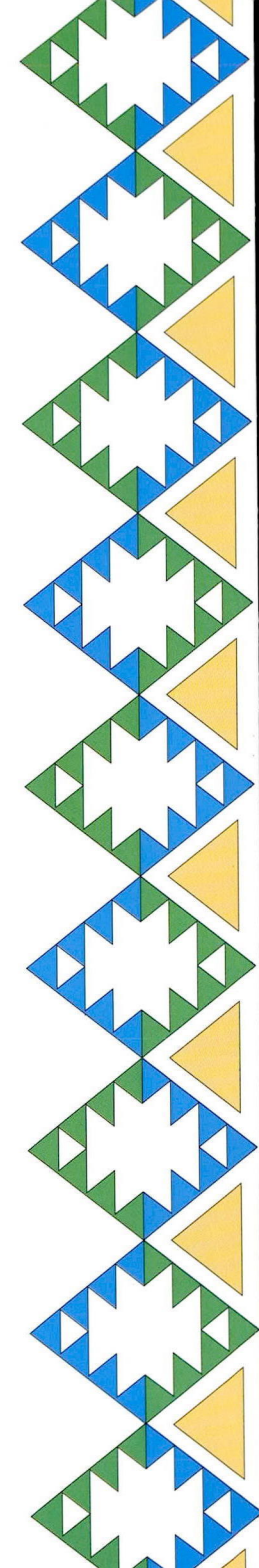
### **The Mkuze Swamps ecosystem.**

- ◀◀ Papyrus, the plant used by the ancient Egyptians for making paper.
- ◀ Banks of papyrus in a pan in the Mkuze Swamps.

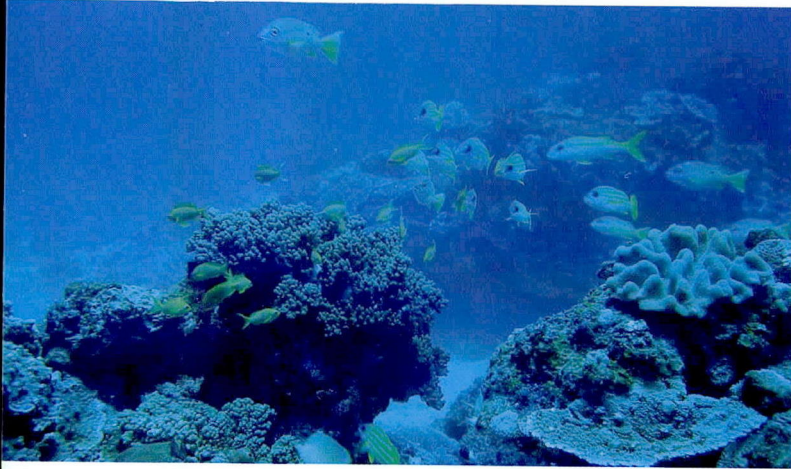


### **The Western Shores ecosystem.**

- ◀◀ The red toad, *Schismaderma carens*, is found only on the western side of the lake.
- ◀ False Bay Park has areas of relatively dry savanna with its characteristic tall grass, ilala palms and *Terminalia sericea* trees.



## THE MARINE ECOSYSTEM - CORAL REEFS AND SANDY BEACHES



Hard and soft corals.

The image that stays with the visitor to the coastal zone of the Greater St Lucia Wetland Park is of long golden beaches and sparkling blue sea. This is accompanied by an awareness of the intricacy of the animal life in the rock pools of Mission Rocks or on the rock reefs of Sodwana, Cape Vidal or Mapelane. For those who have had the opportunity to boat offshore, there is the expanse of the open ocean, and for divers, the thrill of exploring the coral reefs.

A combination of physical factors that act in unison create the marine ecosystem as we know it. Possibly the

most important of these are the currents. The Agulhas Current, generally a few kilometres offshore, brings warm tropical water southwards from the Mozambique Channel. The warming effect of this current enables the tropical plants and animals to survive this far south. Closer inshore is the northward-moving longshore current which is formed by local winds and wave refraction. This is the weak current that carries the sand, brought into the sea by the Tugela and Umfolozi Rivers, which replenishes the beaches and builds the coastal dunes.

Where there are rocky outcrops, the sea has eroded the coastline on the down drift side into the form known as "half-heart" bays, a term that graphically describes their shape. Typical of these are the bays formed by the reefs at Mapelane, Cape Vidal, Leven Point and Sodwana.

This is a coastline without rivers. Between the Umfolozi River, in the south, and Algoa Bay, 250 km to the north, there are only two small rivers - the Ngobeseleni stream at Sodwana and the estuary at Kosi Bay - neither of which carry much sediment. This means that the seas are clean, except in the south where they are affected by the Umfolozi River.

Off the coastline the continental shelf extends 3 to 4 km before steeply dipping down into the deep abyssal waters. Off Leven Point, perpendicular to the coastline, there is a deep submarine canyon, a remnant of the valley cut by

the Mkuze River during a period of lower sea levels. This is the largest of several such canyons. They act as a barrier to the sand being moved southwards by the Agulhas Current in the form of underwater dunes. These dunes tumble into the canyons and the sand is carried out to deeper waters. This reduces the build-up of sediments which would otherwise smother the coral reefs.

Along the shoreline there is incessant wave action, aggravated by surges caused by storms which may be thousands of kilometres out to sea. The resultant swells may be several metres in height from crest to trough. The waves and the swells, when most severe, break coral from the reefs and stir up sediments. This is an area affected by tropical cyclones, and in late summer it is not uncommon for them to produce the most severe of the storm swells. Cyclone Claude in 1966 caused high storm tides which undercut the coastal dunes and deposited debris on the beaches. Its erosive effects on the beaches are still noticeable after nearly 30 years.

The tidal range is more than two metres at spring tide. These tides, with the aid of the currents, continually stir up and re-work the beach sand, maintaining the continual cycle of sand deposition and erosion. It is this effect that gives us the characteristic clean golden beaches, discoloured only in places where there are concentrations of heavy minerals.

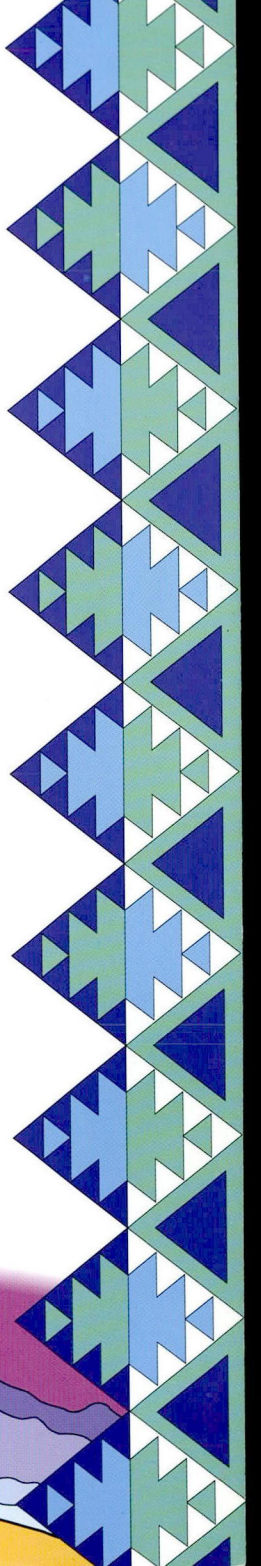
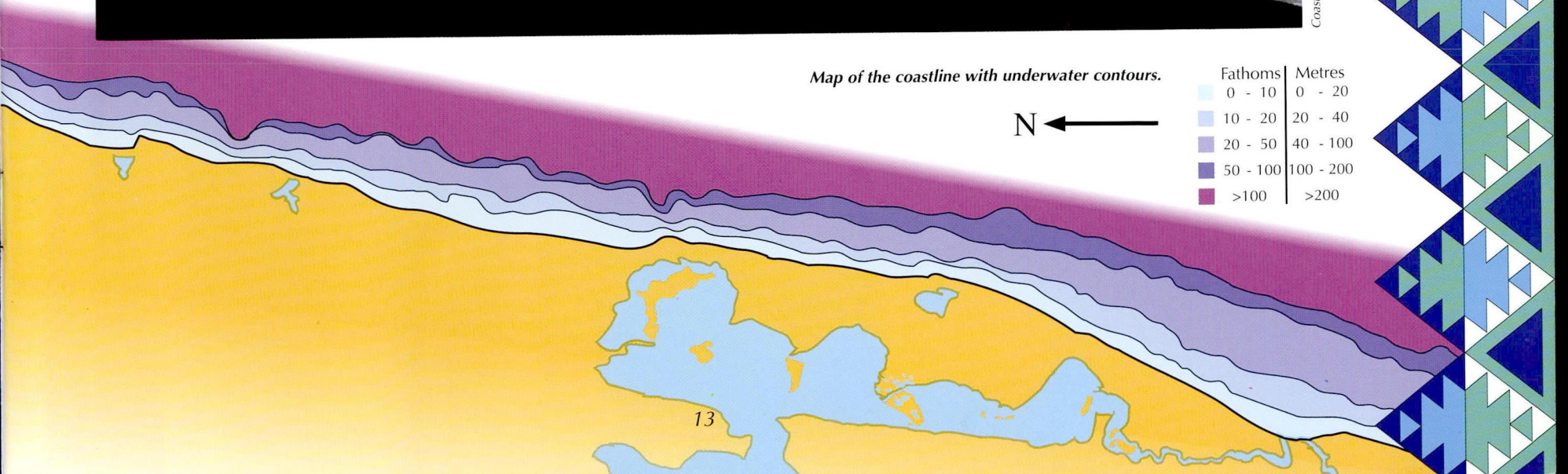


Coastline at Mission Rocks.

Map of the coastline with underwater contours.



Fathoms	Metres
0 - 10	0 - 20
10 - 20	20 - 40
20 - 50	40 - 100
50 - 100	100 - 200
>100	>200



## Coral reefs

A diver explores the multi-coloured corals in the Marine Reserve.



Peter Wilson

Anyone who has the opportunity to dive over coral reefs is immediately captivated by their spectacular beauty, the range of shapes and the profusion of colours. Fish, in all the colours of the rainbow, float like fragile butterflies over an abundance and diversity of reef plants and animals.

The corals in St Lucia, in contrast to the massive ancient coral reefs of the tropics, are a thin veneer cladding sandstone reefs formed by the calcification of beach sands some 80 000 years ago during a period of lower sea levels. The coral animals are colonies of polyps which are related to the familiar sea anemones. Each polyp lives in a limestone skeleton - which forms the hard structure we know as

coral. Within the bodies of the polyps are great numbers of algal cells. These algal cells live in symbiosis with the coral, neither being able to survive without the other. The waste products of the coral polyps are used by the algae which, with the aid of sunlight, convert these and carbon dioxide into carbohydrates and oxygen by the process of photosynthesis. Both of these products are essential for the well-being of the polyp. It is because of this dependence on photosynthetic algae that corals cannot grow at water depths where there is insufficient light. They grow best at depths of 10 metres or less, and are rarely found at depths of more than 25 metres.

These corals are known as hard corals. The skeleton of each species has a distinctive growth form. There are the brain corals, found in areas of the greatest wave action. These form hemispherical domes covered in patterns resembling the convolutions of a brain. The delicate stag-horn corals, with their antler-like projections, are typical of the more protected areas of a reef. Another form, the bracket-shaped plate corals which project with a table-top flatness from the reef, are common on the reefs off Sodwana.

In portions of the reef, soft corals predominate. As their name implies, they do not build hard skeletons but are softly lobed, in shades of pink, purple, orange or salmon.

The coral structures form a habitat used by many creatures. There is a

diversity of fishes, each with its own lifestyle. There are the chaetodons or butterfly fish with their laterally flattened bodies and extended tubular snouts. Usually yellow with eye-spots and bars of black, they feed on the coral polyps which they pluck from the protective limestone armour, using their extended mouths. Then there are the parrot fish - often blue with patterns of red or yellow. They use their powerful beak-like teeth to nip off pieces of coral. There are also the predatory moray eels hiding in caverns, the "goldfish" - orange with blue eyes and body stripe - which hide under overhanging coral. As they orientate their bodies towards the incident light, which is often that reflected off the white coral sand, they may be seen swimming upside down. The iridescent blue cleaner wrasse darts nervously over the body, and at times even into the mouth, of the larger fishes which welcome its grooming. And there is the brindled bass - which divers often find to be very approachable, yet should be treated with caution as it is potentially dangerous.

The invertebrates of the reef are as varied as the fishes. There are the red and white banded barber shrimps which live in pairs, the giant clams, crabs of many shapes and sizes, the giant anemones which are often inhabited by pairs of orange and blue clown fish, which bathe in complete immunity in the stinging tentacles of their host. The variety of shapes, sizes and, especially, colours is endless.



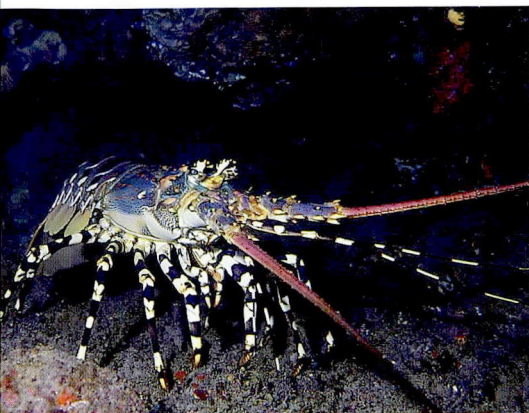
The surgeon fish, *Acanthurus leucosternon*, has a scalpel-like blade in its tail.



Fan worms use their delicate swirling plumes to trap zooplankton prey.



An ascidian, an animal related to red-bait.



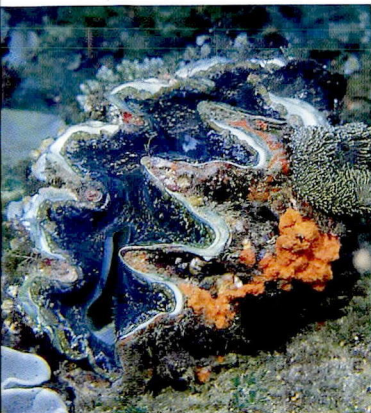
The blue crayfish is less common than the red one.



The convolutions of the brain corals.



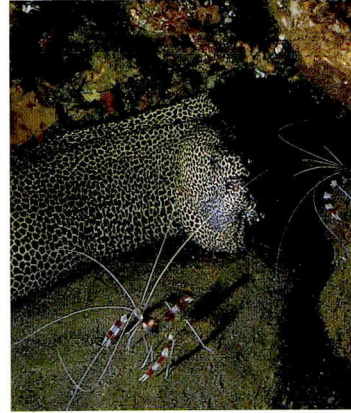
A clown fish is immune to the stinging sea anemone.



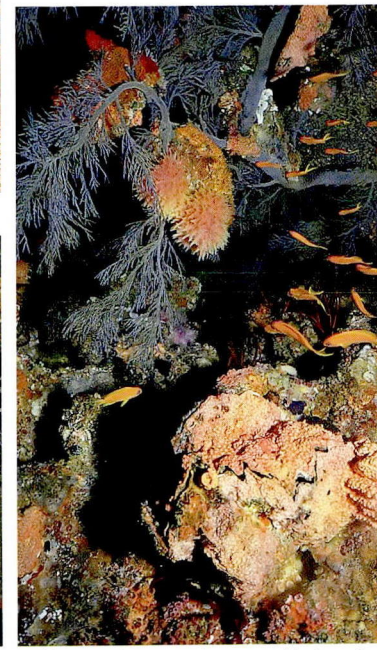
A zigzag of a giant clam. On its side is a sea anemone and the orange coloured sponge.



The nudibranchs are brightly coloured slugs which have unprotected gills exposed on their backs.

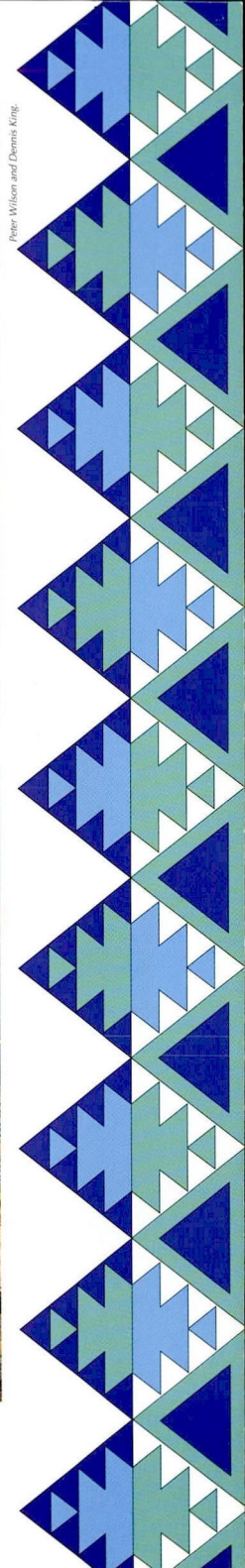


A pair of barber shrimp living in harmony with a moray eel. They clean the eel, which in turn acts as a protector.



Goldies, *Acanthias* sp., swim amongst black coral.

Peter Wilson and Dennis King.



## The seashore

The St Lucia coastline is well known for its beaches, the long expanses of golden sand which form the boundary between the dunes and the open sea. The beach is a harsh environment for colonisation by plants and animals as the intertidal zone is alternately pounded by waves at high tide and baked by the hot, drying sun at low tide. No large plants have been able to colonise the intertidal zone as the sand is too unstable for anchorage. The larger animals of this region include the ghost crabs, the sea lice (which are highly specialised filter-feeding burrowing crabs), burrowing clams and the ubiquitous plough shell. It is a tough habitat to live in, but the benefits are well oxygenated water and a constant supply of food that comes with each tide.

Above the range of the high tide are the first of the land plants such as the thick-leaved *Scaevola*. These have managed to adapt to cope with the heat, the blasting of the wind-blown sand, the salt, the dryness, the shortage of nutrients and water, and the shifting sands. They are the pioneer plants which modify the dune environment so that the secondary colonisers are able to take root.

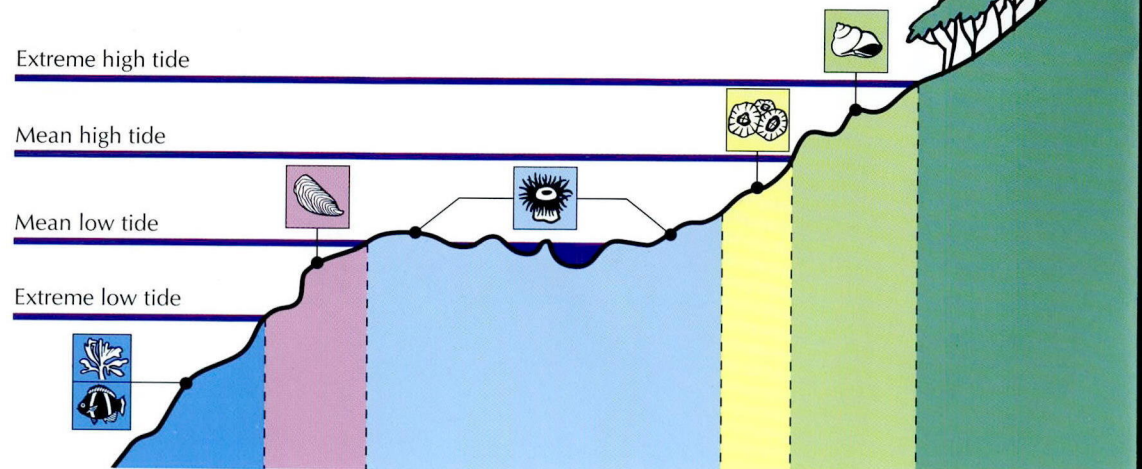
It is in these frontal dunes that loggerhead and leatherback turtles lay their clutches of eggs on summer nights, guided by invisible cues to return to the beaches where they hatched more than

a decade earlier. The turtles heave their huge bodies out of the waves and laboriously pull themselves to above the high water mark - all the time gasping for breath and looking pitiful as "tears" of protective mucous stream from their eyes. With their hind flippers they dig the holes into which they lay their clutches of 100 to 120 eggs and elaborately close the holes before returning to the sea leaving their eggs to incubate unattended. After two months the young hatch and their fight for survival begins. Co-operatively they dig their way out of the nest and then run a gauntlet of predators to get to the sea. Here they ride the currents and those lucky enough to survive - an estimated two in a thousand - will return to this beach once

they have reached maturity.

The rocky shoreline, unlike the sandy beach, provides a solid base to which plants and animals are able to attach themselves to withstand the force of the waves. At the lower levels there is intense competition for available space. The upper reaches are more exposed to the heating and drying action of the sun and are therefore more sparsely populated. This leads to a zonation of the plants and animals - those that can withstand the harsh environment in the upper zones, and those that are able to win in the competition for space in the lower zones, with several zones in between these extremes. The typical zones in the Zululand coastline are shown below. These zones can all be seen at Mission Rocks.

### The zones of life on a rocky shoreline.



# Zones of seashore



Roger de la Harpe

Brightly coloured sponges and rock pools of the intertidal rock shelf at Leven Point.

## Seaweed zone



This is exposed only at extremely low tides, and then only for short periods. There is little drying out or heating as plants and animals in this zone are continually wetted by wave action when exposed. This zone is characterised by dense beds of seaweeds.

## Mussel zone



The mussel zone is exposed during most low tides. The mussels form dense masses on the rocks and, by closing up, are able to avoid drying out and thus tolerate the short periods of heating by the sun. When the mussels are covered by water they feed on particles stirred up in the water by the waves. This is done by sucking in water, passing it over delicate filtration membranes which capture the food, and then pumping it out.

## Rock pools



These occur on the rock shelf in the intertidal level. This is a habitat where the plants and animals are not exposed to drying, but still have to be able to cope with water temperatures which can vary considerably. It is here that many fascinating species of seaweeds, snails, crabs, sea-cucumbers, anemones, urchins and fish are to be seen. The pools are a rewarding place to take children. The excitement and curiosity of exploring these pools is a holiday experience not to be missed, but remember to plan to be at the rocks at low tide, and do not remove or damage any of the rock pool life.

## Oyster and barnacle zone

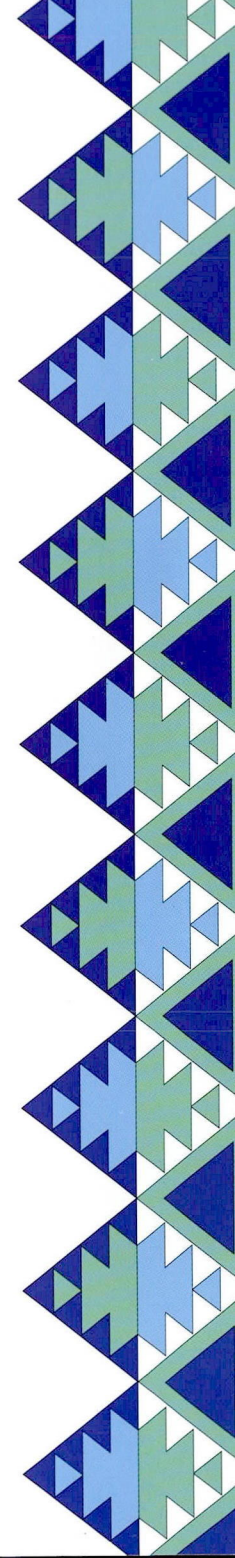


This zone is only covered at high tide. The oysters and barnacles found here live in a habitat which at times is very hot and dry. They are able to survive only by sealing themselves completely when exposed. The oysters feed in a similar manner to mussels, but the barnacles catch food particles by waving a feathery appendage in the water to scoop out small particles.

## Littorina (periwinkle) zone



This is a very harsh environment. It is above the level of the sea and is wet only by the spray. The animals here have adapted to survive extreme heating and drying. This they do by having behavioural adaptations. The periwinkles, for instance, hide in the shade and damp of crevices and thus are able to avoid the worst conditions.





Roger de la Harpe

Summer clouds over Leven Point.

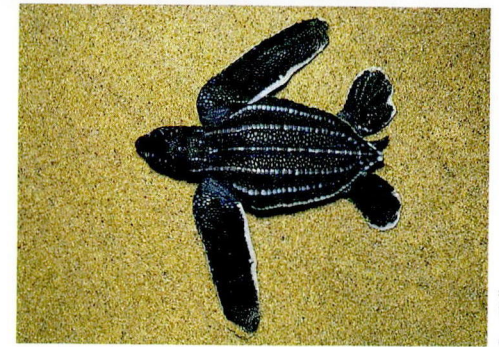


Roger de la Harpe

Loggerhead turtle laying eggs at night.



Pebbles and shells wedged in crevices in the intertidal rocks.



Trevor Wolf

Only two of every thousand leatherback turtle hatchlings will survive to maturity.

## The open ocean

Beyond the shallow water lies the open ocean, a blue expanse inhabited by animals which are always on the move and seldom stay for long in a particular place. The greatest of these are the humpback whales which breed off Mozambique in late winter. They migrate north in July and move south again in October. On their southward migration they have their calves with them as they drift with the Agulhas Current. At this stage they can often be seen from the shore at Cape Vidal where this current is close to the land.

The other gentle giants of this region are the whale sharks. These plankton feeders attain lengths of up to 18 metres and may weigh up to 40 tonnes. Up to 70 whale sharks have been seen in the offshore area between Cape Vidal and Sodwana at one time. The reasons for this concentration are not known - it is likely to be related to their breeding cycle.

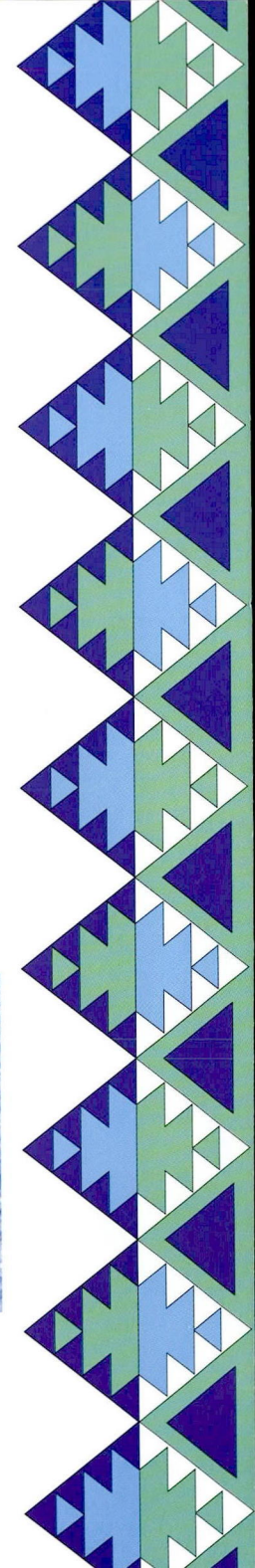
Also in the category of giants are the manta rays which may span six metres from wing-tip to wing-tip; and the leatherback turtles, measuring up to two metres long and weighing up to 900 kg. The fast-moving bill-fish - the name given to the marlins and sailfish for which this sea is well known - swim relentlessly in pursuit of their prey. These hydrodynamically shaped fish, with their rapier snout, and a body which tapers to a crescent-shaped tail,



Noth, Zulouma and Jane Porter

... free and graceful in the open ocean.

A dolphin ...



are the fastest moving of the marine creatures. It is said that they are capable of speeds up to 100 km an hour. To provide their highly tuned bodies with sufficient oxygen, they have to keep moving to maintain the flow of oxygen over their gills. If they stop moving, they die.

In winter, seabirds such as the albatrosses, petrels, skuas, and prions, many of which breed on the islands of the southern oceans, are to be seen off the St Lucia coastline. They are driven northwards by the winter winds and cold weather. Storms at this time may drive many of them onto the beaches where, weakened by fatigue and starvation, many hundreds may die. Other winter visitors are the Cape gannets and Cape cormorants which seem to follow the winter sardine migration up the coastline, and then carry on northwards once the sardine shoals disperse.

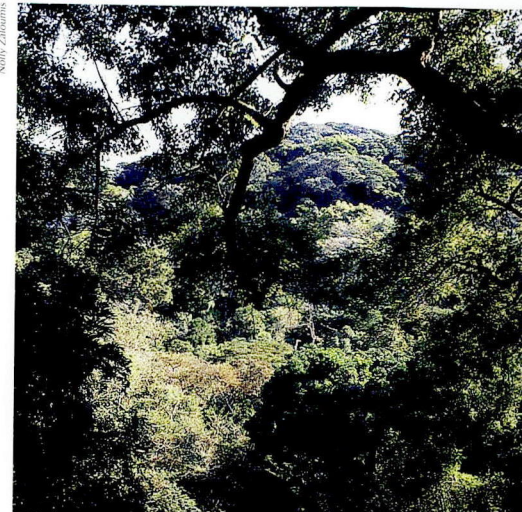
In the open ocean, although we are most aware of the large and spectacular animals, the basis of the food web is microscopic phytoplankton which by photosynthesis converts inorganic nutrients into carbohydrates. This is fed on by bacteria and zooplankton, which are in turn fed on by small fish, and so the food travels up a chain of life to the giants.

Trevor Wolf



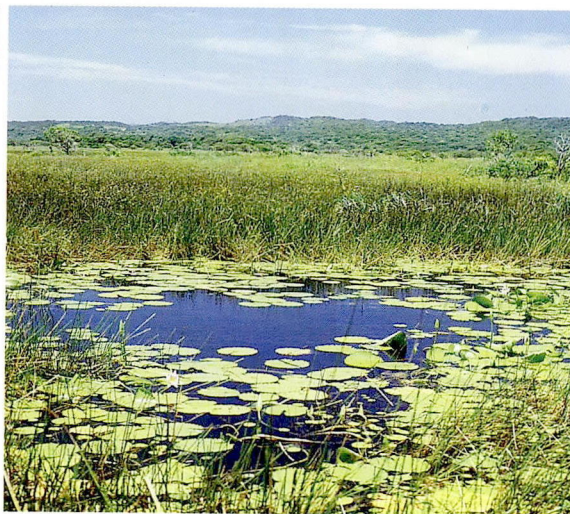
The Eastern Shores with the lake in the background. The dunes are an important catchment for the lake.

Nolly Zuluwini



Tall climax dune forest near Cape Vidal.

Nolly Zuluwini



Water lilies, *Nymphaea capensis*, in a pan on the Eastern Shores.

Ricky Taylor



Trees standing in water in a fresh-water swamp forest. The Eastern Shores have the largest such forest in South Africa.

# THE EASTERN SHORES - THE BARRIER BETWEEN THE LAKE AND THE SEA

The tall vegetated coastal dunes are the feature of the Eastern Shores most likely to make the greatest impression on you, the visitor. These dunes have been built and shaped by the wind over the past 25 000 years. Rising steeply from the waves they are almost 200 metres tall in places and are said to be the tallest vegetated dunes in the world. Beyond these dunes are low-lying

plains; a matrix of grassy ridges interspersed with a diversity of wetlands (see below). Beyond this is the lake in the southern region and the Mkuze Swamp in the north. It is an area of breathtaking vistas.

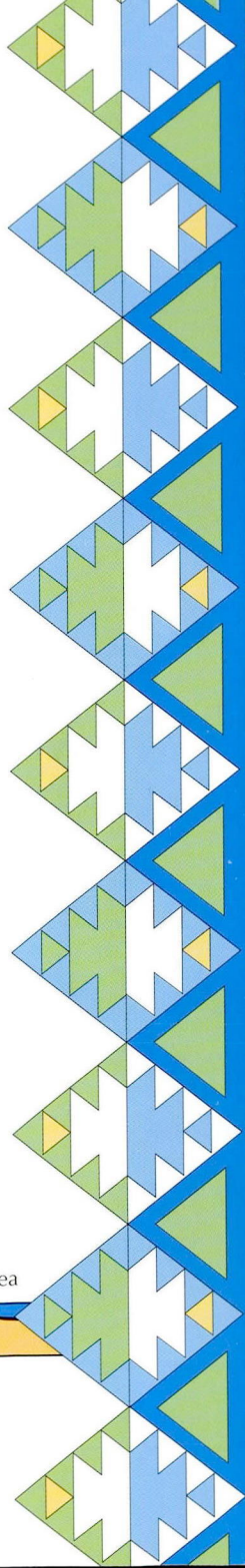
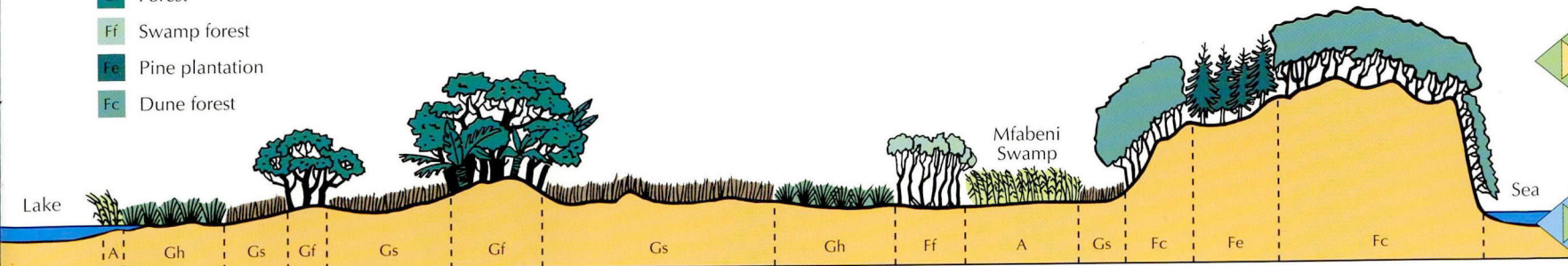
The dunes deflect the moist onshore winds upwards, causing water condensation and rainfall. It is because of this effect that the rainfall here is over 1 200 mm per annum, of which some 40% falls during the winter months. The dunes act as a sand catchment which deflects the rain water; some moving eastwards to the sea and the rest westwards to where it seeps out, first into the low-lying wetlands and then into the lake. Even during the most extreme of droughts these dunes catch some rain, and then they are the sole source of fresh water for the lake.



Ricky Taylor

The blood-lily, *Scadoxis magnificus*, is a spectacular plant of the dunes.

- A Sedge Swamp
- Gh Hygrophilous grassland
- Gs Dry grassland
- Gf Forest
- Ff Swamp forest
- Fe Pine plantation
- Fc Dune forest



The dunes are composed entirely of wind-blown sea sand which has low concentrations of the nutrients needed for plant growth. This condition is even further aggravated by the high rainfall which leaches nutrients from the surface layers of the sand. Plants on the dunes have adapted to grow in this infertile soil. To survive, the plants have become efficient at collecting and retaining what little nutrients are available and these are stored in the living plant rather than in the humus in the soil. Over the years the quantity of this living biomass, as it is called, increases - much as small quantities of money being deposited regularly into a bank would increase. A problem arises if the vegetation is cleared, as this living "bank balance" is lost and the process of nutrient accumulation must start again from scratch.

The dunes have tall forest as their climax form of growth, but this climax form cannot be attained in places where conditions are too harsh. The seaward slopes of the dunes are exposed to the salt-laden winds coming from the sea. This creates a difficult environment for plants to live in, and they respond by being stunted and having a "clipped hedge" appearance. Not very many types of plants can cope with the salt and wind and, as a result, the vegetation of the seaward slope has fewer species than the climax forest.

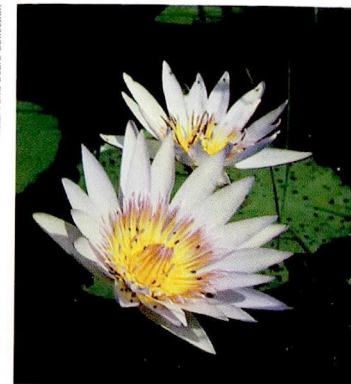
The climax forest is tall, with a canopy which may be up to 20 metres above a thickly wooded understorey.

Nolly Zaharnis



Flame lilies are common summer-flowering plants which grow in sandy soils.

Natal Parks Board Collection



The water lily flowers open in the mornings and close at midday.

Ricky Taylor



This exquisite epiphytic orchid, *Mystacidium venosum*, is common in the forests of the Eastern Shores.

Tony Cunningham



Wild custard apple, *Annona senegalensis*, has a pleasant flavour.

Tony Cunningham



The fruits of the wild date palm, *Phoenix reclinata*.

Tony Cunningham



Another edible fruit is that of the wild medlar, *Vangueria infausta*.

Ricky Taylor



Many visitors are amazed to find proteas, *Protea caffra*, in the coastal lowlands.

Tony Cunningham



*Rhoicissus*, a creeper belonging to the wild grape family.

Roger de la Harpe



*Acacia karoo* is a pioneer tree which colonises patches of disturbed dune forest.

In places the tree trunks are decked with epiphytic plants: tree orchids, ferns, *Rhipsalis baccifera* - the only cactus native to Africa - and lichens such as old-man's beard. Lianas dangle from the canopy and shafts of sunlight pierce the cool shade to spotlight the verdant plants on the ground. Trumpeter hornbills, crying like babies, feed on the wild figs. Generally the birdlife is difficult to see, unless you are lucky enough to come across a bird party. Bird parties are an association of 10 to 15 different species of birds which feed together while slowly moving through the forest. They tend to form in winter and may include golden-tailed woodpeckers, Natal robins, sombre bulbuls, tambourine doves, Woodward's batises, Knysna louries, golden-rumped tinker barbets, white-eared barbets, bleating warblers, square-tailed drongos, bar-throated apalises, wattle-eyed flycatchers, blue-mantled flycatchers, forest weavers and puff-back shrikes. At times a bird party is joined by the slender Tongaland red-chested squirrel which nervously flicks its bushy tail. Few things can be more rewarding for a bird enthusiast than to sit in a forest glade being visited by a bird party. The samango, a forest monkey which is larger and shyer than its relative, the vervet, can be heard scuttling through the canopy or calling to others with a loud explosive bark. They are seldom seen.

The dunes of the Mount Tabor and Ochre Hill areas are covered in a dry

Natal Parks Board Collection



Found in the high canopy of the forests, the green pigeon feeds on fruit.

Tommy Cunningham



The brown-hooded kingfisher feeds mainly on tree frogs, small lizards and insects.

Natal Parks Board Collection



When threatened the hinge-back tortoise flexes its shell to protect its hind legs.

Roger de la Harpe



The resonant calls of the forest dwelling samango monkeys are heard by all who stay at Cape Vidal.

Rocky Taylor



The thick-tailed bushbaby, a nocturnal primate which feeds on insects, tree frogs and fruit.

Trevor Wolf



The rusty spotted genet is a common, yet seldom seen, nocturnal predator.

Roger de la Harpe



At dusk the bark spider spins a huge orb web which it then dismantles at daybreak.

Nolly Zuluwani



The Eastern Shore has a large population of the common reedbuck.

Roger de la Harpe



The gaboon viper relies on its camouflage as it lies in ambush for its prey.

grassland. Archaeologists tell us that the Eastern Shores area had a specialised iron smelting industry in the years before the arrival of the Europeans. Smelting requires large quantities of charcoal and was always carried out where wood (to convert to charcoal) was abundant. It is thought that the present-day grassy dunes were cleared of their forests by the iron workers and maintained by frequent burning. These grasslands are of botanical interest as, in among the grass, woody plants are abundant. Many of these woody plants have large underground storage roots and bulbs which help them resist the effects of burning.

The management policy of the Natal Parks Board is to maintain most of these grasslands and the animals that live in them as they are a habitat which is rare along our coastline. To achieve this they are burnt regularly. In grassy areas which have been protected from fire, pioneer woody plants - the first stage in the progression towards forest - quickly invade. This is the habitat used most by the kudu and black rhino, both of which have been re-introduced to the park in recent years.

In the low-lying areas, the vegetation is dominated by the height of the water table. Woody plants cannot grow where water is close to the surface. This is where the hygrophilous (hygro = water, philous = loving) grasslands occur. The landscape is undulating and the water table is exposed in the troughs to form pans and vleis. The drainage lines may develop into swamp forests.

The large mammals which use the grasslands - both the hygrophilous ones and the "drier" ones - are mainly reedbuck and hippo. In recent years the Natal Parks Board has introduced other grazers such as buffalo and waterbuck.

Characteristic of the Mozambique coastal plain, of which the Eastern Shores is the southernmost extension, are the coastal lakes. There are three: Lakes Ngobeseleni, Bhangazi-north and Bhangazi-south. They are all fresh-water lakes which have tea-coloured water, stained brown by decomposing

plants. They have local dune catchments and, in the case of Bhangazi-north, there is no outlet.

The Eastern Shores is a fragile environment. There are delicate balances between the water, the sand formations, the low nutrient status and the plant growth. It has a lot to offer the visitor - especially the scenery, the biological variety and the greenness. In many ways this is the heart of the Greater St Lucia Wetland Park. It is a national asset to be cherished and enjoyed by the people of South Africa.



About 20 black rhino occur on the Eastern Shores.

## Wetlands of the Eastern Shores

The coastal dunes catch and soak up rain which falls onto them. From there the water percolates downwards until it is deflected by impermeable layers of clay or rock which causes it to flow out at the base of the dunes. When this water flows westwards, into the low-lying plain between the dunes and the lake, it creates extensive wetlands in the form of vleis, pans, swamp forests and hygrophilous grasslands.

What determines which of these wetland types is formed is not well understood. We do not fully understand why one wetland will be covered in sedges while another has swamp forest. We believe it is the combination of different variables such as different wetting and drying regimes, whether the water is flowing or not, its nutrient status and whether the wetland is exposed to fire and grazing that influences the plant growth.

The swamp forests prefer flowing water and develop where they are not burnt by veld fires. The hygrophilous

grasslands are influenced by grazing and occur in sites that are dry for much of the year. The various sedge swamps and vleis generally prefer wetter areas - with some types of sedge occurring only in those depressions which never dry up. Water lilies like deeper water still, where there is little competition for space by other plant species. Reeds and bullrushes seem to prefer those wet areas richer in nutrients, with the reeds being able to tolerate salt in the water and the bullrushes not. The resulting mosaic of wetlands, because of its diversity, has a high conservation value.



A typical wetland scene on the Eastern Shores.

Ricky Taylor

## THE MKUZE SWAMPS - PANS AND PAPYRUS

*The northern parts of the ancestral Lake St Lucia have, over the centuries, been filled with sediments washed down from the Mkuze catchment area. What was formerly lake became shallower and shallower until it could be colonised by reeds and sedges to become the largest swamp in South Africa.*

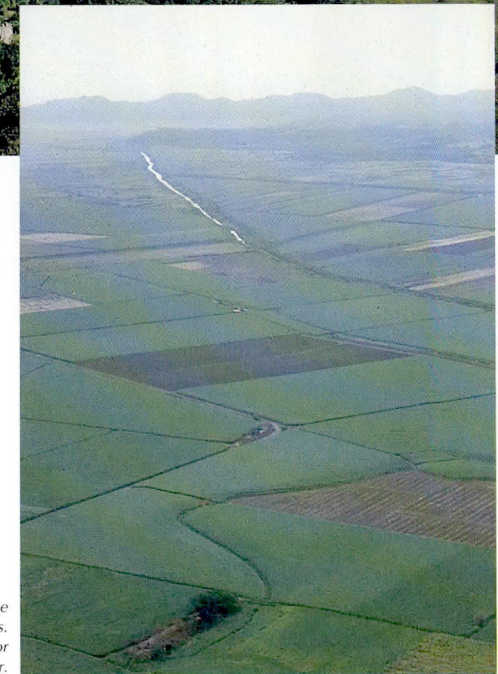
*The Mkuze River enters the swamp in the north-west and flows sluggishly along its meandering, sycamore fig tree lined course. This is the habitat for the rare Pel's fishing owl which, as its name suggests, feeds on fish it catches from just below the surface of the water with its powerful talons. The river frequently dries up, leaving pools of water in its exposed sandy bed. The observant visitor will see from the spoor around these pools that there is an abundance of animal life here - tracks of jackals, serval, red and grey duikers, reedbuck, water mongooses and even the clawless otter can be seen.*

*During floods the river rises and spills over its banks to flood the Muzi and Ngwenya pans. It is evident from their linear shape that they are drowned valleys. These pans are a delight to bird-watchers. The tropical knob-bill, white-faced and fulvous ducks congregate in large numbers on the banks, whiskered terns patrol back and forth, black herons attract their prey by spreading their wings*

Noddy Zuluwini



*The upper reaches of the Mkuze Swamps, seen from the air form a mosaic of pans and riverine forest.*



*The Umfolozi Flats were once a huge swampland similar to the Mkuze Swamps. Now most of this area has been drained for the cultivation of sugar.*

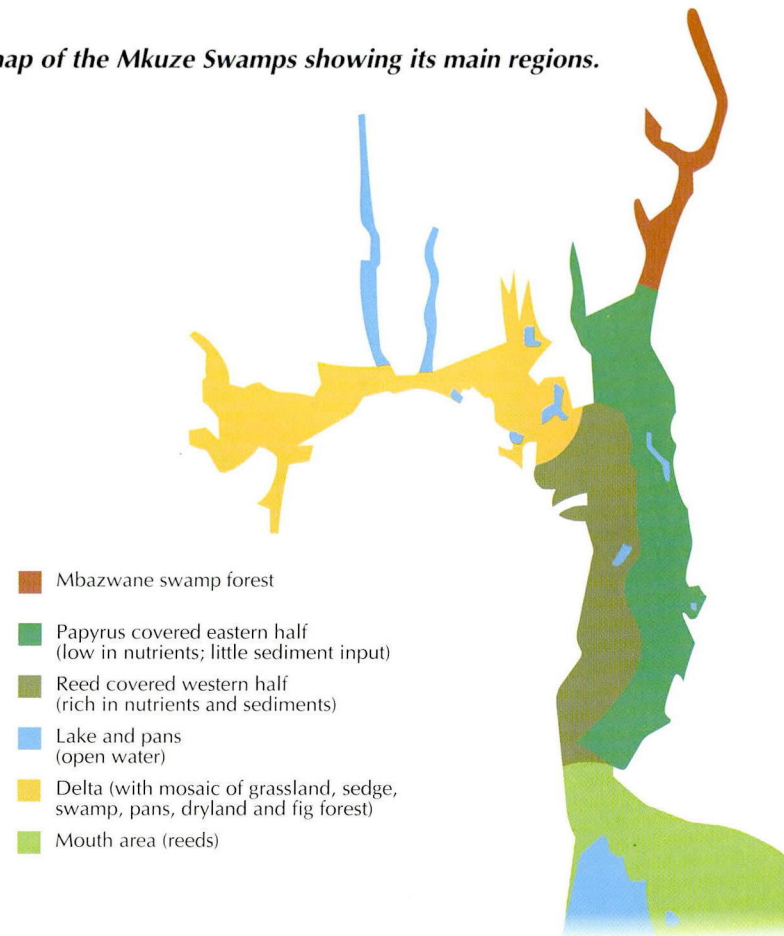
umbrella-like over their heads while the solitary pink-backed pelicans float motionless on the water - waiting silently for a fish to come within striking distance. The yellow trunks of the fever trees are reflected in the water and terrapins bask on floating logs. It is a tranquil scene.

The delta, where the Mkuze River enters the swamp is the region where most of the incoming sediments are deposited as the fast flowing river slows down, spreads out and drops its load. The water, still containing the fine sediment particles and rich in nutrients, enters the western half of the body of the swamp (see map). This area of standing or very slow moving water is covered with reeds. Hidden here are several waterlily-covered pans with their characteristic jacanas, energetically pursuing small insects. These birds are adapted for this life by having long slender toes which span the full width of a waterlily leaf. This enables them to hunt their prey over much of the pan surface.

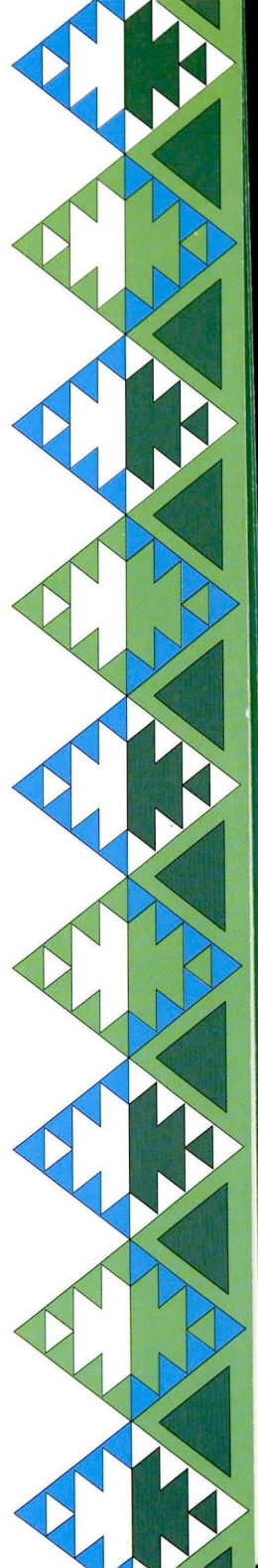
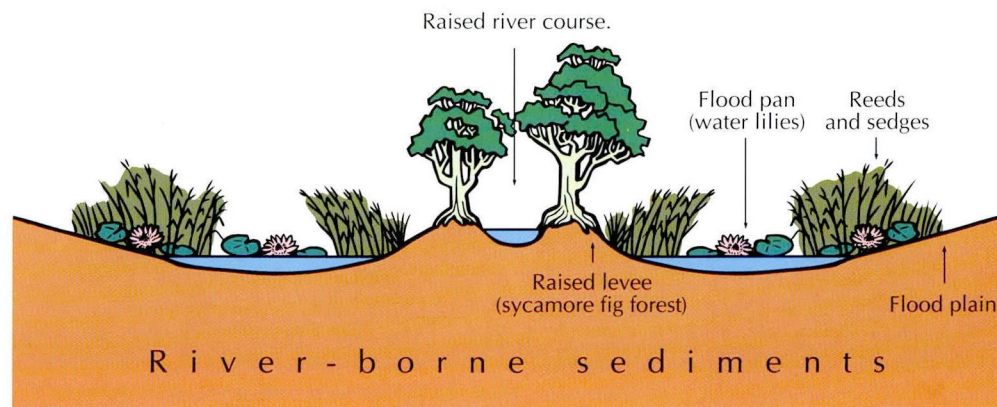
Entering the swamp from the north-east, near Sodwana Bay, is the Mbazwane stream. This is clear, sediment-free water, stained dark brown by decaying vegetation. It flows smoothly through dense swamp forest. Where this water enters the eastern side of the body of the swamp, it is covered by a floating mat of papyrus.

The separation of the swamp into eastern and western halves - with papyrus on the east and reeds on the

**A schematic map of the Mkuze Swamps showing its main regions.**



**A typical profile of a channel in the delta region of the swamps.**



west - is a result of differences in sediment loading, nutrient levels and acidity of the water. The water from the Mkuze River, entering the western half, is rich in nutrients and sediments, while that from the Mbazwane is acidic from decomposing vegetation, low in nutrients and carries few sediments.

In the mouth area of the swamp, where it enters the saline Lake St Lucia,

reeds are prevalent again. The periodic intrusions of salty water prevent the growth of papyrus. The water draining from the swamp into Lake St Lucia has had most of its sediments filtered out of it. It has also picked up fine organic particles - a product of decaying swamp vegetation which is a rich medium for the growth of phytoplankton and bacteria - and, in the lake, enriches the food chain.

A similar process of sediment infilling occurred in the Umfolozi valley, which, after progressing through a stage of being a deep bay, was enclosed by a coastal barrier, silted up and finally became swampland. Now it has been drained, canalised and is the intensive sugar farming area known as the Umfolozi Flats. The eastern portion, near Mapelane, is still natural swamp.



A flock of white-faced ducks flying over swampland.



During the day the black-crowned night heron roosts in the papyrus. At dusk it emerges to feed.

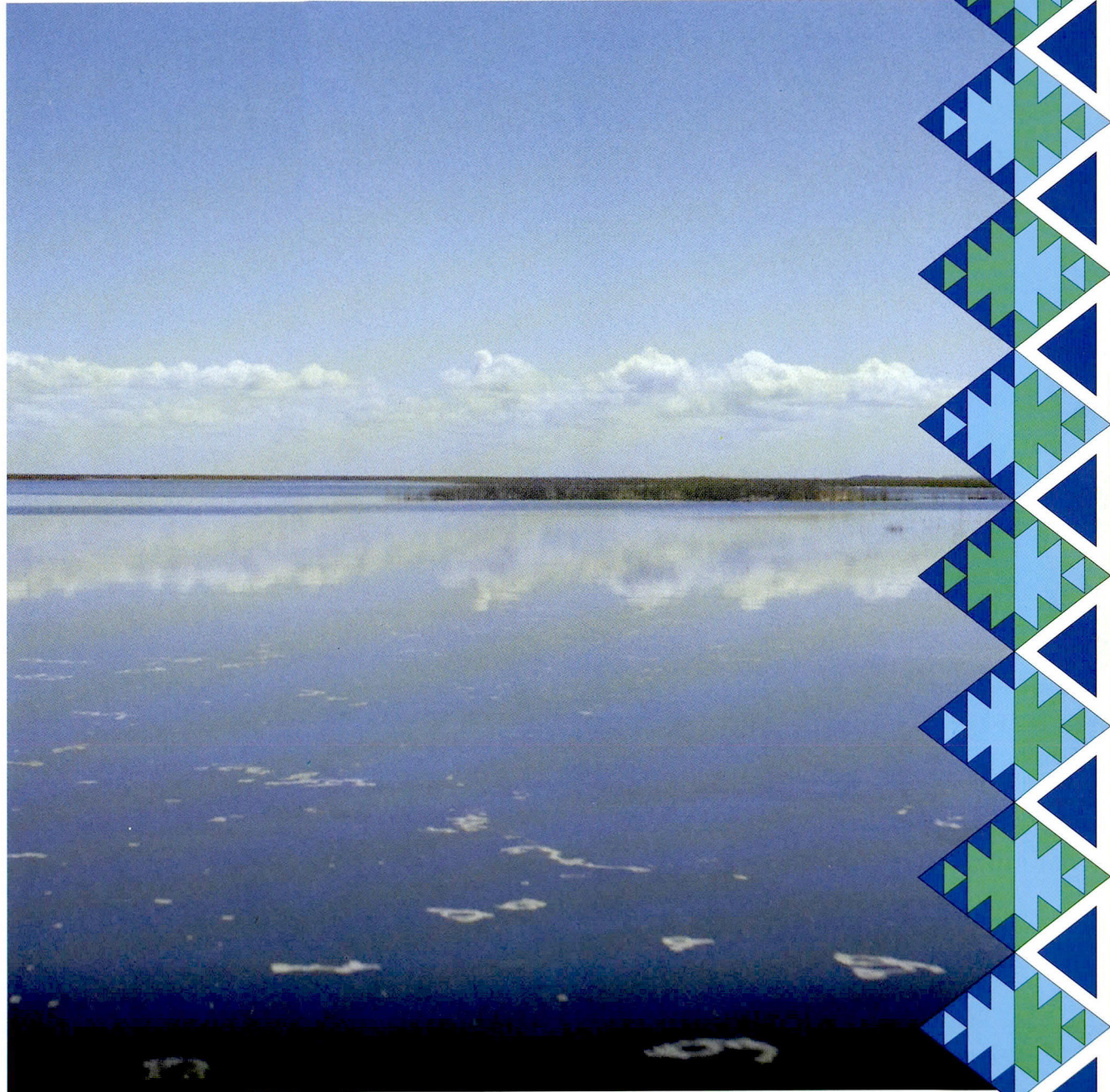


Trapa natans, the water chestnut, is a common plant which has clusters of leaves floating on the water.

## THE LAKE - AN EVER-CHANGING ECOSYSTEM

*Lake St Lucia - the name evokes a variety of images in the minds of all who have visited the area. To some it is a natural paradise - with flocks of pink flamingoes, pelicans riding the thermals overhead, ducks dabbling in the beds of water plants, hippopotamuses lazing in the water and crocodiles basking in the mangroves. To others it is the premier fishing site in South Africa - with memories of the tenacious fight of a springer, the rasping noise from which the grunter gets its name, the thrill of landing a huge kob or the splashing of mullet schools leaping in the wake of a boat. But the lake is a variable system, ever changing and always different. There are times when there are few birds to be seen and not a fish will bite. The visitor's perceptions of the lake under such conditions are very different. Still, what remains are the impressions of the scenery, but even this seems to be constantly changing. The lake can be tranquil with glassy smooth water which merges with the sky at an undefined horizon, it can be fiery as the orange rays of a setting sun sparkle on the water's surface, it can be sultry as heavy clouds overshadow the water and brood over the distant shore, or it can be frightening as its muddy water is swept into angry waves by the south wind.*

Ricky Taylor



Clouds reflected on the surface of a calm Lake St Lucia.

The fascination of the lake is precisely that it is always changing and always different.

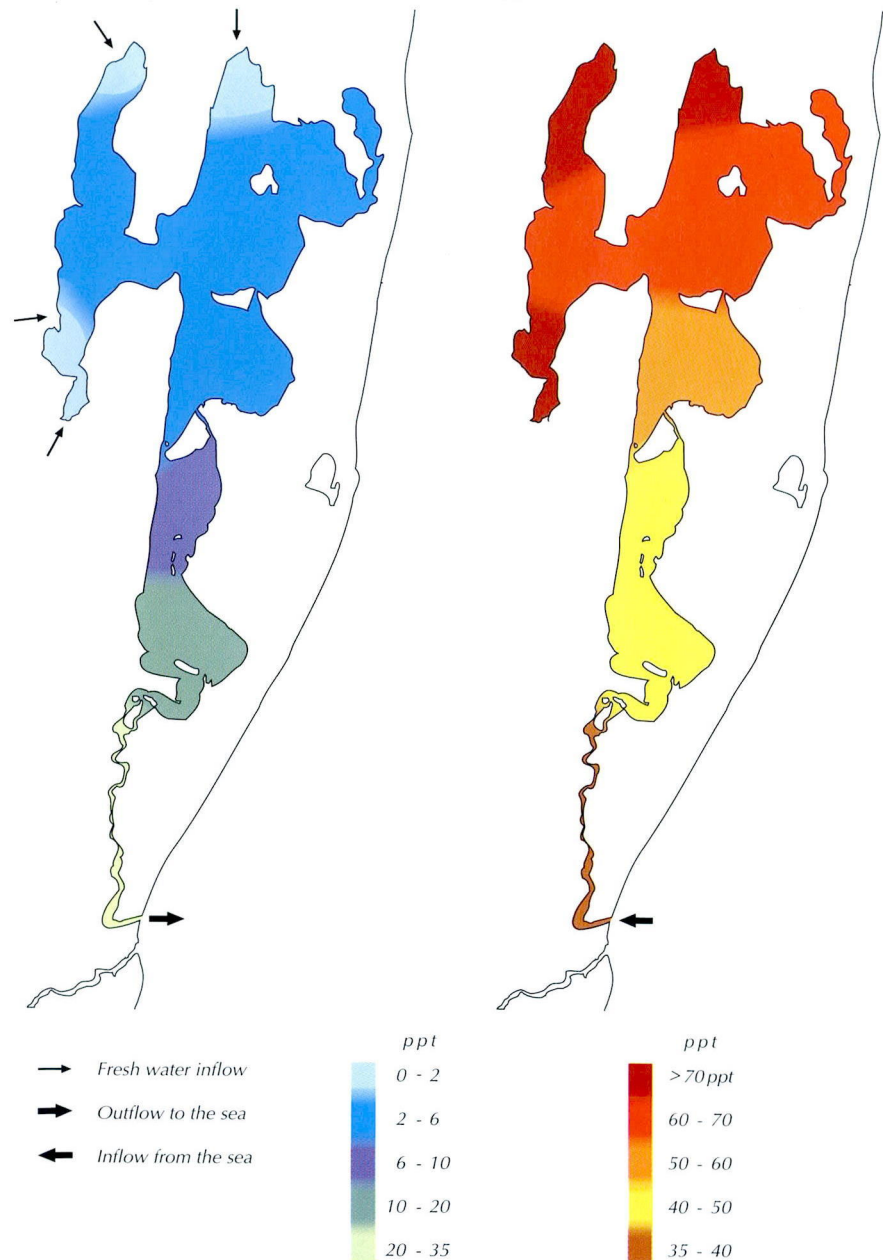
The lake, which is 40 km long, and the Narrows, the 20 km tidal channel that links the lake to the sea, together form the largest estuary in Africa. It is a basin in which fresh water from the catchment area mixes with salty sea water. The mixing of water from these two sources gives an estuary its characteristic richness in nutrients. It has salinity concentrations which range from that of completely fresh water to that which, at times, is three times saltier than the sea. Likewise, temperatures are many times more variable than those experienced in the sea. There are also the suspended sediments for animals to cope with - these clog up gills and water-filtering organs, they restrict visibility, and in the case of plants they reduce the penetration of sunlight which is essential for photosynthesis. The lake is shallow and so the turbulent energy of the waves cannot be avoided. It is a harsh environment, difficult for animals and plants to live in, but, because of the rich nutrient supplies, there are large rewards if they are able to overcome the problems that result from its unstable environment.

The open water area is the main habitat within the lake. The areas to the east generally have a sandy lake bed and to the west, a fine-grained mud. The seven species of mullet that occur in the lake feed mainly on the bacteria and diatoms that live on the lake bed, there

### The salinity gradients in St Lucia.

During a low salinity period.

During a drought period with hyper-saline conditions.



are small soles that feed on the siphon tubes of stickbait and of other bivalves (mussels and clams), the grunters that eat animals that live in the mud and springers that are efficient predators of small fish. Flotillas of pelicans may be seen feeding on these fish and in the sheltered shallow areas, where the water plants grow, the ducks dabble in the mud and the goliath herons stab at fish with their sharp beaks.

On the edge of the lake are the periodically flooded mudflats and the short lawns of salt-resisting grasses, or taller stands of reeds and sedges. The latter, emerging from the water, provide shelter for small fish and prawns. The lake margins are used by multitudes of small wading birds such as the migrant curlew sandpipers, little stints, ruffs and greenshanks. They are attracted by the abundance of food.

Within the lake body are islands, which are important breeding sites for the colonially nesting white pelicans, grey-headed gulls, spoonbills, and Caspian terns.

In the tidal region, the Narrows, the margins are fringed with mangrove swamps. Their trees grow in the region between high and low tide that is flooded twice a day, and here the inhabitants are animals with specialised lifestyles. There are the fiddler crabs that scrape the algae off the surface of the mud. The males have one of their nippers enlarged and brightly coloured. They wave these while doing an elaborate ritualised dance designed to

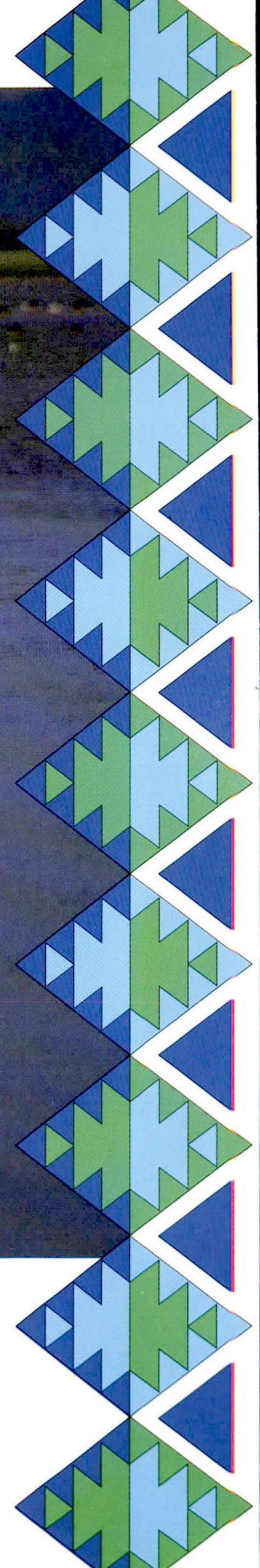
Ricky Parker



Spoonbills at Brodie's Shallows.



When the lake salinity is almost that of sea water, these jellyfish are found in the lake.



attract a mate. Another inhabitant of the mangroves is the mudskipper, a small fish which has broken out of the confines of its watery element. It has achieved this by filling its mouth with water which it then passes over its gills to keep them moist and well oxygenated, enabling it to leave the water and slide over the surface of the mud to feed. Periodically it has to return to the water to replenish its water supply.

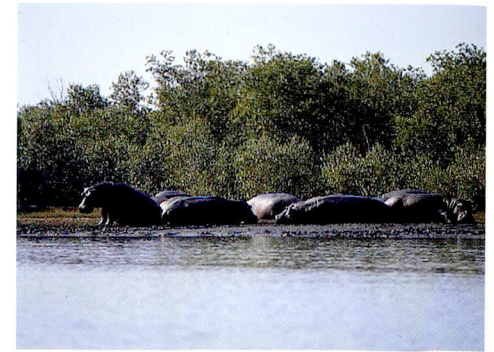
Linking the Narrows to the sea is the mouth. It is through here that all the fish, crab and prawn larvae, which have been spawned at sea, enter. Similarly, the mouth is the bottle-neck through which all the adults of these animals have to pass to reach the sea for spawning. It is an area of mobile sand banks and a constantly changing configuration. In summer, when sand banks are exposed, they are used as roosts for hundreds of terns and gulls. Although the mouth is small in size, its importance for the well-being of St Lucia Lake cannot be underestimated. Through careful management, the Natal Parks Board dredges the mouth to reduce the effects of human alterations to the catchments which cause excessive deposits of marine sands to choke this sensitive area.

The lake has a surface area of 350 km<sup>2</sup>. Although this is very large, its average depth is less than one metre. This means that it has a very high surface area to volume ratio, and as evaporation exceeds rainfall in the St

Lucia region, there is a nett loss of about a quarter of the water volume in an average year. This has to be made up either from catchment runoff, or by replacement with saline water flowing in from the sea. If there is excess runoff from the rivers (the Mkuze, Hluhluwe, Nyalazi and Mzinene Rivers), the water level in the lake rises, and when it is above mean sea level, there is a nett outflow through the mouth to the sea. Conversely, when there is more evaporation than river inflow, there is a nett inflow from the sea and then the salinity of the lake water increases.

Usually there is a gradient of salinity concentrations within the lake, with water being freshest in the north where the rivers enter, and most saline at the mouth where the lake connects to the sea. During severe droughts the direction of the salinity gradient changes. Salinity at the mouth area is still that of sea water. But, from the mouth northwards there is evaporation loss of fresh water which concentrates the salt. The further one is from the mouth, the more the concentration that has occurred. During extreme droughts the water most distant from the mouth may be three times as salty as that of the sea.

Lake water level can range from about 40 cm below that of mean sea level in extreme droughts to over 50 cm above during wet periods. In addition to this, the wind pushes the water to such an extent that, at the extreme ends, water levels can change by more than



In winter the hippos frequently bask in the sun at midday.

Natal Parks Board Collection



As the young crocodiles hatch they emit a loud chirping noise which alerts the mother. She digs open the nest, gently picks up the babies in her jaws and carries them to a protected nursery site.

Tom Parkey



A crocodile basking on a reed-fringed mudbank on the edge of the lake.

Nolly Zukowsky



Nelly Zaharis

Greater flamingoes



Paul Duran

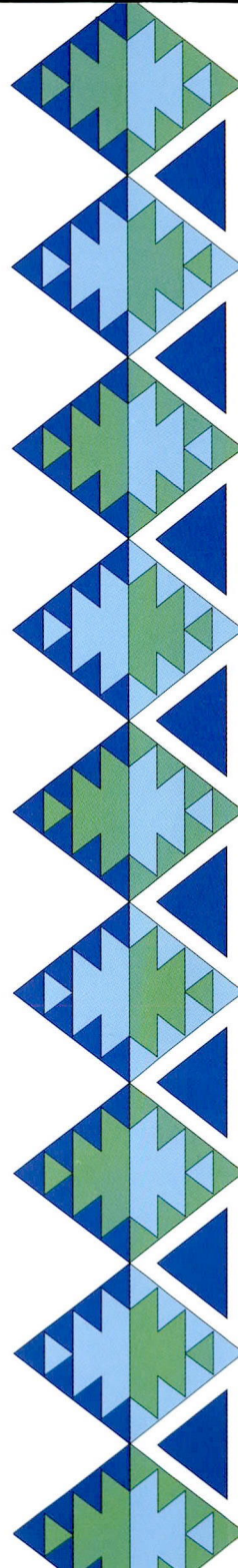
White pelicans return to their breeding colony to feed their black down-covered chicks. The adults will catch the food as far away as in the pans of the Pongola River, some 120 km away.

50 cm over a period of half a day when a north wind changes to a south wind.

One of the effects of the wind in such a shallow lake is that it stirs up sediments, causing the water to become very murky. This gives the water its characteristic muddy-brown colour.

There is a continual changing of salinity and water level as the rain falls, the rivers flow, they dry up, there is evaporation loss and sea water flows in or out. This pattern has interesting consequences. The lake plants and animals are continually responding to the changes. Each form of life has a range of salinity concentrations within which it can survive. As salinity increases or decreases beyond this range, so the plant or animal will die out, and often its place will be filled by another species for which the conditions have become suitable.

A simplified pattern of events that occur as salinity levels rise is as follows. When the lake is very fresh, many of the plants and animals are those commonly found in freshwater situations. The most important submerged water plant is *Potamogeton pectinatus* which is slow to colonise, but which, once established, will grow in much of the lake. It produces a lot of seed which is fed on by large numbers of ducks and coots. It also produces quantities of decaying plant material which provides rich food for many fish and other animals. At low salinities the fish include *Tilapia (kurper)* and, much to the irritation of the fishermen, the



ubiquitous catfish (barbel).

At a salinity of about half that of sea water, the Potamogeton dies out and is replaced by two other submerged plants (*Ruppia cirrhosa* and *Zostera capensis*). These can withstand salinity levels from a third to about one and a half that of sea water, and it is in this range that the lake functions most like a typical estuary. The conditions are ideal for a wide range of fish, for prawns and for crabs. These all enter the lake from the sea where they breed, attracted by the abundance of food. Under such conditions the anglers often have their best catches.

The food chain starts with the green plants which, when they die, are broken down by bacteria. These bacteria are fed on by the benthos - those animals that live in the lake bed which include the mussels and clams, worms and a host of other small organisms. The zooplankton - the animals which float suspended in the water - filter out food particles. Both the benthos and the zooplankton are fed on by a variety of fish which in turn are fed on by predatory fish, fish-eating birds and crocodiles. When the lake is in this state there are many pelicans, terns and herons to be seen.

As salinity levels rise still further - and, as mentioned, they can reach more than three times that of the sea during severe droughts - so the submerged plants die out. Most of the fish move out of the lake, and some die when they are trapped in pockets of excessive salinity.



Fish eagles soaring.



At least 60 per cent of the Caspian terns in South Africa breed at St Lucia. This bird is in full breeding plumage with a pure black cap and bright red bill.



The black heron is well known for its habit of spreading its wings, umbrella-like, over its head when feeding.



White-faced duck, a common tropical duck species.

Salinity



Mangroves occur in the intertidal regions of the lake.



The mud skipper



The male fiddler crab has one of its nippers greatly enlarged to attract females.



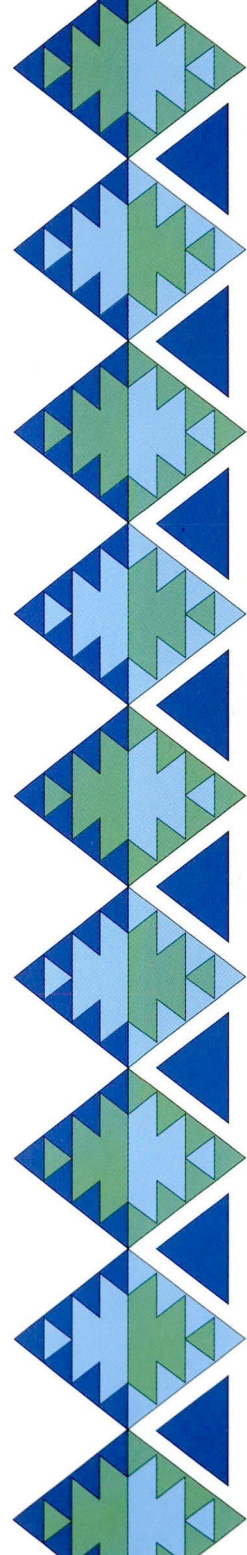
Mangrove snails, *Cerithidea decollata*, on the trunk of a mangrove tree.

Neil Jackson

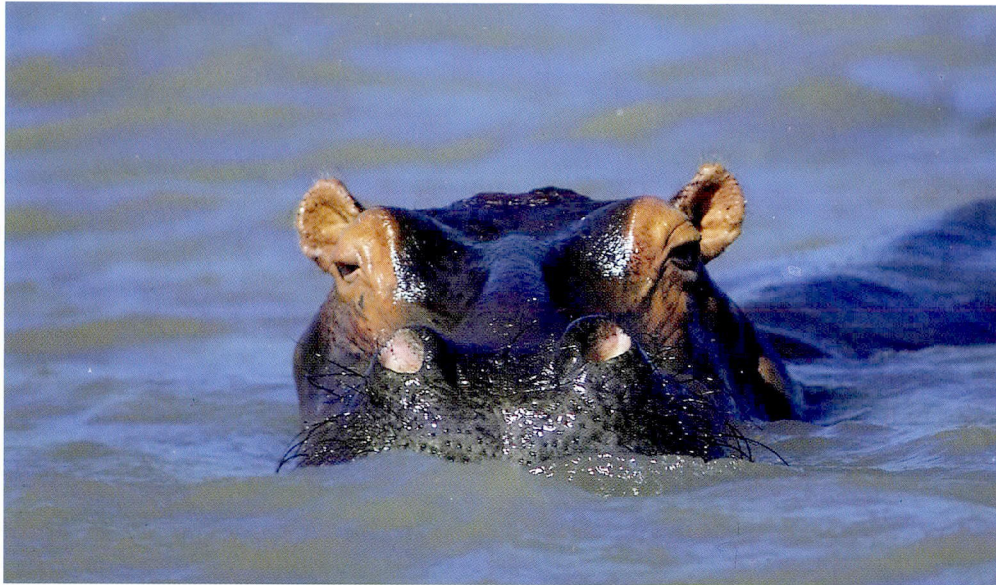
The high salinity causes the sediments to settle more quickly and the clarity of the water to increase. In response to the improved light penetration and the increase of nutrients (due to the concentrating effect of evaporation) the phytoplankton, the floating single-celled algae, increase to become the main source of organic food. This is fed on by the zooplankton. Both of these are in turn fed on by flamingoes - which under these very saline conditions can number up to 60 000.

Ricky Taylor

This is a simplified description of what occurs in St Lucia as the salinity changes. The ecosystem changes as salinity changes. At any particular time there are animals and plants that thrive. For instance, it may not suit the angler when the salinity is very high as there are few fish to be caught, but this is the ideal state for flocks of flamingoes. We should be careful not to impose our human values on the lake and say that any particular condition is optimum. To retain the lake as it is, with the full range of conditions, with its ever-changing nature, is what we should strive for.



## Hippos and crocodiles - how dangerous are they?



Some 700 hippopotamuses live in the Greater St Lucia Wetland Park.

Mention "St Lucia" and many people immediately envisage large numbers of hippos and crocodiles.

There are about 700 hippos in schools which are mainly in the Narrows and along the eastern margins of the lake. Fishermen are full of tales of how they have been threatened by these large beasts, but, in the water they are benign if they are not harassed and their need for disturbance-free slumber is respected.

They feed on land at night, plucking grass, not with their large teeth, but with their lips. This is the time when they are not easy to see and can be dangerous.

They are not particularly alert, and if stumbled upon in the darkness, they try to flee. However, if they are severely frightened their initial reaction may be to attack. So be careful where you walk at night.

Unlike the hippos, crocodiles are predators and to them you are perceived as a legitimate item of food to be stalked and caught. Visitors to St Lucia must be careful and please remember that St Lucia is a park and danger may lurk in any water. We do not want you to be eaten!

From aerial counts we know that St Lucia has 1 000 crocodiles of one metre or longer. They play an important role



Danger in a lily pond.

as the top predator in the aquatic ecosystem. Adults feed mainly on mullet, and the crocodiles concentrate in large numbers in the Narrows every autumn to prey on the schools of mullet which are moving to the sea to spawn. Younger crocodiles are thought to feed mainly on crabs and prawns.

The Crocodile Centre, just outside the St Lucia village, has captive crocodiles for the visitor to see as well as displays which inform you about their biology. At the centre there are also maps and displays relating to all aspects of the Greater St Lucia Wetland Park. It is well worth a visit.

## THE WESTERN SHORES - AN OLD SHORELINE

To the west of the lake is a relatively dry ecosystem. This is the area of the park that includes False Bay Park and the narrow half mile (800 metre) strip west of the Charter's Creek and Fanie's Island camps.

This area has much earlier origins than that of the rest of St Lucia. It was the marine shoreline prior to the formation of the lake system and as a result is rich in Cretaceous fossils. These consist of marine molluscs such as ammonites, snails and clams, as well as fossilised wood from trees deposited at the mouth of an ancient river where it entered the northern parts of what is now False Bay. The peninsula at Lister's Point is formed from a fossilised coral reef of more recent origin. Coral was able to grow at the stage before the Eastern Shores barrier was formed, when False Bay was a clear-water embayment and sea level was about two metres higher than it is now.

The shoreline in many areas is a cliff with a face of up to 20 metres high. Beyond this is an east-sloping landscape which is incised by deep, densely wooded watercourses leading to the lake. The complex interactions of soil, rainfall, fire and herbivores have shaped

the vegetation in this landscape into its present form. The soils are older, richer and more varied than those on the eastern shores. The rainfall is lower and much more erratic than elsewhere in the St Lucia area. False Bay Park has half the annual rainfall of the Eastern Shores only 15 km away. The plants have been exposed to frequent burning, mainly man-caused, and have evolved to cope with fire.

The vegetation has characteristics typical of the bushveld with many acacia trees. On the clay soils there is often a dry forest, or the low thicket which is the early developmental stage of this forest. The sandy areas are fire maintained grasslands except in False Bay Park where some of the sandy areas have developed into sand forest, a vegetation type typical of the drier parts of the Mozambique coastal plain and rare in South Africa.

The vegetation has been modified to a great extent by termites which create mounds of up to 10 metres in diameter and four metres high. These mounds form islands with different soil and moisture characteristics and on them grow plants which otherwise would not occur in the area. They are frequently used by burrowing animals such as aardvark and, in the past, by pangolin. The latter were last seen in False Bay Park several years ago, and now are feared to be locally extinct.

With the variety of vegetation types, this ecosystem is rich in animal life. It has, for instance, at least 111 different



The small forest living red duiker feed mainly on leaves and fruits which fall from the tree canopy.



A huge termite mound in False Bay Park.

The tree fuchsia, *Schotia capitata*, is a common plant in the thickets of False Bay Park.



Stuart Parks Board Collection

Rickie Taylor

Roger de la Harpe

types of butterflies, possibly more than any other locality in South Africa, and it is a rewarding area for the ornithologist. The birds include many of the sub-tropical forest and woodland species. Of particular interest to the birdwatcher are Neergaard's sunbird and the African broadbill, both of which are endemic to this corner of South Africa. Sunbird nests are frequently seen suspended in the forests and from thorn trees in the woodlands, but beware - they are often built close to a wasps' nest. Many a bird-watcher has been stung while

investigating the contents of a sunbird nest. Is this a coincidence, or do sunbirds choose to nest near the wasps for protection?

Red duiker and suni live in the thickets and forests. They feed on leaves and fruits which fall from the forest canopy. These tiny buck are often found associating with vervet monkeys which, being wasteful feeders, drop fruit and leaves to the ground. The suni, not found south of False Bay Park, is the smallest of the African antelope. It is typically associated with the sand forests of the

Mozambique coastal plain. The other antelope characteristic of the Western Shores is the nyala which was first discovered by the French naturalist Angas in the late 1800's in the area that is now False Bay Park.

Apart from the crocodiles at the water's edge there are no longer any large dangerous animals to worry the visitor to the Western Shores, so you can walk safely without a guide. Rhinoceroses, elephants, lions and other large carnivores used to occur in the area, but were all shot out by early hunters.



Ilala palms in False Bay Park.

## Warburgia and other medicinal plants

The pepper-bark tree, *Warburgia salutaris*, or *isiBaha* as it is known in Zulu, grows in this area. It is greatly sought after by herbalists (*sangomas*) as its bark has medicinal properties for the treatment of respiratory ailments. It used



Bark has been collected from this tree for medicinal uses.

to be common in the whole region, but it has been over-exploited and is now rare. The remaining trees have all had strips of bark illegally cut from their trunks by the medicinal plant gatherers. There is concern that illegal gathering of their bark will endanger their long-term conservation. A project to propagate the trees in large numbers by means of tissue culture has been initiated by the Institute of Natural Resources at the Natal University. The trees will be planted at kraals and hopefully will relieve the pressures on the wild plants.

There are numerous sorts of medicinal plants in our conservation areas which are now in short supply elsewhere. Many of these are not easy to propagate and are threatened by the medicinal plant trade which extends throughout southern Africa. This is a major concern to the custodians of the conservation areas.



Nolly Zolovinis

The white pelican is graceful in flight, but clumsy on land.

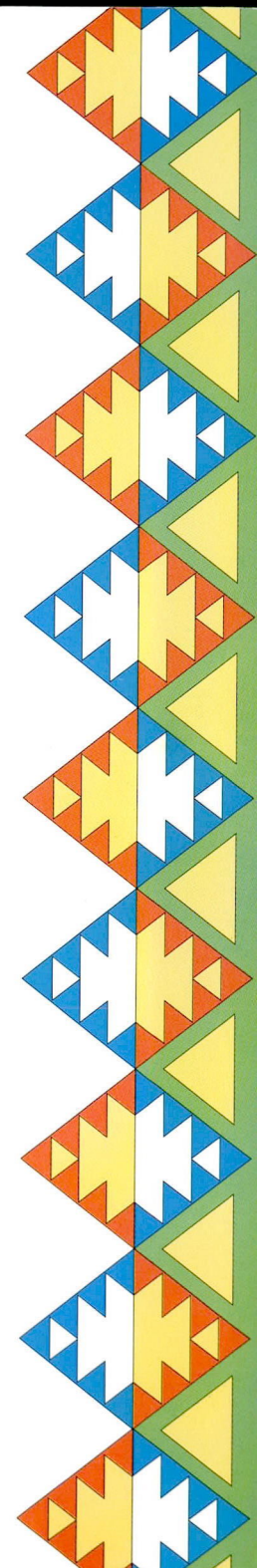
## THE LINKS BETWEEN THE ECOSYSTEMS

The five ecosystems of the St Lucia Wetland Park do not function as totally isolated entities. There is a linking between them. The swamplands, for instance, form a filter which removes sediments from water entering the estuary. Without this the lake would silt

up, and rapidly get shallower. Also the swamps provide organic nutrients for the lake, enhancing its productivity. The estuary functions as a nursery site for many species of marine fish, crabs and prawns. The existence of Lake St Lucia enhances the populations of these creatures up and down the coast of Natal and further afield. The tall dunes of the Eastern Shores catch rainfall, even in the most extreme of droughts. Much of this rainfall seeps into the estuary, reducing the salinity. The salt in the lake is derived from the sea. Without this, the lake could not function as an

estuary.

The importance of the Greater St Lucia Wetland Park as a wetland of international importance has been recognised in terms of the Ramsar Convention. This has been done because of its beneficial effects which extend beyond the boundaries of South Africa. It is important as a stopping point for migrant birds, it is a breeding area for fish and prawns which move north of our international boundaries, and it has important nesting grounds which enable sea turtles from the western Indian Ocean to breed.



## WHY CONSERVE ST LUCIA?



ROSEY TAYLOR

A Zulu woman sorts ncema, a salt marsh plant which she will dry and then use for weaving.

*It is often asked, "Can the money spent on conserving St Lucia be justified when, in this country, more pressing needs exist in the grossly underfunded fields of health, housing and education?" In response to this question it should be realised that conservation is being carried out for the long-term benefit of*

*the human society as a whole. The Natal Parks Board has the mandate to look after St Lucia with responsible care, as this park is recognised as being an asset of national and international value. The need for conserving St Lucia has been recognised by successive governments over the past century, from the British Colonial Government to the present-day one. As the conservation assets of the country have dwindled, so the need has been recognised to add extra portions onto the total St Lucia area.*

*The values of St Lucia to society can best be assessed within the context of the total natural environment. The International Union for Conservation of Nature and Natural Resources (IUCN) in its World Conservation Strategy, has stressed the need to maintain what it terms "life support systems". These are the habitats essential for human survival. They include the forests, the estuaries, the seas, and the wetlands. For each of these, critical minimum amounts are needed to purify the air we breathe, to provide clean water, and to ensure that we have fish to catch.*

*To ensure a high quality of life it is necessary for development to go hand in hand with nature conservation. There is a need for industrial areas as well as wilderness, and for the whole range between these extremes. The St Lucia Wetland Park, well known for its natural beauty and ecological value, has been well chosen to be retained as a natural area to be left to function with minimal*

*interference from man.*

*The economic benefits in conserving St Lucia spread like tendrils through the infrastructure of our society. There is a direct economy based on the use of the area by tourists and anglers, as well as the attraction of overseas tourism to this country, which increases foreign exchange.*

*There are also the indirect and difficult to quantify ecological benefits such as the improvement of fish, prawn and crab catches up and down our coastline.*

*The spiritual values, too, cannot be quantified. Watching a sunrise from Charter's Creek - where the Eastern Shores dunes, silhouetted against a blazing sky, are reflected in the lake; hearing the territorial calling of fish eagles, the pounding of the waves on the Mission Rocks at high tide, the adrenalin-releasing snort of a black rhino in the wilderness area. These are all part of our heritage; part of a rapidly disappearing Africa which needs to be preserved for future generations.*

*St Lucia is an area where visitors can learn to live in harmony with the natural environment. The population of South Africa, growing at 2.6% every year, will turn this country into a sterile and unproductive wasteland unless people are taught to respect and look after their natural environment. St Lucia is a valuable area for environmental education - it is an outdoor classroom that can be used for formal and informal education, for young and old alike.*

## CONSERVING ST LUCIA - CARING FOR THE PARK

*The Greater St Lucia Wetland Park is public land and the Natal Parks Board has the mandate to conserve it for the people of South Africa. Its uniqueness and the need to conserve St Lucia were recognised as long ago as 1895, when portions were first proclaimed as game reserves. Since then additional portions have been identified as being important components and have been added to integrate the various components so that the area can function as naturally as is possible. As the natural environment of South Africa is being modified at an ever-increasing rate, so the possibility of adding additional portions becomes less and less, and soon the Greater St Lucia Wetland Park will be an island of natural area within an altered landscape.*

*Not only does St Lucia have regional and national importance, but it has now been listed by the Convention on Wetlands of International Importance (the Ramsar Convention) as having international conservation value. It also meets all the requirements for recognition as a World Heritage Site and hopefully will be registered as such by UNESCO in the near future.*

*So the responsibility of the Natal Parks Board is firstly to ensure that St Lucia continues to function as naturally as possible and, secondly, to enable the*



*Fire is used as a management tool to maintain the grasslands.*



*Controlling conflicting recreational activities at Sodwana is one of the functions of the Natal Parks Board.*

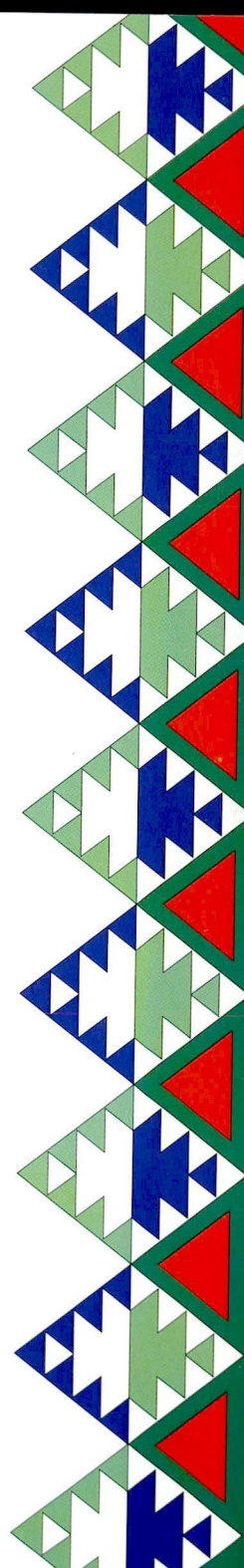
*The Natal Parks Board are leaders in the capture and translocation of animals.*



*Natal Parks Board Collection*

*Ricky Parker*

*Jane Parker*



public to utilise the area as far as possible without jeopardising its naturalness. This requires the support and involvement of the public.

Careful planning and research are required to direct management operations. These include:

- Understanding how the ecosystems function. Research projects are directed at learning about this, so that we can identify and minimise any problems.

- Identifying ecologically sensitive areas. Areas or sites of particular sensitivity, such as bird breeding colonies, are identified so that they are not unintentionally disturbed by visitors.

- Demarcating use zones. Various recreational activities conflict with each other (for instance, hiking and animal viewing from cars are not compatible). To minimise this conflict, use zones are identified and the types of recreation, types of development and the densities of users are strictly specified for each zone.

- Drafting a management plan. This is intended to guide development and management actions within the reserve.

- Monitoring. A programme to monitor key aspects of the ecosystem, the effects of developments and public use, and the effectiveness of management actions, is then implemented.

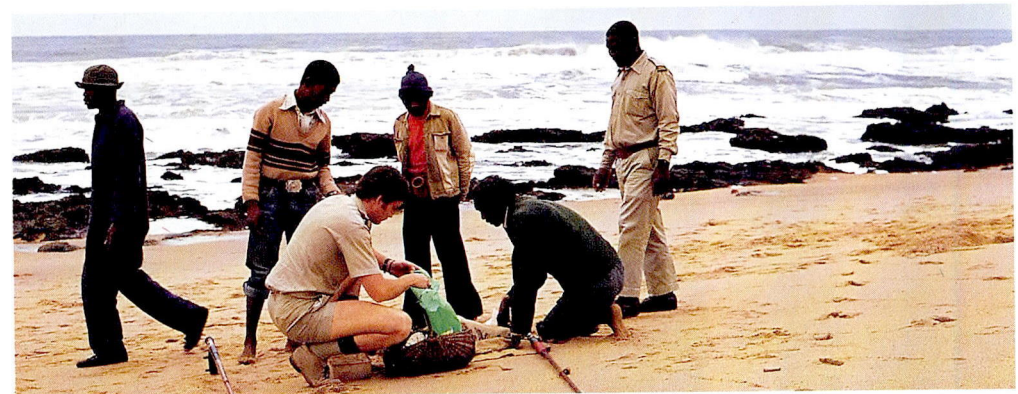
Management actions are initiated to reduce the adverse influences which

affect the reserve and to counteract their effects. These influences can be from sources external to the reserve or due to internal effects - often related to public use of the area. The manager tries to use natural methods for management whenever possible and tries to work with nature rather than dominate it.

Natal Parks Board staff explain the benefits of conservation to neighbours.



Natal Parks Board Collection



Natal Parks Board Collection

Natal Parks Board staff enforce angling regulations which are designed to prevent over-utilisation of our marine resources.



Natal Parks Board Collection

Dredging to remove sediments from the St Lucia Mouth is necessary to counter human caused detrimental influences in the catchment areas.

The main management actions taken are:

## Terrestrial areas



Natal Parks Board Collection

Prawns are netted in the estuary for sale as bait.

- **Burning grasslands.** Fire has occurred in the grasslands for many centuries and is essential for their maintenance as it prevents invasion by woody plants. Most of our grasslands are burnt on a two-yearly rotation.

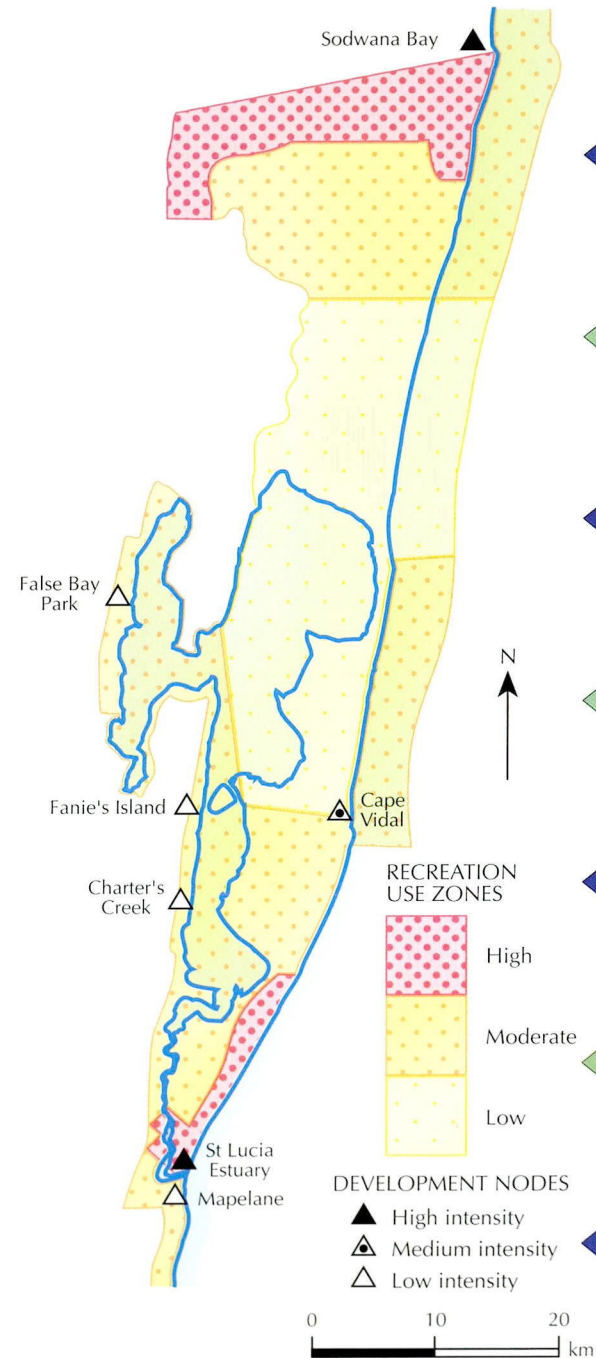
- **Introducing animals.** There is no longer the full complement of animals that used to occur naturally in the area. One of the management aims is to reintroduce all the missing species into the area. With certain species, such as lions, modern circumstances militate against their re-introduction.

- **Controlling populations.** As the animal populations are imbalanced - partly due to the severing of migration routes by the reserve boundaries, and partly due to reduced predator numbers - animals have to be removed to prevent overgrazing. If possible, these animals are caught and moved to other conservation areas. Those that cannot be caught have to be shot. The numbers

of animals to be removed are very carefully worked out, based on the condition of the grasslands and the numbers of the animals present. As a guideline the managers try to simulate the effects that missing predators should be having on their prey populations.

- **Controlling alien plants.** In the last few decades, several species of plants from other continents have invaded the vegetation of the reserve and are a terrible threat to the natural functioning of our ecosystems. The Natal Parks Board has developed management programmes to eradicate these alien plants from the reserve so that they do not compete with and displace our indigenous plants.

- **Setting the limits.** Strict limits to visitor numbers are set for certain areas. These can, for instance, be defined as maximum numbers of cars on the roads or numbers of people who may walk on a nature walk each day.



## Lake and swamps

- *Estuary mouth management.* In former times the lake shared a common mouth with the Umfolozi River. In the early 1950's this mouth was choked completely with sediments from the Umfolozi catchment area. Dredgers were brought in to remove the sediments, and to prevent a recurrence, a separate mouth was excavated for the Umfolozi River. Since then, dredging has been necessary in the St Lucia mouth to remove sea sediments that intrude into St Lucia.

- *Freshwater inflow.* High salinity levels occur more frequently and more severely in the lake now than in the past. This is a result of less fresh water entering the lake from its catchment area as more is used for irrigation or is taken up by afforestation. At present there is little management, but we hope soon to have a quota of water allocated specifically for St Lucia to prevent its deterioration during periods of drought.

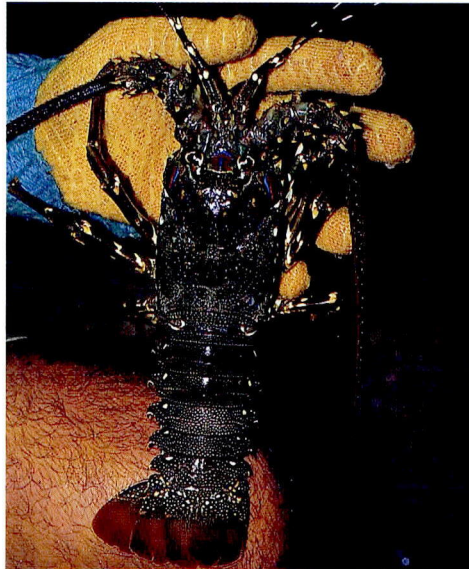
- *Use limits.* To prevent overfishing, numbers of fish taken from the lake are controlled by enforcing daily fish bag limits, as well as minimum fish sizes, and by limiting the numbers of fishermen in various sections of the lake.



A scuba diver observing clown fish off Sodwana. Divers are discouraged from touching the reef.

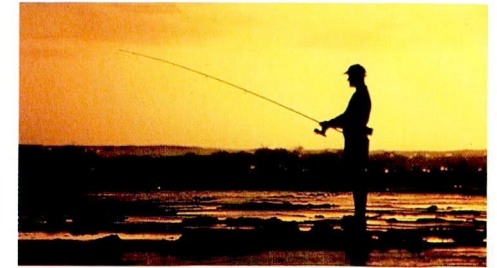


Sea lice are crabs which live in the intertidal areas of the beach. They are used as bait.



During the crayfish open season, the lucky diver is able to make catches such as this.

## Sea and beach



Surf fishing as the sun rises over the ocean.

- *Use limits.* In the marine areas, strict fishing limits are set. The effectiveness of the closed season and reduced bag limits for shad are among Natal's conservation successes. These limitations have resulted in improved catches of this fish.

- *Diving over the coral reefs at Sodwana is being controlled.* The main impact of people was the breaking of coral by boats anchoring on the reefs. This problem has been alleviated by ensuring that the boats moor at permanent buoys.

- *Driving on beaches is being limited to reduce the damage caused by vehicles.*

In order to carry out efficient management, an administrative infrastructure is necessary. This includes the accommodation of staff, personnel management, equipment, maintenance of buildings, roads, water, electricity and other services, workshops to repair equipment and many other back-up services. All of these are essential for the efficient management of the reserve.

## PUBLIC FACILITIES



Self-contained log cabins are available at Sodwana, Cape Vidal and Mapelane.

The Natal Parks Board provides a variety of facilities to enable visitors to use the reserve and enhance their experience of the natural environment. The activities available allow visitors to plan a visit to suit their individual needs. There is accommodation, where the emphasis can be on comfort (log cabins or bush camps) or it can be unsophisticated and simple (rustic camps and camp sites). Visitors can take part in activities that are strenuous and offer physical challenge (wilderness trails) or restful (lake angling from a boat); that require outdoor skills (scuba diving or fly fishing) or for which no



The Mziki hiking trail has a network of 40 km of paths on the Eastern Shores.

expertise is needed (going on a launch tour or walking in the game park). The aim of the Natal Parks Board is to ensure that everyone who visits St Lucia has an enjoyable and relaxing time.

St Lucia is close to the Hluhluwe, Umfolozi and Mkuzi Game Reserves, so a tour can be planned to visit these areas as well. Further afield are the battlefields of the 1879 Anglo-Zulu War. These include Isandlwana and Rorke's Drift in the Tugela valley, Eshowe where the fort is now a museum, and Ulundi where the final battle of the war was fought.

There are also places in the vicinity of Melmoth, Eshowe and Empangeni

where the tourist can learn about Zulu culture and crafts. The Greater St Lucia Wetland Park is a focal point from which all these places can be reached. Make it the centre of your Zululand experience.

The facilities offered by the Natal Parks Board are continually being updated and expanded. A leaflet is available for each locality, giving details of the current facilities. Ask for these from any of the Natal Parks Board offices in the reserve or from the central Natal Parks Board office at PO Box 662, Pietermaritzburg 3200. For bookings phone (0331) 47-1981 or fax (0331) 47-1980.

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# GLOSSARY

**Abyssal waters:** the deep sea beyond the continental shelf.

**Alga (pl = algae):** the group of simple plants that includes the seaweeds, the diatoms and the single-celled green plants that form phytoplankton.

**Ammonite:** fossil of an extinct group of animals which lived in deep marine conditions. Their closest living relatives are the nautilus shells, squids and octopuses.

**Bacteria:** single-celled organisms. Although they may be able to photosynthesise, they usually survive by being parasitic or by feeding on the remnants of plants and animals (i.e. on detritus).

**Biogeography:** the study of the distribution of plants and animals, and the environmental factors causing the distribution patterns.

**Biomass:** a measure of the quantity of living organisms, expressed as the mass of plants and animals.

**Calcium carbonate:** the chemical  $\text{CaCO}_3$  which is the main component of shell, coral and bones. Deposits of this chemical form limestone.

**Carbohydrate:** organic compounds such as sugars, starch and cellulose.

**Carnivore:** an animal that eats meat.

**Catchment area:** the area of land which catches rainfall for a particular river, lake or estuary.

**Climax growth:** the final form which a community of organisms attains after it has been disturbed and then passed through several successional stages.

**Conservation:** the wise use of natural resources.

**Cretaceous:** the geological period lasting from some 135 to 65 million years ago.

**Detritus:** organic matter formed

from dead plants and animals.

**Diatom:** one of the groups of algae which typically have cell walls hardened with silica compounds.

**Dune catchment:** the coastal dunes which act as a rainfall catchment area. See "sand catchment".

**Dune:** accumulated wind-blown sand which may be bare of vegetation and mobile, or stabilised with a covering of plants.

**Echinoderm:** an animal of the group which includes starfish, sea urchins, sand dollars and sea cucumbers.

**Ecosystem:** an interacting system of plants and animals and the environment in which they live.

**Endemic:** plants or animals that are confined to a given region.

**Environment:** the sum of the conditions in which an organism lives. These can include the physical conditions such as salinity, moisture, soil type, temperature; as well as the biological conditions, such as effects of competition of one animal on another, and the effects of predators.

**Epiphytic:** the life form of a plant that grows on another plant and uses it for support.

**Estuary:** a semi-enclosed water body where land-derived fresh water mixes with sea water.

**Filter feeder:** an animal that feeds by filtering small plants, animals and particles of organic matter from the water.

**Global warming:** the worldwide trend towards higher temperatures which we are currently experiencing.

**Greenhouse effect:** the heat-trapping effect of increased levels of certain gases (such as carbon dioxide and methane) which are a result of human modification of the earth's environment.

**Habitat:** place or environment in which specific organisms live.

**Hard coral:** skeleton-forming corals.

**Herbivore:** an animal that feeds on living plants.

**Hydrodynamic:** shaped to offer minimal drag when moving in water.

**Intertidal:** occurring within the range of the high and low tides.

**Invertebrate:** an animal without a backbone.

**Mollusc:** an animal of the group which includes mussels, snails and octopuses.

**Ozone layer:** the layer in the stratosphere which is rich in ozone gas. The ozone screens out much of the ultra-violet light which otherwise would penetrate the earth's atmosphere with damaging effects on plants and animals.

**Parasite:** a plant or animal that lives in or on another and draws nutrients from it.

**Photosynthesis:** the process, which occurs only in green plants, whereby the energy from sunlight is used in the manufacture of carbohydrates.

**Phytoplankton:** the single-celled algae that live suspended in the water column.

**Plankton:** plants or animals which live suspended in the water column.

**Polyp:** the individual sea anemone-like animal that builds and lives within the coral skeleton.

**Saline:** containing salt.

**Salinity gradient:** the change in salt concentration from one point to another.

**Sand catchment:** a catchment area composed largely of sand which acts as a sponge and holds the rain.

**Sangoma:** the Zulu term for a herbalist.

**Savanna:** a grassy area interspersed with trees.

**Soft coral:** the group of corals which do not produce hard skeletons.

**Sub-marine canyon:** the eroded valley cut by a river at a time when sea levels were very much lower than at present. This is now, with a higher sea level, situated in the sea bed.

**Succession:** the progressive change in composition of a community of organisms towards a largely stable climax.

**Symbiosis:** the living together of two species, plant or animal, where each benefits by the presence of the other.

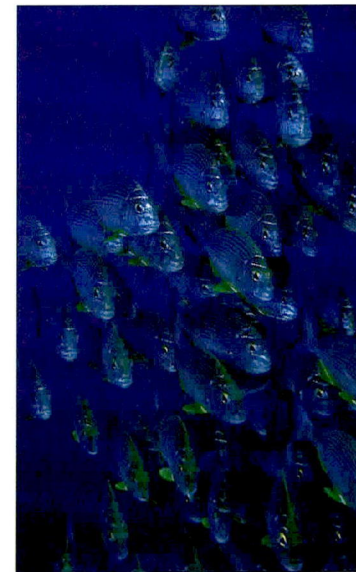
**Thornveld:** the vegetation type which has a large proportion of thorny acacias.

**Understory:** the ground layer of plants in a forest.

**Water column:** the portion of a water body between the surface and the bottom.

**Wetland:** an area where the soils are waterlogged and the vegetation is dominated by the water table.

**Zooplankton:** animals which live suspended in the water column.



Big-eye stumpnose, *Rhabdosargus thorpei*, schooling in the clear water over the coral reefs off Sodwana.

Peter Wilson



Natal Parks Board Collection

A black marlin is the big prize. Nowadays many fishermen tag and release their catch.



Roger de la Haye

The St Lucia lifeboat tour.



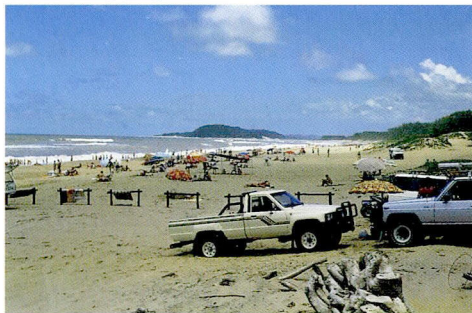
Natal Parks Board Collection

Sodwana from the air.



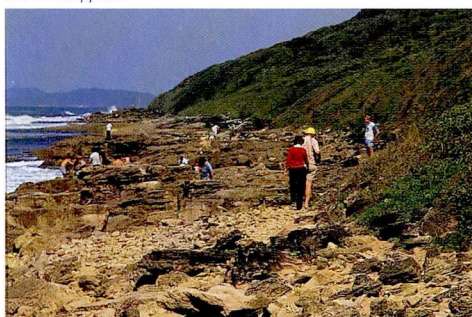
Natal Parks Board Collection

A ski boat returns to Sodwana from an off shore fishing outing.



Matt Jackson

The beach at St Lucia is popular among sun worshippers.



Freder Wolf

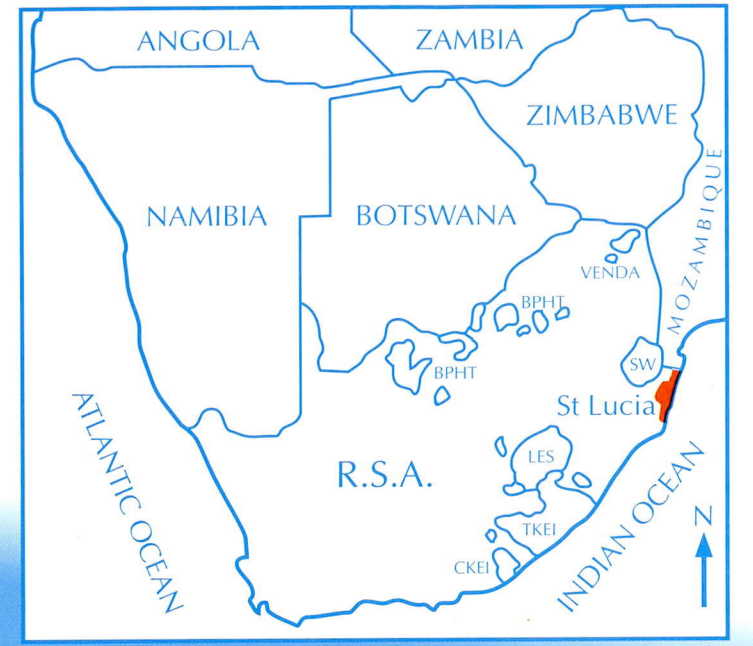
The rock pools at Mission Rocks provide the perfect site for coastal education.

## ST LUCIA ACTIVITY OPPORTUNITIES

	SODWANA BAY	CAPE VIDAL	ST LUCIA	MAPELANE	CHARTER'S CREEK	MT TABOR (Mission Rocks)	FANIE'S ISLAND	LISTER'S POINT	DUGANDLOVU	FALSE BAY PARK	LAKE - OPEN	LAKE - WILDERNESS	NARROWS	MARINE SANCTUARY	MARINE RESERVE	MARINE NO RESERVE	E-SHORES - WILDERNESS	NE-SHORES (Sodwana Area)	W-SHORES	YENGWENI PAN
<b>ACCOMMODATION</b>																				
Fishing cabins		●																		
Rest huts					●		●													●
Cottages					●		●													●
Log cabins	●	●		●																
Rustic huts						●				●										
Bush camp		●																●		
Camping	●	●	●	●			●	●											●	●
Caravanning	●	●	●	●			●	●											●	●
<b>ACTIVITIES</b>																				
Nature walks	●	●	●	●	●	●	●	●	●	●										●
Hiking trails						●			●	●										●
Wilderness trails																				
Game viewing		●	●		●	●	●	●	●	●			●					●	●	●
Board walks			●																	
Bait collecting		●	●	●		●											●			
Crayfishing																				
Mussel collecting		●	●	●		●											●			
Oyster collecting		●	●	●		●											●			
Boat launching	●	●	●	●	●	●	●	●								●				●
Rock & surf angling																				
Skiboat fishing	●	●	●	●												●	●			
Bill fishing	●															●	●			
Spear fishing	●	●		●												●	●			
Lake boat fishing				●	●	●	●	●			●									
Fly fishing	●	●	●	●	●	●	●	●			●					●	●			
Boat tours			●												●					
Lifeboat tours			●											●						
Turtle tours	●														●					
Hides						●														
Beach leisure	●	●	●	●		●										●	●			
Driving on beach	●	●	●	●																
Scuba diving	●															●	●			
Interpretation centre			●																	
Picnic sites		●	●	●	●	●	●	●												●
Canoeing											●						●			
Education centre			●																	
<b>FACILITIES</b>																				
Petrol sales	●	●	●	●	●	●	●	●												●
Curios	●	●	●	●	●	●	●	●												●
Shops	●		●																	
Freezer facilities	●																			
Bait sales	●	●	●	●	●	●	●													●

# MAP OF THE GREATER ST LUCIA WETLAND PARK

## INDIAN OCEAN



**KEY TO MAP**

	Roads		Sand and dunes
	Rivers		Urban areas
	Boundaries		Centres
	Sub-boundaries		Hutted camp (Rest huts, cottages, log cabins)
	Swamps		Bush camp
	Trees and bush		Rustic hut
	Trail		Camping and caravanning
	Rock banks		Boat launching
	Lake and sea		

0 1 2 3 4 5 6  
KILOMETRES

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*Ricky*

From an aircraft Bird Island can be seen in the foreground. Hells Gates in the distance leads into False Bay.

Ricky Taylor

