Bookshelf

Oceanus Vol 29 No 2 Summer 1986
The Evolution of the GBR
David Hopley and Peter J. Davies
This excellent chapter looks at reef origins, sea level changes and reef growth and gives a run down on the various types of reef along the GBR. However, when it was written the modern reef was thought to be 2 million, not half a million, years old

Reader's Digest Book of the Great Barrier Reef
Reader's Digest Services Pty Ltd
Part 2 of this book features a short chapter on the reef's origins and a long and detailed chapter entitled 'The greatest reef on earth'. Written by the above authors, among others, it covers much the same ground, with good illustrative photographs and diagrams.

Coastal Evolution
R.W.G. Carter & C.D. Woodroffe, eds.
Cambridge University Press
Chapter 8: Continental shelf reef systems — David Hopley
This detailed and interesting chapter looks at the various influences on coral growth and, in particular, at how development of the GBR was affected by the last rise in sea level.

Corals of Australia and the Indo-Pacific
J.E.N. Veron
Angus and Robertson Publishers (1986)
At the beginning and the end of this comprehensive guide to hard corals there are chapters on coral reefs, coral communities and geological history.

Exploring Reef Science factsheet
The romance of mud (April 1997)
Although not included in the list on the insert you will find in this issue of *Tropical Topics*, this recent factsheet describes mud core research and findings (see p7).

New Scientist No.2084, 31 May 1997, page 19
How the Great Barrier Reef turned up the heat — Lou Bergeron
A report on corals and global warming 400 000 years ago (se p2).

Websites
If you want to see some photos of the caves on Tijou Reef, check out http://www.home.aone.net.au/divebell/ or do a search for Dive Bell.

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Tropical Topics

An interpretive newsletter for the tourism industry

The geological framework of the reef No. 41 Winter 1997

Notes from the Editor

Why is the Great Barrier Reef situated where it is? Why do corals grow there? Why is most of the reef so far from land? Why does it stop where it does? Why, if we are told it is a very young reef, are there fossil reefs at Charters Towers?

Many time frames are involved, which can be confusing. For this reason the information spread between pages 2 and 7 (lift out the centre pages to see the full spread) is arranged along different timelines. We look at events which have shaped the reef during the past 500 million years, then at events of the last half million years, followed by the past 20 000 years and finally the past one hundred years. The centre pages focus on the forms we see on the reef today and how they are continuing to evolve.

I would like to thank Dr David Hopley of Coastal and Marine Consultancies for his valuable assistance with this issue.

You can now contact your *Tropical Topics* editor via e-mail. The address is: Stella.Martin@env.qld.gov.au

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Divers study history

In September, a group of archaeologists and scientists plan to dive into a cave system on Tijou Reef, north of Cooktown, searching not for marine life but for evidence of terrestrial life.

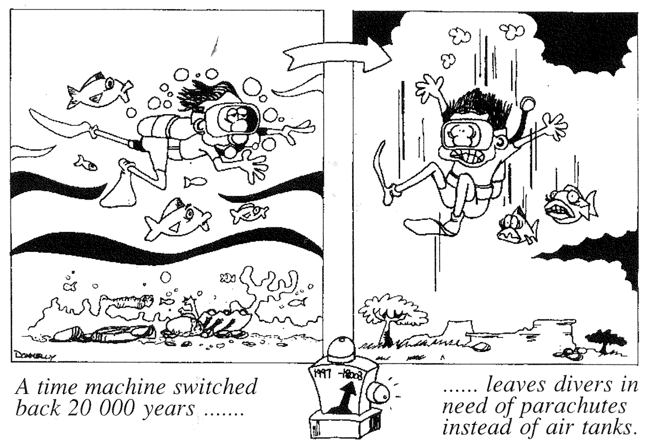
The Great Barrier Reef has had a varied history, not all of it below water. By world standards, it is a mere youngster among coral reef systems. When modern reef-building corals first evolved, about 230 million years ago, Australia was attached to Antarctica and situated much too far south, with waters too cold for these early corals to make it their home.

Eventually Australia broke away and began to drift north but it was not until very recently, by geological standards, that conditions were right for reef-building corals to establish themselves on the relatively shallow continental shelf fringing its northern, eastern and western shores. In fact, cores taken from the corals have shown that most of the Great Barrier Reef is less than half a million years old.

Despite its late start, the Great Barrier Reef has not been able to grow continuously for the past 500,000 years. As the earth went through a series of Ice Ages much of the planet's water was trapped in massive ice sheets at the poles. Consequently, sea levels fell and the continental shelf, along with its reefs, became dry land. However, when the ice melted and sea levels rose again, the area was recolonised by coral larvae from beyond the continental shelf and reef-building resumed.

The last Ice Age was relatively recent, lasting from 25 000 to 15 000 years ago. For those 10 000 years the area we now know as the Great Barrier Reef was probably a grassy or forested plain dotted with flat-topped limestone hills (former reefs). Aboriginal people almost certainly hunted on these plains and coastal shores; in fact their stories record the rise in sea level.

Divers who have visited the caves on Tijou Reef say they are similar to caves on land, having been unusually well protected from oceanic influences. The archaeologists are hoping to discover vegetable remains, such as pollen, charcoal from bush fires and perhaps even some animal remains. Their findings could well give us a much clearer picture of what the Great Barrier Reef was like in the days when you didn't need a boat to get there.



A time machine switched back 20 000 years .... *...... leaves divers in need of parachutes instead of air tanks.*

Marine Parks
Great Barrier Reef Marine Park Authority
Queensland Government Department of Environment

Timelines on the reef — counting in millions

The first reefs

About 470 million years ago, primitive sponges, coralline algae, stony bryozoans and the earliest corals — tabulate and rugose corals — were producing the first 'coral' reefs. For 150 million years these organisms together built massive structures, unrivalled at any other time in history until, for unknown reasons, construction came to an end. Fossil remains of these reefs can be seen near Charters Towers among other places.

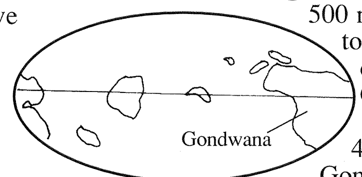
About 250 million years ago the rugose and tabulate corals, along with 90 percent of all the world's marine invertebrate species, became extinct.

Modern stony (scleractinian) corals began to evolve about 230 million years ago in what is now the Mediterranean. It was then part of the Tethys Sea, an ocean which used to exist between the European and Asian land masses to the north and the African and Indian continents to the south. The northward movement of the southern continents gradually closed this ocean but not before most families of modern corals had evolved and colonised the western Pacific.

During this time, about 65 million years ago, one third of all animal families, including the dinosaurs, became extinct. Corals were also affected, reefs taking 10 million years to recover.

35 million years ago the Tethys Sea was closing up but its presence, and the absence of a land connection between north and south America, meant that there was a sea passage right around the globe in tropical regions. This enabled evolving tropical organisms, such as corals, to spread worldwide.

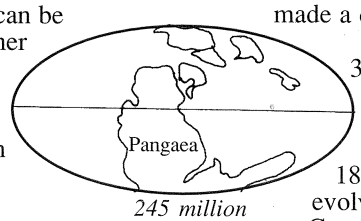
Drifting continents — Australia on the move



500 million years ago

500 million years ago, Australia and Antarctica together enjoyed a tropical climate as they lay close to the equator. Part of the large land mass, Gondwana, they then began to move south.

439-365 million years ago, while most of Gondwana was situated over the south pole, that part which corresponded to northern Australia was still in the tropics but about 363 million years ago it made a dramatic shift to the south.

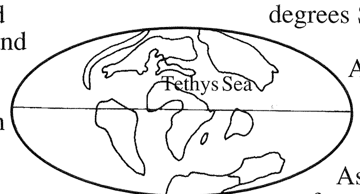


245 million years ago

320 million years ago, Gondwana was part of the super continent Pangaea which began to break up 245 million years ago.

180 million years ago, as modern corals were evolving and spreading from the Tethys sea, Gondwana was breaking into continents which gradually drifted apart.

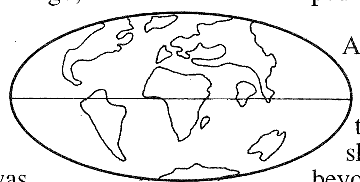
Until about 75 million years ago Australia was joined to Antarctica and most of the continent lay south of latitude 40 degrees South, in waters much too cold for coral growth.



65 million years ago

About 65 million years ago Australia split away from Antarctica and began to move north at about 7cm a year.

As Australia moved north, the continental shelf formed and northern Australia lay close to 30 degrees South. Rivers bringing sediment to the coast helped to build up the continental shelf.


35 million years ago

Australia continued to move north but even when it reached warm waters there was little reef development, except at the northernmost part of the Great Barrier Reef. (Studies, however, have shown that tropical reefs did exist on raised areas beyond the continental shelf.) At this time, about 25 million years ago, the Antarctic ice sheet began to develop, causing sea levels to fall.

Coral reef-building dates back less than half a million years for most of the Great Barrier Reef. Although the youngest coral reef system in the world, it has grown to become the largest.

The past half million years — stops and starts on the GBR

Throughout its history, the Great Barrier Reef has been subjected to the effects of a series of Ice Ages, during which sea levels dropped, alternating with warmer periods when they rose again. These are thought to have been caused by a wobble in the Earth's axis which alters the amount of sunlight reaching parts of the planet.

Layer-cake reefs

With each fall in sea level the continental shelf became a plain across which large rivers meandered, depositing loads of sediment. (Today's figures show that north Queensland rivers deposit an estimated 28 million tons of sediment per year.) Former reefs became limestone hills but weathering, over thousands of years, would have worn them away — it is estimated that as much as 15m of reef was lost to erosion during the last Ice Age. It is also likely that caves, ridges and sink holes, such as we find in limestone areas like Chillagoe today, would have formed.

At the end of each Ice Age, when sea levels rose again, new corals recolonised these bare hills, so many of the reefs we see today are perched on layered foundations representing periods of high sea level growth by their ancestors, separated by erosion surfaces caused by the destruction of that reef during periods of low sea level.

Coral reefs cause global warming?

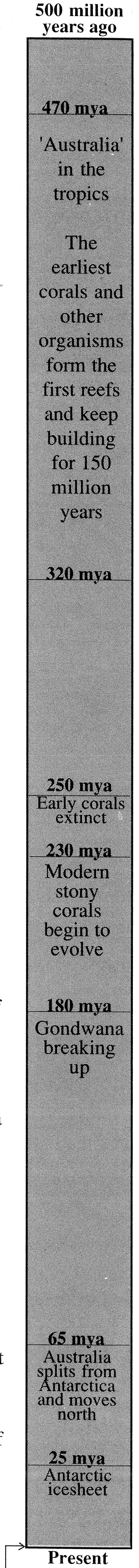
Scientists have been puzzled by high sea levels, up to 20m above present, which occurred 400 000 years ago, at a time when the Earth's tilt should have created cool conditions.

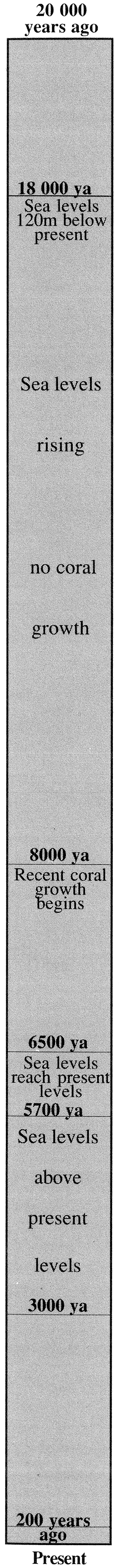
Prof. Peter Davies, of the University of Sydney, has recently suggested that this may have been caused by coral growth. His drilling work has shown that the Great Barrier Reef was beginning to form at about this time and it is likely that active growth was also taking place on other major reef systems around the world. The process of coral skeleton formation results in a release of carbon dioxide, a 'greenhouse gas', and this could have caused a period of global warming. As warmer conditions encouraged yet higher sea levels, more corals would have grown, more carbon dioxide released and a warming cycle created.

Lift out centre pages to see all timelines together

GBR begins to form

Note: mya = million years ago





Timelines on the reef — counting in thousands and hundreds

Fluctuating levels — the latest chapter of GBR history

It is thought that during the last Ice Age sea levels reached their lowest point of 120m below present levels about 18 000 years ago.

When the sea flooded back on to the continental shelf coral growth did not start at once, probably because conditions were not favourable. The ocean entered a landscape thick with river sand and mud as well as nutrient-rich soils created by over 100 000 years of terrestrial conditions. Unfavourable ocean circulation patterns may have prevented coral larvae from reaching the area.

Instead of coral there was abundant growth of the productive limestone-secreting alga, *Halimeda*; extensive banks of *Halimeda* remains, up to 20m thick and dating back 10 000 years, have been found from the northern Great Barrier Reef to as far south as the Swain Reefs.

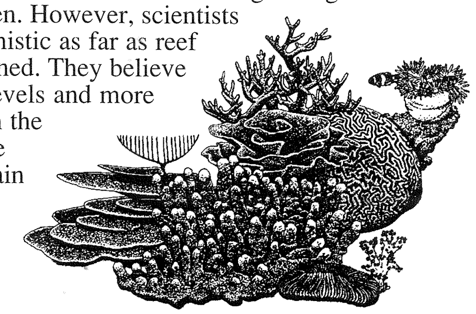
It is unlikely that sea levels rose at a steady rate. In fact, it is thought that they may have even fallen again for a while between 9000 and 8000 years ago.

Coral growth began about 8000 years ago as sea levels approached 20m below present levels. The coastline would have retreated rapidly inland as waters rose quickly on the shallow shelf, restricting the influence of river sediments and freshwater. With this improvement in water quality and, possibly, an influx of coral larvae as the flooding of the Torres Strait created ocean circulation patterns similar to today's, reefs flourished. Up to 80 percent of framework construction seems to have occurred between 8000 and 6500 years ago.

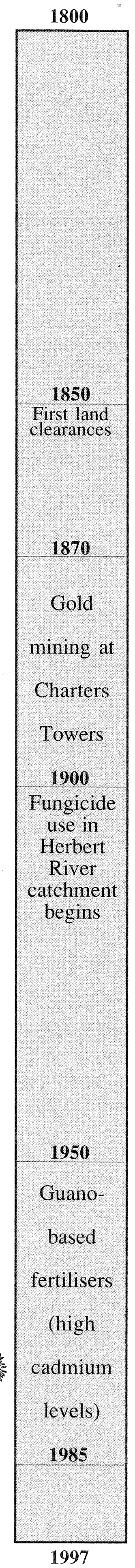
About 6500-6000 years ago sea levels reached present levels. They then continued to rise, reaching a high about 1-2m above present levels about 5700 years ago. They apparently remained at this level for over 1500 years before falling again and stabilising about 3000 years ago. Coral reefs, which had been building up vertically but always lagging behind sea levels, eventually caught up and began to grow horizontally, producing reef flats and the first coral cays.

After this golden age for coral growth, the past 3000 years have seen something of a decline. The stability of the coastline has allowed a build-up of sediments and an increase in nutrients, resulting in a deterioration of conditions for coral growth.

While these natural events have been putting coral growth under increasing stress over the past 3000 years, human activities of the past 200 years, and particularly the past 50 years, have served to further threaten the reefs. Land clearing has increased sediment, nutrient and freshwater run-off with additional nutrients and pesticides coming from agriculture and sewage. How the developing Greenhouse Effect will change things remains to be seen. However, scientists are slightly optimistic as far as reef growth is concerned. They believe that higher sea levels and more storms may flush the area and improve water quality again — a case of one human impact counteracting another.



Note: ya = years ago



Clues in the mud — the modern human dimension

As sediments settle on the bottom of the Great Barrier Reef lagoon they tend to form neat chronological layers. In other words, the deeper the layer, the older it is. Researchers* have recently been taking cores from these sediments and by analysing their contents and applying dating techniques have discovered they contain accurate historical records.

Mud from Bowling Green Bay has shown that while sediments laid down before 1800 were largely limestone-based, there has been an increase of river sediments since about 1850. This coincides with the first land clearances in the area — a time when much more eroded soil would have entered the river systems and been carried to the sea.

At depths of about 2.5m, researchers also found an increase in mercury levels, dating to between 1870 and 1900, a period when gold miners at Charters Towers were using large amounts of this metal. Traces of it had apparently been washed into the sea within only a few years.

High mercury levels, four times those in lower layers, were also found in sediments taken from Missionary Bay (Hinchinbrook). This increase dated from about 1900 and matches the period when fungicides containing the metal were first used in the Herbert River catchment.

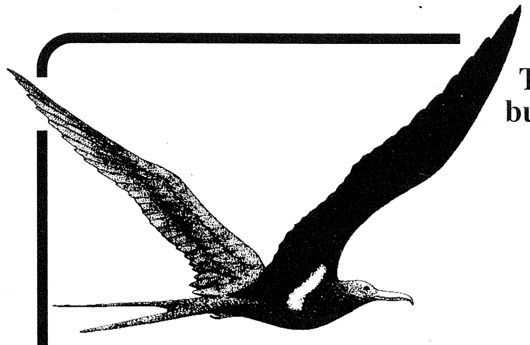
Sediments laid down in the Hinchinbrook Channel since 1950 have been found to contain slightly increased concentrations of cadmium, arsenic, phosphorus and uranium. Cadmium levels show an interesting correlation with the history of fertiliser use in the Herbert River catchment. Levels are at their highest in sediments laid down before the mid-1980s — a period when fertiliser produced from guano (seabird droppings) was extensively used — and then drop again in upper levels which have accumulated since the switch in fertilisers was made and more environmentally friendly green harvesting of sugar cane became the norm.

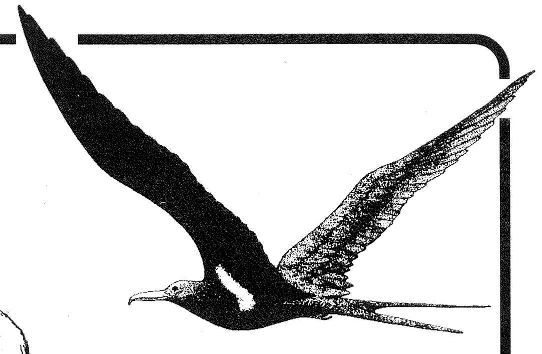
Levels of potentially harmful elements, such as mercury and cadmium, are relatively small when compared with sites in more populated and industrial parts of the world. Nonetheless, they emphasise the fact that the health of the reef is bound up with what happens on the land and that catchment land use practices are one of the main issues affecting the Great Barrier Reef today.

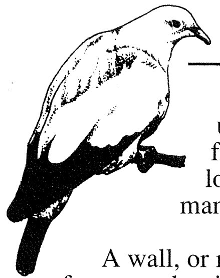
*From the Australian Institute of Marine Science, CRC for Ecologically Sustainable Development of the Great Barrier Reef and CRC for Sustainable Sugar Production.

Today's reef — sitting on the past

The Great Barrier Reef as we see it today is a result of influences both past and present. Reef shapes are largely inherited from those of earlier reefs but are modified by more modern events. Although reefs are very diverse, there are some patterns — we take a frigatebird's eye view.







Low-wooded isles, vegetated with mangroves, are unique to the Great Barrier Reef and are found only from Low Isles north. (Further south rainfall is too low and reefs too far from the coast to support mangroves.)

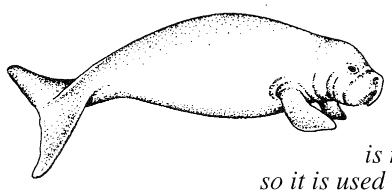
A wall, or rampart, of broken coral forms on the side of the reef facing the prevailing south-easterly winds, breaking wave action. This allows mangroves to become established on the reef flat, often on micro-atolls, and a smaller sand cay to develop on the lee side.

The lighthouse at Low Isles has been built on the sand cay. Nearby, the much larger Woody Isle, is an important mangrove nesting site for pied imperial pigeons.

Micro-atolls are flat disc-like coral colonies which may be found by the hundred in the shallow waters of the reef flat. On reaching the water surface the corals can no longer grow up so expand horizontally, around the radius of the colony, leaving a dead area in the middle. In time this may become hollowed out, forming a little lagoon in which other corals may begin to grow.

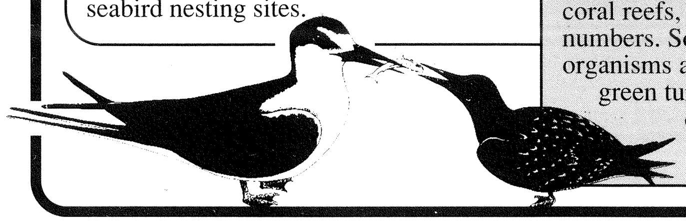
There are no conventional atolls on the Great Barrier Reef. Atolls are found in deep ocean waters and are usually rings of coral which have formed around volcanoes and continued to build upwards as the volcano subsided into the sea. Micro-atolls are so named simply because they look like tiny atolls.

Continental islands are hill and mountain tops which were once part of the mainland before rising sea levels isolated them. Most of the 540 continental islands of the Great Barrier Reef are fairly close to the coast and are more numerous in the central part of the reef.



Cays are new islands which have begun to form only within the past 4000 years or so. They are composed from marine sediments, such as broken coral, shells, coralline algae and foraminiferans, which have been built up by waves on top of the reef flat. Some are mere sand bars which may move and disappear while others are more permanent, covered with stabilising plants and even forests. Cays may be further fortified through the formation of beach rock (see p6).

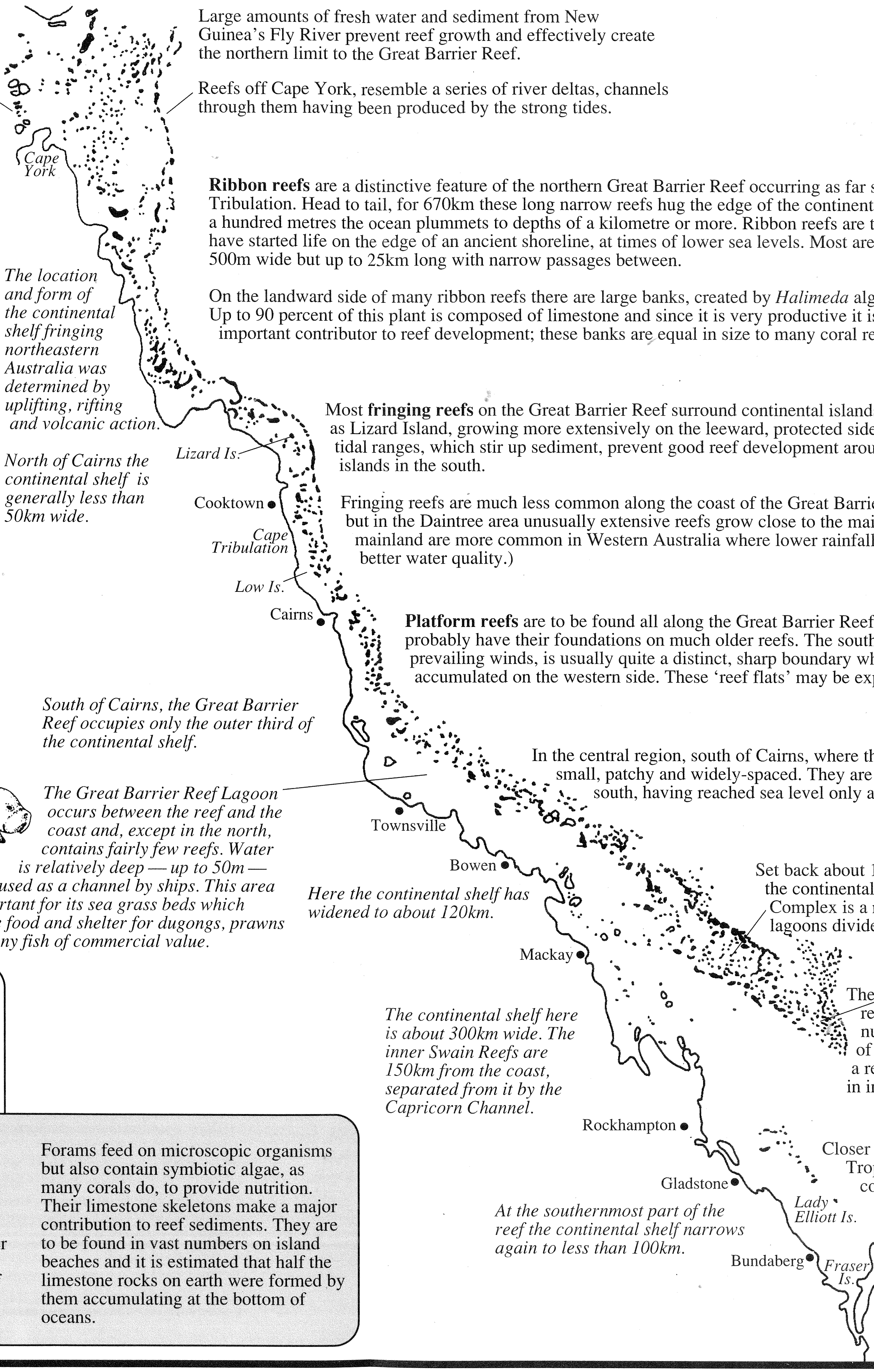
There are at least 240 cays on the Great Barrier Reef. Very few, none of them vegetated, occupy the central section, probably because of irregular reef shapes, high tidal ranges and cyclone damage. Cays are very important seabird nesting sites.



Foraminifera

Known more commonly as forams, these single-celled animals take the form of a jelly-like blob in a hard shell. Although inconspicuous, they are very common on coral reefs, sometimes occurring in huge numbers. Some attach themselves to other organisms and can be found among the green turf and fleshy algae on the reef crest as well as on seagrasses. Others float in open oceans.

Forams feed on microscopic organisms but also contain symbiotic algae, as many corals do, to provide nutrition. Their limestone skeletons make a major contribution to reef sediments. They are to be found in vast numbers on island beaches and it is estimated that half the limestone rocks on earth were formed by them accumulating at the bottom of oceans.



In the Torres Strait strong tides have created reefs which are aligned east-west.

Large amounts of fresh water and sediment from New Guinea's Fly River prevent reef growth and effectively create the northern limit to the Great Barrier Reef.

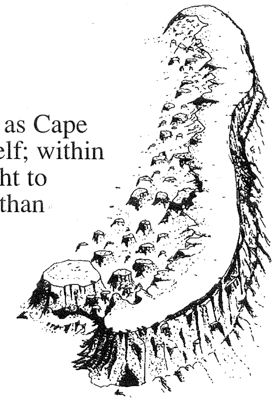
Reefs off Cape York, resemble a series of river deltas, channels through them having been produced by the strong tides.

The location and form of the continental shelf fringing northeastern Australia was determined by uplifting, rifting and volcanic action.

North of Cairns the continental shelf is generally less than 50km wide.

Ribbon reefs are a distinctive feature of the northern Great Barrier Reef occurring as far south as Cape Tribulation. Head to tail, for 670km these long narrow reefs hug the edge of the continental shelf; within a hundred metres the ocean plummets to depths of a kilometre or more. Ribbon reefs are thought to have started life on the edge of an ancient shoreline, at times of lower sea levels. Most are less than 500m wide but up to 25km long with narrow passages between.

On the landward side of many ribbon reefs there are large banks, created by *Halimeda* algae. Up to 90 percent of this plant is composed of limestone and since it is very productive it is an important contributor to reef development; these banks are equal in size to many coral reefs.



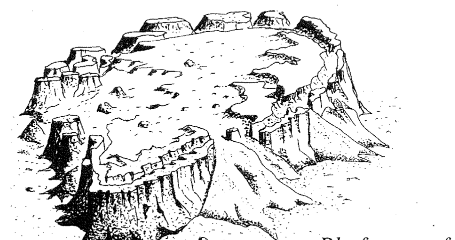
Ribbon reef

Most **fringing reefs** on the Great Barrier Reef surround continental islands, such as Lizard Island, growing more extensively on the leeward, protected sides. High tidal ranges, which stir up sediment, prevent good reef development around islands in the south.

Fringing reefs are much less common along the coast of the Great Barrier Reef but in the Daintree area unusually extensive reefs grow close to the mainland. (Reefs fringing the mainland are more common in Western Australia where lower rainfall and smaller rivers mean better water quality.)

Fringing reef

Platform reefs are to be found all along the Great Barrier Reef. Some are very large and probably have their foundations on much older reefs. The south-eastern edge, exposed to prevailing winds, is usually quite a distinct, sharp boundary whereas sediments have accumulated on the western side. These 'reef flats' may be exposed at low tide.



Platform reef

South of Cairns, the Great Barrier Reef occupies only the outer third of the continental shelf.

In the central region, south of Cairns, where the continental shelf widens, reefs are relatively small, patchy and widely-spaced. They are thought to be younger than those to the north or south, having reached sea level only about 3000 years ago.

The Great Barrier Reef Lagoon occurs between the reef and the coast and, except in the north, contains fairly few reefs. Water is relatively deep — up to 50m — so it is used as a channel by ships. This area is important for its sea grass beds which provide food and shelter for dugongs, prawns and many fish of commercial value.

Here the continental shelf has widened to about 120km.

Set back about 10km from the edge of the continental shelf, the Pompey Complex is a mass of large reefs and lagoons divided by deep tidal channels.

There are three 'blue holes' in the Pompey Complex. These are deep pits, up to 40m in depth, thought to be collapsed caves, formed at a time when this area was above sea level.

The Swain Reefs consist of over 430 small, closely-spaced platform reefs, some with deep lagoons and others with flat tops dotted with numerous sand and shingle cays. The innermost reefs experience some of the highest tidal ranges of any coral reefs in the world (5-6m) and as a result many have terraces built up from algal growth which trap water in internal lagoons up to 3m above sea level at low tide.

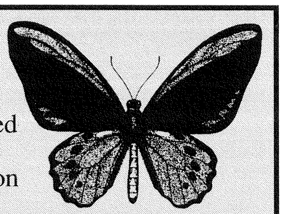
The continental shelf here is about 300km wide. The inner Swain Reefs are 150km from the coast, separated from it by the Capricorn Channel.

Closer to the coast, just 22 reefs and 11 reef shoals, situated across the Tropic of Capricorn, make up the Bunker-Capricorn group, the last reef complex. There are a number of vegetated cays.

At the southernmost part of the reef the continental shelf narrows again to less than 100km.

The Bunker-Capricorn Group is the southern boundary of the Great Barrier Reef. The limiting factor is the huge amount of sand which is transported up the southern Queensland coast, preventing the growth of coral. Fraser Island is created by this sand but further north the coast changes direction, the sand is washed into deeper water, and the Great Barrier Reef begins at Lady Elliott Island.

Questions & Answers



Richmond birdwing

Q How does beach rock and the fossils in it form? Is it different from cay rock?

A Limestone material, dissolved by rain or seawater from beach and cay sands, cements sediment materials together in the lower levels, below the sand. When beach erosion exposes it to the air, a chemical reaction causes it to become as hard as concrete. Sometimes forming extensive pavements, beach rock plays a very important role in stabilising sand cays. Beach rock would not contain fossils because it is too recent.

Cay rock, or phosphate rock, is formed when phosphate from bird droppings binds sand grains together into a hard pan. Like beach rock, it also plays an important part in stabilising cays. At the end of the last century, this material was mined from some cays to be used for agricultural fertilisers; excavated pits remain on some cays.

Q Could you please tell me where I can buy the book *Seaweeds of Australia* by A.J.Cribb mentioned in Bookshelf in *Tropical Topics* 39?

A This book is published by The Queensland Naturalists' Club. It can be obtained from the Club, c/- Dr Woodall, Department of Anatomical Sciences, University of Queensland, QLD 4072. It costs $15 plus $3 postage and handling.

Q I'm confused. I have been told that the Dutchman's pipe vine kills Cairns and Richmond birdwing butterfly caterpillars — but I have also read that it is their food plant.

A There are a number of vines which are closely related and have the same common name; 'Dutchman's pipe' relates to the shape of their flowers. The native Australian pipe vines are the food plants of the caterpillars of these lovely butterflies but some exotic vines, which have been introduced from South America, poison them. The female birdwing butterflies mistake them for the real thing but their caterpillars are poisoned before they reach maturity.

To be sure of growing the safe plant, you need to pay attention to the scientific name of the vine you buy. Between Cooktown and Mackay the best vine to grow for the Cairns birdwing is *Aristolochia tagala*. Another is *Pararistolochia deltantha*, a more slow growing upland plant. Around Brisbane *Aristolochia praevenosa* will feed the much rarer Richmond birdwing.

The most commonly grown South American vine to AVOID (and to pull out if you have it in your garden) is *Aristolochia elegans*. Another, *A. ringens*, has just been identified growing north of Cairns. You can tell these species from the native ones by their heart-shaped leaves which are as wide, or wider, than they are long. Their flowers are much bigger and more rounded than native ones; those of *A. elegans* reach 5cm in diameter while those of *A. ringens* grow to 14cm. Their seed pods are long and thin with straight parallel sides. In contrast to these exotic vines, the native *Aristolochia tagala* has more elongated leaves, much smaller flowers and rounded fruits.

Tourist talk

ENGLISH	GERMAN	JAPANESE	
reef	Riff	reef	リーフ
limestone	Kalkstein	sekkai gan	石灰岩
sediment	Sediment	chindenbutsu	沈殿物
fresh water	Süßwasser	tansui	淡水
Ice Age	Eiszeit	hyogaki	氷河期
sea level	Meeresspiegel	kaimen	海面
continent	Kontinent	tairiku	大陸
continental shelf	Kontinentale Festlandsplatte	tairiku dana	大陸棚
waves	Wellen	nami	波
lagoon	Lagune	showko	礁湖
		or lagoon	ラグーン

Facts and stats

The Great Barrier Reef extends for 2300km over 14 degrees of latitude. Not including the Torres Strait region, reef waters cover an area of more than 230 000km^2, almost 9 percent of which is occupied by reefs or submerged shoals. The Great Barrier Reef Marine Park includes 2900 individual reefs, including 750 fringing reefs. There are about 400 more reefs in the Torres Strait.

The Great Barrier Reef is thin; half a million years of very interrupted growth amounts to a reef no more than 300m thick. Growth since the last sea level rise is 20m thick on average, reaching 30m in places.

The first organisms to accumulate limestone began work long before animals evolved. About 2000 million years ago, stromatolites, blue-green algae, formed stony mounds and columns. Some 1500 million years later, primitive sponge-like creatures (archaeocyathids) became the first animals to produce limestone structures.

At the height of Ice Age glaciation ice more than 2500m thick lay over much of northern America and Eurasia. Today 2.24 percent of the world's water is trapped in the ice caps of Antarctica and Greenland. If it melted sea levels would rise by about 100m.

If Australia continues to moves north at the rate of 7cm a year, in 20 million years the tip of Cape York will lie on the equator and Hobart will have reached the latitude of present-day Sydney.

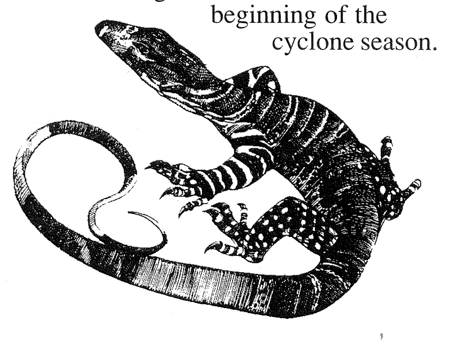
Coral reefs will generally not form in water depths below about 40m, although individual corals can grow below 100m in clear conditions.

Studies from the Atherton Tableland, inland from Cairns, show that until 7800 years ago sclerophyll vegetation dominated in conditions of lower rainfall than experienced today. Rainfall then increased and rainforest replaced sclerophyll. Since sediment is more tightly bound by the greater vegetation cover which rainforest provides it is likely that this helped to improve water quality at a time of flourishing coral growth on the Great Barrier Reef. However, about 3000 years ago rainfall increased again to about 3500mm annually (much more than present). Resulting flooding of freshwater and probably an increase in sediment coincides with a time when conditions for coral growth on the reef deteriorated.

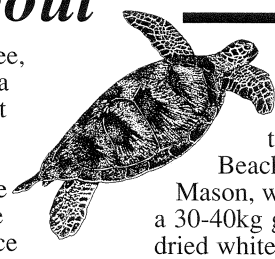
In shallow waters, with 100 percent coral cover, reefs may produce up to 10kg of limestone material per square metre per year. This equates to 7-8mm of vertical growth per year.

Out and about

If you are cutting down a tree, check first to see if there is a termite nest up there. If so it may be occupied by a lace monitor nest — which would obviously suffer if the tree is felled and the termite mound smashed. Female lace monitors dig holes in the mound, deposit their eggs and leave them to incubate within the warm environment. The termites reseal their nest so any sign that the mound has been disturbed and repaired is an indication that eggs may be incubating inside, a process that may take as long as ten months. The safest time to fell trees, from the lace monitors' point of view, should be about October-December, before the next mating season — and at the beginning of the cyclone season.

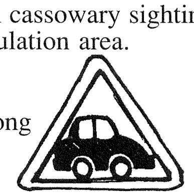


If a tree with a termite nest on board falls it is a good idea to examine it. If it contains eggs which have not been damaged call the Wildlife Care Group on 015 962 075 or take them to the nearest wildlife park. Bear in mind, however, that keeping them would constitute an offence under the Nature Conservation Act.



In April, after a number of tourists had reported a large white turtle stuck on the fringing reef at Myall Beach, local resident, Lawrence Mason, went to its rescue. He found a 30-40kg green turtle, encrusted with dried white salt and sand, which was 'hot but very much alive'. It wasn't trapped in fishing line or net and there was no evidence of disease or infection so Mr Mason helped the animal into deeper water. After a minute's hesitation it dived and swam away strongly. The combination of rough seas and low tide may have trapped the turtle inside the reef and, once stuck on slippery coral, it hadn't been able to get a grip with its flippers.

As the weather cools and dries, a change in animal behaviour may be observed. Echidnas, some of them very small, have been appearing, black-necked storks (jabirus) and ibis have started to return to coastal regions and there has been an increase in cassowary sightings in the Cape Tribulation area.



If you are driving along the road please be careful, especially where signs indicate cassowary crossing points. Observing the 40kph speed limit could prevent a repetition of a recent accident which involved a bus and a cassowary.

COASTCARE

Community groups take note! Coastcare is an exciting funding program that encourages communities to get together to identify local environmental problems and take action to repair them. Coastcare provides opportunities for community groups to do projects on public land, a different concept to Landcare which generally grants private landowners funding to do work on their own land.

Community groups liaise with their local land manager to work on activities that are of priority to the community in a way that will not conflict with local management plans. Groups and local managers can also work co-operatively on Coastcare projects with sponsorship from industry.

Tropical Queensland has about 43 Coastcare projects happening right now. The most recent funding successes were announced recently.

The 1997/98 funding has been advertised and the closing date for applications is 25 July. All interested groups should contact their closest Coastcare Facilitator.

Jana Kahabka, Facilitator for Indigenous Communities (Statewide): Ph (070) 523043 Mobile 017 722 461

Deb Langley, Facilitator, Far Northern Region: Ph (070) 523043 Mobile 017 722 460

Tania Ashworth, Facilitator, Northern Region: Ph (077) 225211

Conference corner

The Marine Teachers Association of Queensland
Reef and Rainforest Conference
St Augustine's College, Cairns
4-7th July
Cost: $250 residential
$210 non-residential
Aimed at anyone with an interest in marine education, the conference will showcase advances made in marine studies throughout Queensland. The conference opens on Agincourt Reef, with further excursions to look at aquaculture, management, conservation and mangroves as well as a sunset cruise on Trinity Inlet. Optional pre-conference events on 3-4 July include a snorkelling instructors course and the GBRMPA Reef Interpretive Course.
Further details: Gwen Connolly, Ph (070) 529146; Fax (070) 315465

Australian Women in Archaeology Conference
Feminism on the Frontier
Kuranda Rainforest Resort
Field Trip: 30 June-2 July
Conference: 3-6 July
Cost: Field trip: $350
Conference: $140 (waged)
$100 (unwaged)
The three-day field trip will visit places of Aboriginal and non-Aboriginal significance at and between Kuranda, Laura, Cooktown, Atherton and Yungaburra.
The conference dinner will be held at the Tjapukai Aboriginal Cultural Park.
Further details: Jillian Comber, Ph (070) 52 3069; Fax (070) 52 3080; e-mail Jillian.Comber@env.qld.gov.au

Interpretation Australia Association National Conference
Big ideas ... small budgets
University of Queensland
28 September-1 October
Earlybird rates for fees paid before 31 July.
Further details: Pamela Harmon-Price, Ph (07) 3227 7710

1997 is the **International Year of the Reef**. For news of associated activities, contact Will Jones at the University of Sydney, Tel (02) 9351 5636, Fax (02) 9351 4119 — or have a look at the special website on http://www.coral.org/IYOR/