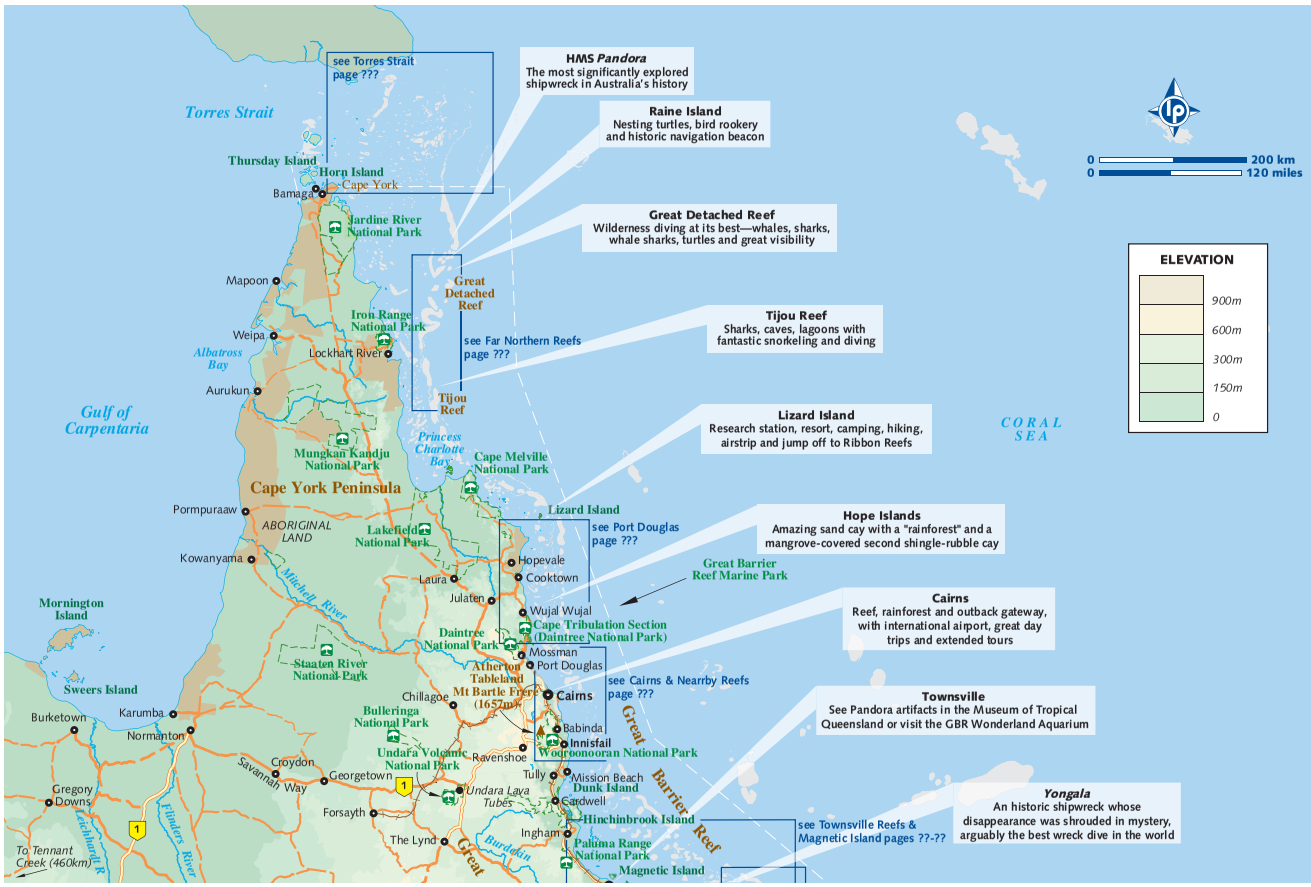

Author

LEN ZELL

Len's passion is in the interpretation of coral reefs and the natural environment. As a biologist he has worked on coral reefs for more than 35 years. Len wrote the first edition of this book, Wild Discovery Guides' *A guide to the Kimberley Coast Wilderness* and the soon-to-be-released *Australian Wildlife – Roadkill,* and co-authored Wild Discovery Guides' *Shark Bay-Ningaloo Coast & Outback Pathways WA* with Susie Bedford. Additionally, he has co-written his family history, *Truth Prevails,* edited and published his parent's biographies, *Andy* and *Dulcie* and is presently writing a book on Australian desert tracks with Ian Glover.

Len has been a lecturer and field guide for many expeditionary cruises, private super yachts, luxury cruise lines and outback walks. Two species of coral, *Australogyra zelli* and *Pocillopora zelli,* were named after him for his contributions to marine science.

Len has dived, researched and run educational programs on the Great Barrier Reef, Lord Howe Island, Papua New Guinea, Line Islands, French Polynesia, Cook Islands, Pitcairns, Easter Island, Tonga, Fiji, the Red Sea, Mediterranean and Caribbean. Len has also appeared in documentaries on Channel 9, Discovery Channel, Ushuaia TF1 France, Fox, BBC and many news and current affairs programs.

Len is a skilled lecturer, underwater photographer and adventurer, and was chairman of Dive Queensland for two years and served on the Council of the Australian College for Seniors for two years.

He worked for six seasons on the Queensland Museum's HMS *Pandora* expeditions and was a director of the Pandora Foundation for four years. At the University of Queensland he established AustraLearn, bringing in US students, and TraveLearn, a high quality ecotourism program.

Len has recently returned from an Antarctic expedition and continues to travel around Australia and undertake many expeditionary opportunities.

FROM THE AUTHOR

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The Great Barrier Reef offers thousands of kilometres of dive site possibilities

Introduction

The Great Barrier Reef (GBR) extends along the northeastern Australian coast from Lady Elliot Island in the south, almost to Papau New Guinea in the north. The world's single largest living system, the reef is part of the superb Indo-Pacific coral reef systems, extending from the Red Sea to Easter Island.

Australia, the island continent, is the most desirable tourist destination in the world. Yet many travellers are daunted by the long haul of jet travel it takes to get to this wonderfully unique and friendly country. Those who do make the trip find the effort well worth it. Sophisticated, modern cities and remote country towns lie adjacent to scorching deserts, rolling green and brown pasturelands and winter snowfields. The extremes of climate supports mining, vineyards, crops of all varieties, a profusion of strange wildlife, and a unique human history woven out of the world's oldest human culture, isolation and multiculturalism. All this and some of the best, most accessible diving found anywhere in the world.

Australia has superb diving around its entire coast and in several inland freshwater cave systems, but the big drawcard is the Great Barrier Reef (GBR) – the world's largest and best known reef system. Bigger than Britain, almost the size of Texas (but a lot deeper!) and stretching 2300km (1429 miles) from north to south, the GBR is enormous. This book concentrates on the GBR Province, which encompasses an area of over 1 million sq km (386,109 sq miles), including the whole GBR, nearby Coral Sea reefs (under Australian jurisdiction) and the Torres Strait (under joint

Divers can explore an enormous variety of coral reef habitats

jurisdiction with Papua New Guinea). Most people consider the Great Barrier Reef as being the area that lies within the GBR Marine Park Region (south of 10°41'S at the tip of Cape York Peninsula), whereas the GBR does in fact extend well to the north of here.

Even though the area is lauded as the best protected marine area in the world, it is under severe pressure. Since humans began harvesting marine species, occupying the nearby coast and agriculture about 180 years ago, the near-shore systems have almost totally deteriorated while the mid-shelf and some outer-shelf systems continue to degrade today – some at alarming rates.

Pressures include long-term insidious coastal runoffs, the resuspension of sediments and removal of harvested species and by-catch, through trawling, cyclones, storms, bleaching events, coral growth and crown-of-thorns sea star invasions, which combine with time and the passing of seasons to continually change the appearance of each reef and its surrounds.

The GBR is alive with about 400 species of coral, 2000 types of fish, 4000 molluscs and countless other invertebrates. Six of the world's seven species of sea turtles breed here, and the diversity doesn't stop there. GBR habitats support a myriad of parasitic and single-celled organisms that free-float in the warm tropical waters – between the sand grains, in and on mud flats and seagrass beds, and among reefs and rocks. All play an important role in the complex food chain and transfer of genetic material throughout the system.

The islands of the GBR range from small, bare sandy 'deserts', often swept away with major storms, to lush rainforest or mangrove masses. Some are home to nesting seabirds and a vast array of wildlife.

Between the reefs and islands are shoal areas of coral and algae (bioherms), with incredible bottom-dwelling animals living on the mud, sand, algal and shell substrates.

With a huge variety of habitats stretching across the continental shelf, the potential for diving, snorkeling and scientific discovery is immeasurable. Those who have dived the GBR thousands of times have only glimpsed the whole system – there are about 3000 reefs!

Many people describe the GBR as having the best diving in the world – it has the potential for that title simply because of its size, accessibility, habitat and species diversity. Keep in mind, however, you will not necessarily experience 'brochure weather' – when clear sunny days, calm seas and beautiful people all come together.

To really discover the GBR, you need to be willing to experience it in all weather and seasons. Stick by the old sayings, 'The best diving is in the water' and, 'A bad day's diving is better than a good day's work,' and the GBR will not let you down.

In this guide book, accessible sites are described to enhance your understanding and enjoyment of the GBR's unique ecosystems. In addition, you'll get a brief overview of the primary accessible Coral Sea reefs. For organisational purposes, the dive sites are divided into nine regions and surrounding areas. These include the Capricorn and Bunker Groups (in the south), the Swain Reefs, Pompey Complex, Whitsunday Islands, Townsville and Magnetic Island, Cairns, Port Douglas, Far Northern Reefs and Torres Strait. Several adjacent, regularly dived Coral Sea Reefs also appear in this book.

Some of the sites described are what we refer to as supersites, which give you the choice of diving the whole area or a smaller portion.

Specific information is provided on each dive site. Further details are also included on the behavioural patterns of some of the marine life you can expect to see at various sites, informative notes on reef formations, depth, and recommended diving expertise. There is also some historical insight into some of this area's most famous shipwrecks (the GBR has tortured navigators for centuries!).

When it's time to dry off, turn to the Travel Facts chapter for helpful topside information.

Facts about Australia


Aussies love the outdoor life

Known as the dry continent, Australia is as big as continental USA and hosts the world's longest surviving human culture. The Aboriginal people arrived more than 50,000 years ago from SE Asia, possibly during a low sea stand during an ice age. It is estimated that the Aboriginal population exceeded one million and was divided into more than 700 clans, each in essence a nation with their own land and dialect of one of around 250 languages. Sadly, much of their cultural and practical knowledge has been lost. James Cook recorded that the Aboriginal people were far happier than he and his fellow English, were well fed and had no 'superfluities' – maybe a message for us today!

The Aboriginal people had many trading networks across the continent and also into SE Asia. They retained information about their travelling routes, food, land boundaries, history, culture, religions, laws and fun in songs. To move through the land of others, they carried message sticks like a passport. This knowledge was occasionally supplemented with paintings in caves and overhangs and many symbols carved into rocks – known as petroglyphs. These works are often referred to as art, though some people believe that term is inappropriate as the works have much deeper meaning than simply 'art.'

The first recorded European discovery of Australia was by Dutch and Portuguese sailors in the 1600s, and New Holland was claimed for the British by James Cook in 1770. It has been suggested by some historians that the Chinese mapped Australia's shores, along with most of the world, in the 1420s. Meanwhile, Macassans had been harvesting and camping on the Australian coast for thousands of years.

Europeans began to arrive in larger numbers from 1788. Since then there have been massive changes. Diseases killed off most of the Aboriginal and Torres Strait Islander populations and those that survived were often shot, poisoned or relocated, which destroyed much of their culture and connection with the land.

Recently, Aboriginal land rights have been exercised, allowing traditional owners access to their traditional lands. Many regard the original concept of Australia as terra nullius (land without owners) as a farce and that the original inhabitants illegally lost their lands.

Many of the early European arrivals until the mid 1800s were convicts and their overseers. A continued influx of immigrants gradually brought new arrivals from all over the world, creating the multicultural mix we see today. As an example, Broome in Western Australia has more than 55 different languages spoken in a town of about 15,000.

In 1901, Australia was declared a Federation of States and the present political system established. Since then a two-party system of adversarial government at the federal, state and local levels has been in operation. The conservative government in power at the time of writing was following closely in the footsteps of the US and Britain.

Agriculture and mining were the first major industries, and fishing, trochus shell, turtle and pearl harvesting were directly associated with the Great Barrier Reef (GBR). Today, tourism and technology have added to the primary industries, but detrimental impact on the environment and atmosphere has continued to increase.

Early Australian settlers razed massive tracts of land, at the cost of the Aboriginal inhabitants, for sheep and later cattle grazing. In the 1930s, the spread of the European rabbit and drought turned much of the country into a dustbowl – a state from which it has yet to recover. The fragile, shallow soils continue to degrade as those with the knowledge of sustainable use desperately try to educate the users of the land and the politicians. These issues of land and water management, coastal run-off effects and overexploitation of natural resources are looming large as massive issues that need to be addressed. Add to these issues the ageing population, and Australia can be seen to be on the cusp of massive changes.

Australia's population is about 20.5 million, mainly concentrated in urban areas (85%) on the coastal fringe, particularly on the coasts of southern Queensland, NSW, Victoria and SW Western Australia. About 25% of the population are first or second generation new settlers with more than 40% of mixed racial origins. The population density of 2.5 persons per square kilometre is one of the world's lowest.

Facts about the Great Barrier Reef & Coral Sea

Pastel reef colours always impress divers and snorkelers
Photo: Andy Lewis

The Great Barrier Reef's waters extend from Lady Elliot Island in the south (offshore from Bundaberg) and north to Bramble Cay and Black Rock in Torres Strait, almost to Papua New Guinea. The GBR should really be named the 'Great Barrier of Reefs' as about 3000 individual reefs – and some 900 islands – are scattered along the Queensland Continental Shelf, with an average water depth of 40m (130ft).

The shelf ranges from as little as 23km (14 miles) wide between Cape Melville and Tydeman Reef, up to 270km (168 miles) wide between Cape Clinton (north of Gladstone and Yeppoon) and Elusive Reef (to the east of the Swain Reefs). This outer edge of the GBR and the continental shelf is fringed by the Queensland Trench, which is up to 2km deep.

East of the Queensland Trench, the flat-topped Coral Sea plateaus give rise to the Coral Sea reefs and atolls. Note that there are atolls in the Coral Sea, but none within GBR waters. About a third of GBR reefs are fringing reefs, dotted along the mainland coast and around most of the mainland type islands. The other two thirds are crescentic, platform, lagoonal or ribbon reefs scattered on the edge of the continental shelf – many with lagoons and/or coral sand bars or cays.

Although the GBR is part of the Coral Sea (which in turn is part of the Pacific Ocean), in this book 'Coral Sea' is used to describe the area of reefs and islands outside the 500m (1640ft) depth contour of the GBR.

Those Coral Sea dive sites that are outside the GBR boundary include a series of atolls and associated islands within Australian territorial waters. Coral Sea reefs covered in this book include Flinders Reefs, Holmes Reef, Bougainville Reef and Osprey Reef, with Bramble Cay in Torres Strait under joint Australian and Papua New Guinean jurisdiction.

The GBR is intimately linked, by the ocean waters and currents, to all other reef systems in the Indian and Pacific oceans. For this reason, most species found in the Red Sea, Hawaii and southeast Pacific have the same or similar species as the GBR. There are few similar species found in the Atlantic Ocean and Caribbean Sea. The centre of diversity of all marine species is in the Sunda Sea in Indonesia and as you move away from there, the number of species diminishes.

Atolls, Cays or Mainland Islands – What's the Difference?

Fairfax Islands and Reef are jewels in the Capricorn Bunkers

Coral Sea Atolls Unlike true coral atolls – ring-like coral islands on reefs that nearly or entirely enclose a lagoon formed on top of a sinking volcano – the outer Coral Sea reefs are a series of reefs surrounding a lagoon on a submerged mountain top or plateau. The inner Coral Sea reefs to the north and south are more like true atolls.

Continental or Mainland Islands These islands are remnants of the mainland, protruding above the sea from the continental shelf. Usually volcanic or sedimentary in origin, they support quite different animals and vegetation than cays. The reefs around these islands are there as a result of the island – the reefs having grown out from the island.

Coral Cays Pronounced both 'kays' and 'keys', cays are there as a result of the reef, formed by debris piled up from the reef tops and edges. This debris is composed mainly of dead coral, shells, calcareous algae and fabulous little single-celled animals called forams. Cays range from pure soft 'coral' sands to those of shingle, rubble and boulders. Some cays, such as Turtle Islands in the north, show remnants of the old fossil reefs from the 2m-higher sea levels of 5000 years ago.

Rainforest, grassy, herbaceous and mangrove plant communities grow on GBR cays, many of which are important bird and turtle nesting areas. Many support vastly different plant communities due to their rainfall and isolation. Green, Heron and Lady Elliot islands are all coral cays, while the mangrove cays at Low and Hope Isles and other reefs to the north, are primarily shingle and rubble, perched on top of coral reefs. Snorkeling in the mangroves is an amazing experience – with corals and shells growing on mangrove roots, horseshoe clams, mini coral heads, seagrasses, upside-down sea-jellies and masses of fish, they're a far cry from the generally held idea of mangroves as muddy, smelly places.

HISTORY

About 18,000 years ago, at the end of the last ice age, sea levels were 130m below present. As the ice melted it caused the sea level to rise at an average of 1.3cm per year. During this time, there would have been periods of rapid rises at a rate faster than walking pace – especially across the flat sections of the shelf. At other times the sea level would have remained stable for extended periods or even fallen. Around 5000 years ago, the sea level was 2m above present levels, then dropped to about the current level, rose again to 1.5m above present, then fell again only to rise 80cm about 1000 years ago.

At least 50,000 years ago, probably during one of the ice-age low seastands, the first Australians made their way across land bridges into Australia. Some suggest this occurred in at least three waves. These early inhabitants were likely coastal dwellers who would have initially lived at the edge of today's continental shelf, on areas 130m (420ft) below today's sea surface. As sea levels changed, further migration would have occurred across the submerging coastal plain, away from the old shelf-edge fringing reefs, past the disappearing fossil reefs (which would have resembled flat-topped limestone hills), to the coastal and island situations we see today.

More recent human history suggests the northern areas were used up to 5000 years ago by the Macassan people – a seafaring group with a now traceable genetic presence to the coastal Aboriginal people. Many fishermen from Indonesia today cause problems for Australian Customs and Fisheries as they continue to work these traditional waters.

Gavin Menzies, in his book *1421*, suggests with good evidence that the Chinese had mapped most of the world in the 1420s, and that future explorers had maps from these Chinese expeditions. Certainly Cook recorded in his log that he expected the now-named Endeavour River, where they careened the Endeavour, to be larger.

The first recorded European visit to the (northern) GBR was probably by Portuguese Manoel Gidinho de Eredia in 1601, although there is strong evidence that fellow Portuguese had visited up to 50 years before. A Spaniard, Luis Vaez de Torres, passed through Torres Strait in 1606 but it wasn't until 1770 that Lieutenant James Cook made the first fully recorded 'discovery' of the GBR. Cook had passed through almost two thirds of the complex before he ran aground on it, giving him a good understanding of the problems later navigators would face. He described it as a labyrinth – a term appropriate to this day.

Many others followed. Two outstanding events included William Bligh's longboat voyage through the area (after the *Bounty* mutiny) in 1789. This voyage produced a quality chart from Bligh Boat Passage and Restoration Island, at Cape Weymouth, to the north. The second event was the wreck of the *Pandora,* which ran aground and sank on the northern GBR in 1791, taking four of the 14 mutineers from the *Bounty* and 31 crew members with her. The *Pandora* wreck, is now well studied and its artefacts are on display in Townsville.

The *Pandora's* cat was on the topmast the morning after the sinking, but there is no record of it after that.

Matthew Flinders, another great navigator, explorer and scientist, circumnavigated and charted Australia for the British Admiralty during many years. In the early 1800s he charted much of the southern GBR shipping route, its coast and islands, and parts of the Coral Sea. He left the GBR through what is now known as Flinder's Passage. Much of his work was still seen on charts until recently, when satellite imagery and sophisticated side-scan sonar systems replaced the older works.

It wasn't until Lt. Charles Jeffreys, on the brig *Kangaroo,* bravely sailed and charted the inner route in 1815 that more sizable ships were able to take the calmer inside route along the GBR. Jeffreys was followed by fellow navigators Phillip Parker King in the *Mermaid* in 1819 and many others.

Once most of the routes were charted, it was possible for more exploration and, inevitably, exploitation of the area to begin. Beche-de-mer, pearl, turbo and trochus shell harvesting, and guano mining meant many smaller vessels were now plying the waters in addition to passing ships. Scores of ships of all sizes were wrecked during these times and many remain undiscovered.

Much of the older harvesting methods have been improved. Some beche-de-mer fishery continues, and pearl and trochus harvesting still occurs in the north. Today modern vessels sweep large areas of the sea floor and shelf between the reefs, trawling for prawns, scallops, crabs and Moreton Bay Bugs. There has been a major push to reduce this activity due to the destruction of habitat and wasteful by-catch – the discarding of unwanted animals weighing up to 10 times more than the intended catch. An increasing number and variety of small vessels fish for live coral trout, reef fish and the pelagic mackerel and tuna.

By far the greatest use of the reef today is tourism and recreation, with thousands of people visiting the reefs daily.

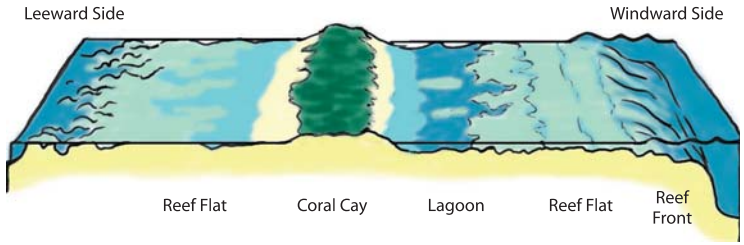
With the increased use of the nearby coast and the GBR came the need for management. Through the late 1960s and early '70s concerns about limestone mining, oil drilling, general degradation and reef overuse grew. Public concern prompted the establishment of the Great Barrier Reef Marine Park Authority (GBRMPA, known locally as 'ga-broom-pa') in 1975, set up to manage the waters around the GBR. The Queensland National Parks & Wildlife (QNPW), an offshoot of the Department of Environment, manages the GBR 'lands'. Obviously, the land and water areas overlap, so there is much cooperation between these two organisations, with QNPW undertaking the day-to-day management of the whole GBR Region.

Note: the area within the so-named GBR Marine Park Region is often used to describe the whole GBR, when it in fact leaves out the large area north of 10°41'S – from Cape York to Papua New Guinea. Bear this variance in mind when you see GBR statistics. This book refers to the entire GBR, including the northern Torres Strait section.

Divers, whose personal experiences or baselines of the GBR started around 1970 (as did this author's), have seen it

Pink lace coral is common in GBR overhangs

Geography



What is a Coral Reef?

The reefs of the GBR are a thin veneer of living coral, algae and other marine life on top of what could be described as the world's largest rubbish dump. As the corals grow, their symbiotic relationship with the single-celled algae – zooxanthellae – in their tissues produces several waste products. One of these wastes is calcium carbonate, or limestone. As the living layer of corals dump this limestone, each species uses a different stacking design for the crystals. This is what gives us the great and beautiful diversity of hard white coral skeletons.

As the colonies of coral die or are smashed by cyclones or storms, killed by polluted fresh, hot or cold waters, or eaten by parrotfish or crown-of-thorns sea stars, they leave their bleached skeleton behind. These skeletons make ideal settlements for many organisms that cement into the matrix of materials that form a reef. Each reef is thus a jumble of bits and pieces.

Waves and currents are the major factors determining the shape of any reef. Reefs of the GBR tend to have a southeasterly face, which is hammered most of the year by the prevailing southeasterly winds and resultant waves. This leads to the smooth algal rim on the top edge. Spurs, grooves, channels and notches follow the slope down to many different structures determined by depth, location, wave action and currents. Coral and algal structures on the reef fronts tend to be solid and smooth. On the 'back' of the reef we find fragile staghorn coral thickets, shallow plate corals, sand slopes and isolated coral heads (bommies). Occasionally a cyclone or severe storm will bring severe wind and waves from the north or northwest, which can devastate a back-reef edge in a matter of hours. These storms throw large reef colonies onto the reef forming boulder fields.

A reef is like an enormous ocean filter, well described as a 'wall of mouths'. With the high capture rate of nutrients and growth rate of corals and algae, coral reefs are highly productive systems.

The speed in which corals and other reef organisms grow, are smothered, buried, broken or otherwise altered is mind boggling. Different times of day, tide, year, El Niño, La Niña, crown-of-thorns invasions, cyclonic or storm damage, bleaching events or coastal run-off all contribute to this constantly changing world. Just as the coral species and animals determine the shape of the skeleton, the force of the waves and wind determine the shape of the reef and its features overlying the hidden fossil past.

visibly degrade since then. Saying that, it had been subjected to almost 150 years of human impact prior to then, so they were seeing an already severely degraded system. Many argue that the coastal and nearshore systems should never have been included in the declaration of the GBR World Heritage Area as they are so badly degraded. Since the declaration of the GBRMPA there has been a doubling in the insidious coastal runoff effects (faecal matter from grazing animals, fertilizers, pesticides, fungicides and silt from farming and even dog droppings from suburbia!).

Fringing reef corals continue to survive despite heavy sediment loads Photo: Andy Lewis

On one dive on a mid-shelf reef during the research for this book, the author wrote a note on his slate: 'this reef reminds me of a friend with some insidious cancer – I know they are sick but I don't know what from'. Unfortunately there is insufficient political will to address the issue.

The GBR is only about 500,000 years old. The last series of four ice ages began about 500,000 years ago. After the last ice age – ending about 18,000 years ago – the sea levels rose from 130m below present at an average of about 1.3cm per year for 10,000 years, causing the old fossil reefs to submerge. Sea level reached its present height about 6-8000 years ago, rose 2m 5000 years ago, fell to present level before rising again 1.5m 3000 years ago and fell again before rising 80cm about 1000 years ago. A new veneer of coral grows over the fossil remains of the reefs during each period of submergence and erodes by wind and rain during the dry periods of exposure.

Earlier ideas had the origins of the system from two million years old in the south, and up to 12 million years in the north, due to Australia's slow drift of around 8cm to 10cm per year into the warm tropical waters. Depths of old reef growth vary from 1500m (4921ft) in the Gulf of Papua in the north, 250m (820ft) off Townsville (roughly the middle of the GBR) and 150m (492ft) near Heron Island in the south.

Not a lot of evidence of the ice ages can be 'seen' in the fossil reefs below the latest growth. This lack of evidence is due to erosion that took place while the reefs were dry during the last ice age, when the sea level was 130m (422ft) below its present level. The erosion is evident in layers of land sedimentation over and between the superimposed reef surfaces. Old river beds are still seen in underwater sonar scanning and seismic profiling out to the edge of the continental shelf, between present-day

A dry reef crevasse in 300-million-year-old fossil reef at Windjana Gorge – Western Australia lets divers walk through what they see underwater


Coral cays are great indicators of geological changes on reefs and important bird nesting and resting sites

reefs. Recent drilling has also found charcoal and mangrove mud below the reefs and underneath the older fossil reefs. Reefs today expose only about a fifth of their total structure – the rest is hidden below the shelf mud, sand and other sediments, washed there during the dry ice ages.

Differing rates of submergence, coastal and tidal affects have caused the great variation in reef structures today. Some are flat-topped platforms of reef. Others are confused masses of little reefs gradually growing together on top of an old submerged reef surface. These are also reflections of the rising or sinking of the coastal edge caused by buckling of the Australian plate.

Archaeologists continue to search for submerged caves on the GBR that may have indications of dry periods and, of greatest excitement, human presence. Caves on Tijou Reef (**Mr Walker's Caves** dive site), may hold some clues to dry periods. Initial research indicates an accumulation rate of about 1m of sediment in the caves for each 1000 years of submergence, with samples cored to 3m so far.

CLIMATE

Weather on the GBR is said, by the locals, to be predictably unpredictable – always expect the unexpected. Being in the southern hemisphere, GBR seasons are the reverse of those in Europe and the US – summer is December to March and winter is June to September.

Because of the length of the GBR, which exists between 9° and 24.5° south (the same distance as New York to Miami, Florida, or the same latitudes and distance as Miami to Trinidad) there is a significant difference in the weather from the north to south. Almost all the GBR complex is in the tropics, except for the reefs south of Heron Island,

Tide Talk

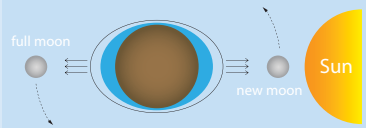
The gravitational pull of the moon and position of the Earth in relation to the sun drive tides so they change throughout the month and year. When the sun and moon are in line, spring tides occur and when at right angles to each other, neap tides occur. Accurate tides tables are available for most of the GBR, but turn to the locals for subtle regional variations. Look for the moon for a fun way to tell approximately where the tide is – a rising moon on the horizon is low tide, mid tide rising is when the moon is at 45°, full tide when directly overhead, mid tide falling at 45° in the west and high tide again at moon set.

Divers like to plan their diving around the neap tides to ensure maximum visibility and lower tide flow. Spring tides bring dirtier water, stronger currents and often worse weather. The GBR generally has tidal changes twice daily – two highs and two lows. At Thursday Island they appear almost random due to the connection, through Torres Strait, between the Coral and Arafura Seas.

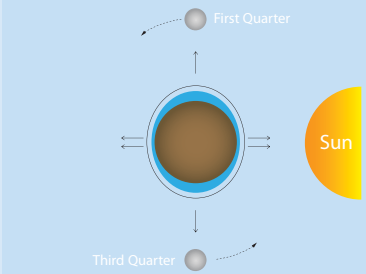
At the southern end of the reef and at Townsville, the maximum tide change is about 3m (9ft). As you move toward Broad Sound (between Mackay and Rockhampton), the ranges increase, and usually decrease moving away from the coast. Outside of Broad Sound it is not uncommon to get currents of up to 15km/h (9mph). Local dive operators know how to avoid the channels, so don't be concerned – just listen to the briefings.

Drift diving with the tidal currents is a great way to go, but always dive with a 'safety sausage'. Learn how to recognise good safety holds on the bottom, plan your dives, have good surface back-up and you'll be set for some great drift dives. Many divers now dive with a small reef hook, which allows them to hang onto the reef without damage.

Spring Tides



Neap Tides




Watch aggregations of fish above coral as they will often show breeding behaviour Photo: Andy Lewis

A branching turret coal filters the passing current for food and light

which straddles the Tropic of Capricorn, so anything below Lady Elliot Island is considered 'sub-tropical'. Distance from the coast and sea-states also influence the weather.

Summer northwest monsoons – seldom extending south of Mackay – give the north a distinct wet season from December to March. It is usually hotter and wetter in the north, with Australia's highest rainfall area on the coast at Tully, just south of Cairns. Humidity during the wet season can be oppressive for short periods, but being on an island or at sea on a boat allows you an escape from the less comfortable weather on the mainland. July to September is drier. Temperatures are cooler in the south – as low as 14°C (57°F) on Lady Elliot Island – and significantly colder on the mainland where there are almost four full seasons.

Winds vary from long periods of calm with occasional medium to strong, but usually gentle, winds – October to February – to cyclonic (hurricane) conditions, which can occur from December to April (a highly effective cyclone warning system is in place in the Pacific). The benefits of diving at this time of the year far outweigh the disadvantages – if there is a cyclone around and you aren't too close, you'll usually have superb calm weather. The prevailing southeasterlies blow from about April to October but can occur any time. Fortunately, most reefs offer a protected side regardless of wind direction.

The water temperature tends to lag behind the air temperature for about one to two months as you go south. The water is warm all year round in the north, from about 24° to 30°C (75° to 86°F). As you head south it gradually gets cooler, dropping to 20° to 28°C (68° to 82°F) in winter.

GBR waters are well mixed so there is usually no distinct thermocline (temperature change) as you go deeper. Thermoclines still occur on hot still days with minimal tide changes or where the colder oceanic waters slop up onto the continental shelf, beneath the warmer shelf waters.

Brochure photographs never reflect the true variability of the GBR's visibility. In coastal areas it is common to have 1m to 3m (3ft to 9ft) visibility, then up to 8m to 15m (26ft to 49ft) just a few kilometres offshore, and 20m to 35m (66ft to 115ft) on the outer edge. In the Coral Sea, 50m (164ft) visibility is common.

Snorkelers delight in GBR opportunities
Photo: LPI