

Great Barrier Reef Reference File



GREAT BARRIER REEF Reference File

This new Reference File provides you with easily accessible information related to the Great Barrier Reef and the Great Barrier Reef Marine Park Authority. Please discard previous Reference Files in your possession.

The content comprises six comprehensive sections: Who, What, Where, When, Why and How. Each of these sections has a number of information sheets that include relevant issues, facts and figures.

This file will be reviewed every two years and new information sheets will be added as required. Please note that knowledge evolves and information should be verified by the Authority in case of new developments.

A questionnaire and return envelope are included at the back of the file. Your comments and suggestions are most welcome.

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A word from the Chair...

As the Great Barrier Reef Marine Park moves into its third decade, the need for a comprehensive approach to sustainably manage one of the world's great natural systems, and one that supports the national economy to significantly more than \$2 billion a year, becomes ever more important.

Our fundamental obligation is to protect the Great Barrier Reef Marine Park and the World Heritage Area.

Guided by the principle of balancing conservation and use, the Authority has created a framework which, while allowing for reasonable human use, will still ensure the healthy survival of the Great Barrier Reef Marine Park for future generations.

However, the increasing use and development in and adjacent to the Marine Park and World Heritage Area are critical matters, and strong policies need to be put in place to ensure that natural, cultural and social values are adequately maintained.

Key issues for the Authority are the management of a large and expansive reef-based tourist industry, commercial and recreational fishing pressures, shipping, urban growth, coastal development, and the downstream effects of land use. The cumulative impacts of all of these trends place critical pressure on management approaches.

The next few years will present significant and exciting challenges and issues for the Authority. The work of the Authority will be guided by five key values: Relevance, Direction, Leadership, People Focus and Partnership.

There have been, and there will continue to be, many important environmental and economic issues to be evaluated and managed. Some will generate considerable public interest and controversy.

We believe that community awareness of these issues and of the way we operate is crucial for the protection of the Great Barrier Reef Marine Park and World Heritage Area.

Yours sincerely

Virginia Chadwick

Chair

September 1999



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QUICK REFERENCE SHEET

The Great Barrier Reef:

- · Is the largest coral reef barrier in the world;
- Includes about 3000 reefs and 900 islands;
- Is more than 2000 km in length and up to 250 km wide; and is
- Home to approximately:

1500 species of fish;

400 species of coral;

4000 species of molluscs;

500 species of seaweed;

20 species of seasnakes;

24 species of seabirds that inhabit and breed on the islands; and

· Harbours:

A dugong population of around 12 000—Australia's entire population is about 80 000 (conservative estimate);

6 species of turtle that breed in the area;

26 species of cetaceans (whales and dolphins).

The Great Barrier Reef Marine Park Authority:

- Was established in 1976 under the Great Barrier Reef Marine Park Act 1975 as a Commonwealth statutory authority;
- Is principal adviser to the Commonwealth Government on the care and development of the Great Barrier Reef Marine Park; and
- Is the lead agency for the care and protection of the Great Barrier Reef World Heritage Area.

Reef HQ:

- Was opened on 24 June 1987 as the Great Barrier Reef Aquarium;
- Was established as an educational centre which also presents and promotes understanding of the Reef and its management;
- Operates on a cost-recovery basis; and
- Was renamed Reef HQ in August, 1999.



The Great Barrier Reef Marine Park:

- Is approximately 339 750 km²;
- Includes five Sections—Far Northern, Cairns, Central, Mackay/Capricorn and Gumoo Woojabuddee (Bigfulla Water), with the first Section (Capricornia) declared in 1979;
- Became, after the addition of the Cairns Section in 1981, the largest marine protected area in the world;
- Includes around 2820 reefs which include approximately 890 fringing reefs (reefs attached to the mainland or islands); and
- Does not encompass all of the Great Barrier Reef.

The Great Barrier Reef World Heritage Area:

- Was established 30 October 1981;
- · Is approximately 347 800 km²; and
- · Is the largest World Heritage Area ever established.

Economy

 The Great Barrier Reef supports the national economy with more than \$2 billion a year. Of this:

The marine tourism industry produces about \$1 billion; and

The commercial fishing industry about \$150–200 million.

Further information

Driml, S. 1999, Dollar Values and Trends of Major Direct Uses of the Great Barrier Reef Marine Park, Great Barrier Reef Marine Park Authority, Townsville.

Murdoch, L. 1992, Discover the Great Barrier Reef Marine Park, Great Barrier Reef Marine Park Authority, Angus and Robertson.

Lucas, P. H. C. et al, 1997, The Outstanding Universal Value of the Great Barrier Reef World Heritage Area, Great Barrier Reef Marine Park Authority, Townsville.

Wachenfeld, D. R, Oliver, J. K and Morrissey, J. I. (eds) 1998, State of the Great Barrier Reef World Heritage Area 1998, Great Barrier Reef Marine Park Authority, Townsville.

See also:

http://www.gbrmpa.gov.au/information/ http://www.aquarium.org.au





THE GREAT BARRIER REEF MARINE PARK AUTHORITY

The Great Barrier Reef Marine Park Authority (GBRMPA), a Commonwealth statutory authority, is the principal adviser to the Commonwealth Government on the care and development of the Great Barrier Reef Marine Park.

Under the *Great Barrier Reef Marine Park Act 1975*, the Authority's functions are specified in sections 7 and 7A. The Authority was not established until late 1976, after the Fraser Government had reviewed the legislation and a unanimous vote was passed to proceed with the Authority's implementation. The Authority is part of the Environment portfolio under the responsibility of the Commonwealth Minister for the Environment and Heritage.

Although it was not appreciated at the time, the Act itself was innovative and farreaching in its vision because it was the first piece of legislation that provided for the establishment of a multiple-use management regime at a scale appropriate to marine ecosystems. In requiring the Authority to provide for conservation and reasonable use, the legislation anticipated the subsequent and now familiar theme of ecologically sustainable development.

The Authority consists of a full-time Chairman and three part-time members. As at April 1999, these members were:

- · Mrs Virginia Chadwick, Chair of the Great Barrier Reef Marine Park Authority;
- Mrs Evelyn Scott, Chair of the Commission for Aboriginal Reconciliation;
- · Mr John Lyons, a Director of Price Waterhouse Coopers; and
- Dr Glynn Davis, Director-General of the Department of the Premier and Cabinet (acting member).

Staff number around 140, with about 130 based in Townsville and 10 in Canberra. This arrangement enables the Authority to have its principal technical resources close to the Reef and also to carry out Ministerial and Departmental liaison functions in Canberra.

The Canberra office advises the Minister and liaises with the Department of the Environment and Heritage parliamentary committees and other Canberra-based departments and organisations with interests in the Marine Park. It also assists in the development and communication of policy advice.

On 1 July 1998 the Authority was restructured to provide a tighter focus for the organisation by concentrating on the major critical issues to be addressed and to ensure clear internal reporting lines and accountability. Considerable effort has been





■ The Great Barrier Reef Marine Park Authority cont'd

expended to design a matrix-based organisational structure and recruit a senior management team consisting of a director for each of the four Critical Issues Groups to address the priority policy areas, and a director for each of the three service groups. The Critical Issues Groups are: Tourism and Recreation; Conservation, Biodiversity and World Heritage; Fisheries; and Water Quality and Coastal Development. The three service groups are: Information Support; Corporate Services and Program Delivery.

As a complement to the Authority's information, education and consultation activities, the Great Barrier Reef Aquarium presents and promotes understanding of the Reef and its management.

In order to achieve a level of excellence in marine park management, the Authority has a 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area 1994—2019 and a Corporate Plan in place that are underpinned by the Authority's goal and aims.

Goal and Aims

The Authority's goal is to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the Great Barrier Reef Marine Park.

The Authority's aims are subordinate to the primary goal and must be read in conjunction with it and with each other.

The aims are:

- To protect the natural qualities of the Great Barrier Reef while providing for reasonable use of the Reef Region;
- To involve the community meaningfully in the care and development of the Marine Park;
- To achieve competence and fairness in the care and development of the Marine Park through the conduct of research, and the deliberate acquisition, use and dissemination of relevant information from research and other sources;
- To provide for economic development consistent with meeting the goal and other aims of the Authority;
- To achieve integrated management of the Great Barrier Reef through active leadership and through constantly seeking improvements in co-ordinated management;
- To achieve management of the Marine Park primarily through the community's commitment to the protection of the Great Barrier Reef and its understanding and acceptance of the provisions of zoning, regulations and management practices;





- The Great Barrier Reef Marine Park Authority cont'd
- To provide recognition of Aboriginal and Torres Strait Islander traditional affiliations and rights in management of the Marine Park;
- To minimise costs of caring for and developing the Marine Park consistent with meeting the goal and other aims of the Authority;
- To minimise regulation of, and interference in, human activities consistent with meeting the goal and other aims of the Authoriy;
- To achieve its goal and other aims by employing people of high calibre, assisting them to reach their full potential, providing a rewarding, useful and caring work environment, and encouraging them to pursue relevant training and development opportunities;
- To make the Authority's expertise available nationally and internationally; and
- To adapt actively the Marine Park and the operations of the Authority to changing circumstances.





Who oversees management of the Great Barrier Reef?

THE GREAT BARRIER REEF MINISTERIAL COUNCIL

The Great Barrier Reef Ministerial Council was established in 1979 to coordinate Commonwealth and Queensland Government policy for the management of the Great Barrier Reef.

The Ministerial Council is made up of two Ministers from each of the Commonwealth and Queensland Governments. As at April 1999 the Ministerial Council members were:

- Senator the Hon. Robert Hill, Minister for the Environment and Heritage (Convener);
- The Hon. Jackie Kelly MP, Minister for Sport and Tourism;
- The Hon. Robert Gibbs MLA, Queensland Minister for Sport and Tourism;
- The Hon. Rodney Welford MLA, Queensland Minister for the Environment and Heritage.

The Great Barrier Reef Ministerial Council meets approximately once every year to discuss the broad strategic issues involved with managing the Great Barrier Reef Marine Park and World Heritage Area. Such issues may include matters relating to fisheries, coastal development, tourism and conservation.





OTHER GOVERNMENT AGENCIES

The obligations of the Commonwealth and Queensland Governments in the protection and management of the Great Barrier Reef Marine Park are outlined in the Emerald Agreement of 1979. This agreement states that the day-to-day management of the Marine Park should be undertaken by officers of the Queensland Parks and Wildlife Service. In carrying out the responsibilities of day-to-day management, the Queensland Parks and Wildlife Service is answerable to the Authority.

Many other government agencies and non-government organisations participate in the management of the Marine Park. For example, all Federal Police and some Queensland Water Police are Marine Park Inspectors. Listed below are some of the government agencies that collaborate closely with the Authority.

Commonwealth Government Agencies

Department of the Environment and Heritage http://www.environment.gov.au/

The Great Barrier Reef Marine Park Authority reports directly to the Minister for the Environment. The Department for the Environment and Heritage helps manage the Marine Park through Environment Australia.

Legislation, acts and policies outline Environment Australia's obligations for the protection of the Great Barrier Reef Marine Park and World Heritage Area (http://www.ea.gov.au/dept legislation.html).

Co-operative management of the Marine Park is effected through most of the groups within Environment Australia. These include:

- Portfolio Marine Group http://www.environment.gov.au/environment/mg/mg.html
- Australian & World Heritage Group http://www.erin.gov.au/environment/awhg/awhg.html
- Biodiversity Group http://www.biodiversity.environment.gov.au/
- Environment Priorities and Coordination Group http://www.erin.gov.au/environment/epcg/epcg.html
- Environment Protection Group http://www.erin.gov.au/portfolio/epg/epg.html





■ Other Government Agencies cont'd

The Authority also works with the Australian Heritage Commission, a Commonwealth statutory body.o http://www.environment.gov.au/portfolio/ahc/ahc_site/html/ahc_home.htm.

Australian Maritime Safety Authority (AMSA) http://www.amsa.gov.au/

The Australian Maritime Safety Authority (AMSA) is responsible for the management of shipping activities throughout the Great Barrier Reef Marine Park.

It participates in Marine Park management as the regulatory authority for ship-sourced pollutants, ship routing, ship safety and marine pollution response, such as in the case of an oil spill. Much of the framework for these issues is detailed in international conventions, such as the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and the International Convention for the Safety of Life at Sea (SOLAS).

AMSA also assists the Great Barrier Reef Marine Park Authority in the development of zoning plans (which specify where ships are allowed to go) and compliance with shipping regulations (such as those related to pollution). AMSA also takes Great Barrier Reef shipping issues to international forums such as the International Maritime Organization.

Aboriginal and Torres Strait Islander Commission (ATSIC) http://www.atsic.gov.au/

Indigenous participation in the management of the Marine Park is supported by the Aboriginal and Torres Strait Islander Commission (ATSIC). Under the umbrella of ATSIC, representative bodies such as Queensland Land Councils, elders' groups and traditional owners work with the Authority in areas like planning and permits.

These bodies help identify cultumal and heritage values and facilitate the sharing of knowledge to help with the effective management of the Marine Park and World Heritage Area.

Australian Customs Service http://www.customs.gov.au/protect/ac12.htm

Coastwatch has been operational under the Australian Customs Service since 1 August 1988 to provide aeriel surveillance of Australian coastal areas.

Coastwatch conducts patrols on behalf of government agencies including Customs, the Australian Quarantine and Inspection Service, the Australian Fisheries Service, the National Parks and Wildlife Service, and the Great Barrier Reef Marine Park Authority.





■ Other Government Agencies cont'd

Surveillance of Australian waters helps deter illegal activities such as the importation of illegal drugs and other prohibited goods, and the unlawful movement of people and cargo across Australian borders.

Other Commonwealth agencies that GBRMPA deals with

Australian Fisheries Management Authority (AFMA)

http://www.afma.gov.au

Australian Heritage Commission (AHC) http://www.environment.gov.au/heritage

Department of Defence http://www.defence.gov.au

Australian Institute of Marine Science (AIMS)

http://www.aims.gov.au

Queensland Government Agencies

Queensland Parks and Wildlife Service (QPWS) http://www.env.qld.gov.au/

The Queensland Parks and Wildlife Service (QPWS) has the responsibility for day-to-day management of the Great Barrier Reef Marine Park subject to the Authority, as outlined in the Emerald Agreement of 1979.

Each party provides an equal amount of funding toward day-to-day management and works on a three-year rolling program.

The QPWS is also responsible for the following permit issues: commercial collecting; education programs; and moorings.

The QPWS also undertakes surveillance, monitoring and enforcement, and resource management, and is instrumental in the design, construction and maintenance of Marine Park facilities.

Queensland Fisheries Management Authority (QFMA) http://www.squirrel.com.au/qfma/

Responsible for Queensland's marine and freshwater fisheries under the *Fisheries Act* 1994, the Queensland Fisheries Management Authority (QFMA) works closely with the Authority in managing an ecologically sustainable fishing industry.





■ Other Government Agencies cont'd

Both authorities work together on management plans that affect Marine Park fisheries. This collaborative approach includes joint research projects, integrated natural resource management, stock assessment, and planning and preservation measures such as area closures.

Compliance monitoring, enforcement and educational programs are also undertaken by QFMA in regard to fisheries issues.

Queensland Department of Primary Industries (QDPI) http://www.dpi.qld.gov.au/

The Queensland Department of Primary Industries (QDPI) is involved in the management of the Marine Park through the Queensland Boating and Fisheries Patrol (QBFP) and through the undertaking of research.

The QBFP performs investigations, monitoring and enforcement, as well as education and extension roles, on behalf of the Authority to ensure compliance with fisheries legislation, marine legislation and Marine Park legislation.

Additional funding from the Commonwealth Government, totalling approximately \$230 000, was provided in late 1998 for the increased enforcement and surveillance of the 16 Dugong Protection Areas (DPAs) situated along the Queensland coastline. The QBFP and QPWS are involved in conducting boat patrols and aerial surveillance under the DPA Enforcement Program.

Research programs are also conducted by QDPI—ranging from the effects of prawn trawling to developing a policy on biodiversity. This information can then be used by QDPI and the Authority in the development of management plans and arrangements.

Queensland Department of Transport (QDoT) http://www.transport.qld.gov.au/

The Queensland Department of Transport (QDoT) is a consultative body for the Authority that offers advice on particular issues in relation to the Marine Park, but it does not have any legislative responsibility.

However, QDoT is the lead response agency for oil and chemical spills from shipping in the Great Barrier Reef. QDoT Regional Harbour Masters are appointed as On Scene Coordinators.

Queensland Department of Natural Resources (QDNR) http://www.dnr.qld.gov.au/

Land-based activities can have an impact on the Great Barrier Reef. Agricultural, urban and industrial activities can all contribute nutrients, sediments and pollutants to inshore areas of the Reef.





■ Other Government Agencies cont'd

The Authority liaises with the Queensland Department of Natural Resources (QDNR) in regard to land-based activities, but most information exchange occurs through QDNR's water program (http://www.dnr.qld.gov.au/water/water index.html).

Water quality monitoring is important to ensure discharges from the Queensland coastal regions are not adversely affecting inshore Reef habitats.

For example, a QDNR study, From Land to River to Reef Lagoon: Land Use Impacts on Water Quality in the Johnstone River Catchment, recognises the need for agricultural industries to address environmental impacts on water quality linked to their activities.

For further information on any of the abovementioned agencies, contact their nearest office or website.





CONSULTATION AND COMMUNITY INVOLVEMENT

Great Barrier Reef Consultative Committee 1998 – 2000

The Great Barrier Reef Consultative Committee has been operational since 1976. It is a statutory body of the Commonwealth, separate to the Great Barrier Reef Marine Park Authority, that advises both the Authority and the Minister. The Committee is distinct from other community advisory committees that deal with marine issues in the Great Barrier Reef Region.

The Committee is appointed by the Commonwealth Minister for the Environment and Heritage and comprises:

Mr Harry Bonanno CANEGROWERS (Queensland Canegrowers

Council)

Cr Greg Breckell Local Government Association of Queensland Inc.

Mrs Irene Butterworth Girudala Council of Elders (Whitsundays)

Mrs Virginia Chadwick Great Barrier Reef Marine Park Authority

Mr Robert Crick Commonwealth Department of Industry, Science and

Tourism

Mr Colin Earle Queensland Game Fishing Association Inc.

Ms Margaret Moore World Wildlife Fund for Nature Australia

Mr Tony Fontes Whitsunday Coastal Advisory Committee

Mr Eddie Hegerl Australian Marine Conservation Society Inc.

Mrs Bernice Kelly Direct Employment Service Inc.

Mr Ted Loveday Queensland Commercial Fishermen's Organisation

Prof. Helene Marsh James Cook University

Mr John Millward Cairns Marine Tourism Operators Association
Mr Peter Neville Queensland Department of Primary Industries

Ms Suzette Pelt Whitsundays Bareboat Charter Operators Association

Mr David Perkins Environmental Protection Agency

Dr Russell Reichelt Australian Institute of Marine Science

Sir Sydney Schubert Association of Marine Parks Tourism Operators

Mr Alan Turnbull Sunfish (Queensland Sport and Recreational Fishing

Council).





■ Consultation and Community Involvement cont'd

Membership reflects the diverse nature of the stakeholders in the Great Barrier Reef. Members are not nominated as representatives of particular organisations. They are appointed in their own right by virtue of their personal expertise and experience in relation to the Reef. In making these appointments, the Minister ensures that, as far as practicable, those selected cover the range of user groups and interests associated with the Great Barrier Reef.

Members are appointed for a three-year term. Professor Helene Marsh of James Cook University is the elected Chairperson for the period 1998–2000.

Functions of the Committee

As a consequence of its structure, the Committee provides an important channel of communication between the Authority, the Queensland Parks and Wildlife Service and stakeholders. The Committee also serves as an effective avenue of communication between different sectors which often have conflicting values and priorities.

At this forum, representatives from the full range of sectors (not just those immediately involved in issues) may discuss matters of concern. Individual members are encouraged to examine issues, not just from their own sector's perspective, but for the benefit of the Reef and its users generally.

The Committee provides strategic rather than operational advice. For example, if there was controversy over zoning, the Committee might be more concerned about advising on the appropriateness of resolution processes, rather than on how to zone. Of course, members are free to have input into issues on an individual basis as well. Most members of the Committee have experience in operating at a strategic level in their own organisation and take a Reef-wide, rather than local, view.

Several members of the Committee were involved in the development of the 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area. The Committee retains a key role in monitoring the implementation of this Plan. In addition, matters considered by the Committee are viewed in the context of this Plan whenever possible.

The Authority's Advisory Committees

The Authority has established various advisory committees, which generally comprise persons external to the Authority, to assist in the management of particular issues, Marine Park locations and operational programs.





■ Consultation and Community Involvement cont'd

Reef Advisory Committees (RACs)

Following the restructure of the Authority in 1998 and the establishment of four Critical Issues Groups within the new structure, the Authority established a Reef Advisory Committee for each of the groups. These are:

- RAC Conservation, Biodiversity and World Heritage;
- · RAC Fisheries;
- · RAC Tourism and Recreation; and
- RAC Water Quality and Coastal Development.

People with expertise in a cross-section of stakeholder interests have been recruited. Each RAC will work closely with staff of the relevant Critical Issue Group to ensure that policy development and strategic direction are developed in consultation with appropriate stakeholders. A national perspective to the treatment of the issues is desired. Specific provision has been made for the representation of Aboriginal and Torres Strait Islander peoples in each of the RACs.

Local Marine Advisory Committees (LMACs)

There are nine Local Marine Advisory Committees (LMACs) in operation in regional centres adjacent to the Great Barrier Reef between Cooktown and Gladstone.

LMACs provide advice to the Authority, other government agencies and organisations on broad environmental issues and specific activities that affect the Marine Park in the nine regions. The nine Committees are:

- LMAC Cooktown;
- LMAC Port Douglas;
- LMAC Cairns;
- LMAC Mission Beach;
- LMAC Hinchinbrook;
- LMAC Townsville;
- LMAC Whitsunday;
- · LMAC Mackay; and
- LMAC Gladstone.

The Committees also provide information to the public in regard to the various local marine and coastal regions to facilitate communication between user groups and the local community.





■ Consultation and Community Involvement cont'd

Zonal Advisory Committees (ZACs) and Management Advisory Committees (MACs)

The Queensland Fisheries Management Authority (QFMA) established Zonal Advisory Committees (ZACs) and Management Advisory Committees (MACs) to aid in their delivery of ecologically sustainable development of the Queensland fisheries.

QFMA receives technical advice from its MACs and local community advice from its ZACs. Each of the committees include working groups that target specific issues and report back with their findings.

MACs consist of seven different target groups:

- · Trawl MAC;
- · Reef MAC;
- · Crab MAC:
- · Freshwater MAC;
- Tropical Fin Fish MAC;
- · Sub-Tropical Fin Fish MAC; and
- Harvest Fisheries MAC.

Some Authority staff members are members of ZACs and MACs and information provided by these committees is used in Marine Park fisheries management policies.

GBRMPA also has observer status on the Australian Fisheries Management Authority's East Coast Tuna MAC.

Research Institutions

The Great Barrier Reef Marine Park Authority relies heavily on other marine science research agencies. The Authority is primarily a management agency, not a research institution, and out-sources the majority of its research. In order for the Authority's managers to make well-informed and scientifically-based decisions it has been crucial to establish cooperative relationships with other research institutions.

A joint arrangement has been established with the Cooperative Research Centre for Ecologically Sustainable Development of the Great Barrier Reef (CRC Reef). CRC Reef provides an improved scientific basis for reef management and regulatory decision making. The Authority provides funds of around \$1.6 million annually to aid with CRC Reef's research.

The Authority also works closely with the Australian Institute of Marine Science (AIMS), James Cook University (JCU) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).





■ Consultation and Community Involvement cont'd

To find out more about these research institutions, access their websites.

CRC Reef: http://www.gbrmpa.gov.au/~crcreef/

AIMS: http://www.aims.gov.au/ JCU: http://www.jcu.edu.au/

CSIRO (Division of Marine Science): http://www.marine.csiro.au/

Fisheries Groups

There are many fisher-representative groups that are involved in consultation processes with the Authority, especially in relation to Marine Park planning.

Such groups include the Queensland Commercial Fishermen's Organisation (QCFO) and Sunfish North Queensland, which aim to protect commercial and recreational fishing interests respectively. These interests may highlight concerns such as access to certain Marine Park areas and habitat and species protection.

Tourism Associations

To effect a more collaborative and interactive approach to management between the marine tourism industry and the Authority, negotiations have taken place to promote shared responsibility and encourage greater use of self-regulatory mechanisms. These include industry Codes of Practice and joint management agreements.

A Tourism Advisory Group was established by the Authority in 1997. This Group was established as an interim body to provide advice at a strategic level on a range of Marine Park and tourism issues. Included in this role is advice on management proposals dealing with Park-wide planning, and streamlined licensing and permitting systems.

Aboriginal and Torres Strait Islander Groups

Authority guidelines are in place to identify and define strategies and methods for effective involvement, assistance, cooperation and provision of expertise from both traditionally affiliated and historically associated Aboriginal and Torres Strait Islander peoples.

Consultation is the basic means by which Aboriginal and Torres Strait Islander peoples and the Authority resolve differences in the application of policies and regulations in terms of all management regimes, particularly planning and permits.

Recognition of common interests between Aboriginal and Torres Strait Islander peoples and the Authority in the care of the Marine Park is an important step towards indigenous involvement in management.





■ Consultation and Community Involvement cont'd

Conservation and Environmental Groups

Conservation and environmental issues are extremely important when negotiating policies and management guidelines to protect the Marine Park and associated areas, such as the Great Barrier Reef World Heritage Area.

Part of the process to define and identify any activity that is a threat, or may be a threat, to the ecologically sustainable use and protection of these areas requires the Authority to work closely with these groups.

The Great Barrier Reef Marine Park, World Heritage Area and the Authority have achieved international recognition, in part due to the World Heritage Convention and the World Conservation Union (IUCN), along with other conservation and environmental groups.

Reef HQ Volunteers — Reef Advocates

Volunteers at Reef HQ, formerly the Great Barrier Reef Aquarium, play a crucial role in helping the Aquarium to meet its mission of inspiring everyone to care for the Great Barrier Reef. Over 160 volunteers contribute over 25 500 service hours annually.

The Public

Often overlooked as managers of the Great Barrier Reef and the World Heritage Area, the public play a crucial role in the protection and conservation of these areas.

Public consultation and feedback are needed to aid managers in developing well-informed and well-rounded policy directions. The public are active in surveillance, voluntary organisations, clean-up days, monitoring and statutory public participation in zoning, planning and permits.





There are many terms that define areas associated with the Great Barrier Reef. The terms are often incorrectly used. It should be noted that the area referred to by each term is distinct, with a defined boundary (although some areas have parts of their boundaries in common). For example, the Great Barrier Reef Marine Park lies totally within the Great Barrier Reef Region which lies totally within the Great Barrier Reef World Heritage Area, although they share some boundary lines.

Some terms define the areas for which governments and agencies have obligations. For example, the Great Barrier Reef Marine Park Authority is legislatively responsible for the Great Barrier Reef Marine Park. The Marine Park does not contain all of the Great Barrier Reef (e.g. not that in the Torres Strait and around Queensland-owned islands). However, it contains areas that would not necessarily be directly associated with the Reef such as some inshore waters and Commonwealth-owned continental islands. The Commonwealth Government is custodian for the Great Barrier Reef World Heritage Area.

Great Barrier Reef (refer map 1)

The Great Barrier Reef is the complex coral reef system off the tropical east coast of Queensland and is regarded to be the largest coral reef system in the world. The Reef lies between latitude 24°15′ south (north of Bundaberg) and latitude 9° south, where it meets the coast of Papua New Guinea. Measured along its eastern edge the Reef stretches approximately 2300 km.

The width of the Reef—between the coast of Queensland and the edge of the continental shelf—varies from 20 km (near Cape Melville) to 250 km (off Cape Townshend). The Great Barrier Reef includes both coral cays and islands of non-coralline origin.

Great Barrier Reef Lagoon

The large areas of water, devoid of coral reefs, that lie inshore of the barrier reefs may be regarded as part of the Great Barrier Reef and are collectively termed the Great Barrier Reef Lagoon.

The Lagoon area is approximately 116 350 km² and makes up around 33.45 per cent of the Great Barrier Reef World Heritage Area. Waters in the Great Barrier Reef Lagoon are up to 35 metres deep.





Great Barrier Reef Province (refer map 2)

G. H. Maxwell, in his 'Atlas of the Great Barrier Reef' described the Province as the region off the Queensland shelf where reefs and reef-derived sediment are situated, or the part that has been influenced by them at any time after the Tertiary period, approximately 2 million years ago.

The Province is estimated to be 283 000 km². Maxwell gave the figures for the Province to extend from around latitude 20°10′ south to 9°20′ south; that is from just south of Lady Elliott Island to the coast of Papua New Guinea. However, these measurements do not include large tracts of the Queensland shelf that are occupied by reef. Therefore, the latitudes 24°15′ south and 9°00′ south are more accurately in line with Maxwell's definition. The Province's western-most point coincides with the western edge of the Torres Strait Reef and Island Complex at around longitude 141°55′, and its easternmost point is found at the Swain Complex at longitude 153°20′.

Great Barrier Reef Region (refer map 3)

The Great Barrier Reef Region is the area defined in the *Great Barrier Reef Marine Park Act 1975*, within which areas may be declared to be parts of the Great Barrier Reef Marine Park. It is approximately 345 850 km², only 1.8 per cent larger than the Marine Park.

It does not include any Queensland-owned islands, nor any waters excluded by virtue of section 14 of the *Seas and Submerged Lands Act 1973* (S&SLA), namely any bay, gulf or estuary waters that were waters within the limits of the State of Queensland at the time of Federation (1901). However, this will change if the current exclusions become incorporated into the Marine Park.

The Region does not contain all of the Great Barrier Reef (e.g. not that in the Torres Strait and Queensland-owned islands), although the *Great Barrier Reef Marine Park Act* 1975 provides for extension northwards of the Region into the Torres Strait. The Region contains areas that would not ordinarily be directly associated with the Reef, such as waters adjacent to the mainland and Commonwealth-owned continental islands.

The Great Barrier Reef Region boundary:

- 1. Commences at the point that, at low water, is the northernmost extremity of Cape York Peninsula, Queensland;
 - Runs thence easterly along the geodesic to the intersection of parallel of Latitude 10°41′ South with meridian of Longitude 145°00′ East;
 - Runs thence southerly along that meridian to its intersection by the parallel of Latitude 13°00′ South;
 - Runs thence south-easterly along the geodesic to a point of Latitude 15°00′
 South Longitude 146°00′ East;





- Runs thence south easterly along the geodesic to a point of Latitude 17°30′
 South Longitude 147°00′ East;
- Runs thence south-easterly along the geodesic to a point of Latitude 21°00′
 South Longitude 152°55′ East;
- Runs thence south-easterly along the geodesic to a point of Latitude 24°30′ South Longitude 154°00′ East;
- Runs thence westerly along the parallel of Latitude 24°30′ South to its intersection by the coastline of Queensland at low water; and
- Runs thence generally northerly along that coastline at low water* to the point of commencement; and
- 2. Such area (if any) contiguous with the northern boundary of that area as is prescribed, other than any part of such an area that is referred to in section 14 of the S&SLA or is an island, or part of an island, that forms part of Queensland and is not owned by the Commonwealth (s 3 and schedule 1 of the *Great Barrier Reef Marine Park Act*).

The *Great Barrier Reef Marine Park Act 1975* provides for the establishment, control, care and development of the Great Barrier Reef Marine Park in the Great Barrier Reef Region. One of the Authority's functions is to make recommendations to the Minister as to the areas within the Region that should be declared by the Governor-General to be parts of the Marine Park (s 5 and s 7 of the Act).

Great Barrier Reef Marine Park (refer map 4)

Covering approximately 339 750 km², the Marine Park includes around 2100 kms of the Great Barrier Reef (measured along its eastern edge).

The Great Barrier Reef Marine Park consists of such areas in the Great Barrier Reef as are declared under section 31 of the *Great Barrier Reef Marine Park Act 1975* to be parts of the Marine Park.

These are:

- The waters of any sea within the area;
- The sea-bed beneath any sea within the area;
- The sub-soil beneath any such seabed, extending to such depth below the seabed as is specified in the Proclamation;
- The sub-soil beneath any land within the area, extending to such depth below the surface as is specified in the Proclamation; and
- The airspace above the area, extending to such height above the surface as is specified in the Proclamation.

The height and depth for all sections that have been declared are 915 metres above sea surface and 1000 metres below the seabed.





The Marine Park has been proclaimed over most of the Great Barrier Reef Region (98.2 per cent). The only parts of the Region presently excluded are 28 areas, generally five kilometres wide and in all cases adjacent to the mainland and situated along the western boundary of the Region. Many are in the vicinity of population centres. The Marine Park includes Commonwealth-owned islands but does not include Queensland-owned islands. The Commonwealth Minister for the Environment and Heritage, Senator the Hon. Robert Hill, has proposed that excluded areas should be incorporated into the Marine Park. With the Queensland Government's approval, steps will be taken under the *Great Barrier Reef Marine Park Act 1975* to include the areas in the Marine Park.

The Great Barrier Reef Marine Park does not contain all of the Great Barrier Reef (e.g. not that in the Torres Strait and Queensland-owned islands). However, it contains areas that would not necessarily be directly associated with the Reef, such as some inshore waters and Commonwealth-owned continental islands.

There are presently (as at March 1999) five sections comprising the Great Barrier Reef Marine Park, all of which were proclaimed at different times. Some have been created out of an amalgamation of previously proclaimed sections.

Current Sections	Proclamation	Zoning Plan Effective	Approx. Area
Far Northern	31 August 1983	01 February 1986	85 050 km²
Central	15 October 1984	01 October 1987	75 850 km²
Mackay/Capricorn	24 September 1987	01 August 1988	143 000 km²
Cairns	13 September 1989	03 April 1992	35 500 km²
Gumoo Woojabuddee	14 January 1998	in preparation	350 km²

Previous Sections	Proclamation	Zoning Plan Effective
Capricornia	21 October 1979	01 July 1981
Central	31 August 1983	*
Southern	31 August 1983	*
Townsville	30 October 1993	*
Inshore Southern	30 October 1993	*
Capricorn	15 October 1984	*
Cairns	19 November 1981	07 November 1983
Cormorant Pass	31 October 1981	07 November 1983

Note: These sections were amalgamated with other sections prior to Zoning Plans being prepared.





Great Barrier Reef World Heritage Area (refer map 5)

Inscribed onto the World Heritage List on 26 October 1981, the Great Barrier Reef World Heritage Area is 347 800 km². That is, approximately 345 850 km² (Region) plus an estimated 2000 km² for the Queensland-owned islands and the internal waters of Queensland. Only 2.3 per cent of the World Heritage Area lies outside the Marine Park. However, this percentage will decrease if the current exclusions become incorporated into the Marine Park.

In effect, the Great Barrier Reef World Heritage Area extends from the low-water mark* off Queensland's mainland on its western side, and coincides with the Great Barrier Reef Region boundary on its northern, eastern and southern sides. Included in the World Heritage Area are all islands regardless of tenure, Queensland internal waters and S&SLA exclusions, which are below low water along the coast.

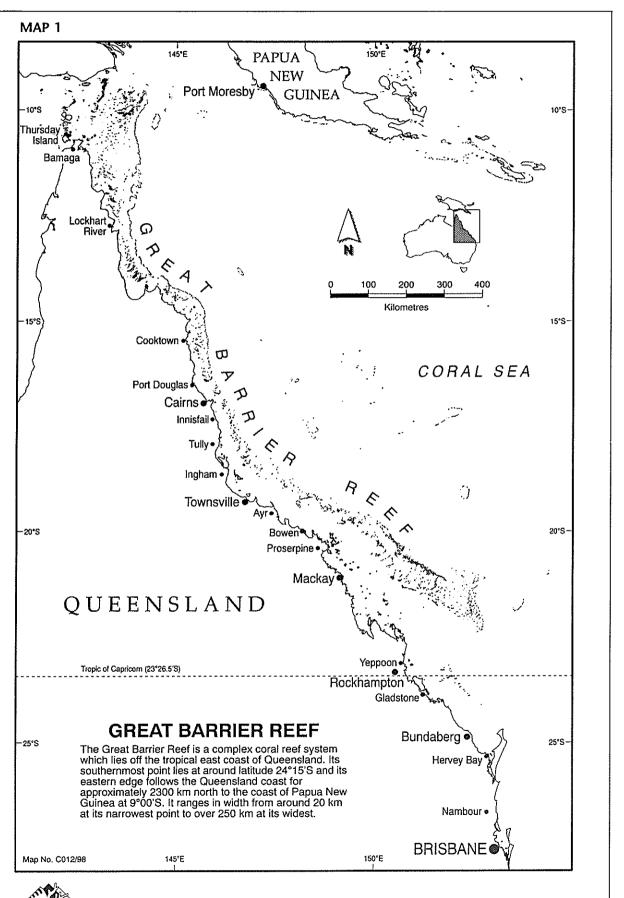
The World Heritage Area does not contain all of the Great Barrier Reef (e.g. not that in the Torres Strait) and it contains areas that would not necessarily be directly associated with the Reef, such as some inshore waters and continental islands. It contains areas of the Great Barrier Reef that are not included in the Great Barrier Reef Region (e.g. Queensland-owned islands).

The Commonwealth Government is the body responsible for the Great Barrier Reef World Heritage Area under the World Heritage Convention. The Great Barrier Reef Marine Park Authority has been designated as lead agency for this Area.

* The Commonwealth Government tables the view that low water means 'mean low water'. The World Heritage Area boundary follows low water along the Queensland coast and generally crosses river/creek mouths following the general line of the coast.

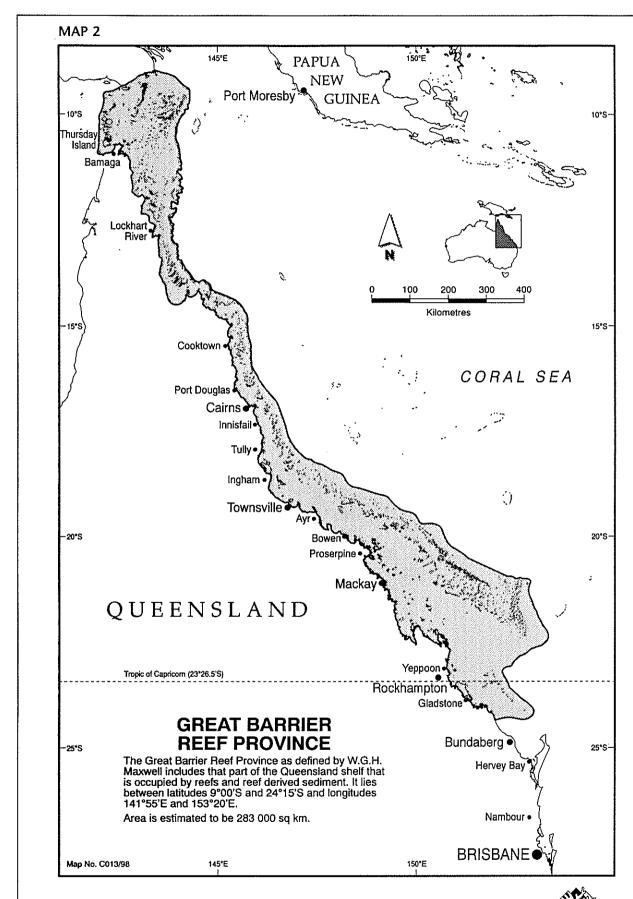


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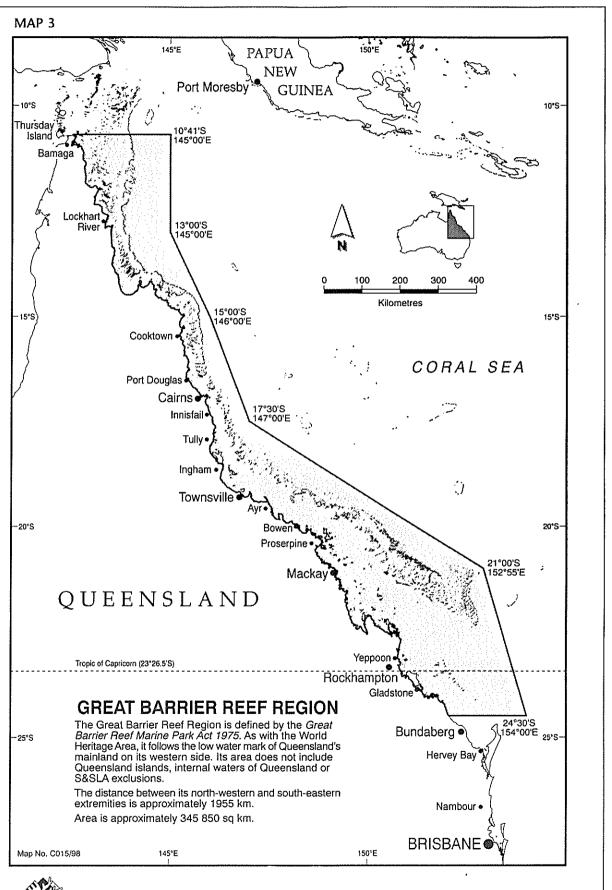






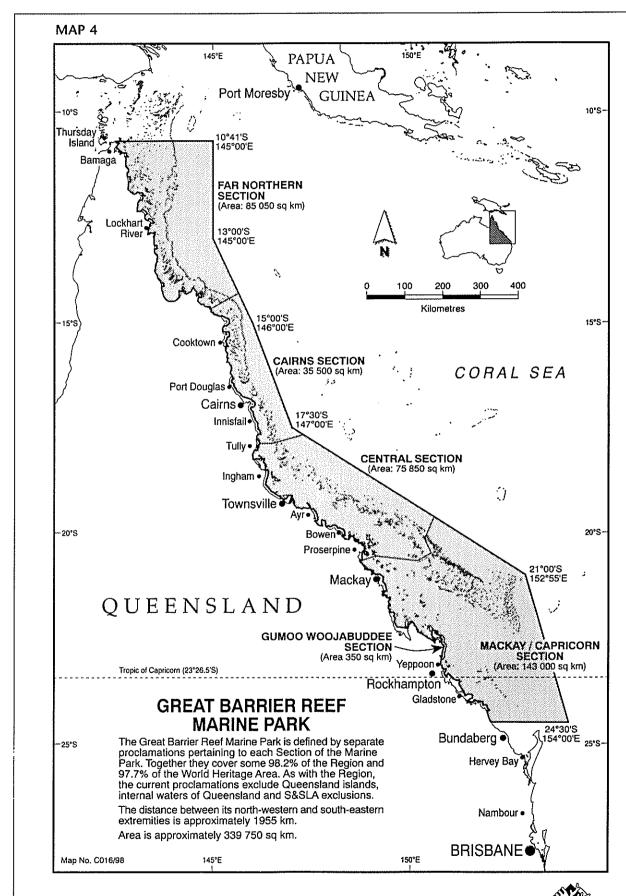


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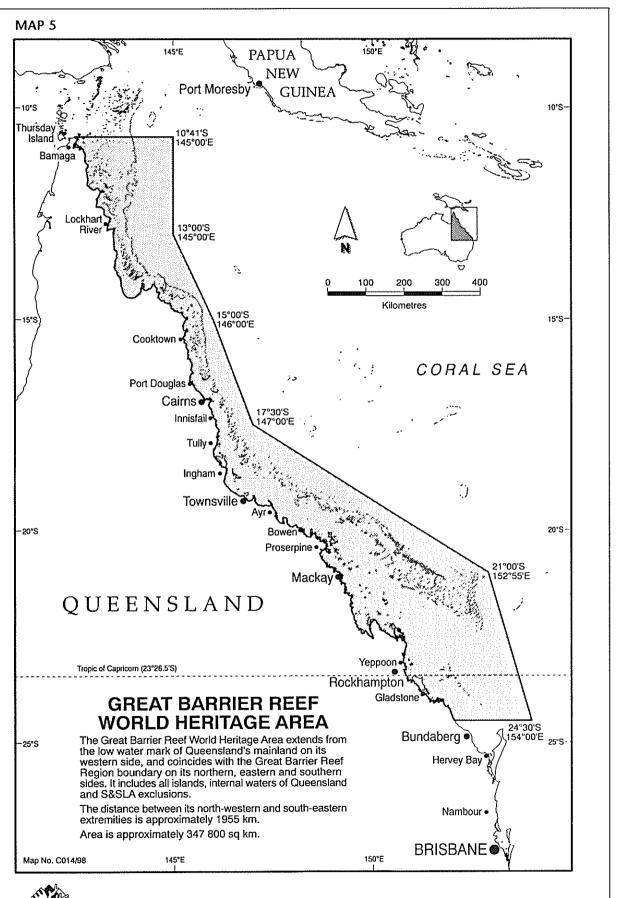








WHERE





Past, Present WHEN and Future

History of the Great Barrier Reef

GEOLOGICAL ORIGIN OF THE GREAT BARRIER REEF

Approximately 50 million years ago, the Australian continent separated from the supercontinent 'Gondwana' and began drifting northwards by a few centimetres each year. Over time, Australia's ecosystems endured a change from equable temperate through to subtropical and, in the north, tropical conditions. The northern Australian continental shelf was eventually bathed in warmer seas, providing ideal conditions for tropical species such as those found on coral reefs and other ecosystems in the Pacific region.

At this time, the planktonic larvae associated with coral reefs drifted into the seas over the northern Australian continental shelf from the surrounding tropics. They settled on hard substrates in the clear shallow waters that favour reef growth. Evidence suggests that Australia entered the tropics about 20 million years ago during the Miocene epoch of the Tertiary period, with the first substantial coral reef growth development not occurring until much later.

The formation of the Great Barrier Reef, as we know it today, required the continental shelf to be submerged in seawater. The shelf has not always been covered by seawater, however, and this only occurs during intervals of global high sea level called interglacials. During the last two million years, the Earth has experienced a series of dramatic climatic fluctuations known as ice ages, during which sea levels fell by up to 150 metres. Intervals of high sea level (interglacials) and low sea level (glacials) are a result of changes in polar ice caps in response to global climate changes.

The present Great Barrier Reef grew during the most recent interglacial, high sea level period. Rising seas spilled on to the continental shelf around 11 000 years ago. By 9000 years ago, the shelf was a circulating seaway and the present Great Barrier Reef began to flourish. Sea levels continued to rise and reached the present level about 6500 years ago. Subsequently, most of the actively growing reefs of the Great Barrier Reef reached sea level and ceased vertical growth.

A previous interval of high interglacial sea level occurred approximately 120 000 years ago and an earlier incarnation of the Great Barrier Reef grew at this time. Wherever geologists have investigated the structure of the modern Great Barrier Reef, the ancient, weathered limestone remains of the previous Great Barrier Reef have been found below. The limestone rock of this very old reef complex acts as the colonising surface for the present reef system. There may also be other, even older underlying fossil reef structures.

Reef-building corals and coralline algae are responsible for the very existence of reefs. By secreting a hard skeleton of calcium carbonate (limestone), corals combine with coalline algae to create a wave-resistant structure that is the framework for the reef.





History of the Great Barrier Reef

■ Geological Origin of the Great Barrier Reef cont'd

When corals die, their limestone skeletons act as the foundation on which future generations of organisms will grow.

When sea levels fall during an ice age, the reef's limestone mass is exposed. It becomes weathered by the elements and vegetation. As a result of this weathering process, caves may form in the limestone. When the sea level later rises, coming out of an ice age, these hard substrate hills provide favourable sites for a new cap of reef growth. Occasionally the roof of a hidden cave may collapse and form a 'sink' hole, as seen in the Pompey reefs of the southern Great Barrier Reef.

The timing of the peak in sea levels varies around the world because of the way the continents respond to being loaded with rising seawater. Evidence from around the Palm Islands, 45 kilometres north-east of Townsville, shows that corals lived at levels around one metre above the present sea level 6500 years ago. These corals, now buried by intertidal flats and mangroves, are actually part of a continuum of fossil corals that extends, in some places, from the mangroves to the present upper limit of coral growth.

Age dating and survey levelling of these intertidal coral 'pavements' have shown that the sea has fallen 1 metre since it peaked 6500 years ago. This late and local adjustment in sea level (Great Barrier Reef Province only) was not due entirely to the sea level falling on a global scale. It was also due, in part, to the continent adjusting to rapid loading of sea water on to the shelf between 11 000 and 6500 years ago. This process is called isostatic re-adjustment. Imagine sitting down on a springy bed; at first you sink deeply but shortly after you spring back up a little. So too, the northeastern Australian continent slowly sprang back up by a metre after the sea level stopped rising.

Another interesting geological story told by the Great Barrier Reef relating to the ice ages is associated with the deep channels separating the ribbon reefs at the shelf edge. These ribbon reefs define the outer edge of the shelf and run from just north of Cairns to Cape York. Seismic profiles show that ice age rivers flowed through these passes to shorelines further east of the current ribbon reefs.

Currently, the size of the modern Great Barrier Reef is constrained by the size of the Australian continental shelf and the present phase of high sea level. During the last 10 000 years, warm, sunlit waters and favourable colonising surfaces have encouraged the regional-scale growth of the Great Barrier Reef we know today.

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History of the Great Barrier Reef

INDIGENOUS HISTORY

Contemporary indigenous interests in the Great Barrier Reef Marine Park and World Heritage Area arise from longstanding cultural association with, and use of, coastal and marine environments along the Queensland coastline. Aboriginal people are known to have occupied the Australian continent for at least 40 000 years, although recent archaeological evidence suggests occupation may have commenced as early as 60 000 years ago.

The last significant global sea level change occurred approximately 6000 years ago. Rising sea levels submerged large areas of coastal land occupied by Aboriginal people in what is now the Gulf of Carpentaria and most areas along the Australian continental coastline. It was during this period that Bass Strait was created and the Torres Strait Islands were formed. Current archaeological evidence indicates that the permanent occupation of the Torres Strait Islands occurred approximately 2500 years ago. At this time, the islands were occupied by seagoing Melanesian people, the descendants of whom can be found amongst present-day Torres Strait Islanders.

Indigenous Australians once walked on beaches in the vicinity of today's outer reef areas. Some Indigenous groups have sites of significance, such as ancient burial grounds, buried below the outer reef. Indigenous people used the entire coastal environment, not only the land but the sea, beaches, reefs, estuaries and mangroves. They hunted and collected a variety of animals and plants including crustaceans, fish, shellfish, dugongs, birds and turtles and their eggs.

Despite Indigenous population displacement associated with European occupation, Indigenous people of the Great Barrier Reef World Heritage Area still have strong cultural and economic interests in the Area. Aboriginal association with the land and sea originates in the belief that both landscapes/seascapes and people were created by Ancestral Beings. It is believed that these Ancestral Beings not only caused the physical landscape to be shaped in a certain way, but spread social groups and their languages across the landscape in a particular manner.

Ownership of, and responsibility for, particular tracts of land and sea (commonly referred to as clan estates) rest with particular groups within an identified language group. These rights and responsibilities are inherited through lines of descent. Customary law governs Indigenous peoples' use of coastal and marine resources, their cultural practices and methods of resource management. Contemporary cultural meanings and links to the coastal and marine environments are maintained though the peoples' continued use of these environments and the teaching of stories which relate individual sites to indigenous society and history.

Sites may be specific locations or part of larger areas. Coastal sites are often linked to islands, cays or reefs and include underwater features. Areas submerged during the last sea level rise are still considered by Aboriginal and Torres Strait Islander peoples





History of the Great Barrier Reef

■ Indigenous History cont'd

to be part of estates today. Areas of reef or cays may have stories attached to them, ranging from legends of a 'wind place' (where the wind comes from) to places where certain animals may have been created. There are also many sites that are respected as sacred and as such are not to be disturbed by visitation.

Many of these sites of significance and story places lie within the Marine Park and Reef area. Most people who are not familiar with Aboriginal and Torres Strait Islander traditions and culture only see the physical aspects like rock art, tools and weapons. There are, however, many important indigenous sites which constitute part of the natural environment.

An ethnographic map recently produced by David Horton of the Australian Institute of Aboriginal and Torres Strait Islander Studies, indicates that there are some 40 Aboriginal coastal and marine estates which extend to offshore islands of the World Heritage Area. At the beginning of 1999 there were 15 Native Title claims lodged for offshore areas including areas of the Marine Park, as well as separate claims for islands such as Magnetic Island, Raine Island and some of the islands in the Whitsunday region.

Before European contact with the Australian continent, it is estimated that there were around 2500 different Indigenous clans with over 650 different languages. Despite common assumptions to the contrary, Aboriginals and Torres Strait Islanders are two distinct Indigenous groups, with different cultures.

The Torres Strait Island group lies in the passage between the Cape York Peninsula in the north-east of Australia and the south coast of Papua New Guinea. The Strait is 150 km wide and contains approximately 150 islands, with an estimated population of 6300 Islanders living on 16 of the islands. Furthermore, there are an estimated 15 000 Islanders living on the mainland of Australia including Bamaga and Seisia at the tip of Cape York.

Hunting, fishing and gathering play a significant role in the cultural life and economy of Indigenous communities. For example, turtle and dugong hunting is an important component of the Indigenous economy and cultural life in the World Heritage Area. Traditional hunting practices are based on collectively accumulated ecological knowledge, skills and continued cultural association with the species. Under the Authority's zoning plans, dugong and turtle hunting require permits which are granted to Indigenous people for customary purposes.

Hunting, fishing and gathering were carried out by Australia's traditional inhabitants from beaches and mangroves, right out to offshore islands and the outer fringing reefs. Indigenous groups, especially those from the Torres Strait Islands, travelled in a variety of seafaring vessels, some capable of holding a sizeable number of adults. These craft were used as hunting platforms and for transport. Some seafaring expeditions would be thousands of kilometres in length, chartering treacherous waters to trade with other groups.





History of the Great Barrier Reef

■ Indigenous History cont'd

Aboriginal coastal dwellers lived within a small territory throughout the year and moved camp little more than half a kilometre at a time. Such shifts were nearly always to establish a clean campsite or to harvest a seasonal abundance of food, such as yams or crabs. Large gatherings were held at intervals of two to three years at well-established sites to carry out ceremonial activities.

Traditional ceremonies are still very much a part of Aboriginal and Torres Strait Islander cultures today. Ceremonies are a part of weddings, births, deaths, initiations or simply the gathering of family and friends. Ceremonial feasts may also include a number of native animals, like dugongs and turtles, and plant foods, such as nuts and berries.

Indigenous groups attach spiritual and cultural value to all living things. For example, most groups are associated with a totem animal, whether it be a shark, dugong or turtle, and are not permitted to hunt or eat their totem. There are also laws that should be obeyed when hunting animals. For example, the hunting of dugongs and turtles are guarded by rules including specifications for dividing up the animal. Parts of the animals hold different significance and are given to people according to their role in society. Even the disposal of the remains should be carried out under traditional law. It is believed that failure to comply with these traditions may bring bad luck, such as cyclones, to individuals, their families and communities.

As it has done for thousands of years, the Great Barrier Reef area remains significant to the culture, economies and spirituality of Australia's Indigenous groups.

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History of the Great Barrier Reef

EUROPEAN HISTORY

English explorer Captain Matthew Flinders referred to the 'barrier reefs' in journal accounts of his voyage to 'Terra Australis' in 1801–3. Today, the vast reef system is still known as the 'Great Barrier Reef'. The purpose of Flinders' voyage on the 344 tonne sloop *Investigator*, was to map Australia's east coast. On the north-eastern leg of the voyage, Flinders was frustrated in his attempts to cross the reef barrier in order to sail into open water. He finally found a passage through the 'barrier reefs' near Cleveland Bay, now known as Flinders Passage.

The identity of the first European to discover the Great Barrier Reef is still not known for sure. Some believe that Spaniard Luis Vaez deTorres was the first European to see the Great Barrier Reef. He sailed through the Strait that now bears his name in 1606. Torres was part of a three-ship expedition that left Peru in 1606, under the command of Pedro Fernandez de Quiros, to find the 'South Land'. Torres commanded the ship San Pedrico, and, in his report to the king, he described the Torres Strait 'shoals', currents and islands.

Yet it is thought that in the early 1500s the Portuguese may have sailed to Australia's north-east coast and experienced the navigational dangers of the Great Barrier Reef. Both Christova de Mendonca, who commanded a 1522 expedition, and Gomez de Sequeiro, leader of the 1525 expediton to the 'South Land', recorded on their maps of the north-eastern coast of Australia, 'coste dangerouse' (dangerous coast). There are also unconfirmed reports of rock etchings in the Sydney area depicting Portuguese or Spanish ships of the early 1500s, an Aboriginal story of nine armour-clad skeletons found in a cave near Cooktown and unidentified shipwrecks thought to be of Spanish or Portuguese origin.

Over 200 years later Frenchman Louis Antoine Comte de Bougainville supposedly also sighted the Great Barrier Reef. According to Holthouse: '...on the night of 4 June 1768, Bougainville was close to the latitude of today's Endeavour Reef (near Cooktown) when his lookout sighted white water gleaming in the moonlight. Daylight showed the sea breaking on a very low, sandy isle, bare of vegetation, but almost covered with sea birds ... Bougainville named the islet the "Shoal of Diana", after the goddess of the moon, in appreciation of her light having revealed the danger to him ...'

Bougainville sailed on for two days and sighted the Great Barrier Reef again. This time, he and the crew could see no end to the waves breaking on the Reef and could not find safe passage to head toward what they correctly presumed to be the South Land. Low on provisions, Bougainville decided to turn away from the Great Barrier Reef and headed towards the Solomon Islands.





History of the Great Barrier Reef

■ European History cont'd

Although it seems many came before him, it is Captain James Cook who is best known for his exploration of the Great South Land, charting its waters and naming many geographical features.

In 1770 Cook used the term 'the labyrinth' to describe the maze of reefs he encountered along Australia's east coast and warned others of the hazards to be found there. Indeed, Cook's ship, the *Endeavour*, was stranded on a reef near Cape Tribulation on 11 June 1770. The ship was dislodged and Cook was able to repair it when he eventually found safe harbour at the mouth of the Endeavour River where Cooktown is now situated.

Like those before him and even many who came after him, Cook found the Great Barrier Reef extremely difficult to navigate. However, it was Cook's charts that made it possible for British colonisation of the 'South Land' and, although he may have been responsible for naming many places in Australia that hold today, the term 'the labyrinth' did not stick.

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SHIPWRECKS

To date, there are an estimated 2000 shipwrecks in Great Barrier Reef waters. The Maritime Archaeology Section of the Queensland Museum has researched about 900 of these, and has positively identified 44. Listed below are some of the more relevant wrecks that have been declared historic shipwreck sites.

Ship	Date wrecked	
HMS Pandora	1791	
Mermaid	1829	
Gothenburg	1857	
Quetta	1890	
Foam	1893	
Yongala	1911	

The Historic Shipwrecks Act was enacted by the Commonwealth Government in 1976. This Act specifies that all wrecks aged 75 years or over (as well as a few more recent wrecks) in Australian waters are protected under Commonwealth jurisdiction. Additionally, the Commonwealth's Navigation Act 1912 defines salvage laws and includes specifications regarding the possession of salvaged material. All shipwrecks and relics remain the property of their lawful owners or the Crown.

HMS Pandora (1779-1791)

The *Pandora* was dispatched to capture Fletcher Christian and his followers, who mutinied against the *Bounty*'s Captain Bligh on 28 April 1789. Some reports state that the mutiny was due to Bligh's brutality. Others, however, indicate that after a stay in Tahiti, the crew of the *Bounty* were reluctant to leave the friendly Tahitian girls and Bligh did not accommodate the crew's wishes. A total of 14 of the mutineers who had returned to Tahiti after the mutiny were captured by Captain Edward Edwards and his crew on the *Pandora* on 23 March 1791. Christian and another eight mutineers had sailed on to Pitcairn Island where they remained undetected for 19 years. The 14 captured mutineers were confined to a small wooden cell, known as Pandora's Box, to be taken back to England for trial.

On 28 August 1791 the *Pandora*, a 24-gun Royal Navy frigate, struck the Great Barrier Reef near Raine Island. It wasn't until the early hours of the next day that she sank. Four of the mutineers and 31 crew drowned. The surviving 99 men made their way to a sand cay in lifeboats. Eventually the survivors gained passage back to England.





History of the Great Barrier Reef

■ Shipwrecks cont'd

The wooden vessel is well preserved in its watery grave off the Queensland coast. The Queensland Museum in Brisbane currently holds a collection of the *Pandora*'s artefacts. However, the artefacts will be moved to a new wing in the Museum of Tropical Queensland, Townsville, to be opened in 2000.

For further information on the *Pandora* access the Queensland Museum's web site at http://www.qmuseum.qld.gov.au

HMCS Mermaid (1816-1829)

This cutter, built of teak, was once under the command of Phillip Parker King and was used for conducting surveys of the Australian coast between 1818 and 1820. The *Mermaid* was declared unseaworthy after the completion of the surveys, but some years later she was repaired and used by John Oxley. She was on her way to Raffle Bay when she was wrecked on a reef south of Trinity Inlet, Cairns, on 13 June 1829.

SS Gothenburg (1854–1875)

The *Gothenburg*, under the command of Captain James Pearce, was a 500-ton screw steamer. On 24 February 1875, around 7 p.m., the *Gothenburg* struck Queensland Reef as she headed for Adelaide. It wasn't until the next day that she heeled over and a number of the 120 persons on board were swept off into rough seas. Among the passengers were various dignitaries, miners, women and children. It is thought that 103 people died.

Soon after the *Gothenburg* went down a salvage party was organised and set sail on the *Bunyip* to recover any valuables. Amongst the *Gothenburg* wreckage, the rescuers found many of the crew and passengers who had drowned.

Quetta (1881-1890)

The *Quetta* was a 3483-ton iron screw steamer that was wrecked off Mount Adolphus Island in the Torres Strait on 28 February 1890. She was a mail steamer under the command of Captain Alfred Sanders. On the fateful journey, the *Quetta* carried predominantly Javanese passengers who were heading home after working in the cane fields in Queensland. The course taken by Captain Sanders was a charted route that showed no obstacles. However, it was later discovered that a rock, only three metres from the surface at low tide, was the cause of the sinking. The *Quetta* took three minutes to sink and, of the 293 passengers and crew on board, 133 died.





History of the Great Barrier Reef

Shipwrecks cont'd

Foam (1877-1893)

The topsail schooner *Foam* was wrecked on Myrmidon Reef off Townsville while on a voyage to return Pacific Islanders (known as 'kanakas'), who were employed as labour in the Queensland cane fields, to their homes. The Islanders were often paid in trade goods worth a mere three pounds for a year's hard work.

More than 80 people were on board the *Foam* when she went down. All were saved. Traditional Islander trade goods were recovered from the ship in the 1980s and have contributed greatly to archaeological and anthropological knowledge of Pacific Island culture. Some of these trade objects are now held in the Queensland Museum, with the collection including many imitation shell armlets, traditionally carved from giant clams, and smoking pipes.

Yongala (1903-1911)

The *Yongala*, a single screw passenger steamer, was owned by the Adelaide Steamship Company. On a voyage from Brisbane to Townsville the *Yongala*, her Captain, William Knight, 72 crew and 48 passengers disappeared.

The tragic end to the *Yongala* may have been avoided if she had stayed a few hours longer at her previous berth, Flat Top Island, where cargo had been unloaded. The signal station at Flat Top Island received warning of a cyclone between Mackay and Townsville shortly after the *Yongala* had steamed away. She was still in view. With no wireless on board, it was impossible to warn the fated ship.

One of the last people to see the *Yongala* was a lighthouse keeper on Dent Island in the Whitsunday Passage. The *Yongala* was declared missing a few days after her estimated date of arrival (24 March) in Townsville. An extensive search was undertaken but there was no sign of the Yongala until a week later when wreckage and the carcass of a racehorse, named Moonshine, washed ashore. No other bodies were recovered.

A Royal Australian Navy vessel detected the wreck in 1957 off Cape Bowling Green, south-east of Townsville. In 1958 two Townsville divers, Don Macmillan and Noel Cook, discovered that salvors had already removed the wreck's bronze propellor. The hull of the ship is virtually intact on the seabed and provides a valuable archaeological site, with artefacts still in context. It also harbours an abundant array of marine life, making it one of the most popular dive wrecks in the world.

Sources:

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National Historic Shipwrecks Data Base: http://www.museum.wa.gov.au

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Past, Present WHEN and Future

Present and Future: Plans for the management of the Great Barrier Reef

THE 25 YEAR STRATEGIC PLAN FOR THE GREAT BARRIER REEF WORLD HERITAGE AREA

The Great Barrier Reef is unique. Therefore, the managers of the Reef face unique problems that demand innovative management solutions.

For over 20 years, the Great Barrier Reef Marine Park Authority has been continually creating new initiatives to manage and protect the Great Barrier Reef. Often, it has been a case of creating rather than re-writing the rule book. There have been no precedents set anywhere else in the world for the management of such a vast marine region.

Perhaps no other initiative has been as far-reaching in its vision, innovative in its approach, or more encompassing in its scope, than the 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area. The Plan was launched by then Prime Minister Paul Keating on 20 July 1994.

The Strategic Plan gives everyone who has a stake in the Reef's long-term future a say in how the Great Barrier Reef World Heritage Area is to be managed over the next 25 years. This approach will ensure the Reef remains in a healthy state and can be enjoyed by future generations.

The Proposal

For the first three years of its existence the primary objective of the Authority was to establish the first Section of the Great Barrier Reef Marine Park Capricornia, which was proclaimed on 21 October 1979. By 1981, after the proclamation of the Cairns Section, the Great Barrier Reef Marine Park was the largest marine park in the world. In that year, the world's largest World Heritage listed area, the Great Barrier Reef World Heritage Area, was also established.

Alongside the process of establishing the Marine Park and World Heritage Area, came the reinforcement that effective management was dependent on the activities of other agencies, groups and individuals operating both inside and adjacent to these areas. The Authority realised that a jointly developed, long-term agreement by all stakeholders on the future management of the Reef was needed and the Strategic Plan was developed. It is designed to get everyone working together towards a shared future rather than competing with or duplicating one another's activities.

From the beginning, emphasis was placed on the concerns and opinions of all stakeholders. These included governments, Aboriginal and Torres Strait Islander communities, conservationists, scientists, recreational users and established Reef industries such as fishing, shipping and tourism.





The Strategic Plan has been endorsed by more than 70 organisations representing all levels of government, recreational and commercial users, conservation and scientific groups and Aboriginal and Torres Strait Islander communities.

The Authority's commitment to the 25 Year Strategic Plan strongly reflects one of its aims. That is, to achieve integrated management of the Great Barrier Reef through active leadership and through constantly seeking improvements in coordinated management. A core element of the Plan is a commitment by all parties to review and update the Plan every five years.

Through the Strategic Plan one of the Authority's basic beliefs comes to life: the Great Barrier Reef belongs to everyone and should be managed by everyone to ensure a healthy Reef for the future.





THE CORPORATE PLAN

The Corporate Plan is a direction-setting plan. It focuses on a series of issues that are considered crucial for the wellbeing of the Marine Park and World Heritage Area. It also focuses on the management tools, corporate support and services crucial to effective management of the Great Barrier Reef.

Development of the Corporate Plan has been guided by the vision, objectives and strategies identified in the 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area. The Corporate Plan will also be used to support implementation of strategies and tasks identified in the Strategic Plan.

Vision

The Authority's approach to the management of the Great Barrier Reef is founded on the following vision in the 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area. The approach is also in accordance with Australia's obligations to ensure the protection, conservation, presentation and transmission of the World Heritage Area.

In the Great Barrier Reef World Heritage Area in 25 years there will be:

- A healthy environment: a World Heritage Area that maintains its diversity of species and habitats, and its ecological integrity and resilience, parts of which are in pristine condition;
- Sustainable multiple use: non-destructive activities which can continue forever, that
 is, in such a way that maintains the widest range of opportunities for appropriate
 sustainable use, and does not adversely affect the ecological integrity of its natural
 systems;
- Maintenance and enhancement of values: the continuation and enhancement of diverse aesthetic, ecological, economic, cultural and social values, providing for the aspirations of residents, users, Aboriginals and Torres Strait Islanders and the global community;
- Integrated management: management of activities which take into account the
 ecological relationship between the Area and other adjacent areas, particularly the
 mainland;
- Knowledge-based but cautious decision making in the absence of information: decisions based on a commitment to research, monitoring and review, using data and experience from all sources and erring on the side of caution in the absence of information; and
- An informed, involved, committed community.





Principles for Management

Management of the Great Barrier Reef Marine Park and World Heritage Area will be undertaken according to the Objectives and Broad Strategies laid down in the 25 Year Strategic Plan. In carrying out its management responsibilities, the Authority will be guided by the following principles.

Nature Conservation

- Protection of the natural values of the Great Barrier Reef World Heritage Area will be the primary concern of the Authority.
- Rare, depleted, threatened and endangered species and communities, together with their critical habitats, will be protected.
- Use practices which threaten the natural values will be effectively managed. Some areas, representative of the variety of communities and habitats found in the World Heritage Area, will be maintained free from human use.

Maintaining a Cultural Landscape

- Management will recognise that the sea level rise that led to the present Great
 Barrier Reef occurred after Aboriginal people settled in Australia. This will enable
 Aboriginals and Torres Strait Islanders to pursue their own lifestyles and cultures
 and have responsibility for areas and resources relevant to their heritage. However,
 this must be undertaken within the bounds of nature conservation and ecologically
 sustainable use.
- Sites of historical significance will be preserved, and if appropriate, interpreted.

Presentation and Use Management

- The Authority will provide for a diverse range of use opportunities, consistent with World Heritage obligations, nature conservation, cultural and heritage values and presentation principles.
- High standards in community education and presentation of World Heritage Area values will be maintained, including the provision of relevant education, training and interpretive materials.
- Impacts of use will be managed to maintain nature conservation, cultural, heritage, use and community values, and will take into account individual and cumulative impacts of use on the World Heritage Area.
- Decision making concerning use of the World Heritage Area will involve affected user groups and stakeholders and will take into account information gathered from public participatory processes.





Corporate Values

The work of the Authority will be guided by five key values.

Relevance

 We ensure that our activities remain relevant by meeting contemporary needs through creativity, innovation and continuous improvement.

Direction

 We have a clear purpose, with staff knowing how they each contribute to this through efficiency, effectiveness and service delivery.

Leadership

 We all take responsibility for leadership and are committed to performance, accountability and ethical conduct.

People Focus

• We recognise that the greatest strength of the Authority is its people through a commitment to merit, equity and development.

Partnership

 We build strong internal and external partnerships by listening, understanding, valuing and responding.





Critical Issues for the Great Barrier Reef Marine Park and World Heritage Area

Through developing the Vision, Principles for Management and Corporate Values, and with guidance from the 25 Year Strategic Plan, it has been possible to identify a series of issues crucial for the wellbeing of the Marine Park and World Heritage Area and for the management of use. These critical issues are:

- · Conservation, Biodiversity and World Heritage;
- · Tourism and Recreation;
- · Fisheries; and
- · Water Quality and Coastal Development.

For the foreseeable future, the Authority will focus its work more directly towards these critical issues.

Sources:

A 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area 1994–2019, 1994, Great Barrier Reef Marine Park Authority, Townsville.

Corporate Plan, 1997, Great Barrier Reef Marine Park Authority, Townsville.





Home to thousands of plant and animal species, the Great Barrier Reef is the largest system of platform reefs in the world and is certainly one of the most extraordinary marine ecosystems.

The Great Barrier Reef is also a safe haven for many threatened marine animals. Raine Island is the world's largest green turtle rookery, humpback whales use the central Great Barrier Reef as their calving ground, and the Great Barrier Reef is the last mainstay for dugongs.

What makes this tropical marine environment even more remarkable is the epic expression of nature represented by the abundant corals and the multitude of diverse seascapes.

Ecosystems such as wetlands, mangrove estuaries, tidal rivers and seagrass meadows all support the richness and vitality of the Great Barrier Reef. These inshore habitats supply nutrients and provide food, shelter and other survival needs in the life cycle of many reef species.

Equally important are the deeper water habitats that act as corridors for the movement of animals, such as juvenile fish and prawns, away from the coast to the offshore reefs.

The maintenance of biological diversity of the habitats and species of the Great Barrier Reef is of utmost importance. Plants and animals in the marine environment are dependent upon each other and their physical environment in an elaborately interwoven community, the complexity of which we still don't understand. It is often the case that if one habitat or species is destroyed it may have drastic repercussions for other habitats and species.

Understanding the way in which all these habitats and species are connected underpins the philosophy of modern marine park management. The Great Barrier Reef has no fences—marine plants and animals and their myriad planktonic larvae can swim, drift and dwell at will.

The unique and relatively pristine nature of the Reef not only attracts a vast array of marine organisms but also entices people with its magnificent beauty, wondrous diversity and valuable resources.

Protection, enjoyment and the privileged use of such an important environment are made possible by careful and effective management provided by the Great Barrier Reef Marine Park Authority.

The Authority's multiple-use management philosophy provides for human activity within the Marine Park and World Heritage Area under the governance of environmentally sustainable practices and the precautionary principle. The Authority is committed to maintaining and enhancing the Great Barrier Reef's natural, cultural and social values.





In order to achieve this aim of conservation and sustainable use, awareness of and respect for the Reef and associated environments must be universally established.

We are all fortunate to have this extraordinary natural gift. It is our collective responsibility to ensure the Reef's protection, as the quality of our lives will surely be eroded if this spectacular wonder is destroyed.





REEFS

Reefs are wave-resisting structures of organic origin. They are also home to a myriad of plants and animals including corals. The major part of a reef is non-living limestone (calcium carbonate) formed by coralline algae, coral and other skeleton-secreting creatures, with the living organisms forming only a thin layer on top.

Reef classification is a confusing and messy subject. While the foundations of all coral reefs are made of limestone, there are different reef types, depending on how and where they are formed.

Reefs can be classified into two main categories: *platform reefs* and *atolls*. Reefs like the Great Barrier Reef, that grow on stable, shallow continental shelves, are platform reefs. Reefs that are formed by upward growth, on a subsiding volcanic island in deep oceanic settings, are atolls.

It is important to maintain these distinctions because the terms *atoll* and *platform reef* infer entirely different modes of origin in different geological settings. (N.B. The term 'fringing reefs' is associated with both atolls and platform reefs; its use is described below).

In western Australia the term *shelf atoll* has come into use for platform reefs growing in deeper water just beyond the shelf-edge. These reefs, with long and complex geological histories, have grown on the torn, ragged margin of the Australian continent and are very similar in setting to the 'Great Detached Reef' in the northern Great Barrier Reef. They should be more properly classified as *detached shelf-edge platform reefs*.

Another point of confusion is the term *micro-atoll*. This refers to any coral with a flat, dead top caused by growth limitation and weathering. Corals are unable to grow past sea level and often the top of the coral is killed due to overexposure. However, coral growth may still occur on the sides. These micro-atolls are predominantly found on inner reef flats. Despite their title, micro atolls have nothing to do with real atolls—the mighty underwater mountains of coral which sit atop subsiding volcanoes in the Pacific Ocean.

The formation of a true atoll occurs in deep oceanic waters. Charles Darwin defined the various reef phases that may occur as a volcanic island subsides, as: [1] fringing reefs; [2] barrier reef with lagoon; and finally [3] an atoll (when the volcanic island is submerged).

Strictly speaking, the term *barrier reef* is reserved for explaining reef formation around atolls, along the plate boundaries and volcanic hot spots of the ocean basins. Obviously, no-one is going to change the name of the Great Barrier Reef but it is worth noting that the correct classification is *platform reef*.





■ Reefs cont'd

Reefs of the Great Barrier Reef

All reefs on the Australian continental shelf are platform reefs. Those near the edge of the continental shelf are known as *shelf-edge platform reefs*. Further refinement comes with descriptive terms like linear. Thus, the geologically correct, but not necessarily practical, name for the *ribbon reefs* north of Cairns would be *linear shelf-edge platform reefs* (also known as *outer-shelf reefs*). These linear reefs are commonly called barrier reefs but, as already pointed out, this usage is not strictly correct.

Fringing, inner-shelf, mid-shelf and outer-shelf platform reefs are the common terms used to describe the reefs across the shelf. Outer-shelf reefs experience the full force of the Coral Sea swells generated by the south-east trade winds. They form an almost continuous wall-like 'barrier' in the north and a dense maze of reefs, offshore from Mackay, in the south. Offshore from Cairns to Bowen there are no linear outer-shelf reefs to act as a barrier. There is, however, a linear series of shoals which echo the shelf-edge platform reefs to the north and south.

Mid-shelf reefs display great variety in shape, size and development. As they do not directly face the Coral Sea and Pacific Ocean swells, mid-shelf reefs are able to form a more open and rambling architecture. Similarly, they do not face the steep, deepwater drop-offs at the shelf edge, making the scope for subtle habitat variation profound. It is this broad, continental shelf setting that makes the Great Barrier Reef so special and unlike the open drop-off ocean settings found elsewhere in the Indo-Pacific.

Many mid-shelf reefs also support coral cays. Cays, which are usually made from reef-derived debris, can vary from simple piles of sand to islands of dense forest.

Inner-shelf reefs have developed in the more turbid waters close to land. Some fringe inshore continental islands (fringing platform reefs) while others, such as at Cape Tribulation, fringe the mainland. They occur in shallow depths, compared to the outer- and mid-shelf reefs. Inner-shelf reefs are also subject to river run-off, pollution from human activity in the hinterland/coastal areas and greater impacts from human use. Biologically, they support a different mix of plant and animal species.

As different species have different environmental tolerances, their role in a reef community varies. Factors such as sedimentation, fresh water, nutrient input, light and wave action influence biological responses to physical conditions. Collectively, these variations account for the different look and feel a diver experiences on inshore, mid- and outer-shelf platform reefs.

Across the broad, continental shelf of north-east Australia, there is tremendous variation in physical conditions to which reefs have responded over geological time. It is this which underpins the extraordinary richness and variation on the theme of coral reefs found within the Great Barrier Reef World Heritage Area.





■ Reefs cont'd

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CORALS

Types of Coral

The Great Barrier Reef is one of the last reef systems still in a relatively pristine condition. Coral reefs all over the world have been affected, some completely decimated, by pollution, overfishing, physical destruction and natural perturbations. It is crucial that the Great Barrier Reef remains in a healthy condition to ensure the survival of corals and associated plants and animals.

Reefs are spectacularly beautiful because of the colourful corals that abound. Before corals were scientifically studied they were thought to be plants. Corals are, however, tiny animals called coral polyps. These polyps look to some people like flowers and corals have been referred to as 'flowering animals'. Corals are of the large group of animals known as *coelenterates* and are related to jellyfish and sea anemones. All coelenterates have a simple body structure—[radially symmetrical] a stomach, a mouth opening and no excretory or blood system.

There are three categories of corals: the *stony* (also known as hard) corals, the *soft* corals, and the *hydrozoan* corals.

The stony coral polyps (also called hermatypic or 'reef-building' corals) secrete a hard limestone skeleton. This external skeleton acts as a house in which the polyps live. If threatened, the polyps can retract into their hard skeleton. Most of the stony coral polyps are zooxanthellate which means they contain a microscopic plant (algae) called zooxanthellae. The stony corals rely on this photosynthetic algae for over 90 per cent of their food and growth requirements. Sunlight, therefore, is needed for photosynthesis. However, these corals can supplement their diet with zooplankton (animal plankton) and some have adapted to low-light conditions.

Stony corals that do not rely on zooxanthellae are *azooxanthellate*. They are not restricted to sunlit waters and can grow at any depth where there is a supply of food. They use stinging cells to paralyse prey, which can include plankton, small fish and worms.

Most soft corals are, as the name suggests, soft. They have a fleshy appearance and lack a compact external skeleton. However, they are not completely spineless. They contain needles of limestone in their flesh, which support their soft bodies. (There are exceptions to this rule, however, with a couple of the soft corals actually secreting a limestone skeleton). Unlike hard corals, soft corals are unable to disappear into a hard, protective home if threatened. Protection is provided by the limestone needles found within the polyps which contain toxic chemicals that ward off most predators.

For food, these corals too rely on a symbiotic relationship with zooxanthellae, capture zooplankton and take up particulate matter from the water.





■ Corals cont'd

Hydrozoan corals have *nematocysts* (specialised cells) that inject poison. Many of the hydrozoans resemble stony corals but are capable of inflicting a painful sting, such as the *Millepora*, a common hydrozoan known as 'fire coral'. However, some hydrozoans do not secrete a limestone skeleton and do not look like coral. For example, the jellyfish-like Portuguese Man-of-War (bluebottle) is a type of hydrozoan.

The most common hydrozoans are the hydroids. Feather-like in appearance, the hydroids have a stalk with side branches that are made up of polyps. Some of the polyps are used for feeding and stinging while others are used for reproduction. Hydroids reproduce sexually by releasing eggs or sperm into the water column for fertilisation.

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■ Corals cont'd

Coral Spawning

Every year an extraordinary event occurs on the Great Barrier Reef. Corals release massive amounts of egg and sperm into the warm sea water to create a kaleidoscopic soup of sex.

This unique event is as colourful as it is dramatic. Millions of eggs and sperm (gametes) ranging in colour from the predominant pink to red, orange, purple, blue and green are released by 'broadcast-spawning' corals for fertilisation. (Not all corals release their gametes for fertilisation. Corals that fertilise their gametes inside the polyps and release baby corals at other times of the year are known as 'brooders'). Broadcast-spawning corals can have both male and female gametes developing within a single polyp (hermaphrodites) or each coral colony will have either male or female gametes (gonochoric or separate sexes).

The day after the gametes have been released, if conditions are calm, bright pink slicks of mucus associated with the spawn can be seen on the surface of the water. The fertilised coral larvae, known as *planulae*, drift on the currents to new locations before settling as a single polyp, which clones itself to form a coral colony.

Mass spawning was only discovered in 1981 by marine scientists from James Cook University, Townsville. The event always occurs at night and can continue for days after the late spring and early summer full moons; different corals spawn on different days. Nearshore coral reefs tend to release gametes in October, while offshore reefs release gametes in November.

A series of environmental cues are thought to trigger the mass spawning. These include the spring rise in sea temperatures (at least partially responsible for synchronising the month of spawning), the lunar cycle (synchronises the night of spawning) and the daily photoperiod cycle (synchronises the hour of spawning).

Scientists also think the reason different coral species release their gametes within days of each other is to increase gamete survival; predators would have a hard time consuming millions of gametes at once. Another possible outcome of synchronous spawning is to create more new species of resilient corals through cross-fertilisation (hybridisation).

Sources:

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■ Corals cont'd

Coral Bleaching

Coral bleaching is often referred to as the 'whitening' of corals. However, bleaching has now been observed in just about all marine organisms that host zooxanthellae.

Many marine invertebrates such as most species of hard and soft corals, sea anemones, zoanthids (related to hard corals), giant clams, some sponges, and foraminifera have a symbiotic relationship with types of algae known as zooxanthellae or zoochlorellae. The invertebrates host these photosynthetic algae within their tissues.

Of the invertebrate hosts, it is the corals and giant clams that appear to rely most heavily on their symbiotic algae for the production of energy for metabolic processes. For some coral and giant clam species, more than 90 per cent of their energy requirements are provided through the process of photosynthesis.

Bleaching usually occurs when environmental stress causes the host species to suffer a loss of zooxanthellae. However, it can also occur when the host retains the zooxanthella but the alga loses some of its photosynthetic pigments.

Psychedelic colours can also result during partial bleaching. Although hosts commonly turn white when fully bleached, there are some hosts that turn pink, yellow, purple, blue or iridescent green when partially bleached.

Some of the factors that are thought to cause the bleaching are elevated sea temperatures, exposure to excessive irradiance and lowered salinity. However, when corals approach their upper thermal limits, even small additional doses of ultraviolet light or other sunlight spectra can cause them to bleach.

The phenomenon of coral bleaching was noted as early as the late 1920s during the Great Barrier Reef Expedition. However, mass bleaching events have only been recorded since the late 1970s and became a more closely studied event in the 1980s.

In some parts of the world coral bleaching has occurred every three to four years since the late 1970s. The subsequent research has led to increased knowledge about the event but much is still unsubstantiated.

The 1997-98 Bleaching Event

Reports on coral bleaching have attested to the fact that the 1997–98 event has been the most geographically extensive bleaching scientifically recorded.

Sites identified as being affected by the phenomenon were in Kenya, the Netherlands Antilles, Cayman Islands, Florida Keys, the Yucatan coast, Baja California, Galapagos Islands, French Polynesia, Christmas Island, Lord Howe Island and the Great Barrier Reef. Dozens of other sites were also affected.

Surveys of the Great Barrier Reef, conducted by the Great Barrier Reef Marine Park Authority, indicated that 88 per cent of inshore reefs from Gladstone to Cape York





■ Corals cont'd

bleached to some extent (25 per cent severely bleached), and that around 28 per cent of mid-shelf reefs were affected (five per cent severely).

It is the inshore reefs that were most susceptible during this event. Most bleaching occurs in the top few metres of the water column due to the temperatures and irradiance being highest at the surface. Because most inshore reefs are in shallower waters than offshore reefs, more of the inshore reef corals become affected.

Links between the Great Barrier Reef bleaching event and the El Niño Southern Oscillation (ENSO) as well as global warming were drawn. However, to date there is no data available to support or reject these links.

In fact, regional weather patterns experienced in North Queensland during the 1997–98 summer were opposite to those expected during 'normal' El Niño years. Normally during an El Niño year the east coast of Australia experiences cooler waters and lowered rainfall; 1997–98 saw the reverse.

While increased bleaching may be linked to global warming there is no conclusive evidence to prove this at present. Rises in sea water temperatures may be due to natural global climate or regional changes because we are at the peak of a warming phase in geological terms and sea temperatures are naturally still on the rise.

Although an agreement has not been reached on the cause of sea temperature rises, the general consensus appears to be that on the central Great Barrier Reef, in early 1998, a combined effect of high sea temperature and exposure to high irradiance caused widespread bleaching. In addition, lowered salinity due to flooding in North Queensland caused extensive bleaching on inshore reefs.

Recovery of bleached marine invertebrates can vary. However, recovery on the Great Barrier Reef is generally good. More research is needed to determine the adaptability of marine invertebrates and zooxanthellae to such events. Some research is now highlighting the possibility that coral community structures may be altered because some species are more resilient than others. Also reef connectivity may be important for recovery.

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■ Corals cont'd

Crown-of-thorns Starfish

The crown-of-thorns starfish is one of few animals that feed on living coral tissue. At low densities, this animal is just another part of the ecology of a coral reef. However, when the crown-of-thorns starfish reaches densities at which it eats corals faster than the coral can reproduce and grow, this can lead to significant reductions in coral cover and results in major disturbance to the entire ecology of a reef.

The first *outbreak populations* (populations that exceed 30 mature starfish per hectare) of crown-of-thorns starfish to be noticed and described were at Green Island and nearby reefs offshore from Cairns in 1962. A group of reefs experiencing outbreak populations simultaneously is known as an *outbreak*. Over the next 14 years, this outbreak slowly spread southwards as far as reefs offshore from Mackay, where it gradually petered out.

A second outbreak, probably again beginning to the north of Cairns and spreading southwards, occurred between 1979 and 1991. Both outbreaks were mostly confined to midshelf coral reefs. The second outbreak affected approximately 17 per cent of the more than 2800 coral reefs in the World Heritage Area, with five per cent of reefs having severe outbreaks. It is thought that the apparent southward spread of outbreaks is due to crown-of-thorns starfish being transported from one reef to another by the East-Australian current.

In 1993, the first stages of another outbreak were detected. Since then this outbreak has developed, with increasing numbers of crown-of-thorns starfish being found and increasing numbers of reefs being affected. Surveys of the Cairns Section of the Marine Park in 1994–95 found only two out of 27 surveyed reefs had reef-wide outbreaks. In 1996–97 this figure was seven out of 28. The proportion of observed crown-of-thorns starfish that were sexually mature increased every year, indicating that the outbreak will increase in severity and geographic range.

In the most recent surveys, populations of small juvenile crown-of-thorns starfish have been found in the southern parts of the survey area. This suggests that, as in the first two outbreaks, the new outbreak is spreading southwards.

Crown-of-thorns starfish outbreaks may be caused by the interaction of many factors, all of which may vary both in space and time. Despite significant research effort, there is still uncertainty as to the causes of crown-of-thorns starfish outbreaks.

It is possible that these outbreaks are a natural phenomenon. The crown-of-thorns starfish has the ability to produce very large numbers of offspring, allowing populations to grow rapidly under favourable conditions. There is some geological evidence to suggest that outbreaks have occurred on the Great Barrier Reef for the last 3000–7000 years. However, as with most aspects of the crown-of-thorns starfish issue, this evidence is not unequivocal and there are those who disagree with the conclusions drawn from it.





■ Corals cont'd

Others have speculated that human activities may be responsible for at least making outbreaks worse and/or more frequent, if not causing them. Two major theories have been put forward as to how this may happen. Firstly, it is possible that increased nutrient run-off from the land increases the amount of phytoplankton in the water. Larval crown-of-thorns starfish feed on this phytoplankton and an increase in the food supply may lead to a higher survival rate of the larvae, eventually leading to an outbreak.

Secondly, it has been proposed that fishing and shell collecting have lead to decreased numbers of predators of the crown-of-thorns starfish. The reduced number of these predators is thought by some to allow crown-of-thorns starfish populations to increase beyond natural levels.

The crown-of-thorns phenomenon is not unique to the Great Barrier Reef as there have also been indications that outbreaks are widely spread throughout the Indo-Pacific region. Places such as Fiji, Indonesia, the Maldives, the Philippines, South Africa, the Seychelles, the Solomon Islands, the Cook Islands and Japan have also experienced crown-of-thorns starfish outbreaks.

In the absence of definitive information about whether crown-of-thorns starfish outbreaks are natural, the Authority has adopted a policy of minimum intervention. This means that there is no interference with the crown-of-thorns starfish populations on a large scale. However, small-scale control programs may be permitted by the Authority in areas of tourism or scientific importance threatened by crown-of-thorns starfish outbreaks. The Authority is also gathering as much information about the outbreaks as possible in a bid to understand more about the causes and effects of crown-of-thorns outbreaks.

Source:

Wachenfeld, D. R., Oliver, J. K. and Morrissey, J. I. (eds) 1998, State of the Great Barrier Reef World Heritage Area 1998, Great Barrier Reef Marine Park Authority, Townsville.





MARINE ANIMALS

An impressive array of animals inhabit or visit the Great Barrier Reef—from very small zooplankton to whales. All are interconnected and rely on each other for survival, whether it be for food, shelter or alliances. They also rely on humans not polluting and destroying their habitats or harming them. Only a few of the Reef's animals have been studied in great detail and there is still much to learn about a great number of them. Some of the most commonly asked questions about marine animals are mentioned below.

Mammals

Marine mammals give birth to live young, have mammary glands to suckle young, surface to breathe air and are 'warm-blooded' (homeothermic); that is they maintain a relatively constant body heat. Whales, dolphins and dugongs are all mammals.

Whales and Dolphins

Whales and dolphins are cetaceans. There are at least 26 species of cetaceans that inhabit or visit the Great Barrier Reef. Cetaceans are divided into two groups: toothed and toothless (baleen whales). Baleen whales include the blue whale, the largest organism ever to have lived on the planet, and have bristly plates attached to their jaw that act as filters. These massive mammals sieve huge quantities of the tiniest animals—krill (tiny shrimp-like creatures) and small fishes—from the water. Baleen whales also have paired blowholes rather than the single blowhole characteristic of toothed cetaceans. The toothed cetaceans generally hunt much bigger prey than the baleen whales. For example, killer whales hunt large prey such as seals, and dolphins such prey as fish and squid.

The Great Barrier Reef is visited by many species of whales. The most frequently observed species in the Marine Park are the humpback and dwarf minke whales. Primary threats to whales on the Reef are disturbance from human interaction, boat collisions and noise. Without careful management and a strict adherence to whale-watching guidelines and boating and aircraft practices, there is a concern these activities may cause long-term stress. Stress may impair growth and reproduction, thereby potentially threatening the population.

Humpback Whales

Humpback whales are baleen whales that migrate from summer feeding grounds in the Antarctic to warm, tropical waters to breed. Humpbacks spend from July to October in Great Barrier Reef waters where they mate or give birth. Females are pregnant for 10 to 12 months and suckle their calves for up to a year. Humpbacks can grow to a maximum length of 19 metres (females are generally one metre longer than males) and can weigh





■ Marine Animals cont'd

up to 48 tonnes. The pectoral fins, a third of their body length, are the largest of any whale. Humpback whales are known for their majestic 'songs' and it is thought that only the males 'sing'. Populations were almost decimated in the early part of the century due to whaling. Whaling on the east coast of Australia ceased in 1963 and today the Great Barrier Reef humpback population is increasing by around 11 per cent per year.

Dwarf Minke Whales

Dwarf minke whales are one of the smallest baleen whales, growing to around 7.5 metres in length. Since the mid-1980s they have been regularly sighted offshore from Cairns to Lizard Island during June and July, although they have been sighted in the Marine Park between March and October. Not much is known about them and some scientists think they may be a new species of minke whale. The dwarf minke whales are unusual in their behaviour because they are very playful and inquisitive, a characteristic very similar to that of dolphins.

Dolphins

Dolphins are also threatened by human interaction, boating, mesh and gill netting and, for coastal species, the destruction of inshore habitats. Some species of dolphins spend most of their time inshore, however, other species utilise offshore areas. There are two species of inshore dolphins in the Great Barrier Reef that only live in estuaries and coastal areas; the Irrawaddy dolphin and the Indo-Pacific hump-backed dolphin. These species are under threat due to habitat degradation and increasing human use of the coastal zone. Populations of Irrawaddy dolphins and Indo-Pacific hump-back dolphins are in decline in much of South-East Asia and the species found in Australia may be the only ones that will survive into the next century. Although bottlenose dolphins are also classified as inshore species, they are found throughout the World Heritage Area.

Bottlenose Dolphins

Bottlenose dolphins are the largest of the beaked dolphins that occur in the inshore Great Barrier Reef. They grow to an average of three metres and mate and calve between spring and autumn. Gestation is around 12 months and the calves suckle for about 18 months. Their diet consists of fish, eels and squid. Bottlenose dolphins would be familiar to most people because they are the most common species seen in captivity.

Irrawaddy Dolphins

Irrawaddy dolphins have a blunt, bulbous head with no beak, and grow to an average length of two metres. Little is known about their reproduction, but those that have been kept in captivity have had a gestation period of approximately 14 months and the calves were not weaned until around two years. When Irrawaddy dolphins hunt they spit water to scare small fishes into shallow waters. Although they favour coastal seawater and brackish rivers in the Great Barrier Reef area, the Irrawaddy dolphin lives in fresh water permanently in some parts of South-East Asia.





■ Marine Animals cont'd

Indo-pacific Hump-backed Dolphins

The most obvious difference between Indo-pacific hump-backed dolphins and bottlenose dolphins is in the shape of the dorsal fin. On average, they grow to two metres at maturity and calves are born all year round, although most are born in summer. They predominantly eat fish and sometimes crustaceans.

Other Cetaceans

Other whale and dolphin species reported from the Great Barrier Reef include spinner dolphins, false killer whales, killer whales, short-finned pilot whales, sperm whales and various beaked whales. Nothing is known of the status of these species in the Great Barrier Reef World Heritage Area, other than that they occur there. Some species, for example Longman's beaked whale, are known only from a single record.

Many species of cetaceans are involved in 'live stranding' events. Most mass strandings involve species that normally inhabit deep oceanic waters. It is still not known why cetaceans strand but there are many theories ranging from illness to inability to distinguish sonar echoes leading to disorientation. A possible explanation appears to be mistakes made when they read the geomagnetic field (flux density) of the Earth. This flux density acts as an orientation guide. Unfortunately, it appears that when offshore cetaceans come close to shore, their ability to read this guide becomes less and they accidentally strand. The Commonwealth Department of Environment and Heritage now has in place a National Contingency Plan for Cetacean Strandings to aid with rescue operations and to gain scientific knowledge.

All cetaceans are protected under the *Commonwealth Whale Protection Act 1980*. In Queensland they are protected under the *Nature Conservation (Whales and Dolphins) Conservation Plan 1997*. In October 1998, the Authority released a draft *Whale and Dolphin Conservation Policy* which specifies the manner in which the Authority proposes to manage the Marine Park for the conservation of cetaceans within its water. It is intended to support related initiatives of the Commonwealth Government, such as the new National Guidelines for Cetacean Observation, and operate in harmony with Queensland's dolphin conservation legislation and management program.

Of the cetaceans that visit or inhabit the Great Barrier Reef there are two species of whale and two species of dolphin listed under conservation legislation (see Table 1.1).





■ Marine Animals cont'd

Table 1.1

Cetaceans found in Great Barrier Reef waters that have a Conservation Status, 1998

Cetacean Species	International IUCN Red List of Threatened Animals 1996	Commonwealth Endangered Species Protection Act 1992	Queensland Nature Conservation (Wildlife) Regulation 1994
Humpback whale (Megaptera novaeangliae)	vulnerable	vulnerable	vulnerable
Southern right whale (Eubalaena australis)	lower risk/ conservation dependent	endangered	not listed
Irrawaddy river dolphin (Orcaella brevirostris)	data deficient	not listed	rare
Indo-Pacific hump-backed dolphin (Sousa chinensis)	data deficient	not listed	rare



■ Marine Animals cont'd

Dugongs

Another marine mammal that is protected under conservation legislation is the dugong. Dugongs are classified as 'vulnerable to extinction' internationally (1990 IUCN Red List of Threatened Animals) and 'vulnerable' under Queensland's *Nature Conservation Act 1992*. Dugongs are not listed under the Commonwealth Endangered Species Protection Act.

The dugong (*Dugong dugon*) is the only remaining member of the family Dugongidae. The other modern member of the family, Steller's sea cow (more than double the size of a dugong), was hunted into extinction in the eighteenth century. The dugong is also related to manatees that inhabit the Atlantic region. Both the dugong and manatee are of the Order Sirenia and are called seacows because they predominantly graze on seagrass.

Dugongs grow to about three metres in length, can weigh up to 400 kilograms and have a lifespan of more than 70 years. Females are reproductively mature at around 10 years of age but may not have their first calf until they are 17 years of age. Pregnancy lasts around 13 months and calves are suckled for at least 18 months. Usually only one calf is born at a time, at intervals of three years or more. Because they are a long-living and slow-breeding species, their populations may deplete to an unsustainable level if unnatural deaths of females exceed one to two per cent.

Australia's total dugong population is a conservative estimate of around 80 000 and is believed to be the largest population left in the world. In Australia their range is from Shark Bay, Western Australia to Moreton Bay, southern Queensland. The northern end of the Great Barrier Reef is regarded as the mainstay for dugongs where they are the most abundant marine mammal in the inshore waters. They are estimated to number around 30 000 in the Torres Strait region and around 12 000 in the Great Barrier Reef World Heritage Area.

While dugong populations in other areas of Australia appear stable, in the southern half of the Great Barrier Reef and Hervey Bay regions, dugong numbers have declined by more than 50 per cent over the last eight years.

The Great Barrier Reef Ministerial Council, chaired by the Commonwealth Minister for the Environment and Heritage, the Hon. Senator Robert Hill, formally introduced 16 dugong sanctuaries on 12 January 1998. The decision was made after scientific evidence and independent analysis suggested dugongs were in serious decline south of Cooktown.

The 'A' and 'B' sanctuaries (or dugong protection areas) that have been created are spread over approximately 1100 kilometres of the Queensland coastline, from Hinchinbrook Island to Hervey Bay.

Zone 'A' sanctuaries include significant, high priority dugong habitats and have the more stringent measures put in place. For example, the use of offshore set nets, foreshore set nets and drift nets is prohibited. Zone 'B' sanctuaries are additional





■ Marine Animals cont'd

protection areas and have fewer restrictions. For example, mesh netting is allowed, although with more safeguards and regulations than before. Both areas will be monitored to ensure effective protection of dugongs, with surveillance and enforcement of these sanctuaries being a high priority for the Authority.

The causes of death and dramatic decline are not certain in some cases. However, acknowledged threats include mesh netting, indigenous hunting, shark nets, loss of seagrass, vessel collision, pollution, and explosions for purposes such as defence training or marina construction.

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Nature Conservation (Wildlife) Regulation 1994. (Queensland)





■ Marine Animals cont'd

Reptiles

Marine reptiles lay soft-shelled eggs and have to return to the surface to breathe. They are classified as 'cold-blooded' (poikilothermic), which means their body temperature is strongly influenced by the temperature of the surrounding environment. However, in the last 30 years, it has been discovered that some reptiles have a certain degree of thermal control. Turtles, seasnakes and crocodiles are all reptiles that inhabit or visit the Great Barrier Reef, of which turtles are most under threat.

Marine Turtles

The Great Barrier Reef is one of the most important marine turtle habitats in the world. Thousands of marine turtles nest on mainland beaches and islands, such as Heron Island in the south and Raine Island in the north. Turtles also use the Reef as a rich source of food and shelter.

There are seven species of marine turtle found in tropical waters around the world. Six (flatback, green, hawksbill, leatherback, loggerhead and olive ridley) occur in Australian waters and visit the Great Barrier Reef. Of these, four species regularly visit the Reef and associated islands for food and to breed. The flatback turtle only nests in the northern half of Australia. The leatherback rarely visits the Reef to feed and breed, and the olive ridley turtle only visits the Reef to feed.

Although somewhat different in appearance and habits, all marine turtles have basic similarities: sexual maturity is around 30–50 years; they lay eggs on mainland beaches or islands; breeding occurs, on average, every two years; they nest from summer to autumn; egg incubation is around two months, but may vary; they can live more than 100 years; and their diet (varies among species) consists of jellyfish, seagrass, crustaceans, corals, sponges and fish.

Females return to the same region to nest. Around one hour before, or two hours after, high tide at night the female turtles make their way up a beach to lay their eggs. First they make a body pit and dig out a chamber with their hind flippers; this ritual may occur several times until they find a suitable patch of sand. Around 100 eggs are laid in the chamber, the site is then covered up and the females head back to the sea. Incubation time and sex of the hatchlings depend on the temperature of the sand. Warm sand generally means a shorter incubation period and the production of mainly female offspring. Cooler sand makes for a longer incubation time, and predominantly male offspring. Hatchlings head straight for the water when they have broken out of the chamber, although they can sometimes be disorientated by artificial light. Lights from resorts and beachfront roads can attract the young turtles, where they may become prey or are sometimes run over.

The main threats to marine turtles are pollution, destruction of habitats such as seagrass and nesting beaches, drowning in nets, predation of eggs and babies by feral animals, and boat strikes.





■ Marine Animals cont'd

Because marine turtles migrate from one country to another, it is difficult to protect them unless a nationally and internationally shared strategy is adhered to that will help ensure their survival. One type of strategy introduced into Queensland fisheries in 1998 was the introduction of Turtle Excluder Devices on trawlers operating in sensitive areas.

In Australia all species of marine turtle are protected under the Commonwealth's *National Parks and Wildlife Conservation Act 1975*. Additionally they have conservation status under international, Commonwealth and Queensland legislation (see Table 1.2).

Table 1.2

Conservation Status of turtle species found in Great Barrier Reef waters, 1998

Turtle Species	International IUCN Red List of Threatened Animals 1996	Commonwealth Endangered Species Protection Act 1992	Queensland Nature Conservation (Wildlife) Regulation 1994
Flatback (Natator depressus)	vulnerable	not listed	vulnerable
Green (Chelonia mydas)	endangered	vulnerable	vulnerable
Hawksbill (Eretmochelys imbricata)	endangered	vulnerable	vulnerable
Leatherback (Dermochelys coriacea)	endangered	vulnerable	endangered
Loggerhead (Caretta caretta)	vulnerable	endangered	endangered
Olive Ridley (Lepidochelys olivacea)	endangered	vulnerable	not listed





■ Marine Animals cont'd

Sources:

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Nature Conservation (Wildlife) Regulation 1994. (Queensland)





■ Marine Animals cont'd

Fish

Coral reefs are not the only important habitat for the survival of marine fish. Mangroves, seagrass beds and hard- and soft-bottomed areas between reefs are also very important. These habitats provide fish with nursery grounds, food resources and shelter. Many fish start life in a mangrove habitat, move to seagrass beds to feed on crustaceans such as prawns, and nearing maturity move offshore and prey on other fish. If just one of these habitats is degraded from pollution or physical destruction, it could affect the survival of many marine fish. Other threats include overfishing and tourism.

More than 1500 species of fish live on the Great Barrier Reef—from whalesharks to seahorses. Only a few species, however, are targeted as commercial and recreational favoured species and these include coral trout, barramundi cod, maori wrasse and red-throat emperor. All of these species, except for red-throat emperor (unknown), are aggregate spawners, meaning they gather in large numbers to release their sperm and eggs into the water column. The fertilised eggs hatch after a short period; it is thought only after a day or two. Larvae feed off a yolk sac until it is depleted and then seek food such as plankton.

Aggregation is regulated by season, lunar phase and temperature. All of the commercial species mentioned aggregate to spawn between October and January, though red throat emperor may spawn as early as July/August. Spawning is associated with state of moon phase, around dusk, on the incoming tide. Possible reasons for aggregation are: greater partner choice; increased chance of egg survivorship from predation; and sites chosen where currents are likely to take larvae offshore to feeding grounds rich in plankton.

Larval fish may move thousands of kilometres away from the Reef where they started life ('parent Reef') as a fertilised egg. It is not known if juveniles return to settle on the parent Reef or if they settle on the closest reef available. Therefore, it is not possible to predict the number of juvenile fish that will start life on a Reef or to be able to relate numbers of small fish to numbers of adults. This uncertainty makes it very difficult for fisheries managers to implement strategies to protect the commercial species from overfishing on one particular reef. Hence, a regional-based approach to fisheries management has been needed.

Limited commercial licences, size and bag limits, and seasonal and area closures are a few of the management strategies already in place on the Great Barrier Reef.

Management strategies have also been proposed to protect the spawning cycle of primary target species by introducing closures during the aggregation months.

Research on the Great Barrier Reef is now being conducted to determine spawning and settlement phases, reef connectivity and aggregation patterns. From other countries' experiences, such as the United States, it is known that fish that do aggregate to spawn are more susceptible to overexploitation and, in some cases, this





■ Marine Animals cont'd

has led to species extinction. Tourism activities at or around aggregation sites are also known to disrupt aggregation behaviour, which may lead to fewer larvae.

Sources:

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■ Marine Animals cont'd

Seabirds

The Great Barrier Reef and associated islands are ideal habitats for seabirds. Small, tropical reef fish and crustaceans are available for food and the islands provide an isolated habitat with few predators. However, seabirds are not without threats to their wellbeing. Fishing activities, such as trawling and long-line fishing, human disturbance and introduced animals all contribute to seabird fatality. Indirect threats, such as disturbance, have led to reduced breeding success and may be more damaging to populations than direct threats.

There are approximately 32 species of seabirds that inhabit and breed on islands in the Great Barrier Reef Marine Park. Some of these species may also be found on the mainland but many are exclusively island birds.

Many of the islands are Queensland national parks and are managed by the Queensland Parks and Wildlife Service through a combination of both tenure protection (National Park protection) and the *Nature Conservation Act* that provides protection for wildlife, including seabirds, on all islands. Some are continental islands and, as so, are part of the Marine Park and come under the Authority's jurisdiction.

The concentration of seabirds in the Marine Park is in the Cairns and Far Northern Sections. All 32 species can be found on approximately 125 islands in these two sections of the Park.

Most of the Reef's seabirds nest on the ground but a few nest in burrows (wedge-tailed shearwater) and in trees (black noddy terns). Seabirds play an important role in marine and associated ecosystems by providing nutrients for some plants and by dispersing seeds to aid with the vegetation of islands. For example, the black noddy and bridled tern, are important for the dispersal of pisonia tree seeds, an extensive plant cover on islands. Seabird droppings (guano) provide nutrients for these trees and was once mined on some of the islands and used as a commercial fertiliser due to its high phosphorus content.

Raine Island, offshore from Cape Grenville, supports 15 breeding species of seabirds. It is the only location in Australia where the herald petrel nests and it has the largest colonies of masked booby. Four other species, uncommon elsewhere, are also found on the island—the red-footed booby, the red-tailed tropicbird and the great and lesser frigatebirds.

Michaelmas Cay, offshore from Cairns, is a significant site for seabird breeding. There have been drastic declines in the past decade of breeding sooty tern, common noddy, and crested tern. Human activity is the likely cause of the declines, with over 70 000 people visiting the cay annually.

The roseate tern is threatened in the northern hemisphere and the population in the Great Barrier Reef is thought to constitute 15 per cent of the remaining world





■ Marine Animals cont'd

population. The roseate tern breeds on inner-shelf cays off northern Cape York Peninsula and in the Capricorn–Bunker group of islands.

Wedge-tailed Shearwaters (commonly known as 'mutton birds') predominantly breed on the Capricorn–Bunker Islands, with 90 per cent of eastern Australia's population breeding there.

Eshelby Island, in the Central Section of the Marine Park, has the largest known colony of bridled terns, followed by Stephens Island with 10 000 breeding pairs and Sisters Island, with 3000 breeding pairs.

There is an array of management strategies to protect seabird populations. For example, Eshelby Island and Wreck Island (Cairns Section) are preservation zones that restrict all forms of visitation except for research. In addition, Plans of Management for each section of the Marine Park identify sensitive areas and stipulate restrictions and provide visitation guidelines.

Programs are also in place to eradicate feral animals and cull species like silver gulls that are in superabundance and impact on other species such as pied currawong, kelp gull and seabirds in general through direct predation on juvenile life stages.

No breeding seabirds are endangered in the Great Barrier Reef area. However, some are rare nationally or regionally, such as the herald petrel, red-tailed tropicbird and the little tern—listed as vulnerable by the Queensland Government under the *Nature Conservation Act* 1992.

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PLANT COMMUNITIES

It is a popular belief that reefs are dominated by animals such as corals and fish. However, plants reign in reef systems. Marine plants are the reef's primary producers, providing oxygen, food and shelter for the survival of marine animals. Many of the plant communities are interconnected and it is therefore important that all are kept in a healthy state, as the degradation of one community may affect the health of another. Without plants the marine environment would be a watery desert. Unfortunately, many marine and associated plant communities are under threat.

Seagrasses

Seagrasses are flowering plants that have evolved to live in sea water but are not true grasses. They are called 'seagrass' because most have long, thin 'grassy' leaves. Some, however, do not look like grass at all and have flat, oval leaves. The seagrass community is one of the most productive and dynamic ecosystems. They provide shelter, food and nursery grounds for many marine animals, and act as substrate stabilisers.

Worldwide there are about 12 major divisions, consisting of approximately 57 species, of seagrass. Australia has over 30 seagrass species. These are mainly found in bays, estuaries and coastal waters from the mid-intertidal (shallow) region down to depths of 50 or 60 metres.

Seagrasses inhabit all types of substrates, from mud to rock. The most extensive seagrass beds occur in shallow inshore areas on soft substrates like sand and mud. They have roots, stems and leaves and also form tiny flowers, fruits and seeds. Most reproduce by pollination; the pollen is transported to other plants by water movement.

Rhizomes and roots of the grasses bind sediments on the bottom, where nutrients are recycled by micro-organisms back into the marine ecosystem. The leaves of the grasses slow water flow, allowing suspended material to settle on the bottom. This increases the amount of light reaching the seagrass bed for photosynthesis, providing oxygen for marine organisms. It also creates a sheltered habitat for many species.

The number of seagrass species is greater in the tropics than in the temperate zones. Only two species, *Halophila ovalis* and *Syringodium isoetifolium*, occur in both regions. The most diverse seagrass communities are found in the waters of north-eastern Queensland and are an important part of the flora in the Great Barrier Reef region.

In northern Australia, seagrass beds are important as they provide sheltered refuges and feeding areas for prawns and juvenile fish. In some coastal areas, entire fisheries may depend on the productivity of these seagrass beds.





■ Plant Communities cont'd

Seagrasses are also a major food source for a number of grazing animals in the Great Barrier Reef region. The dugong (*Dugong dugon*) and the green turtle (*Chelonia mydas*) mainly feed on seagrass. An adult green turtle eats about two kilograms of seagrass a day while an adult dugong eats about 28 kilograms a day.

Threats to Seagrass

A number of problems threaten the long-term survival and health of seagrass communities in the coastal zone.

Human pollution has contributed most to seagrass declines around the world. The greatest pollution threat to seagrass populations is from high levels of plant nutrients. High nutrient levels, often due to agricultural and urban run-off, cause algal blooms that shade the seagrass. Reduction in light decreases seagrass growth and can kill whole populations.

Suspended sediments also reduce light. This sediment can come from land development run-off and through drains. Boating activity may also stir up sediment, reducing light levels. Other threats to seagrass include damage to the leaves, stems and roots by boat propellers, trawlers' nets and dredging.

Loss of seagrass habitats will mean losses in marine ecosystem productivity as well as extinction of species that depend on seagrass for survival.

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■ Plant Communities cont'd

Algae

Algae are the major primary producers in reefal systems and most are highly productive photosynthetic groups. They contribute to the construction of the reef and are a food source for many marine animals such as fish, sea urchins, crustaceans and turtles.

Unlike seagrasses, algae are non-flowering plants. The main types of algae are phytoplankton, zooxanthellae and benthic macroalgae such as seaweeds, turf algae and crustose coralline algae. Taxonomically they are divided into colour groups. These are red (Rhodophyta), green (Chlorophyta) and brown (Phaeophyta). There is also a blue-green (Cyanophyta) colour group that is generally termed algae but is actually cyanobacteria, which is more closely related to bacteria than algae. Algae classified in a certain colour group does not literally have to be that colour.

Encrusting or coralline red algae are the most important calcareous algae on the Great Barrier Reef for cementing the reef structure. On exposed, windward reefs this algae plays an important role in protecting the reef from wave action.

Turf algae, which may be red, green, brown or blue-green, are the single most important source of fixed carbon in the reef food chain (trophic structure). A matforming alga, it occurs in coastal waters throughout the world and is significant in coral reef systems as the major food source for herbivorous reef fishes.

The seaweed, *Sargassum*, is common on the inshore reefs of the Great Barrier Reef. Summer provides the most favourable growth conditions for this seaweed and it is most prevalent at this time. In winter it is less noticeable as its growth is stunted due to the environmental conditions.

Cyanobacteria or *blue-green algae* is an important nitrogen-fixer and is therefore extremely important for marine plant growth and health. However, it can be dangerous to marine animals. When very large blooms of blue-green algae occur, the oxygen in the water is depleted, causing oxygen-reliant organisms to asphyxiate.

Blue-green algae commonly bloom between August and December. *Trichodesmium* is a blue-green alga that is commonly known as 'sea sawdust' due to its tiny bundles of thread. When decomposing, this alga can take on various colours ranging from blue to hot pink, and is often mistaken for a chemical spill. It is often washed up on beaches and, when weathered, can also take on the appearance of oil. Certain characteristics help determine whether the substance is an algal bloom or a chemical or oil spill: i.e. algal blooms often have a fishy smell; when placed in a jar of water and shaken tiny algal threads are visible, and; algae will wash off someone's hands with water.

Phytoplankton drift wherever the wind and currents take them. They are microscopic algae that are generally unicellular and live in the upper 200 metres of the ocean where sunlight is available for photosynthesis. In addition to forming the basis of the pelagic food chain, they provide oxygen for marine organisms and add oxygen to the atmosphere for terrestrial organisms. A litre of seawater may contain millions of phytoplankton and





■ Plant Communities cont'd

consist of 60 different species. There are two broad categories of phytoplankton that occur on the Great Barrier Reef: lagoonal communities (diatom and dinoflagellate species) and oligotrophic oceanic community (cyanobacteria and prochlorophytes).

Toxic algaal blooms are, as the name suggests, blooms of poisonous and often deadly algae, and appear to have increased in frequency over the last two decades. The blooms are thought to proliferate when there is an increase in nutrients, such as nitrogen, from agricultural run-off and sewage. The blooms may extend thousands of kilometres out to sea. Not only are they hazardous to marine life, they also affect humans. Different types of algae can induce different kinds of poisoning in humans, from diarrhetic to neurotoxic shell-fish poisoning.

Some blooms of toxic dinoflagellate algae, such as *Gymnodinium catenatum*, are eaten by filter-feeding shellfish and produce compounds that can accumulate in the flesh of the shellfish. If the shellfish are eaten by humans, Paralytic Shell-fish Poisoning (PSP) can result. In some cases, PSP has led to paralysis and death but most commonly it causes vomiting and diarrhoea. It is thought this particular algae species was introduced via ballast water. Other dinoflagellates, such as *Gymnodinium breve*, kill fish by releasing neurotoxins onto the gills of the fish, which causes asphyxiation. Farmed fish are particularly vulnerable because they are unable to avoid the blooms and entire farms have been wiped out. Red tides are another type of phytoplankton bloom which have caused the deaths of whales and humans through poisoning and asphyxiation.

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■ Plant Communities cont'd

Mangroves

Living in salty water, mangroves are able to tolerate certain levels of salt due to their modified aerial root systems and leaves. They bear seeds, fruit, flowers or spores. Mangroves live between land and sea, inhabiting estuaries, sheltered bays and river deltas on the mainland as well as on islands. They are important primary producers, bank and shore stabilisers and nutrient filters. There are 69 species of mangrove worldwide (37 of which are found in the Great Barrier Reef World Heritage Area) and mangroves play an important role in the health and survival of many of the Reef's species by providing a habitat for many species.

Even though mangroves have adapted to saline conditions—they are sea water-logged most of the time—they still need freshwater for ideal growth. Fresh water leaches salt from the soil and prevents the build-up of toxic salt levels. If conditions become too saline, mangroves die and usually a salt plain remains. Adaptations to prevent salt build-up include the ability to filter salt from sea water, store salt in their leaves, and excrete salt through salt glands. Some species use one of these methods, others use all three.

Waterlogging also limits mangroves' oxygen supply. Mangroves have overcome this problem by developing aerial roots which are exposed to air at low tide and store enough oxygen to see them through until the next low tide. The root systems also act as sediment and nutrient traps. Sediment and nutrients including clay, organic matter, phosphates and nitrates, are brought in on the high tide or from rivers and are trapped and recycled by the mangroves. Much of the sediment and nutrients would end up covering corals in inshore areas of the Great Barrier Reef if it were not for mangroves.

Crabs, crocodiles, molluscs, fish, prawns, jellyfish, birds, spiders, insects, bats and reptiles all rely on mangroves for food and shelter. Mangroves are a nursery for many commercial species, such as mangrove jack. Mangrove litter is rich food for many juvenile fish and prawn species and the shade and roots of the mangrove protect them from predators.

Coastal development and pollution, such as fertilizer run-off and oil spills, threaten mangrove communities. This in turn threatens the health of the Great Barrier Reef. There is a Queensland *Marine Parks Act 1982* that provides for the setting apart of tidal lands and waters as marine parks. This is intended to be complementary with the Commonwealth's *Great Barrier Reef Marine Park Act 1975*.

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■ Plant Communities cont'd

Wetlands

Wetlands play an important role in the maintenance of the Reef's health and include mangroves and freshwater communities. As 'kidneys of the planet', they are instrumental in their ability to cleanse waters that pass through them. They trap sediment and filter pollutants and nutrients before the waters reach the inshore reefs.

Coastal wetlands are, typically, areas of marsh or wet areas inundated with fresh, brackish or saline water on a permanent, seasonal or ephemeral basis. They are generally vegetated by plants that can tolerate being waterlogged, and harbour an array of wildlife. Threats to wetlands include clearing and reclaiming of land for agriculture and development and land use for cattle grazing—which has also resulted in the introduction of pasture grass species that threaten to dominate native wetland plant species.

Townsville is an area of coastal wetland concentration adjacent to the Great Barrier Reef, and one of the city's wetlands has been given international recognition through the Convention on Wetlands. Of international importance, the Convention was signed in Ramsar, Iran in 1971. It is an intergovernmental cooperation for the conservation and wise use of wetlands and their resources.

Cape Bowling Green, south of Townsville, is a Ramsar listed site that lies within one of the most expansive wetland complexes on the east coast of Australia. It consists of seagrass, intertidal mangrove and supratidal samphire communities, macrophytes and emergent communities associated with fresh and brackish water, such as *Melaleuca spp. forested wetlands*. It also harbours an extensive array of fauna including dugongs, loggerhead turtles, estuarine crocodiles and commercially and recreationally important species of fish, such as barramundi. Part of the area has been declared a fish habitat and a number of cultural heritage sites are also recorded for the site. Even though most of the site lies within the Bowling Green Bay National Park and parts of the area have been identified as culturally and conservationally significant, certain activities still pose a threat.

The Haughton River is the major catchment for the area and a number of small coastal catchments also drain to the site. The hydrology of Barratta Creek and the Haughton River have been modified by the Burdekin River irrigation scheme which diverts water from the main Burdekin River channel into these systems via irrigation supply channels and as tail water. Nutrient inputs derived from agricultural areas appear to be contributing to the eutrophication of freshwater wetlands and have assisted with the domination of exotic species. Stock dams have also been constructed on the lower reaches of coastal plain drainage depressions and have altered the hydrology and salinity regime by preventing the inflow of high spring tides.

Another wetland significant to Townsville is the 'Town Common Conservation Park', near the city of Townsville. The Park has over 300 species of birds which include several species of rare birds, 30 species of reptiles, 12 species of amphibians, and 20 species of mammals. The Park is essentially used as a recreational and educational area.





■ Plant Communities cont'd

The Queensland Parks and Wildlife Service is the lead agency for wetlands in Queensland, and the Authority works closely with this department to ensure areas such as wetlands are protected, thus ensuring a degree of protection for the Reef. Other agencies, such as the Queensland Department of Primary Industries, Forestry and Fisheries, are responsible for the fish habitat areas associated with Queensland wetlands.

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The Great Barrier Reef Marine Park Authority's primary obligation is to ensure the conservation of the natural, cultural and social values of the Great Barrier Reef Marine Park and World Heritage Area.

In order to meet its goal, the Great Barrier Marine Park Authority has identified four critical issues to address: Conservation, Biodiversity and World Heritage; Tourism and Recreation; Fisheries; and Water Quality and Coastal Development.

The four Critical Issues Groups will form an integral part of the Authority's comprehensive approach to sustainably managing the world's largest Marine Park and World Heritage protected area.

The Authority regularly enlists the help of various State and Commonwealth Government agencies, stakeholders and the public in a coordinated effort to preserve the natural, cultural and social values of the Great Barrier Reef Marine Park and World Heritage Area.





CONSERVATION, BIODIVERSITY AND WORLD HERITAGE

The Great Barrier Reef Marine Park Authority aims to protect the natural and cultural values of the Great Barrier Reef, while providing for reasonable use of the Region by zoning to minimise conflicts between activities. The Conservation, Biodiversity and World Heritage Critical Issue Group has a crucial role to play in the achievement of this goal.

World Heritage

In 1981 the outstanding universal value of the world's largest coral reef ecosystem was recognised, when the Great Barrier Reef World Heritage Area became one of the earliest properties inscribed on the World Heritage List. As principal custodian of the World Heritage Area, the Great Barrier Reef Marine Park Authority is obliged to pursue World Heritage values, primarily the protection and enhancement of the natural and cultural integrity of the area. The Great Barrier Reef World Heritage Area:

- Is the world's largest World Heritage Area (bigger than the total area of the UK and Ireland combined or only slightly smaller than the total area of Japan) and nearly two million times larger than the smallest natural World Heritage site (Seychelles, 18 ha);
- Is unique in its size: it encompasses an extensive latitudinal and cross-shelf range (from fringing coastal reefs to the cross-shelf components of lagoons and outer reefs and slope, and then the open ocean to seaward) and includes biological diversity at ecosystem, community, species and genetic levels;
- · Comprises (arguably) the world's largest and most complex ecosystem; and
- Is a relatively pristine area (in comparison to other coral reefs in the world), with comparatively low fishing effort and human pressures.

The 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area stressed the importance of considering World Heritage obligations in the Authority's planning and management regime. The Great Barrier Reef Marine Park Act 1975 now includes provision for the incorporation of World Heritage values into Great Barrier Reef management planning. The Authority must also consider a number of other relevant state, national and international agreements. (See Appendix 1).

Cultural Values

The Great Barrier Reef is important in the history and culture of Australia's Aboriginal and Torres Strait Islander peoples, with important cultural sites existing on a number of islands in the Great Barrier Reef Region, for example, Lizard and Hinchinbrook Islands. Animals such as dugongs and turtles have long been part of Aboriginal dreaming and are important in many aspects of Aboriginal and Torres Strait Islander culture.



■ Conservation, Biodiversity and World Heritage cont'd

About 30 shipwrecks of historic importance are known to exist on the Great Barrier Reef, as well as a number of historically significant lighthouses. The Authority is committed to maintaining and enhancing both indigenous and non-indigenous cultural heritage through the identification and protection of culturally and historically significant sites throughout the Great Barrier Reef World Heritage Area.

Threatened Species

Of particular concern are the threatened dugong and marine turtle populations living in the Great Barrier Reef region. The Authority identifies potential threats to threatened species and coordinates and facilitates conservation programs to ensure their long-term survival.

Australia is the last stronghold for the world's dugong populations, although research shows that dugong numbers have seriously declined in the southern Great Barrier Reef region. Threats to dugongs include loss of seagrass meadows, mesh netting, shark netting for bather protection, boat strikes and illegal take.

A system of dugong sanctuaries, or protection areas (DPAs), has been established along the Queensland coastline to serve as long-term sanctuaries for these animals and their habitats. Sanctuaries are of two types (or zones) — 'A' and 'B' sanctuaries. In 'A' sanctuaries the use of offshore nets, foreshore nets and drift nets is prohibited. In 'B' sanctuaries mesh netting practices have been allowed to continue, but with more rigorous safeguards and restrictions than before.

Six species of marine turtle live in the Great Barrier Reef World Heritage Area. Current human pressures on marine turtle populations in Australian waters include bycatch in trawl nets, traditional hunting, habitat degradation, bycatch in shark control programs, boat strikes and floating rubbish such as plastic and fishing line.

The Authority consults closely with fisheries agencies, researchers and industry in developing and implementing a turtle conservation program on matters such as bycatch reduction devices (BRDs) and turtle excluder devices (TEDs). The Authority is also working with other agencies to reduce the threats to marine turtles by developing marine turtle management agreements with Indigenous peoples to ensure that any harvest of marine turtles and their eggs is sustainable, by identifying the sources of marine debris causing mortality, and through the identification and management of the impacts of coastal developments.

Many species of dolphins and whales (cetaceans) are known to occur in Great Barrier Reef waters, including some species that are vulnerable worldwide, such as the blue whale and humpback whale. To better protect cetacean populations, the Authority has commenced the development of a cetacean management policy which will include restrictions on commercial whale watching in the Marine Park.





■ Conservation, Biodiversity and World Heritage cont'd

Six seabird and shorebird species that occur regularly within the Great Barrier Reef World Heritage Area are considered threatened under Commonwealth and Queensland legislation. The Authority collaborates with the Queensland Parks and Wildlife Service and Environment Australia's Biodiversity Group, in an effort to monitor and manage seabird populations in the Marine Park and adjacent waters.

An inventory of threatened flora and fauna in the Great Barrier Reef World Heritage Area is being prepared along with an approach to defining 'potentially threatened' species. Some 79 plants on Great Barrier Reef islands are considered to be rare or threatened and there are a number of birds, reptiles and invertebrates that are endemic to particular islands.

Representative Areas

The Authority's Representative Areas Program will identify the various broadscale habitat and community types that exist on the Great Barrier Reef and then select examples of each habitat type to be given a high status of protection.

Coral reef communities within the Great Barrier Reef already have high levels of protection but other less-spectacular seabed and water-column communities are poorly represented by highly protected zones. By late 2000, it is expected that a review of existing protective arrangements will have been completed to ensure appropriate levels of protection for all habitat types in the Great Barrier Reef World Heritage Area.

A carefully planned network of strictly protected areas based on a representative area approach will be fundamental to the effective long-term management of the Great Barrier Reef Marine Park and adjoining State Marine Parks, and will ensure that marine biodiversity and World Heritage values are maintained.

Based on expert scientific research as well as cultural and socioeconomic considerations, representative areas will be free from human disturbances, with the prohibition of structures such as pontoons and extractive uses such as fishing. Public input will play a vital role in establishing representative areas, which will be designed to allow the Great Barrier Reef's flora and fauna to survive and thrive in their natural environments.

Large-scale Ecological Disturbances

Large-scale disturbances, such as cyclones, coral bleaching and outbreaks of crown-ofthorns starfish, have significant effects on the ecology of coral reefs. The Authority recognises that understanding the ecological role of these perturbations is crucial to the sustainable management of coral reefs worldwide.

Management actions in response to these phenomena need to be based on a sound understanding of both the causes and consequences of each event. Scientific research provides the only means of assessing the possible role of some human activities in affecting the frequency and/or intensity of the observed outbreak cycles of crown-of-thorns starfish and coral bleaching events.





TOURISM AND RECREATION

Those who have visited the Great Barrier Reef, with its array of balmy tropical islands, colourful corals and unique wildlife, will understand why the area attracts 1.5 million visitors each year. Popular activities include snorkelling, scuba diving, swimming and fishing. Such a large volume of visitors has the potential to adversely affect the Reef and the Great Barrier Reef Marine Park Authority plays an important regulatory role in preserving the ecological integrity and wise use of the Great Barrier Reef Marine Park and World Heritage Area.

The majority (around 95 per cent) of marine tourism in the Great Barrier Reef Marine Park is centred in the offshore Cairns and Whitsunday areas, which represent only five per cent of the Marine Park's total area. In Cairns, the marine tourism industry attracts large numbers of international tourists, with day visits to pontoon and mooring sites, and extended diving and fishing charters. Whitsunday marine operations focus largely on visits to island bays and resorts, with Australia's largest bareboat fleet operating in the area.

Ensuring that the impacts of tourism and recreation activities are effectively managed remains a priority for the Authority. It is important that the policies developed provide for both the conservation of natural, cultural heritage and social values and an appropriate balance of use opportunities. In particular, priority is being given to building strong working relationships with the Marine Park tourism industry.

Tourism use in the Great Barrier Reef Marine Park is jointly managed by the Authority and the Queensland Parks and Wildlife Service, within the statutory framework of zoning plans, management plans and permits. The volume and profile of tourism use of the Great Barrier Reef Marine Park has changed significantly in the past 20 years, presenting new challenges to managers. The Authority's new approach to managing marine tourism will be based on strategic policies and planning, direct management, self-regulation by industry and active partnerships.

Strategic Policy and Planning

The Authority is developing a Reef-wide plan for managing tourism use throughout the Marine Park. This will provide a strategic framework for future management which will take into account the cumulative impacts of tourism use. The planning process will identify natural, social, cultural and heritage values which could be affected by tourism and recreation, and identify methods to protect these values.

The strategies will be implemented through changes in legislation and policy, statutory Plans of Management, and education and training. The first Plans of Management, for the Cairns Area and the Whitsundays, were gazetted on 22 June 1998, incorporating provisions for protection of the values of both areas, and for managing use of the Reef, particularly tourism and recreation activities. These Plans introduce management strategies such as settings, limits to use for some sites,





■ Tourism and Recreation cont'd

recognition of historic use of sites by tourist operators, and a booking system for access by tourism operators to some sites or areas. As of 1 July 1999 the Plans will come into effect.

Direct Management

The Authority, in consultation with the Queensland Parks and Wildlife Service, is revising its approach to managing the existing permit system. Currently based on detailed assessment and ascribed conditions at the individual operation level, the system will be changed to standardised permits based on statutory requirements for activities undertaken within the Great Barrier Reef Marine Park. Large and complex tourism proposals and developments will still require individual assessment.

Self-regulation by the Industry

The Authority has been working with the marine tourism industry to encourage and facilitate greater self-regulation, through the adoption of codes of conduct and compliance with best environmental practices. A number of industry associations have been effective in regulating their activities through their own codes.

Operators also recognise the importance of interpretive activities and employ staff with appropriate skills to inform passengers about the Reef and best practices. For example, the Authority is investigating, with the marine tourism industry and other stakeholders, systems of accreditation for Marine Park guides and operators. Authority staff are working closely with the Whitsunday bareboat industry to pilot a staff training program which will form the basis of future accreditation for this industry.

Active Partnerships

Stakeholder participation will continue to be an important component of marine tourism management. Formal processes for consultation with the tourism industry are being established through the Association of Marine Park Tourism Operators (AMPTO), and mechanisms for community consultation are already established through coastal Local Marine Advisory Committees with representation from a wide range of stakeholder groups. In addition, new expertise-based Reef Advisory Committees are to be established by the Authority to advise on issues specific to the four Critical Issue Groups, including the Tourism and Recreation Group. The Great Barrier Reef Consultative Committee will continue to fill a strategic advisory role to the Minister and the Authority.





FISHERIES

Fishing, the largest harvesting activity in the World Heritage Area, includes the major commercial fisheries of trawling, line fishing, inshore net fishing and crabbing, in addition to fisheries for aquarium fishes, coral, sea cucumber, tropical rock lobster, trochus, specimen shell and bait. The direct economic value of commercial fisheries in the Great Barrier Reef Region is about \$200 million annually. Recreational fishing is an important activity with an estimated 24 300 privately registered boats annually fishing in the Region. Traditional fisheries also occur adjacent to indigenous communities.

Under the offshore constitutional settlement between the Australian States and the Australian Government, the management of fisheries within the Great Barrier Reef Marine Park is the responsibility of the Queensland Government through the Queensland Fisheries Management Authority and the Queensland Department of Primary Industries. The Great Barrier Reef Marine Park Authority, in its aim to protect the natural qualities of the Great Barrier Reef whilst providing for reasonable use of the Region, contributes to fisheries management through the use of management zones which restrict fishing activities, and involvement in fisheries management planning conducted by the Queensland Government.

The Authority recognises that the harvesting of fisheries resources is an important and reasonable use of the Marine Park and consistent with use of the Great Barrier Reef World Heritage Area. However, the Authority acknowledges that fishing affects target species, non-target species and their habitats and consequently has the potential for producing ecological effects in both the fished areas and the reef system as a whole. The Authority is working to ensure that all fishing activities in the Great Barrier Reef Marine Park and World Heritage Area are ecologically sustainable.

To ensure fishing in the Great Barrier Reef Region is ecologically sustainable, the Authority will, in collaboration with fisheries management agencies and stakeholders, seek to:

- Minimise ecosystem effects caused by fishing through the adoption of ecologically sustainable fishing practices and the adoption of new and improved gear technologies;
- Establish a comprehensive system of protected areas that are representative of the complex range of ecological communities found in the Marine Park;
- Ensure adequate monitoring and assessment are undertaken to determine the impacts of fishing activities and the status of harvested stocks, non-target species and the ecosystems on which they depend; and
- Ensure that ecologically sustainable fishing activities are managed in a way that is maintained in perpetuity.





m Fisheries cont'd

The Authority is seeking to ensure understanding of and compliance with the management regimes in the Great Barrier Reef Region through public information and education programs and the adoption of satellite monitoring and communications technology. The Authority is developing ongoing and effective communications with stakeholders associated with fisheries in the entire World Heritage Area. These stakeholders include commercial, recreational and indigenous fishers, conservation groups, other community groups and government agencies.





WATER QUALITY AND COASTAL DEVELOPMENT

Water Quality

The health and wellbeing of the plants and animals on the Reef is dependent upon good water quality. Management tools for reducing impacts on the waters of the Great Barrier Reef have been developed following long-term research and monitoring of both pollution sources and the effects that water pollution may have on the Great Barrier Reef and associated ecosystems.

The management of the land-based impacts on the World Heritage Area is complex as the activities causing the problems often lie outside the boundaries of the Marine Park and involve multiple authorities. The 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area identifies integrated land and coastal development as an important process in minimising pollutant input from the land to the sea.

The reduction of nutrient loads entering the Marine Park from coastal catchments is seen as the most important water quality issue facing the Marine Park and World Heritage Area. Extensive clearing of the land adjacent to the Great Barrier Reef since European settlement has accelerated soil erosion, with the nutrient-rich soil from exposed land washing into river systems and eventually flowing into the ocean.

Much of this land has been cleared for agricultural purposes, primarily cropping and grazing. Pesticides and fertilisers used by farmers usually end up in coastal lagoons close to inshore reefs. In high concentrations, the plant nutrients nitrogen and phosphorus (found in fertilisers) can be harmful to marine ecosystems. In an attempt to offset disturbances to the delicate nutrient balance of the marine environment, the Authority encourages the preservation of riparian vegetation and freshwater wetlands which filter out many potentially harmful substances before they reach the ocean.

The Authority works with the Queensland Department of Primary Industries, the Queensland Parks and Wildlife Service and industry groups to develop and implement measures to ease the downstream effects of cropping and grazing. At the largest scale, it is hoped to reduce catchment run-off of sediments, nutrients and pesticides through the Integrated Catchment Management program. Integrated catchment management is the principal tool of the Queensland government for reducing catchment-based pollutant discharge to aquatic systems and the coastal zone.

Codes of Practice have been developed for many agricultural industries to address environmental problems. These codes are a voluntary response and commitment to catchment care and have already been implemented by the cotton and sugar industries, with a dairyfarmers' code presently under way.

Population growth in the towns alongside the Queensland coast has resulted in more sewage and litter finding its way into the marine environment. Urban sewage discharge into river systems flowing into the waters adjacent to the Marine Park may affect Reef ecosystems, but outfalls may lie outside the Authority's jurisdictional





■ Water Quality and Coastal Development cont'd

boundaries. In such cases there is much need for complementary policy between Reef managers and coastal authorities. Many local councils and resorts have opted to recycle treated water to irrigate parks, gardens and golf courses, or, to divert it to road-making projects and for industrial purposes.

Stormwater run-off often sweeps up litter on its way towards the ocean and distributes it throughout the marine ecosystem. The litter not only detracts from the aesthetic value of the Great Barrier Reef, but can be a deathtrap for the animals living there.

The few major industrial sites along the Great Barrier Reef that discharge industrial discharge wastewater to the ocean are controlled under the Queensland Environmental Protection Act through a licensing system. Plants being constructed in more recent times have been required to have no ocean wastewater discharge. Aquaculture of saltwater prawns along the coast is also controlled by the Environmental Protection Act.

Shipping and related activities in the Marine Park pose potentially disastrous water quality problems for the Great Barrier Reef. Of most concern is the threat of a major oil spill. Although the Great Barrier Reef has not witnessed the devastating effects of a major oil spill, the Authority is committed to implementing management strategies to prevent such a disaster, as well as to research and development in the latest oil spill response techniques. Particular emphasis is placed on research into bioremediation as a means of clean-up.

The Authority is concerned with the impacts that the introduction of exotic organisms, through the release of ballast water from ships, may have on the marine environment. The Authority and other agencies dealing with shipping on the Great Barrier Reef have put in place shipping management policies to prevent exotic organisms from wreaking havoc on native plants and animals.

It is important that the Authority both monitors and regulates the discharge of waste water and sewage from vessels into the Marine Park, as well as from heavily populated islands and resorts. Sewage directly entering Marine Park waters must be treated to tertiary levels as specified by the Authority's permit system.

Coastal Development

The coastal zone is the location of the majority of marine tourism infrastructure, ports and harbours, and urban and industrial development. Effective planning and management of coastal zone development is required to ensure that this development does not impact adversely on the Marine Park and World Heritage Area.

Population growth in urban centres adjacent to the Great Barrier Reef and World Heritage Area invariably leads to increased pressure for access to Marine Park resources. This becomes a management issue when it results in overuse of certain sections of the Marine Park or where sensitive environments are exposed to excessive human impacts such as damage to corals from anchoring or interference with bird nesting and breeding areas.





■ Water Quality and Coastal Development cont'd

Marine Park management through section zoning plans prescribes allowable and permissable uses and provides for a variety of recreation settings both across and between sections. Plans of management provide more detailed information on the management intent for certain areas or specific sites, such as in the case of the management of dugongs.

The inappropriate location of new urban centres or the unplanned expansion of existing centres can impact on the management intentions for offshore areas in the Marine Park. Growth in residential nodes often leads to increased demand for marine tourism and recreation infrastructure such as marinas, ferry terminals, safe harbours and jetties. Likewise, the scale location and charter of individual developments, such as large integrated residential and tourist resorts, can pose similar problems for the Marine Park management regime, particularly if they are located adjacent to marine areas with a low-intensity use setting.

In addition to the broader issues of population pressure associated with coastal development, there are a number of site-specific impacts including sediment loss during construction, the clearing of vegetation, increases in litter and a loss of visual amenity.

The development of partnerships with other spheres of government as well as community and sectoral groups is an important management approach for the Authority in dealing with outside influences into the Marine Park and World Heritage Area.

To the extent that all or parts of a proposed development occur inside the Marine Park, either along the coastline or around islands, impacts are managed through the assessment of permit applications by the Authority. Permits are assessed against criteria prescribed in the *Great Barrier Reef Marine Park Act 1975*. The Queensland Parks and Wildlife Service participates in the assessment process as part of the joint management arrangements between the Commonwealth and the State.

In addition to its involvement in project-specific impact assessment, the Authority has also developed partnerships with State and local governments in the preparation of planning frameworks such as Regional Coastal Management Plans and Local Government Planning Schemes. Through these planning instruments State and local governments can increase the level of protection and management afforded to coastal resources which in turn assist in the protection and management of the Marine Park and the values of the World Heritage Area. Other areas of joint concern, where the Authority is working closely with local governments, include the development of design standards and guidelines for stormwater drainage, wastewater treatment and marinas.





The Great Barrier Reef Marine Park Authority operates within a multiple-use philosophy when managing the Great Barrier Reef Marine Park and World Heritage Area. The Great Barrier Reef Marine Park and World Heritage Area are managed not only to ensure conservation of the Reef's natural, cultural and social values but also to allow for a diverse range of human-use opportunities. As use of the Marine Park and World Heritage Area continues to increase, it is important that management strategies are effective in managing human use, especially in intensively-visited areas such as those offshore from Cairns and the Whitsundays.

In order to achieve management of the highest calibre, the Great Barrier Reef Marine Park Authority has put in place a number of strategies and tools that address long-term, reef-wide issues as well as short-term, site-specific concerns. Broadly, the Authority aims to protect the Reef through effective communication, a sound scientific knowledge base, stakeholder group participation and a system of checks and balances.

The principles of management are available to any organisation keen to expand their field of knowledge, expertise and management capacity. A key principle is collaborative interaction between user groups—the philosophy behind this principle is the need to balance the requirements of economic development with adequate environmental protection of our natural heritage. The lessons learned in Australia, and particularly in the Great Barrier Reef World Heritage Area, are now available to professionals managing marine and coastal environments elsewhere, and to decision makers responsible for the implementation of marine and coastal resource policy.





PLANNING

Planning for the protection of the Great Barrier Reef and ecologically sustainable use is achieved through the 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area, Marine Park zoning, and plans of management.

Zoning

One of the most complex jobs faced by the managers of the Great Barrier Reef Marine Park and World Heritage Area is the process of deciding who may do what, and where they may do it.

One of the primary tools for protecting and preserving the Great Barrier Reef, as specified by the *Great Barrier Reef Marine Park Act 1975*, is zoning. Zoning separates activities that may conflict with each other, such as commercial fishing and tourism. Zoning also allows areas that need permanent conservation to be protected from potentially threatening processes by being placed 'off-limits' to users (except for the purpose of scientific research) for varying lengths of time.

Marine Park zoning plans are not dissimilar to planning schemes prepared for local government areas. For example, zoning plans provide for activities that are as-of-right, with permission or prohibited. Each zone category specifies which activities can or cannot be undertaken and whether or not permission is required to undertake those activities.

The principle objectives of any zoning plan (according to sec. 32(7) of the Act) are:

- The conservation of the Great Barrier Reef;
- The regulation of the use of the Marine Park so as to protect the Great Barrier Reef while allowing reasonable use of the Great Barrier Reef Region;
- The regulation of activities that exploit the resources of the Great Barrier Reef Region so as to minimise the effect of those activities on the Great Barrier Reef;
- The reservation of some areas of the Great Barrier Reef for its appreciation and enjoyment by the public; and
- The preservation of some areas of the Great Barrier Reef in its natural state undisturbed by humans except for the purposes of scientific research.





■ Planning cont'd

Putting the Theory into Practice

There are generally seven stages in the development of a zoning plan for the Great Barrier Reef Marine Park.

- Initial information gathering and preparation: the Authority assembles and reviews information on the nature and uses of the area, and develops materials for public participation and for consideration by the public.
- Public participation and consultation before the preparation of the plan: the Authority seeks public comment on the accuracy and adequacy of the information, and gathers suggestions for the content of the zoning plan.
- Preparation of a draft plan: a draft zoning plan is prepared together with accompanying notes and/or displays explaining the plan to the public. It is at this stage that specific objectives are defined for each zone.
- Revision of the draft plan through public participation and consultation: the Authority seeks comment on the published draft plan.
- Consideration of public comment and finalisation of the plan.
- Adoption of the revised plan: the plan now takes into account the comments and information received in response to the published draft plan.
- Submission of the plan to the Commonwealth Minister for the Environment and Heritage: if the plan is accepted, the Minister tables it in both houses of Parliament. If no motion of disallowance is passed after 15 days, the plan is brought into force.

Zoning maps are then prepared and distributed. They show what activities are permitted (and where those activities are permitted), the locations of zones and other relevant information to help park users abide by their responsibilities (see the enclosed Marine Park zone map).

Continued research and constant monitoring of Marine Park activities and changing circumstances require that zoning plans be reviewed as required. Zoning plans can be reviewed individually or on a Reef-wide scale.

Zones of the Great Barrier Reef Marine Park

General Use 'A' Zone

The least restrictive of the zones, this provides for all reasonable uses, including shipping and trawling. Prohibited activities are mining, oil drilling, commercial spearfishing and spearfishing with underwater breathing apparatus.

General Use 'B' Zone

Provides for reasonable use, including most commercial and recreational activities. Trawling and general shipping are prohibited as well as those activities not allowed in General Use 'A' Zone.





■ Planning cont'd

General Use Zone

Provides areas of Marine Parks for a diverse range of recreational and commercial activities, consistent with the Region's long-term conservation.

Marine National Park 'A' Zone

Provides for appreciation and recreational use, including limited line fishing. Fishing is restricted to one line with one hook per person. (When trolling for pelagic species more than one line may be used.) Spearfishing and collecting are prohibited, as well as those activities not allowed in General Use 'B' Zone.

Habitat Protection Zone

Provides areas of Marine Parks free from the effects of trawling, while allowing for a diverse range of recreational and commercial activities.

Estuarine Conservation Zone

Provides for estuarine areas free from loss of vegetation and disturbance and from changes to the natural tidal flushing regime, while maintaining opportunities for commercial and recreational activities.

Conservation Park Zone

Provides areas of Marine Parks which allow opportunities for their appreciation and enjoyment including limited recreational fishing.

Marine National Park 'B' Zone

Provides for appreciation and enjoyment of areas in their relatively undisturbed state. It is a 'look but don't take' zone. Fishing and all other activities which remove natural resources are prohibited.

Marine National Park Buffer Zone

Normally 500 metres wide, this zone provides for trolling for pelagic species around reefs which have been given a level of protection that prohibits all fishing. Trolling for pelagic species is unlikely to significantly affect the 'resident' marine life for which protection is needed.

Buffer Zone

Provides protected areas of Marine Parks and allows opportunities for their appreciation and enjoyment. Buffer Zones allow mackerel trolling in areas adjacent to reefs zoned as National Park.

National Park Zone

Provides protected areas of Marine Parks of high conservation value, but allows public access for appreciation and enjoyment — a 'look but don't take' area.

Scientific Research Zone

Set aside exclusively for scientific research. Entry and use for other reasons is prohibited.





■ Planning cont'd

Preservation Zone

Provides for the preservation of the area in an undisturbed state. All entry is prohibited, except in an emergency, with the exception of permitted scientific research that cannot be conducted elsewhere.

Prior to the Establishment of the Marine Park

For much of this century and before, the formalised management of the marine environment that we see today did not exist. The vastness of the oceans suggested that they were inexhaustible resources, and were exploited as such.

Problems escalated when modern science and engineering took to the sea in pursuit of commercial goals; resources were extracted on a greater scale and at a much faster pace. Unfortunately, attitudes and knowledge failed to keep up with the changing circumstances. In many places slow degradation of the marine environment had already begun.

When these effects became noticeable, many communities started to think about preserving the marine environment for its many and varied natural, cultural and social values.

A Multifaceted Approach

Under the strict direction of the *Great Barrier Reef Marine Park Act 1975*, the Authority has adopted a multifaceted approach to the development of zoning plans. The complexity of issues involved in developing and implementing zoning plans makes input from all stakeholders essential. This integrated approach, involving scientific expertise, community discussion and innovative management strategies, is the cornerstone of the Authority's zoning system.

An integrated approach brings the specialist areas of science, technology and humanities together in order to understand the links between human activity and the Great Barrier Reef ecosystem. Consultation with stakeholders such as user and interest groups, indigenous communities and scientists is an integral part of the zoning process, with consensus and the development of a 'sense of ownership' having proved to be essential for good management.

This broad base of community involvement will continue to play a major role in the Marine Park zoning process. Methods used by the Great Barrier Reef Marine Park Authority will also continue to reflect as accurately as possible the stake all Australians have in preserving one of the world's most marvellous and precious living treasures.





■ Planning cont'd

Plans of Management

Plans of management are generally prepared for intensively used, or particularly vulnerable groups of islands and reefs, and for protection of vulnerable species or ecological communities. Plans of management complement zoning by addressing issues specific to an area, species, or community in greater detail than can be accomplished in the broader, Reef-wide zoning plans.

Objectives of plans of management are identified in Section 39Y of the *Great Barrier Reef Marine Park Act 1975* and are as follows:

- To ensure, for particular areas of the Marine Park in which the Authority considers that nature conservation values, cultural and heritage values, or scientific values, are, or may be threatened, that appropriate proposals are developed to reduce or eliminate the threats;
- To ensure that species and ecological communities that are, or may become vulnerable or endangered, are managed to enable their recovery and continued protection and conservation;
- To ensure that activities within areas of the Marine Park are managed on the basis of ecologically sustainable use;
- To provide a basis for managing the uses of a particular area of the Marine Park that may conflict with other uses of the area or with the values of the area;
- To provide for the management of areas of the Marine Park in conjunction with community groups in circumstances where those groups have a special interest in the areas concerned; and
- To enable people using the Marine Park to participate in a range of recreational opportunities.

In the preparation of plans of management, the precautionary principle and the natural and cultural World Heritage values of the Marine Park and World Heritage Area must be taken into consideration.

The basis of planning for the Marine Park is modelled upon conventional urban and regional planning techniques such as Development Control Plans used by local authorities. Development Control Plans make provision for *settings*, which may limit the extent, number, height, colour, style and type of structure or development that may be permitted within a local government area.

Settings are also used in plans of management for the Marine Park and are determined through consideration of the values of an area, including the natural, conservation, social, and cultural values. By limiting, or not limiting, activities or uses in an area, settings are created for that area. For example, settings may be prescribed for 'high' use or 'low' use areas.





■ Planning cont'd

In determining settings, a framework is established for assessing whether or not an activity is appropriate within that setting area. Settings create an expectation of a certain type of experience. Within settings, the types of activities that can occur in an area, along with the number of those activities, are prescribed.

Consultation and Plan Development

The *Great Barrier Reef Marine Park Act 1975* sets out the process to be followed when preparing a plan of management. This process involves two stages of public input, with notices placed in the Gazette and relevant newspapers. The stages of public input must last for at least 30 days each.

The first stage of public input occurs when a planning project commences. It offers the public and interest groups an opportunity to comment on management issues relevant to the area for which the plan will be developed.

The second stage of public input is designed to provide opportunities for the public and interest groups to make comment on a plan that has been prepared. After the second stage of public input, the plan may be revised to take into account public comments, and is then gazetted as the final plan.

However, planning is not the end of the matter. Many activities are identified in plans that require individual permits, such as tourism and aquaculture. These permits are issued only after the applicant has provided information about the activity to be undertaken, and the Authority has been satisfied that the activity meets all the required environmental safeguards.

Sources:

Great Barrier Reef Marine Park Act 1975

McGinnity, P. Former Director, Planning, Great Barrier Reef Marine Park Authority, 1998.





PERMITS

The use of permits helps the Great Barrier Reef Marine Park Authority and the Queensland Parks and Wildlife Service to ensure the conservation of the Great Barrier Reef's state and commonwealth marine parks. The permits allow these organisations to:

- · Reduce impacts on high-use and sensitive areas;
- Separate potentially conflicting activities;
- Encourage responsible behaviour in all Marine Parks users;
- · Collect data for planning of Marine Parks; and
- Monitor activities which may become damaging to the Marine Parks.

When do you Need a Marine Parks Permit?

Before any activity is undertaken in the Marine Park it is essential to check the zoning plan for that area to see if the activity is allowed, and whether the activity requires a Marine Parks permit. Ignorance is no excuse. Zoning plans are available from the Great Barrier Reef Marine Park Authority and Queensland Parks and Wildlife Service regional offices.

As a general guide, the following activities require a Marine Parks permit:

- · Most commercial activities, including tourist operations;
- Installation and operation of structures, such as jetties, marinas, pontoons and mariculture facilities;
- Any works, such as repairs to structures, dredging and dumping, placement and operation of moorings;
- · Anchoring or mooring for an extended period;
- Waste discharge from a fixed structure;
- · Research:
- · Educational programs; and
- Traditional hunting.

Most visitors to the Marine Park will not require a permit for recreational activities.





■ Permits cont'd

Steps in the Permitting Process

In order to be granted permission to undertake an activity, an application must be submitted to the Authority or the Queensland Parks and Wildlife Service. It should provide enough information so permit assessors can clearly understand what the intended activity is and where it is to be carried out. Furnishing false or misleading information in a permit application is an offence and can incur a \$1000 fine. An application for a Marine Parks permit to conduct commercial activities requires the payment of a Permit Application Assessment Fee (PAAF). The fee varies depending on the type of operation.

The Authority is required to assess all valid permit applications. In assessing an application, the Authority must consider criteria that include the following:

- · The objective of the zone;
- The need to protect the cultural and heritage values held in relation to the Marine Park by traditional inhabitants and other people;
- The likely effect of granting permission on future options for the Marine Park;
- The conservation of the natural resources of the Marine Park;
- The nature and scale of the proposed use in relation to the existing use and amenity, and the future or desirable use and amenity of the relevant area and of nearby areas;
- The likely effects of the proposed use on adjoining and adjacent areas, and any
 possible effects of the proposed use on the environment and the adequacy of
 safeguards for the environment;
- The means of transport for entry into, use within or departure from the zone or designated area and the adequacy of provisions for aircraft or vessel mooring, landing, taking off, parking, loading and unloading;
- In relation to any structure, landing area, farming facility, vessel or work to which the proposed relates:
 - the health and safety aspects involved, including the adequacy of construction;
 and
 - the arrangements for removal upon the expiration of the permission of the structure, landing area, farming facility or vessel or any other thing that is to be built, assembled, constructed or fixed in position as a result of that use;
- The arrangements for making good any damage caused to the Marine Park by the proposed activity;
- Any other requirements for ensuring the orderly and proper management of the Marine Park;





■ Permits cont'd

- Any charge payable by the applicant in relation to a chargeable permission (whether or not in force) that is overdue for payment; and
- If the application relates to an undeveloped project—the cost of which will be large—the capacity of the applicant to satisfactorily develop the project.

As the Marine Park is also part of the World Heritage Area, the Authority must consider the effect that a proposal is likely to have on World Heritage values.

In the event that the proposal will affect the environment to a significant extent, the proponent will be designated under the Commonwealth *Environment Protection (Impact of Proposals) Act 1974* and an Environmental Impact Statement may be required.

If it is considered that the proposal may restrict reasonable use by the public of a part of the Marine Park, the Authority can require a public notification of the proposal and invite public comments. These comments will then be considered in assessing the application.

With all applications for Marine Parks permits, the onus is on the applicant to establish that the environmental impacts of the proposed operation are acceptable.

Structure of a Permit

Marine Parks permits are usually two permits in the one document. They grant permission for activities in both State Marine Parks (under the Queensland Marine Parks Act 1982) and the Great Barrier Reef Marine Park (under the Commonwealth Great Barrier Reef Marine Park Act 1975).

New applicants are granted a permit for one year. This allows time to establish the operation, and provides the applicant and the Marine Park managers an opportunity to review the operation.

Existing permit holders are normally granted a permit for six years, depending on the activities to be conducted.

Deeds of Agreement

All permits for commercial operations include a requirement to enter into a Deed of Agreement. This deed binds the permit holder to certain obligations, such as: indemnifying the Authority; maintaining adequate insurance; removal and clean-up of such things as vessels; moorings and structures; and the payment of a bond for structures other than vessel moorings.





■ Permits cont'd

Variations to Permits

If an operation changes in any way, an application must be submitted to vary the conditions of the existing permit or seek a new permit. Changes may include adding or changing a vessel, undertaking different activities, operating in different locations or changing a name on the permit.

Most Marine Parks permits for commercial activities are transferable, but the transfer must be approved by the Authority. An application form is available from the Authority or the Queensland Parks and Wildlife Service and should be submitted at least 28 days prior to the proposed transfer.

Suspension and Revocation

A Marine Parks permit can be suspended or revoked. This may happen, for example: when the permitted activity causes damage to the Marine Park; the permit holder fails to comply with a permit condition; or any Environmental Management Charges that are outstanding have not been paid.

The maximum penalties that apply for failing to comply with a Marine Parks permit are \$20 000 for an individual and \$100 000 for a body corporate. Vessels and other equipment (including catch) may also be seized.

Review Rights

A permit holder has the right to request the Authority to reconsider any decision made concerning their permit application. Such a request must be made within 21 days of gazettal of the decision. If dissatisfied with the outcome of the subsequent reconsideration, the permit holder has the further right to apply to the Administrative Appeals Tribunal for a review of the reconsidered decision. Provisions for the Commonwealth *Freedom of Information Act 1982* also apply.

Source:

Permit Application Infopack, 1996, Great Barrier Reef Marine Park Authority and Queensland Parks and Wildlife Service. (Text above is edited extracts from the Infopack).





ENVIRONMENTAL MANAGEMENT CHARGE

The rapid expansion of tourism, and other commercial operations, in the Great Barrier Reef Marine Park in the last decade have given a new urgency for research and education programs. Information is needed to guarantee the survival and conservation of the world's largest Marine Park and World Heritage Area which are one of the most popular national and international tourist attractions.

The Commonwealth Government has reasoned that it is only fair that those companies and individuals making a living from the Great Barrier Reef should help pay for increasingly urgent research and improved management techniques.

An Environmental Management Charge (EMC) came into effect on 1 July 1993. Most commercial operations in the Marine Park are subject to the charge and include: tourist operations; mariculture; commonwealth-island resorts; and land-based marine sewage outfalls.

The Consultation Process

Following the June 1992 announcement of the introduction of the new charge, two series of meetings (in August/September 1992 and in May 1993) were held in centres along the Queensland coast from Brisbane to Port Douglas. A large number of follow-up meetings with specific industry sectors and individual operators were also held.

How the System Works

The system is based on Part 5A of the *Great Barrier Reef Marine Park Regulations*. The following is a summary of the EMC.

- The charge is for commercial operators.
- Charges for tourist operators are \$4 per passenger per day (or part thereof).
- The fees are levied according to the size and nature of an operation.

It was originally proposed to introduce the charge on a formula basis. This was not supported by tourist operators as many tourist operators believed that the actual numbers of visitors undertaking a tourist program was a more accurate measure of an operator's use of the Marine Park.





■ Environmental Management Charge cont'd

This system has been adopted and involves the addition of new logbooks in which data on use of the Marine Park will be recorded. All charges will be indexed annually to the Consumer Price Index. Payment will be on a quarterly basis, in arrears.

Detailed Data an Invaluable Side Benefit

Logbooks that have been developed in close consultation with industry are issued to operators in June each year. The Environmental Management Charge logbooks provide information necessary for the purposes of charging but they also provide valuable data to the Authority relating to operators' commercial use of the Marine Park. Aggregate data relating to trends in Marine Park use provide the most accurate information yet available on Marine Park usage. This data is invaluable in helping to highlight trends and possible problems emerging with increased human activity.

Who Doesn't Have to Pay?

The main types of commercial operations exempt from the charge are private navigational aids, commercial fishing operations, and direct transfer operations from one part of Queensland to another. Commercial fishing does not attract a charge because one is already levied by Queensland fish management organisations. Transfer trips between islands, or islands and the mainland, are exempt on the basis that such passengers are transiting the Marine Park, not taking part in tourist excursions. Consideration has also been given to exempting operators from paying for certain classes of Free of Charge (FOC) passengers.

How the Tourism Industry Benefits

Benefits offered to the industry include improved research, management and information programs within the Great Barrier Reef Marine Park. An immediate and tangible benefit for operators is that their permits are now issued over a more substantial period of time (up from the previous three years to six years for existing operators), and they are transferable. A one-year permit will be issued to first-time applicants, but following a successful review after a year, these operators will also be entitled to apply for a six-year transferable permit.

Where Does the Money Go?

All funds raised by the Environmental Management Charge are used by the Great Barrier Reef Marine Park Authority for research, education and Marine Park management.





■ Environmental Management Charge cont'd

A major proportion of the funds is allocated to the Cooperative Research Centre for the Ecologically Sustainable Development of the Great Barrier Reef (CRC Reef), located in Townsville.

The tourism industry, through the Association of Marine Park Tourism Operators (AMPTO), holds four seats on the eleven-member CRC Board. Therefore, they have a strong say in how the money is spent on research and education.

The EMC system will be kept under constant review.





DAY-TO-DAY MANAGEMENT

The Great Barrier Reef Marine Park Authority and the Queensland Parks and Wildlife Service (QPWS) are jointly responsible for the day-to-day management of the Great Barrier Reef Marine Park and World Heritage Area. Protection of such a vast and diverse area is a challenging task.

The Day-to-Day Management Program guides the field operations and routine day-to-day activities required for the management of the Great Barrier Reef Marine Park and World Heritage Area. The Day-to-Day Management Program is primarily delivered through the QPWS by Marine Parks Officers, who are professional rangers and conservation staff, working with industries and coastal communities.

Protection of the values of the Reef against illegal activities is also achieved through strategic alliances with the Queensland Boating and Fisheries Patrol (QBFP), Queensland Water Police, Coastwatch and the Australian Maritime Safety Authority (AMSA).

There are approximately 100 QPWS Marine Parks Officers employed under the Dayto-Day Management Program working out of 14 centres between Cooktown and Gladstone. The QPWS Marine Parks Officers manage the Great Barrier Reef Marine Park and World Heritage Area through:

- · Resource protection programs;
- · Visitor education and services;
- · Park monitoring; and
- Surveillance and enforcement.

Resource Protection

The Day-to-Day Management Program addresses the long-term management of resources to protect sensitive areas. Resource protection activities in the Marine Park include the installation of public moorings and reef protection markers to reduce the impact of anchoring on coral reefs.

Weeds, feral animals, fire and erosion can deteriorate the natural resources of the Great Barrier Reef islands

Activities such as tourist operations, commercial and recreational camping and traditional hunting in reef areas require a permit. QPWS Marine Parks staff assess and approve activity permits.





■ Day-to-Day Management cont'd

Visitor Education and Services

The Day-to-Day Management Program plans for the dissemination of information to the varied users of the Marine Park and World Heritage Area, offering both regional and site-specific information. The need for information from the community ranges from people seeking information on camping and day use of the Marine Park, to promotion of the values and management processes of the World Heritage Area for larger groups such as schools.

Marine Parks officers provide information on both a structured and informal basis, using opportunities to inform visitors, education groups and commercial users on the safe and environmentally sustainable use of the Marine Park.

Facilities are provided to ensure that visitors gain maximum enjoyment from the use of the World Heritage Area, with minimal damage to the delicate environment. In addition to public moorings and reef protection markers, infrastructure includes marine parks signage, campgrounds, day-use facilities and walking tracks. The Day-to-Day Management Program allocates more than \$2.6 million each year toward infrastructure management and maintenance.

Resource Assessment and Monitoring

Monitoring programs measure the condition of natural values and evaluate the effectiveness of management. Resources assessment and monitoring activities throughout the Marine Park and World Heritage Area are being carried out by Program staff to:

- · Identify critical sites which will need to be specially managed;
- Assess threats to values of the World Heritage Area;
- Assess the effectiveness of current and proposed management of sites to provide guidance for future management; and
- Monitor experiences and attitudes of visitors to assist future communication strategies.

Surveillance and Enforcement

Policing an area about the same size as Japan requires a systematic and disciplined operation, which costs around \$1.7 million a year. Boat and aircraft patrols operate in the Marine Park on a daily basis, checking on general activities and monitoring ecological conditions.

The Authority has always, and will continue, to view education as the most effective strategy to get users to recognise and abide by Marine Park management principles.





■ Day-to-Day Management cont'd

However, enforcement action and prosecution are two of the most important tools that managers have available to them. Yet, because of the dedication to user education, these are not necessarily the tools of first opportunity, nor are they always the tools of last resort. Marine Parks inspectors have the discretionary power to decide a course of action on a case-by-case basis.

The QPWS uses ten primary vessels to patrol the Marine Park, each one spending, on average, 220 days at sea each year. The QPWS also makes about 140 charter surveillance flights each year.

The Queensland Boating and Fisheries Patrol (QBFP) carries out specialist surface surveillance of remote offshore areas where illegal fishing has been identified as a major problem. The QBFP also conducts aerial fisheries patrols, particularly targeting inshore closed-area trawling and netting. By reporting on enforcement matters during normal fisheries patrols, the QBFP greatly boosts the presence of surveillance and enforcement officers in Marine Park waters.

Coastwatch (part of the Australian Customs Service) is used by several Commonwealth Government departments for surveillance and enforcement of Marine Park regulations, with two Coastwatch bases situated adjacent to the Marine Park. Information gathered in the area from another 600 flights for other departments is also made available to the Authority. Coastwatch operates both day and night patrols, and can act as forward air support for surface vessels and can immediately investigate reports of oil spills.

Members of the public who use the Marine Park for both commercial and recreational purposes are also vital to the effective surveillance and enforcement of Authority regulations. The role of education and public participation in much of the decision making related to the Great Barrier Reef Marine Park cannot be underestimated. Reports from members of the public about suspected illegal activities and general usage patterns are an invaluable source of surveillance information for the Authority.

The Powers of Marine Park Inspectors

Great Barrier Reef Marine Park inspectors are appointed by the Authority, and are generally appointed in those agencies that do the day-to-day management tasks. Additionally, all federal police officers are appointed inspectors.

The Authority specifies what powers each individual inspector may exercise; the power of arrest is available under the Act, however, at present only inspectors who are police officers have been appointed the right to exercise that power.

Included in other powers available to Marine Parks inspectors are:

- The power to stop a vessel or aircraft;
- The power to search a vessel or aircraft;
- The power to order a person from the Marine Park;





■ Day-to-Day Management cont'd

- The power to seize any vessel, aircraft or article the inspector reasonably believes to have been used or involved in an offence, or order it to be delivered to another place for seizure;
- The power to obtain a search warrant, and the power to enter and search a
 premises outside the Marine Park with such a warrant, or with the owner's
 permission; and
- The power to give general direction to ensure compliance with the *Great Barrier Reef Marine Park Act 1975*.

The Prosecution Process

Although the duties of enforcement lie squarely with the Authority and its agencies, the final decision whether or not to prosecute is made by the Commonwealth Director of Public Prosecutions (DPP). In this way (as was the stated purpose of the DPP when it was set up in 1983) any prosecution is removed from the political arena.

Following an investigation by a Marine Park inspector of any incident, a brief of evidence is sent to the Commonwealth Director of Public Prosecutions for consideration. The DPP takes into account many factors, including the seriousness of any alleged offence, whether there is sufficient evidence justifying action, and whether a conviction is likely. Another factor considered by the DPP is whether the prosecution is in the public interest.

If the DPP decides not to prosecute, the Authority or its day-to-day management agencies may issue a written warning to an offender. However, if the DPP decides to go to court, that office issues all summonses and conducts the prosecution.

Priorities for Enforcement

There are three general priority levels for enforcement—high priority, medium priority and low priority—and the Authority has begun a process of legislative changes to give effect to these.

Complaints from the community that are substantiated by evidence, or where there is a commitment from a member of the public to assist investigations, are considered a high priority for day-to-day management staff.

High Priority

These are activities that have resulted in large-scale habitat or environmental damage, or where such damage is likely to occur, or where the natural resources of the Marine Park have been or will be severely depleted. These will be classed as Indictable Offences, which carry high penalties and allow for a trial by a judge and jury.





■ Day-to-Day Management cont'd

Medium Priority

Medium priority offences are those where significant environmental damage has occurred or may occur, where financial reward or gain from an offence may exist or where significant management principles are disregarded. These will be classed as Summary Offences, which can be heard by a Magistrate without a jury.

Low Priority

These are offences of a minor or technical nature or where environmental damage is not likely to occur. These will be classed as either Summary Offences, or be dealt with by Infringement Notices.

Penalties

The *Great Barrier Reef Marine Park Act 1975* provides for penalties of up to \$22 000 for an individual who enters or uses a zone for a purpose other than that allowed for in a zoning plan (the entire Marine Park is zoned for various uses and accessibility).

Penalties for pollution are up to \$22 000 for an individual. In certain circumstances, the owner of the vessel may also be liable and face penalties of up to \$220 000, or, where the owner is a company, \$1.1 million.

Other offences, such as not carrying a pilot in a compulsory pilotage area, can attract a fine of up to \$55 000 for the master of the vessel if heard on indictment, and \$11 000 if heard summarily.

Offences connected with the Environmental Management Charge (paid by most permit holders) range from \$4000 to \$8000.

Breaches of regulations carry penalties of up to \$1000.

Policy

The Authority's enforcement policies are aimed at providing good quality, uniform and dependable services for the good of the community and the environment. Inspectors are expected to consider the intent of the legislation when conducting investigations and to use their common sense in applying those provisions.





TRAINING AND ADVISORY SERVICES UNIT

Sharing the Authority's Expertise

There continues to be demand for the Authority's expertise and knowledge from other states in Australia and from governments and marine conservation agencies in other countries, particularly from the Asia–Pacific region.

Techniques that have been developed by the Authority are now recognised as being potentially applicable in other parts of Australia and overseas as other nations move to further protect their marine environments, while still allowing for sustainable use of marine resources.

Marketing Marine Management

The Training and Advisory Services Unit (TASU) of the Authority was established to provide, on an advisory or consultancy basis, the expertise and experience developed by the Authority to any government or organisation that requests assistance. This assistance is generally short-term, is subject to the Authority's priorities at the time and is provided on a cooperative and cost-recovery basis.

Assistance is based on, or derived from, the massive regional planning and environmental techniques developed and applied to the Great Barrier Reef.

Training and consultancy program objectives are:

- To provide an introduction to the concepts and management tools used in the policy and day-to-day management of the Great Barrier Reef World Heritage Area;
- To provide background knowledge and skills to produce management plans and strategies for marine and coastal environments;
- To assist trainees in applying knowledge and skills to national, regional and local issues;
- To encourage analysis, discussion and application of management concepts, strategies and tools;
- To establish networks between trainees and useful contacts in Australia and elsewhere; and
- To follow-up the Australian-based training with solid, in-country program evaluation.

The Training and Advisory Services Unit has managed many consultancies around the world. These consultancies have brought the added bonus of allowing the





■ Training and Advisory Services Unit cont'd

Authority's officers to gain an insight into the management of marine environments in other countries.

At the global level, the TASU works through such agencies as the World Bank, the World Conservation Union (IUCN), the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP) and the Australian Agency for International Development (AusAID). Other global initiatives include preparation of a report for the World Bank for a global system of Marine Protected Areas (published in 1995) and participation in the International Coral Reef Initiative (ICRI).

The Unit is also a partner in INTROMARC, a joint venture between the Great Barrier Reef Marine Park Authority, James Cook University and the Australian Institute of Marine Science. INTROMARC focuses on the provision of quality education, training, scientific capability and management expertise in tropical marine aspects of ecologically sustainable development. INTROMARC provides assistance on a commercial basis. The Authority, through the TASU, provides the secretariat for INTROMARC.

Due to the broadscale and specialised training and consultancy process, the Authority attracts high-calibre staff and remains informed on the latest international initiatives in marine conservation. This ensures the Authority has the latest and best information to assist in its principal task of ensuring the ecologically sustainable use of the Great Barrier Reef.





INDIGENOUS CULTURAL LIAISON UNIT

There is a significant Indigenous cultural relationship with the Great Barrier Reef that predates non-indigenous involvement in the area. Contemporary Indigenous peoples are attempting to retain their cultural association with, and values and use of the Area in the face of increasing pressure from coastal development, commercial fishing, private recreational use and rapidly increasing tourism use.

An Indigenous Cultural Liaison Unit (ICLU) was established by the Authority in 1995 to more effectively identify the interests and needs of Indigenous peoples in relation to Native Title, governance, and the maintenance of the cultural and traditional values associated with the Great Barrier Reef.

Issues addressed by the Unit include the recognition of cultural heritage values, semisubsistence resource use, information sharing, cooperative management, protocols, cultural advice, and liaison. One of the Unit's goals is to provide timely and accurate information in regard to Indigenous issues and achieve cooperative management of the Great Barrier Reef World Heritage Area.

Empowering Indigenous peoples through involvement in all tiers of management will help develop effective and acceptable solutions for key indigenous issues, and is crucial for effective management of the Marine Park. The starting point for this involvement is at the grassroots level. Community management gives recognition to communities, reinforces self-determination and provides benefits for all.

Through the Unit, the Authority supports, rather than instigates, Indigenous community initiatives through information sharing and resource support. Complex and broad-scope views inherent with multiple use of the Great Barrier Reef make cross-cultural communication an important management tool.

The ICLU staff not only work with Indigenous groups, but work closely with other government authorities, the tourism industry, the fishing industry and conservation groups in order to build a greater understanding among all users.

Getting Indigenous groups involved in all user-group management issues, for example tourism, Coastcare programs and permitting, allows for foundation building. This then leads to the development of management structures or models that involve all concerned so that effective and mutually acceptable practices can be put in place.





■ Indigenous Cultural Liaison Unit cont'd

The Unit has been instrumental in:

- Highlighting Indigenous relationships with the marine environment to ensure cultural and heritage values are recognised;
- Providing equity for indigenous involvement in setting directions and management action;
- Presenting indigenous values of the World Heritage Area positively to stakeholders and the wider community;
- Providing for the maintenance and protection of indigenous subsistence activities
 within the bounds of ecological sustainability, with particular emphasis on
 ensuring the long-term viability of threatened species;
- Ensuring fisheries management strategies meet the traditional, social, cultural and economic needs of Aboriginal and Torres Strait Islander communities; and
- Implementing mechanisms to resolve conflicts between stakeholder interests and cultural values.





RESEARCH AND ETHICS

Having the best available information for decision making is essential to high quality, scientifically-based management of the Marine Park. The Authority has a strategic and coordinated approach to information acquisition, management, analysis, interpretation, dissemination and application.

The Authority is a Registered Research Agency under the Australian Industry Research and Development Board and can conduct and manage research. As the Authority is a management agency, the majority of research is carried out by research institutions such as the Cooperative Research Centre for Ecologically Sustainable Development of the Great Barrier Reef and the Australian Institute of Marine Science (see WHO section).

Scientific Research is needed to:

- Ensure that decision making is supported by the best available information;
- Increase our understanding of the natural variability of the Great Barrier Reef's ecosystems and their response to natural or anthropogenic disturbances;
- Provide accurate and timely scientific information and advice for Park management, including reporting on the state of the Great Barrier Reef;
- Provide information systems and services that meet the needs and priorities of the organisation;
- Achieve efficiency gains through the strategic and effective application of information technology; and
- Integrate and cooperate on information with other organisations with an interest or role in the management of the Marine Park and the World Heritage Area.

If research has been approved in the Great Barrier Reef Marine Park, researchers are requested to forward to the Authority or the Queensland Parks and Wildlife Service a report on field work undertaken, including:

- A detailed list of specific research sites at the reefs or other locations visited (incorporating a map);
- Details of the names and quantities of specimens collected;
- The location of the raw data collected;
- Details of any reports or publications arising from the permitted research, either published or in preparation; and
- Implications for management of the Marine Park.

The details of this report are recorded on a computer database which, along with existing resource information, provides important data necessary for the planning and management of the Marine Park.





■ Research and Ethics cont'd

Research Ethics Committee

To address increased community interest and concern over research issues, the Authority established a Great Barrier Reef Research Ethics Committee on 19 March 1997 to ensure a more transparent and accountable research process. The Committee advises whether research proposed in referred permit applications constitutes reasonable use of the Great Barrier Reef Marine Park and the World Heritage Area.

Terms of Reference

The Committee advises the Great Barrier Reef Marine Park Authority on:

- Ethical aspects arising from research activities in the Great Barrier Reef Marine Park and World Heritage Area;
- Criteria for the determination of manipulative and/or intrusive research which has ethical implications;
- Research permit applications, assessment documentation and assessment reports involving research referred on the basis of meeting one or more of the referral criteria. This includes research funded and/or conducted by, or on behalf of, the Authority; and
- Actions and measures to ensure that the ethical review process provides adequate consideration of relevant issues.

Research Ethics Committee Membership

The Committee consists of five members including:

- · A community specialist in heritage and conservation;
- An expert in experimental design not involved in reef research, but with knowledge of marine ecosystems;
- An ethicist/philosopher with expertise in the application of ethics relevant to natural resource management situations and environmental research;
- A person reflecting the broad interests of the community in the Great Barrier Reef;
- A senior officer of the Authority with knowledge of reef management, policy and procedures.

Although the Committee does not represent any particular group, it can receive advice through the appointed independent Chair. The Committee may also, from time to time, invite external experts to review aspects of matters where additional expertise may be required.





■ Research and Ethics cont'd

Because of the need for rapid consultation, the membership of the Research Ethics Committee consists of people who can be generally available at relatively short notice in the Townsville Region.

Criteria for Referral and Guidelines for Establishing Reasonable Use

Application for a research permit will be referred to the Committee if the research involves one or more of the following:

- · An endangered, vulnerable or threatened species;
- Introduction into the Great Barrier Reef Marine Park of animals, plants or other biological material;
- Relocation within the Great Barrier Reef Marine Park of animals or plants or other biological material to areas in which they are not normally found;
- Introduction or release of any genetically modified animals, plants or other biological material;
- Habitats of particular importance to the biology of endangered, vulnerable, threatened or commercially important species;
- Destruction and/or, intrusion such as:
 - Deliberate damage;
 - Taking of plants and animals; and
 - Behaviour manipulation and/or use of intrusive techniques at a significant scale in space and time, and relative to the size of populations and habitats affected, and ecological and geophysical processes applying in the area;
- Use of toxic, radioactive, cumulative and/or persistent chemicals;
- Will take place in a Preservation zone;
- May have a significant impact on use(s) and values of the area concerned, and would require new or changed zoning provisions and regulations; and
- Is likely to be controversial or sensitive (culturally, socially), seen to be cruel, or to involve the infringement of privacy and property rights.

The researcher must ensure that the proposed project does not compromise or disturb existing projects. In most cases, in order to avoid unnecessary conflict, collection adjacent to recognised tourist areas will not be approved.

Researchers are expected to be familiar with Marine Park zoning of the area in which the research is proposed. Where possible, manipulative research, involving collecting and disturbance to the biological, physical and chemical environment, should be conducted in General Use zones only.





■ Research and Ethics cont'd

Alternative collecting locations to Marine National Park 'A' and 'B' zones should be considered. The objective of zoning waters adjacent to established Research Stations, such as at Orpheus Island and Lizard Island, as Marine National Park 'B' zones was to provide opportunities for researchers to work in areas of minimum extraction and disturbance.

Permission may be sought to undertake research in a Scientific Research zone where the relevance to management of the area can be demonstrated and where manipulation is minimal. The Preservation zone provides only for research that cannot be conducted in any other zone.

Reasonable Use Guidelines

To guide the Committee's deliberations in deciding what research is reasonable use, the following questions have been proposed.

- · What does the research seek to establish?
- How does this research fit with existing research?
- What are the expected impacts of the research on the species, habitat, other species, and use and values of other direct and indirect users?
- What is the extent of the effects of the manipulation and/or intrusion?
- Does the experimental design address the objectives with minimal disturbance?
- How would the impacts of the proposed research compare with impacts of other permitted uses of the Marine Park?
- Are there any prudent and feasible alternatives?
- What are the expected benefits that may be expected to arise from the successful conduct of the research?
- Do the benefits of the research warrant the extent of likely impacts?
- Are there community issues that should be addressed?

Recommendations take into account the principles of ecologically sustainable development.





EDUCATION AND INFORMATION

Library Services

The library at the Great Barrier Reef Marine Park Authority provides a service of major national and international significance in the subject areas of natural resource management and, in particular, marine park management.

The library aims at providing a pro-active and effective information service that supports the overall goal and aims of the Authority, and that meets the information needs of all our clients. While the collection's emphasis is the sustainable management of the Great Barrier Reef Marine Park, other important subjects are marine protected area planning and management, environmental impact assessment, national park planning, coral reef ecology, environmental monitoring, environmental law and World Heritage issues.

The library holds:

- Approximately 7000 monographs;
- 1000 serial titles;
- · Nearly 200 video titles;
- · A large collection of staff and research institution papers;
- A comprehensive cartographic collection of topographic maps, hydrographic charts and satellite images;
- Photographs and slides;
- · An extensive collection of cd-rom based material; and
- Access is available to online databases such as DIALOG, ABN, BIBLIOLINE and UNCOVER.

Image Collection

The image collection at the Authority comprises a large collection of spectacular photography showing all aspects of life on the Great Barrier Reef. This collection includes over 70 000 colour transparencies and black and white and colour prints. This unique and comprehensive collection is available for external use as well as for supporting the information needs of the Authority and its staff.





■ Education and Information cont'd

REEF Bibliographic Database

The REEF bibliographic database is managed by the Great Barrier Reef Marine Park Authority. REEF indexes material on or about the Great Barrier Reef, and is commercially available online and on the Heritage & Environment cd-rom from RMIT Publishing–Informit. REEF is Australia's largest single-bibliographic information source on the Great Barrier Reef.

FISHNET, IAMSLIC and GEMIM

The library is a member of FISHNET, an Australian-wide cooperative network of marine libraries, and IAMSLIC, the International Association of Marine Science Libraries and Information Centers. The Librarian represents Australia on GEMIM, the Group of Experts on Marine Information Management. GEMIM is a working committee which answers to the International Oceanographic Data Exchange.

Loans

Loans of monographs, videos and document delivery services are possible through the standard procedures and conditions listed in the Australian Interlending Code. Specific conditions apply for external use of the Authority's Image Collection.

Library Hours for the Public

Monday, Tuesday, Thursday, and Friday: 10.00 a.m.-12.00 a.m. & 2.00 p.m.-4.00 p.m.

Contacts:

Librarian Great Barrier Reef Marine Park Authority PO Box 1379 (2-68 Flinders Street) Townsville Qld 4810 Australia

Facsimile: 07 4772 6093

Email: library@gbrmpa.gov.au

http://www.gbrmpa.gov.au/information/services/library/index.html





■ Education and Information cont'd

Reef HQ

Reef HQ Membership

Reef HQ, formerly the Great Barrier Reef Aquarium, boasts 7500 local residents who are Aquarium Members. They recognise the Aquarium as a living museum of the Great Barrier Reef—with all the seasonal variations that nature brings. With 5 per cent of the local population who consider this Aquarium as their own, this is the most successful membership program of its kind in Australia. Members are encouraged to support Aquarium sponsors.

Aquarium Education Program

There are 15 000 school students taking part each year in specially designed education programs at the Aquarium. Some of the programs extend into the night, with night tours and sleepovers, opening the nocturnal reef world to young, inquiring minds. Teachers aren't left out, with training programs offered each year. An intern program provides extended research opportunities for tertiary and graduate students.

Aquarium Volunteers

The Aquarium currently has an outstanding volunteer program, with more than 160 people actively involved in all aspects of the operation. Part of this scheme is a student volunteer program, which acts as an environmental education and vocational training program in one. Volunteers support the Aquarium in its mission to develop healthy attitudes to looking after the Great Barrier Reef.

Research at Reef HQ

The Aquarium undertakes research pertinent to the development of aquarium exhibits and the future management of the Great Barrier Reef Marine Park. Recently, the Aquarium has been researching: ways to improve the survival of corals under aquarium conditions; how clams might be used to indicate water quality and reef health; the nutrition of baby turtles and ways to develop a seahorse captive breeding program.

Relationship with the Great Barrier Reef Marine Park Authority

The Aquarium is a section of the Great Barrier Reef Marine Park Authority but is not funded entirely by the Authority. The Aquarium operates on a cost-recovery basis, raising revenue from general admissions, retail, venue hire, donations and corporate sponsorship. This, combined with the high level of community and commercial support, enables the Aquarium to deliver high-quality education and interpretive programs about coral reef ecosystems and the Great Barrier Reef Marine Park.



APPENDIX 1

LEGISLATION AFFECTING THE GREAT BARRIER REEF WORLD HERITAGE AREA

Federal Legislation

Great Barrier Reef Marine Park Act 1975

This is the primary act that gave rise to the Great Barrier Reef Marine Park, the managing agency and outlined many of the planning and management aspects.

The Great Barrier Reef Marine Park Act 1975 is comprehensive and includes provisions that:

- Establish the Great Barrier Reef Marine Park and provide for its control, care and development through such instruments as Zoning Plans and Plans of Management;
- Recognise that the Marine Park provides for a statutory right of reasonable use;
- Prohibit drilling and mining (except for research);
- Establish a single, independent Federal agency for management (i.e. Great Barrier Reef Marine Park Authority);
- Establish a four-person 'board', i.e. the Great Barrier Reef Marine Park Authority;
- Establish a Consultative Committee made up of a diverse range of stakeholders (who report directly to the Minister); and
- Set out the process for preparing regulations and other legislative instruments including provision for public consultation.

World Heritage Properties Conservation Act 1983

The Great Barrier Reef World Heritage Area was declared in 1981, recognising its unique natural, cultural and aesthetic values. This Commonwealth legislation provides for the protection of Australia's World Heritage properties (listed or subject to an Inquiry established under Commonwealth law) that are likely to be damaged. The Commonwealth Government has used the World Heritage Properties Conservation Act 1983 to stop activities damaging cultural and natural heritage in three Australian World Heritage properties to date:

- 1983 (re-construction of the Franklin-below-Gordon Dam);
- 1988 (re-logging/road construction in the Wet Tropics of Queensland); and
- 1994 (mangrove removal and channel dredging at Oyster Point adjacent to the GBRWHA).

This Act will be repealed and replaced by the Environment Protection and Biodiversity Conservation Act 1999 when it is proclaimed in or about July 2000.

^{&#}x27;Material in this section was provided by the Great Barrier Reef Marine Park Authority.



Endangered Species Protection Act 1992

This Act:

- promotes the recovery of species and ecological communities that are endangered or vulnerable;
- · prevents other species and ecological communities from becoming endangered;
- provides for public involvement in, and promotes public understanding of, the conservation of such species and ecological communities; and
- encourages cooperative management for the conservation of such species and ecological communities.

This Act will be repealed and replaced by the Environment Protection and Biodiversity Conservation Act 1999 when it is proclaimed in or about July 2000.

Whale Protection Act 1980

This applies to all those 'encountering' whales (including foreign vessels and aircraft within the Exclusive Economic Zone) and prohibits 'interfering' with cetaceans (this includes harassment, chasing and herding of whales). See also state legislation below.

This Act will be repealed and replaced by the Environment Protection and Biodiversity Conservation Act 1999 when it is proclaimed in or about July 2000.

Historic Shipwrecks Act 1976

This Act prohibits certain activities in relation to historic shipwrecks and relics and requires discoveries to be notified.

Environment Protection (Sea Dumping) Act 1981

This prohibits dumping of waste or other matter (including vessels) from any vessel, aircraft or platform in Australian waters unless a permit has been issued.

Environment Protection (Impact of Proposals) Act 1974

This Act provides for proper environmental assessment of any works or proposals likely to effect the environment to a significant extent.

This Act will be repealed and replaced by the Environment Protection and Biodiversity Conservation Act 1999 when it is proclaimed in or about July 2000.

Australian Heritage Commission Act 1975

This provides for the establishment, functioning and powers of the Australian Heritage Commission and the protection of the National Estate including the Register of the National Estate.



Native Title Act 1993

This provides for a number of important aspects of native title, including the recognition and protection of native title and a mechanism for determining claims to native title.

Sea Installations Act 1987

This Act provides for a number of aspects relating to sea installations including requirements that they be operated in a manner consistent with the protection of the environment.

State Legislation (Queensland)

Marine Park Act 1982

This State Act enables declaration of State Marine Park(s) over tidal lands and tidal waters.

Many aspects of this Act were modelled on the *Great Barrier Reef Marine Park Act 1975*; certainly the State Zoning Plans are virtually 'mirror-images' of their Federal counterparts. Note however that there are some differences, for example, in the assessment criteria for permits.

Coastal Protection and Management Act 1995

This is relatively recent legislation for the 'coastal zone' which aims to:

- provide for the protection, conservation, rehabilitation and management of the coast including its resources and biological diversity;
- have regard to the goal, core objectives and guiding principles of the national strategy for ecologically sustainable development in the use of the coastal zone;
- provide, with other legislation, a coordinated and integrated management and administrative framework for the ecologically sustainable development of the coastal zone; and
- encourage the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.

The primary provisions in the Act include Coastal Planning (developing a State Coastal Management Plan plus Regional Coastal Management Plans), Development Controls and the Declaration of Control Districts. This Act also incorporates some of the relevant parts of the *Harbours Act* (although section 86 of the *Harbours Act* still relates to approvals to construct works in tidal lands and tidal waters) and the *Canals Act* 1958.

Nature Conservation Act 1992

This is the principal State Act addressing nature conservation and species management and provides for subordinate legislation such as the Regulations. See also Nature Conservation (Whales and Dolphins) Conservation Plan 1997 and the Dugong Conservation Plan 1997.



Environmental Protection Act 1994

This is the principal State Act addressing water and air quality and pollution (including noise pollution) and enables approvals or licences to discharge.

Integrated Planning Act 1997

This is the principal State Act addressing planning across local and State levels of government.

Local Government (Planning and Environment) Regulation

This Regulation states that a 'designated development' proposal requires an environment impact statement if located on, or having a common boundary with:

- an area identified under a conservation plan as critical habitat for native wildlife or an area of major interest;
- a catchment area under the Water Resources Act 1989;
- a protected area (for example, national park), unless exempted under a conservation plan; and
- a wetland.

International Obligations/Conventions

Australia complies with many obligations/conventions which have implications for the Great Barrier Reef World Heritage Area including:

- MARPOL (International Convention for the Prevention of Pollution at Sea);
- CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora);
- Convention on Biological Diversity (1992);
- Convention Concerning the Protection of the World Cultural and Natural Properties (the World Heritage Convention, 1972);
- UNCLOS (United Nations Convention on the Law of the Sea, 1994);
- Ramsar (Convention on Wetlands of International Importance Especially as Waterfowl Habitats, 1971);
- International Maritime Organisation (IMO) The IMO has declared the entire Great Barrier Reef as a 'particularly sensitive sea area' which allows the implementation of ship management measures such as compulsory pilotage and mandatory ship reporting; and
- Convention on the Conservation of Migratory Species of Wild Animals (Berne Convention).



QUESTIONNAIRE

Please answer the following questions. The answers will help us to help you.

•	Have you, or has anyone in your org	ganisation, had occasion to refer to the
	□ YES □ NO	
•	Do you find the information in the Great Barrier Reef Reference File useful?	
	☐ YES ☐ NO	
	If YES, in what ways?	
•	Can you suggest any ways in which the Reference File could be of greater interest and use to you?	
•	Other Comments	
	Name	
	Please return this questionnaire to:	Craig Sambell Great Barrier Reef Marine Park Authority PO Box 1379 TOWNSVILLE QLD 4810 Facsimile: (07) 4772 6093



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