

FAUNA and FLORA of the GREAT BARRIER REEF WORLD HERITAGE AREA

**A compendium of information and basis for the Species Conservation
Program in the Great Barrier Reef Marine Park Authority**

SECOND EDITION

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[*Species Conservation Program](#)

Conservation, Biodiversity and World Heritage Group

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Whilst every attempt has been made to include Great Barrier Reef species that are listed under legislation, conventions, agreements and other such documents, for certainty the original source documents should be examined.

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INTRODUCTION

The Great Barrier Reef is the world's largest coral reef ecosystem and one of just a few World Heritage Areas that includes marine and coastal values that meet all four natural [World Heritage criteria](#). The Great Barrier Reef Marine Park (GBRMP) is also the world's largest marine protected area (344 400 m²; more than 2000 km in length and several hundred kilometres wide in some parts). The Great Barrier Reef Marine Park incorporates a large number of different habitats (e.g. more than 2900 reefs and about 900 islands and coral cays comprising 30 reef and 40 non-reef bioregions) because of its size. This size underlies the vast diversity of marine life occurring in the region and the region's proximity to the global centre of marine biodiversity. About 99.3 per cent of the World Heritage Area is within the GBRMP, the remaining 0.7 per cent being Queensland waters and islands, most of which is contained within a complementary system of marine parks managed by the Queensland Government.

The Great Barrier Reef Marine Park Act also established the Great Barrier Reef Marine Park Authority ('the Authority'). 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 stated Aims of the Authority include protecting the natural qualities of the Great Barrier Reef while providing for reasonable use of the Reef Region, and minimising regulation of, and interference in, human activities, consistent with meeting the [Goal and other Aims](#) of the Authority. Consistent with these obligations, the Authority is responsible for conserving species of high conservation value (e.g. rare, threatened) in the GBRMP. This is achieved through managing human activities and associated impacts occurring in the GBRMP, including both current activities and predicted future activities. To the extent that it is consistent with protecting the natural values of the Great Barrier Reef, the Authority provides for ecologically sustainable use of the Marine Park.

Purpose of this Report

The way in which the Great Barrier Reef Marine Park Authority (GBRMPA) manages for the conservation of species in the GBRMP is determined mainly by legislative instruments and policy decisions, which are supported by education and enforcement. Given the migratory nature of many species, the GBRMPA works closely with other Australian and Queensland Government agencies to ensure complementary management approaches as far as possible. This Report is a compendium of information on the fauna and flora of the GBRWHA and explains the rationale behind the work priorities of the Species Conservation Program of the GBRMPA, which focuses on the management of threatened species. The Report will be reviewed and updated as additional information becomes available and in the light of changes to conservation priorities.



FIGURE 1. MAP OF THE GREAT BARRIER REEF MARINE PARK AND GREAT BARRIER REEF WORLD HERITAGE AREA BOUNDARIES

OBLIGATIONS TO RARE¹ AND THREATENED² SPECIES

The Great Barrier Reef Marine Park Authority's (GBRMPA) 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*'. Under the [Great Barrier Reef Marine Park Act 1975](#), (the Act) zoning plans are a primary tool for managing the GBRMP. In preparing [zoning plans](#), the GBRMPA is required under s.32 (7) to have regard, among other things, to the '*conservation of the Great Barrier Reef*'. [Plans of Management](#) may be regarded as a more specific management requirement for specific areas, and under s.39Y (b) of the Act, one object of Plans of Management is, '*to ensure management for the recovery and continued protection and conservation of species and ecological communities that are, or may become: extinct; or extinct in the wild; or critically endangered; or endangered; or vulnerable; or conservation dependent*'.

Another Marine Park management tool is the requirement that permission be acquired from the GBRMPA prior to the undertaking of certain activities, particularly commercial use. In considering applications for relevant permissions, the GBRMPA must have regard under s.74 (5) of the [Great Barrier Reef Marine Park Regulations 1983](#) to, among other things, '*the conservation of the natural resources of the Marine Park*,' and under s.74 (6) in relation to the traditional use of marine resources involving the taking of animals, plants or marine products, '*the need for conservation of protected species and, in particular, the capability of the relevant population of that species to sustain harvesting*'. For a list of protected species, see regulation 29.

In addition to the legislative requirements, a 5-year objective under the [25 Year Strategic Plan for the Great Barrier Reef World Heritage Area: 1994-2019](#) (Great Barrier Reef Marine Park Authority 1994) is '*to pay special attention to conserving rare and endangered species*'. Broad strategies are recommended that involve the identification of threatened species and human related threats to their survival, and the development and implementation of appropriate coordinated management actions. Logically, perhaps, the identification of species and human related threats would be expected to precede management actions for their conservation. However, for marine species this is not so easy. Although much is known about some large vertebrate species (e.g. cetaceans, dugongs, marine turtles), there have been few descriptive studies of inter-reef and lagoonal benthic communities of the Great Barrier Reef. As such, there is little information about the status and population trends of species in those areas (Wachenfeld 1998).

Following is a list of key species conservation instruments that the GBRMPA must consider in determining its response to species conservation issues. This list is not exhaustive but rather gives a context for some of the GBRMPA's obligations to various conventions, agreements and pieces of legislation.

- International
- National
- Queensland

¹ Rare wildlife is defined in the Queensland *Nature Conservation Act 1992* as including native wildlife whose population is represented by— (a) a relatively large population in a restricted range; or (b) smaller populations thinly spread over a wider range.

² A threatened species is one that is listed in a category of endangerment internationally, nationally or regionally (Australian States and Territories).

International

- [Convention for the Protection of the World Cultural and Natural Heritage \(World Heritage Convention\)](#)

- [Convention on Biological Diversity](#)

- [Convention on the Conservation of Migratory Species of Wild Animals \(the Bonn Convention\)](#)

Species occurring in the Great Barrier Reef World Heritage Area (GBRWHa) and listed on the Bonn Convention are in Table 1.

- [Convention on the International Trade of Endangered Species of Wild Flora and Fauna \(CITES\)](#)

Species occurring in the GBRWHa and listed under CITES are in Table 1.

- [The Convention on Wetlands of International Importance especially as Waterfowl Habitat \(the RAMSAR Convention\)](#)

The following RAMSAR listed wetlands occur in the [GBRWHa](#):

- Bowling Green Bay
- Shoalwater and Corio Bays Area

In addition:

- [Agreements between the Government of Australia and the Governments of Japan and China for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment: JAMBA and CAMBA](#)

Table 2 lists birds occurring in the GBRWHa that are included on the agreements.

- [The World Conservation Union \(IUCN\)](#)

An important function of IUCN is to compile lists of internationally threatened species in the [Red Data Book](#). Table 3 lists Great Barrier Reef species occurring in the GBRWHa that are included in the Red Data Book.

National

- Great Barrier Reef Marine Park Act 1975
- Environment Protection and Biodiversity Conservation Act 1999

The GBRMPA also must have regard to Australia's:

- National Strategy for Ecologically Sustainable Development
- National Strategy for the Conservation of Australia's Biological Diversity
- Australia's Oceans Policy
- National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction

Great Barrier Reef Marine Park Act 1975

The [Great Barrier Reef Marine Park Act 1975](#) enabled the establishment and functioning of the Great Barrier Reef Marine Park Authority (GBRMPA) and the Great Barrier Reef Marine Park (GBRMP).

The GBRMPA'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 [Aims](#) of the GBRMPA include protecting the natural qualities of the Great Barrier Reef while providing for reasonable use of the Reef Region, and minimising regulation of, and interference in, human activities consistent with meeting the Goal and other Aims of the GBRMPA.

The Act provides for the protection of the Great Barrier Reef through [zoning](#), issuing of [permits](#), and implementation of [Plans of Management](#) that collectively enable management of human activities. The Act establishes a requirement for proponents of a range of activities to first obtain a permit to operate in the GBRMP. Under Regulations, the GBRMPA must not grant a permit to enter, use or carry on an activity in the GBRMP unless an assessment has been made of the impact that entry, use or activity is likely to have on the Marine Park, including animals such as threatened or rare species. Zoning also defines permissible activities in the GBRMP.

In addition, section 39Y of the Act states that when developing Plans of Management, threatened species should be managed for their 'recovery and continued protection and conservation'. Similarly, in considering the issue of traditional use of marine resources the GBRMPA is required under the [Great Barrier Reef Marine Park Regulations 1983](#), to have regard to the conservation of protected species.

Under the Act, the GBRMPA must have regard to the protection of [World Heritage values](#) of the GBRMP and to the precautionary principle in preparing Plans of Management. The 'precautionary principle' is defined in the GBRMP Act by the [Intergovernmental Agreement on the Environment 1992](#), which states that in the application of the precautionary principle, public and private decisions should be guided by:

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and,
- (ii) an assessment of the risk-weighted consequences of various options.

Environment Protection and Biodiversity Conservation Act 1999

An object of the [*Environment Protection and Biodiversity Conservation Act 1999*](#) (EPBC Act) is ‘*to provide for the protection of the environment, especially those aspects of the environment that are [matters of national environmental significance](#)*’. The act identifies six matters of national environmental significance: World Heritage properties; Ramsar wetlands of international significance; nationally listed threatened species and ecological communities; listed migratory species; Commonwealth marine areas and nuclear actions (including uranium mining). Another object of the Act is to ‘*promote the conservation of biodiversity*’. Species listed as threatened under the EPBC Act and found in the Great Barrier Reef World Heritage Area (GBRWHA) are listed in Table 3.

Species that are nationally listed as threatened species or are listed under certain Conventions protecting migratory species (including the Bonn Convention) receive additional protection under the corresponding provisions of the EPBC Act. Further, within ten years of the commencement of the EPBC Act on 16 July 2000, inventories must be prepared that identify and state the abundance of these species in Commonwealth marine areas.

The EPBC Act provides a framework for the protection of species listed as endangered and vulnerable, and ecological communities listed as endangered. The EPBC Act provides for the preparation of recovery or conservation plans for all scheduled species and ecological communities. Recovery plans must specify research and management actions necessary to stop the decline of, and support the recovery of, the species or community so that its chances of long-term survival in nature are maximised. As a Commonwealth agency, the Great Barrier Reef Marine Park Authority (GBRMPA) must not take any action that contravenes a recovery plan or a threat abatement plan. The EPBC Act also establishes a number of offences relating to, for example, killing, injuring, or taking listed threatened, migratory or marine species and cetaceans, and provides for issuing permits for these species.

The EPBC Act also allows for the identification of [key threatening processes](#). A process is defined as a key threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community. Key threatening processes that are currently listed and which impact on threatened species in the GBRWHA include:

- [Incidental catch \(bycatch\) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28 degrees South](#)
- [Incidental catch \(or bycatch\) of seabirds during oceanic longline fishing operations](#)
- [Predation by Feral Cats](#)
- [Predation by the European Red Fox \(*Vulpes vulpes*\)](#)
- [Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs](#)
- [Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases](#)
- [Injury and fatality of marine wildlife caused by ingestion and entanglement of wildlife in marine debris](#)

The following threatening process has been nominated and is currently being assessed (December 2004):

- [Death or injury to marine species following capture in beach meshing \(nets\) and drumlines used in Shark Control Programs](#)

The assessment of an activity as a key threatening process is the first step in addressing, under Commonwealth law, the impact of a particular threat. Once a threatening process is listed under the EPBC Act, a [Threat Abatement Plan](#) can be put into place if it is proven to be "a feasible, effective and efficient way" to abate the threatening process.

- [National Strategy for Ecologically Sustainable Development](#)

This Strategy sets out the framework for co-operative decision-making in government and the promotion of ecologically sustainable development throughout Australia. The Strategy, which was endorsed by Commonwealth and State Heads of Government in 1992, is also relevant to industry, business and community groups. The goal of the Strategy is '*development that improves the quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends*'.

- [National Strategy for the Conservation of Australia's Biological Diversity](#)

This Strategy aims to bridge the gap between current activities and the effective identification, conservation and management of Australia's biological diversity. The Strategy's primary focus is Australia's native biological diversity. The goal of the Strategy is '*to protect biological diversity and maintain ecological processes and systems*'.

- [Australia's Oceans Policy](#)

This Australian Government Policy (1998) sets in place the framework for integrated and ecosystem-based planning and management for all of Australia's marine jurisdictions. It includes a vision, a series of goals and principles, and policy guidance for a national Oceans Policy. Building on existing effective sectoral and jurisdictional mechanisms, it promotes ecologically sustainable development of the resources of our oceans and the encouragement of internationally competitive marine industries, while ensuring the protection of marine biological diversity.

- National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction

The overall aim of this 1992 Strategy, is '*to ensure that endangered and vulnerable species and ecological communities can survive and flourish, and retain their genetic diversity and potential for evolutionary development in their natural habitats, and to prevent further species and ecological communities from becoming endangered*.' While the primary focus is on species, attention also needs to be directed to the conservation of subspecies or distinct populations that may be endangered although the species itself may be secure. Maintenance of sub-species and distinct populations is essential if the range of genetic diversity within a species is to be retained.

Queensland

The principal Queensland legislation relating to marine and island wildlife conservation and management are the [Nature Conservation Act 1992](#), the [Marine Parks Act 1982](#) and the [Fisheries Act 1994](#) and associated regulations. Under the Queensland [Nature Conservation \(Wildlife\) Regulation 1994](#), the Queensland Government's proposed management intent for threatened wildlife is:

For those species listed as endangered, vulnerable or rare, the proposed management intent is:

- to regularly monitor and review the wildlife's conservation status and its habitat;
- to establish formal communication with the Commonwealth and other State agencies about the management and conservation status of the wildlife;
- to encourage scientific research and inventory programs likely to contribute to the understanding of the wildlife, its habitat and management requirements;
- to monitor and review the adequacy of environmental impact assessment procedures to ensure that they take into account the need to accurately assess the extent of the impact on rare wildlife and develop effective mitigation measures; and
- to recognise that the habitat of endangered, vulnerable or rare wildlife is likely to be a critical habitat or area of major interest.

Additional for endangered or vulnerable wildlife the proposed management intent is:

- to establish a database of records and information about the wildlife;
- to put into effect recovery plans or conservation plans for the wildlife and its habitat;
- to seek funding to help achieve the objectives of recovery plans and conservation plans;
- to take action to ensure viable populations of the wildlife in the wild are preserved or re-established;
- to start education programs for the community and managers of public land on extinction processes and threatened species conservation and habitat.

Additional for rare wildlife the proposed management intent is:

- to treat newly described plant species and vertebrate animals, or plant species or vertebrate animals reclassified as an identifiably different species, as rare wildlife until formal appraisal of its conservation status is complete;
- to collate information about management requirements for the wildlife and its habitat; and
- if a significant threatening process is affecting the wildlife, to treat the wildlife as endangered or vulnerable until it is included in Schedule 2 or 3.

Threatened species listed under this legislation and occurring in the Great Barrier Reef World Heritage Area (GBRWHA) are in Table 3.

TERMINOLOGY: ADVERSE IMPACTS, EFFECTS & HUMAN RELATED THREATS

- Adverse impacts
- Effects
- Human related threats

Human activities may affect marine wildlife in many ways. Such effects are caused by specific impacts or a combination of impacts. When assessing the possible consequences of human activities to marine organisms and developing management measures, it is important to identify impacts, effects and human related threats. These terms are used throughout this report and are defined as follows:

Adverse impacts

An adverse impact is an action or event that has an unfavourable influence (or effect) on an individual or a population.

Human activities on land and at sea can cause several different types of impacts on marine species. Impacts may directly affect the species. Impacts range in geographic scope from localised, affecting species in a small area, to global, affecting the species around the world. The duration of a particular impact may be short-term, ceasing within minutes or hours of the causal event or activity, or long-term, persisting for months or years. Effects may be short-term, long-term or permanent (e.g. death or permanent injury).

The susceptibility of marine wildlife to impacts varies according to the species and the nature of the impacts. For example, species or populations with few individuals, or that are confined to limited geographic areas, are generally more vulnerable than those that are common or cosmopolitan in distribution. In addition, species may be more vulnerable at certain times in their life cycle (for example when they are very young), at certain times of the year such as during breeding seasons, or when they are engaged in particular behaviours such as feeding. Species may also be more vulnerable to certain impacts because of physiological, behavioural, or other factors, such as breeding aggregations.

Furthermore, exposure to some impacts may lead to habituation, so that the effect of an impact on the animal declines with time as the animal becomes ‘accustomed’ to the impact. However, habituation does not always occur and is difficult to measure.

Whilst impacts that affect one or a few individuals are of concern, particular attention should be directed at impacts that affect many individuals, thereby threatening entire populations or genetic stocks and possibly risking species extinction.

Not all activities can be regulated by the Great Barrier Reef Marine Park Authority (GBRMPA). Some activities that may threaten species within the Great Barrier Reef World Heritage Area (GBRWhA) occur outside its boundary and direct responsibility for managing the impact of those activities rests with State or local governments. For example, land-use practices affecting catchments that flow into the GBRWhA are generally regulated by either [Queensland Environmental Protection Agency](#), [Department of Natural Resources, Mines and Energy](#) or through [local government plans](#) (Wachenfeld 1998). Alternatively, some issues are global in nature (e.g. climate change) and require international co-operation. Global-level impacts are no less serious than those operating at a smaller scale and, indeed

they may be more so. However, the primary intent of this paper is to provide a basis for the Species Conservation Program of the GBRMPA for managing human activities that will, or are likely to, affect species occurring in and around the World Heritage Area.

Many impacts may operate at once and it is difficult to assess the extent to which a particular impact will affect, or is affecting, individual species or a population. The main categories of impacts within the GBRWHA are, alphabetically:

- Accidental ingestion of and entrapment in marine debris
- Capture
- Deliberate or reckless killing and injuring
- Disease
- Explosions
- Harassment
- Incidental catch in fishing gear
- Noise
- Physical displacement
- Physical habitat degradation or destruction (e.g. downstream effects of land-use)
- Pollution
- Predation by feral animals
- Prey depletion
- Vessel strikes

Effects

An effect is the result of an adverse impact on an individual or a population.

Possible effects of impacts include mortality, injury or disease, reduced reproductive success, and behavioural modification. Many human activities can cause an animal to change its behaviour. Possible behavioural modifications include:

- changing swimming speed or direction (for example to approach or avoid a boat);
- changing dive depths or duration;
- changing breathing rates;
- changing nesting location;
- ceasing particular activities (e.g. feeding, breeding, nesting); and
- leaving an area.

These kinds of behavioural changes may not be significant if they occur infrequently, but may become a serious threat to the animals if they are frequent or persistent. For example, regular interruptions of feeding and other activities could threaten the survival of individual animals and ultimately of populations. Similarly, if human activities cause animals to leave key habitats such as sheltered bays used for foraging (*i.e.* if the animals neither habituate to nor tolerate the impacts), this could have serious consequences for a population.

Also, it is important to consider not only the potential impacts of individual activities, but also the potential cumulative impact of activities that are likely to affect the populations, over both the short and long terms. This is especially true for long-lived slow breeding species that may be under pressure from a variety of impacts.

Taking into account the wide variety of impacts and effects, and in accordance with the precautionary principle, as defined under the GBRMP Act, reasonable actions should be taken to avoid or minimise potentially serious or irreversible effects. Management decisions

must take into account reasonable predictions of likely effects of human activities on species, despite a lack of supporting scientific evidence. Regular evaluation of the effects of human activities on marine animals, as well as determination and monitoring of the conservation status of the various populations, are essential to allow early detection of problems and allow the development, evaluation and modification of management measures.

Human-related Threats

A threat is an action or event, or the cumulative collection of adverse impacts that effect an individual or population to such an extent that it is faced, respectively with death or extirpation.

The effect of an impact may or may not pose a threat to an animal or a population. For example, a dolphin may be startled by the noise of a vessel. The noise (*impact*) causes the startle reaction (*effect*), but this may not pose a threat to the survival or well being of the animal. If the noise occurs repeatedly and continues to cause a startle reaction, the animal's behaviour may be disrupted sufficiently to threaten its survival. If a sufficient number of animals in a population are threatened, then the population itself may be threatened.

Appendix 1 is a list of threats to species that was adopted by the [World Conservation Union](#) (IUCN) in February 2000. These threats apply mainly to the terrestrial environment and are difficult to extrapolate to species within the GBRWHA.

The main categories of human related activities that may threaten species within the GBRWHA are, alphabetically:

- Aircraft movement
- Aquaculture
- The movement of boats, ships and other motorised watercraft
- Coastal development and land-based practices that discharge to marine waters
- Conduct of defence exercises in marine environments
- Declining marine water quality
- Fishing
- Hunting and collecting
- Introduction of marine pests
- Marine dredging and construction
- Marine research and monitoring
- Marine based tourism and recreation
- Shark control programs

Generally, management should strive to eliminate or minimise adverse impacts in order to eliminate or minimise consequent effects and human related threats. It should be noted however that not all impacts or effects are necessarily adverse.

SPECIES IN THE GREAT BARRIER REEF WORLD HERITAGE AREA

For ease of consideration of all the species in the Great Barrier Reef World Heritage Area (GBRWhA), in this report the Species Conservation Program has grouped species of conservation interest according to the following divisions:

- ‘Listed Threatened, or Migratory or Marine Species’
- Species of special interest
- Other marine species of conservation concern
- Island flora and fauna

‘Listed Threatened, or Migratory or Marine Species’

These species are given special conservation protection by the [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act).

Species listed as threatened under the EPBC Act, Section 178, have a conservation status classified as either extinct, extinct in the wild, critically endangered, endangered, vulnerable, lower risk, or data deficient (Table 3).

[Listed migratory species](#), Section 209 of the EPBC Act, are those that occur on the appendices to the Bonn Convention or are listed under JAMBA and CAMBA as noted in Tables 1 and 2.

Species are also categorised as ‘[listed marine species](#)’ in the EPBC Act, Section 248. The listed marine species, described in detail in Appendix 2, include:

- Sea snakes (Families Hydrophiidae and Laticaudidae)
- Seals (Families Phocidae and Otariidae)
- Crocodiles (Genus *Crocodylus*)
- Dugongs (Genus *Dugong*)
- Marine turtles (Families Cheloniidae and Dermochelidae)
- Seahorses, Sea-dragons, Pipefish (Families Syngnathidae, Solenostomidae)
- Birds (Class Aves)

Species of special interest

[Cetaceans](#) require special consideration under Division 3 of the EPBC Act. Within the GBRMP, this is provided for under the GBRMPA’s [Policy Document for Whale and Dolphin Conservation in the Great Barrier Reef Marine Park](#) (Great Barrier Reef Marine Park Authority 2000) (Appendix 3).

The EPBC Act establishes an [Australian Whale Sanctuary](#) ‘*in order to give formal recognition of the high level of protection and management afforded to cetaceans in Commonwealth marine areas and prescribed waters*’. It also establishes a number of offences relating to, for example, killing, injuring, or taking cetaceans, and provides for issuing permits to conduct whalewatching.

The Australian Whale Sanctuary includes most of the Great Barrier Reef World Heritage Area except State coastal waters (3 nautical miles from the Queensland coast or a State owned island).

Other marine species of conservation concern

Although not included in the previous two categories, the marine species in Appendix 4 are considered to also be of conservation concern within the GBRMP.

Island flora and fauna

The non-marine species discussed in Appendix 5 occur on continental islands and coral cays in the GBRWHA. Their management is primarily the role of the [Queensland Parks and Wildlife Service](#) (QPWS) as part of [day-to-day management](#) of the Great Barrier Reef Marine Park, State Marine Parks and Island National Parks.

Outline of information in Appendices 2-5

For each of the species or species groups in Appendices 2, 3, 4, 5 information is presented about the:

- **extent of knowledge** including information on the biology, ecology, life history and population trends in the GBRWHA. This information is not an exhaustive account of all available knowledge about the species or species group. Rather it highlights species diversity and knowledge about population trends in the GBRWHA. Additional information is contained within [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997), and [State of the Great Barrier Reef Report](#) (Great Barrier Reef Marine Park Authority 2003).
- **conservation status** of individual species. This is the species' status as listed under Queensland and Commonwealth legislation and international agreements and noted in Tables 1, 2, 3, 4, 5, 6 and Appendix 2.
- **human related threats to populations** include both potential and actual threats and those listed as [Key Threatening Processes](#) under the EPBC Act; and
- **actions** currently underway or proposed by the [Species Conservation Program](#) of the GBRMPA and by associated agencies and stakeholders to address conservation concerns for the species/species groups.

DISCUSSION

Species are lost at alarming rates around the world. Countless marine species are being wiped out by a range of human associated activities including overfishing, pollution, the loss of habitat and the invasion of exotic species (Jackson *et al.* 2001). Although the goal of most conservation programs is to keep species and populations well away from the “danger zone” of extinction (Powles *et al.* 2000), lack of funding, interest or knowledge can often mean that relatively few marine and island species are adequately protected.

Chapter 15 of [*The State of the Marine Environment Report for Australia*](#) or SOMER (1996) summarises the difficulties in determining the conservation status of marine species as:

- Marine populations have characteristics that make the detection of depletions difficult.
- Fluctuations in recruitment and breeding population size can obscure long-term trends.
- Patchy distributions can make reliable estimates of density or population size difficult to obtain. Often only quantum changes in numbers can be detected.
- Adequate methodologies for detecting and determining trends in abundances of rare species are generally lacking. High biodiversity generally comes with a proportion of rarity in species.

It concludes that ‘*much of the current theory developed in terrestrial conservation biology cannot be uncritically applied to marine species and habitats*’, and that ‘*at this early stage of marine conservation, any attempt to grade species according to the degree of threat is likely to prove futile*’.

As a result, an alternative system was suggested to recognise the characteristics of species that are at least ‘potentially threatened’ by extinction, and to develop management measures for them as a precaution. The following nine characteristics were proposed (not prioritised):

- species with restricted geographic ranges
- species with unusually restricted breeding sites
- species that are very large, long-lived and/or of low fecundity
- species subject to large-scale mass mortality
- species subject to prolonged periods of recruitment failure
- species highly susceptible to environmental stress
- species that are extreme habitat specialists
- obligate supratidal, intertidal, estuarine and coastal embayment species
- species subject to excessive exploitation

An additional characteristic not mentioned in the SOMER but which is a key characteristic of many of the high profile species on the Great Barrier Reef is the species’ behaviour of crossing many jurisdictional boundaries (regional, national and international) during its life history.

SOMER concluded that a diversity of approaches is required to maximise the chances of long-term protection of marine species. These include focusing on:

- species deserving special conservation status – ecological indicator, keystone, umbrella, flagship, vulnerable – noting that vulnerable species are the most difficult to identify in marine ecosystems, while flagship species are the most identifiable;
- networks of marine protected areas (MPAs); and
- other conservation tools such as regulations against collecting, quotas, size bans and habitat preservation.

In 1998, a [global marine policy](#) was adopted jointly by the [World Wide Fund for Nature \(WWF\)](#) and the [World Conservation Union \(IUCN\)](#). Under an objective of conserving and recovering threatened marine species, the Policy sees a twofold challenge to conserve and manage both species that are clearly connected to specific areas and those that are highly migratory. Its priority activities include:

- supporting the continuing development and application of the [IUCN Red List](#), as well as regional and national lists of threatened species;
- supporting the preparation and implementation of Species Action and [Recovery Plans](#);
- reducing the exploitation of threatened species by monitoring and regulating international trade using global mechanisms such as [CITES](#) and the [International Whaling Commission](#); and
- demonstrating sustainable use through activities including whale-watching and traditional forms of subsistence use.

In 1998-99 a number of international workshops were held under the auspices of the [Species Survival Commission](#) of the IUCN to review the IUCN system for inscribing taxa under its Red List categories. One of these workshops looked specifically at application of the criteria in the marine environment. In its final report to the IUCN Council, the Commission retained marine species within the existing system for classifying species at risk of global extinction.

An article in the IUCN Bulletin by Brautigam (2001) notes in relation to the 2000 IUCN Red List that:

- Important additions to the 2000 Red List are the increased number of sharks, skates and rays, listed as threatened. These assessments are the result of several years of data collection, analysis and wide consultation.
- Although cetaceans are amongst the best known of marine species, most small cetaceans have been classified as Data Deficient. There is a great need for much more and better quality data on these species and the threats they face, in particular direct and indirect exploitation by the world's fisheries.
- The leatherback turtle, *Dermochelys coriacea*, was reclassified as Critically Endangered in the Red List. Populations have declined dramatically in recent decades, primarily because of incidental capture in commercial longline fisheries.
- Although most marine organisms are invertebrates, only a few tens of these species have been assessed and included in the Red List (for example, the giant clams *Tridacna* sp.). These perhaps less appealing species are often victims of a lack of interest and funding.
- In addition to the improved coverage of marine species, the Red List provides evidence that fisheries bycatch is a major threat to a number of marine species, several of them Critically Endangered. This finding should provide added impetus to efforts aimed at reducing fisheries bycatch, in particular through the establishment of 'no-take' zones and the development of more selective fishing methods and gear to reduce this impact.

Powles *et al.* (2000) compared fishery management approaches with endangered species management and concluded that the latter can be a powerful tool for protection of endangered or vulnerable marine organisms, if applied widely in fishery management.

In recent years there has been a growing realisation that marine park managers should be identifying and protecting representative examples of the diversity of habitats and processes upon which all species depend, rather than focusing on individual species or specific habitats. Research has highlighted the interconnectedness of species that share the same habitat as well as the reliance of many species on a wide range of habitats throughout

different stages of their life cycle and has found that spillover effects from the legal protection of one species may inadvertently benefit others within that habitat (Ando 2001).

[Blue Highway Poster](#): click to enlarge.

The Great Barrier Reef Marine Park Authority (GBRMPA) has formalised a Representative Areas Program, which has enhanced the protection of the entire range of biodiversity of the Great Barrier Reef World Heritage Area (GBRWhA). This Program is part of Australia's [National Representative System of Marine Protected Areas Program](#).

The Representative Areas Program helps:

- maintain biological diversity;
- allow species to evolve and function undisturbed;
- provide an ecological safety margin against human-induced disasters;
- provide a solid ecological base from which threatened species or habitats can recover or repair themselves; and
- maintain ecological processes and systems.

Adequate protection of representative areas of ecosystems is widely accepted, in Australia and around the world, as the best way to achieve the objectives listed above. A representative area is an area that is typical of the surrounding habitats or ecosystem at a chosen scale. The physical features, oceanographic processes and ecological patterns within a representative area reflect those of the surrounding habitat. This approach was recently implemented by the GBRMPA in the form of a bioregion-based system of marine protected areas. More information about the [Representative Areas Program](#) can be found at the GBRMPA website.

As mentioned earlier, the need for complementary approaches among the various agencies that have legislative responsibility for different aspects of the Great Barrier Reef ecosystem is important for ecosystem-based management to succeed. For example, the Queensland Government implemented a largely complementary system of marine protected areas for the Great Barrier Reef Coast Marine Park to match those established during the Representative Areas Program. This was part of their 2004 Election Platform committing 'to the protection of Australia's biological diversity through the establishment of a national system of comprehensive, adequate and representative national parks and reserves (including a representative range of terrestrial and marine ecosystems'. They have mapped intertidal habitats and evaluated the protection status for each of these habitats to inform their decisions about protecting representative examples in their new Zoning Plan (Banks and Skilleter 2002).

In terms of species conservation, various approaches have been proposed for establishing priorities. The Australian Government's [Biodiversity Advisory Council](#) has suggested that an 'ecological triage' should be applied to threatened species, whereby they are placed in three groups:

- Species likely to become extinct even with huge expenditure;
- Threatened species that can be recovered quickly for a reasonable cost; and
- Species that are threatened but not immediately faced with extinction (Ando 2001).

The Council concluded that most funding should be allocated to the second group and that cost-benefit analyses should be applied to threatened species in order to set priorities for conservation.

In applying a cost-benefit analysis to priority setting for species conservation issues, it is often difficult to disaggregate and quantify the actual benefits and costs. The benefits of conserving species include both objective and subjective factors, whereas costs are often portrayed solely in dollars. For example, it can not be disputed that threatened species play a role in maintaining wider ecosystem functioning by virtue of their, *inter alia*, foraging habits and being prey for other animals. However, threatened species also have an intrinsic value, enhancing experiences for recreational users and tourists who dive or snorkel on the Great Barrier Reef, maintaining the culture of the Aboriginal and Torres Strait Island Traditional Owners living adjacent to the coast and just being part of the natural ecosystem.

The costs associated with research and monitoring of threatened populations or the management measures introduced to address factors associated with the declines of populations are often considered unacceptably large or take too long to show results. Yet the costs of losing threatened species and their functional roles within an ecosystem are rarely quantified and given the same detailed consideration.

In the end, a range of factors must be used to prioritise species conservation issues.

ELEMENTS FOR PRIORITISING WORK PROGRAM

Elements that are considered in developing the Species Conservation Program of the Great Barrier Reef Marine Park Authority (GBRMPA) are:

Conservation status

Does GBRMPA have an obligation to conserve the species or taxon because it is listed as threatened under Commonwealth or Queensland legislation, by the World Conservation Union, or under other international agreements (e.g Bonn Convention, JAMBA, CAMBA, CITES, IUCN)?

Knowledge

How much is known about the biology, life history, ecology, population trends and movements of and human related threats to the populations found in the GBRMP?

Environmental indicator status

Is the species or taxon useful as an indicator of health of the Great Barrier Reef?

Likelihood of management success

How readily/easily can specific targeted actions be developed and implemented to improve the conservation status of the species/taxon populations on the Great Barrier Reef?

Community perception

Is the species or taxon held in high regard by members and/or of concern to the public?
Is the species or taxon of special interest in the political arena?

Resources

The number of staff and activities for species conservation and management by the GBRMPA. Species conservation and management is integral to all program areas of the GBRMPA and not limited to the staff of the Species Conservation Program; however they provide a coordinating role in policy development. For example, the [Representative Areas Program](#) will have reef-wide benefits to species conservation through a range of initiatives including zoning, special management areas and standard provisions for activities (e.g. traditional use of marine resources).

THE SPECIES CONSERVATION PROGRAM OF THE GBRMPA

The Species Conservation Program is presently focused on initiatives to enhance conservation of dugongs, turtles and cetaceans. The Program has a lesser involvement with seabirds and a 'watching brief' and involvement as necessary with issues concerning other species. There is, however, flexibility in the Program to address emerging issues on an as-needs basis.

[Dugongs](#) are likely to remain a high work priority in the foreseeable future as an accepted conservation imperative and in view of the high level of scientific, public and political concern. The GBRMPA has provided considerable funding since the 1980s to research Great Barrier Reef dugong populations. However, whilst there is an improved understanding of the species and its habitat requirements within the Great Barrier Reef World Heritage Area (GBRWhA), there is also a need to regularly review research and monitoring priorities to address management issues.

[Turtles](#) are likely to remain a high work priority in the foreseeable future as an accepted conservation imperative and in view of the high level of scientific, public and political concern. Because of extraordinary research since the 1970s, the Queensland Parks and Wildlife Service has acquired a large database on the turtles of Queensland, which is being used as a basis for management decisions. There is scientific evidence that the Queensland populations of at least three turtle species are in trouble and all six species are threatened.

[Whale and dolphin](#) policy issues have been addressed in the [Whale and Dolphin Conservation Policy](#) (Great Barrier Reef Marine Park Authority 2000). However, certain management issues are still to be addressed such as the response to risks facing inshore dolphins of the Great Barrier Reef.

[Seabirds](#) are likely to remain a lower work priority.

The involvement of the Species Conservation Program with other species will be considered as reports and new information become available, and as requirements dictate and resources permit. The conservation status of most other groups of species and/or taxons is not known with any certainty on the Great Barrier Reef or elsewhere. As information becomes available and measures for high profile species and/or taxons can be developed, management actions specific to those species will be considered.

The vast majority of Great Barrier Reef species/taxa will continue to depend, as in the past, upon the conservation of ecological communities through management tools such as zoning and management plans, and permits. The GBRMPA's [Representative Areas Program](#) has been implemented and will assist immeasurably the efficacy of such conservation through a new network of zoning within the Great Barrier Reef Marine Park.

A variety of other activities is occurring within the GBR Marine Park that are part of the conservation of ecological communities. These include the:

[East Coast Trawl Fishery Management Audit](#)

[Permit Allocation, Latency and Tenure for Tourism on the Great Barrier Reef](#)

[Water Quality Action Plan](#)

[Reef Water Quality Protection Plan](#)

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REFERENCES

1. Ando, A.W. 2001, Economies of Scope in Endangered-Species Protection: Evidence from Interest-Group Behaviour, *Journal of Environmental Economics and Management*, 41, 312-332.
2. Arnold, P.W. & Birtles, R.A. 1999, Towards sustainable management of the developing dwarf minke whale tourism industry in Northern Queensland, Technical Report No. 27, CRC Reef Research Centre, Townsville.
3. Australian State of the Environment Committee 2001. *Coasts and Oceans*, [Australia State of the Environment Report 2001](#) (Theme Report), CSIRO Publishing on behalf of the Department of the Environment and Heritage, Canberra.
4. Bakus, G. J. 1973, 'The biology and ecology of tropical Holothurians', in *Biology & geology of coral reefs Volume 2 Biology 1*, eds O. A. Jones & R. Endean, Academic Press, New York.
5. Banks, S.A. & Skilleter, G.A. 2002, Mapping intertidal habitats and an evaluation of their conservation status in Queensland, Australia, *Ocean & Coastal Management*, 45, 485-509.
6. Bannister, J.L., Kemper, C.M. & Warneke, R.M. 1996, [The Action Plan for Australian Cetaceans](#), Australian Nature Conservation Agency, Canberra.
7. Barnes, R. D. 1987, *Invertebrate Zoology 5th edition*, Saunders College Publishing, Philadelphia.
8. Birtles, R.A., & Arnold, P.W. 1988, 'Distribution of trophic groups of epifaunal echinoderms and molluscs in the soft sediment areas of the central Great Barrier Reef', *Proceedings of the Sixth International Coral Reef Symposium*, 3, 325-332.
9. Birtles, A., Valentine, P., Curnock, M., Arnold, P. & Dunstan, A. 2002, Incorporating visitor experiences into ecologically sustainable dwarf minke whale tourism in the northern Great Barrier Reef, Technical Report No. 42, CRC Reef Research Centre, Townsville.
10. Brautigam, A. 2001, 'Marine Species: victims of complacency', World Conservation IUCN Bulletin No. 3, 2001.
11. Butler, A. & Jarnakoff, P. 1999, *Seagrass in Australia: Strategic Review & Development of an R&D Plan*, CSIRO Publishing, Collingwood, Victoria.
12. Cannon, L. R. G. 1993, 'Worms'. pp. 80-83, in *A Coral Reef Handbook: A Guide to the Geology, Flora & Fauna of the Great Barrier Reef*, eds P. Mather & I. Bennett, Surrey Beatty & Sons Pty. Ltd., Chipping North.
13. Cheshire, A.C., Collings, G.J., Edyvane, K.S. & Westphalen G. 2000, Overview of the Conservation Status of Australian Marine Macroalgae: A report to Environment Australia. <http://www.reefwatch.asn.au/cosema/cosema.html>.

14. Coles, R. G., Lee Long, W. J., McKenzie, L. J. & Roder, C. A. 2002, [*Seagrass and marine resources in the Dugong Protection Areas of Upstart Bay, Newry Region, Sand Bay, Llewellyn Bay, Ince Bay and the Clairview Region April/May 1999 and October 1999*](#), Research Publication No. 72, Great Barrier Reef Marine Park Authority, Townsville.
15. Colin, P.L. & Arneson, A.C. 1995, *Tropical Pacific Invertebrates: A Field Guide to the Marine Invertebrates Occurring on Tropical Pacific Coral Reefs, Seagrass Beds and Mangroves*, Coral Reef Press, Beverly Hills, California.
16. Corkeron, P.J., Morrisette, N.M., Porter, P., & Marsh, H. 1997, 'Distribution & status of hump-backed dolphins, *Sousa chinensis*, in Australian waters', *Asian Marine Biology*, 14, 49-59.
17. Dawson C.E. 1985, *Indo-Pacific Pipefishes (Red Sea to the Americas)*, The Gulf Coast Research Laboratory, Ocean City, Mississippi, USA.
18. Environment Australia, 2003, [*Recovery Plan for Marine Turtles in Australia*](#), Environment Australia, Canberra.
19. Eros, C., Marsh, H., Bonde, R., O'Shea, T., Beck, C., Recchia, C. & Dobbs, K. 2000, [*Procedures for the salvage and necropsy of the dugong \(Dugong dugon\)*](#), Research Publication No. 64, Great Barrier Reef Marine Park Authority, Townsville.
20. Fry, G.C., Milton, D.A. & Wassenberg, T.J. 2001, The reproductive biology and diet of sea snake bycatch of prawn trawling in northern Australia: Characteristics important for assessing the impacts on populations. *Pacific Conservation Biology*, 7, 55-73.
21. Garnett, S.T. & Crowley, G.M. 2000, *The Action Plan for Australian Birds*, Environment Australia, Canberra.
22. Gosliner, T.M., Behrens, D.W. & Williams, G.C. 1996, *Coral Reef Animals of the Indo-Pacific. Animal life from Africa to Hawaii exclusive of the vertebrates*, Sea Challengers, Monterey, California.
23. Great Barrier Reef Marine Park Authority, 1994, [*The Great Barrier Reef – Keeping it great, A 25-Year Strategic Plan for the Great Barrier Reef World Heritage Area*](#), Great Barrier Reef Marine Park Authority, Townsville.
24. Great Barrier Reef Marine Park Authority, 1997, [*Guidelines for managing visitation to seabird breeding islands*](#), Great Barrier Reef Marine Park Authority, Townsville.
25. Great Barrier Reef Marine Park Authority, 2000, [*Whale & Dolphin Conservation Policy for the Great Barrier Reef Marine Park*](#), Great Barrier Reef Marine Park Authority, Townsville.
26. Great Barrier Reef Marine Park Authority, 2003, [*State of the Great Barrier Reef Report*](#), Great Barrier Reef Marine Park Authority, Townsville.
27. Hale, P. 1997, 'Conservation of inshore dolphins in Australia', *Asian Marine Biology*, 14, 83-91.

28. Harris, A. 1994, 'Species review: the olive ridley' pp. 63-67, in *Proceedings of the Australian Marine Turtle Conservation Workshop, Sea World Nara Resort, Gold Coast, 14 - 17 November 1990*, compiler R. James, Queensland Department of Environment & Australian Nature Conservation Agency.
29. Heatwole, H. 1987, *Sea Snakes*, The New South Wales University Press, Kensington.
30. Heatwole, H. & Burns, G. 1987, *Final report for ANPWS Consultancy on sea snake populations 1984-1987*, Unpublished report to the National Parks & Wildlife Service.
31. Heatwole, H., O'Neill, P., Jones, M. & Preker, M. 1996, 'Long term population trends of seabirds on the Swain Reefs, Great Barrier Reef', [Technical Report No. 12](#), Townsville, CRC Reef Research Centre Ltd, 50 pp.
32. Heppell, S., Limpus, C. J., Crouse, D., Frazer, N. & Crowder, L. 1996, 'Population model analysis for loggerhead sea turtle, *Caretta caretta*, in Queensland', *Wildlife Research*, 23, 143-159.
33. Houston, W., Porter, G. & O'Neil, P. 2003, Conservation Assessment of the Yellow Chat (Dawson), *Epthianura crocea macgregori*, on the Marine Plain at Curtis Island, Central Queensland. Unpublished Final Report to Birds Queensland.
34. Ikuta, L.A. & Blumstein, D.T. 2003, Do fences protect birds from human disturbance?, *Biological Conservation*, 112(3), 447-452.
35. IUCN Species Survival Commission, 2002, [IUCN Red List Categories](#), Unpublished report to the IUCN Council.
36. Jackson, J. B. C., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., Bradbury, R. H., Cooke, R., Erlandson, J., Estes, J. A., Hughes, T. P., Kidwell, S., Lange, C. B., Lenihan, H. S., Pandolf J. M., Peterson, C. H., Steneck, R. S. Tegner, M. J. and Warner, R. R., 2001, '[Historical overfishing and the recent collapse of coastal ecosystems](#)', *Science*, 630-638.
37. Kikkawa, J. 2003, The Capricorn White-eye *Zosterops chlorocephalus*, *Sunbird*, 33(2), 64-76.
38. King, B.R. 1993, The status of Queensland seabirds, *Corella*, 17(3), 65-92.
39. Kott, P. 1982, Replication in the Ascidiacea: an adaptive strategy in the coral reef environment, pp. 725-733, in *Proceedings of the Fourth International Symposium on Coral Reefs*, University of the Philippines, Manila.
40. Kuitert, R. H. 2000, *Seahorses, pipefishes and their relatives. A comprehensive guide to the Syngnathiformes*, TMC Publishing, Chorleywood, Herts.
41. Kuitert, R. H. 2001, 'Revision of the Australian seahorses of the genus *Hippocampus* (Syngnathiformes: Syngnathidae) with descriptions of nine new species', *Records of the Australian Museum* 53(3), 293-340.
42. Last, P.R. & Stevens, J.D. 1994, *Sharks & Rays of Australia*, CSIRO, Australia.

43. Lawler, I. & Andrew, J. 2001 [*Analysis of stomach contents of dugongs stranded in the central region of the Great Barrier Reef Marine Park: May - August 2000*](#), Final report to the Great Barrier Reef Marine Park Authority, Townsville.
44. Leis, J.M., & Rennis, D.S. 1983, *The Larvae of Indo-Pacific Coral Reef Fishes*, NSW University Press & University of Hawaii Press.
45. Lightowler, M. 1998, *Proposed Management Arrangements for Syngnathids taken in Queensland waters*, QFS., Brisbane.
46. Limpus, C. J. 1975, 'Coastal sea snakes of subtropical Queensland waters (23° to 28° south latitude)', pp. 173-182, in *The Biology of Sea Snakes*, ed W. A. Dunson, University Park Press, London.
47. Limpus, C. J. 1999, *Green turtle, Chelonia mydas, in Queensland: population status & sustainable harvest, September 1999 review*, Unpublished report to the Queensland Parks and Wildlife Service, Brisbane.
48. Limpus, C. J. & Limpus, D. J. 1999, *Summary report on the status of the eastern Australian loggerhead turtles, Caretta caretta 1999*, Unpublished report to the Queensland Parks and Wildlife Service, Brisbane.
49. Limpus, C. J. & McLachlan, N. 1994, 'The conservation status of the leatherback turtle, *Dermochelys coriacea*, in Australia', pp. 68-72, in *Proceedings of the Australian Marine Turtle Conservation Workshop, Sea World Nara Resort, Gold Coast, 14 - 17 November 1990*, compiler R. James, Queensland Department of Environment & Australian Nature Conservation Agency.
50. Limpus, C. J. & Miller, J. D. 2000, *Final Report for Australian Hawksbill Turtle Population Dynamics Project*. Unpublished report to the Japanese Bekko Association and the Queensland Parks and Wildlife Service, Queensland Parks and Wildlife Service, Brisbane.
51. Limpus, C. J. & Reimer, D. 1994, 'The loggerhead turtle, *Caretta caretta*, in Queensland: a population in decline', pp. 34-48, in *Proceedings of the Australian Marine Turtle Conservation Workshop, Sea World Nara Resort, Gold Coast, 14 - 17 November 1990*, compiler R. James, Queensland Department of Environment & Australian Nature Conservation Agency.
52. Limpus, C. J., Miller, J. D., Parmenter, C. J., Reimer, D., McLachlan, N. & Webb, R. 1992, 'Migration of green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles to and from eastern Australian rookeries', *Wildlife Research*, 19, 347-358.
53. Lourie, S.A. Vincent, A.C.J. & Hall, H.J. 1999, *Seahorses An identification guide to the world's species and their conservation*. Project Seahorse, London, UK.
54. Lucas, P. H. C., Webb, T., Valentine, P. S. & Marsh, H. 1997, [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#), Great Barrier Reef Marine Park Authority, Townsville.

55. Marsh, H. 1995, 'The life history, pattern of breeding & population dynamics of the dugong', pp. 75-83, in *Population Biology of the Florida Manatee Information & Technology Report 1*, eds T. J. O'Shea, B. B. Ackerman & H. F. Percival, U. S. Department of the Interior, National Biological Service, Washington, DC.
56. Marsh, H., Corkeron, P. J., Lawler, I. Preen, A. & Lanyon, J. 1996, *The status of the dugong in the southern Great Barrier Reef Marine Park*, Research Publication No. 41, Great Barrier Reef Marine Park Authority, Townsville.
57. Marsh, H., Corkeron, P. J., Limpus, C. J., Shaughnessy, P. D., & Ward, T. M. 1993, 'Conserving marine mammals & reptiles in Australia & Oceania', pp. 225-244, in *Conservation Biology in Australia & Oceania*, eds C. Moritz & J. Kikkawa, Surrey Beatty & Sons, Chipping North.
58. Marsh, H., De'ath, G., Gribble, N. & Lane, B. 2001, [*Shark control records hindcast serious decline in dugong numbers off the urban coast of Queensland*](#), Research Publication No. 70, Great Barrier Reef Marine Park Authority, Townsville.
59. Marsh, H, C. Eros, H. Penrose & J. Hugues. 2001, [*The Dugong \(Dugong dugon\): Status reports and action plans for countries and territories in its range*](#), IUCN (the World Conservation Union), Switzerland.
60. Marsh, H. & Lawler, I. 2001, [*Dugong distribution and abundance in the southern Great Barrier Reef Marine Park and Hervey Bay: results of an aerial in October – December 1999*](#), Research Publication No. 70, Great Barrier Reef Marine Park Authority, Townsville.
61. Marsh, H. and Lawler, I. 2002. [*Dugong distribution and abundance in the northern Great Barrier Reef Marine Park November 2000*](#), Research Publication No. 77, Great Barrier Reef Marine Park Authority, Townsville.
62. Marsh, H. & Penrose, H. 2001, [*Seasonal distribution of the dugong in the southern Great Barrier Reef Marine Park*](#), Final report to the Great Barrier Reef Marine Park Authority, Townsville.
63. Massin, C. 1982, 'Food and feeding mechanism: Holothuroidea', pp. 43-55, in *Echinoderm Nutrition*, eds M. Jangoux, J. M. Lawrence. Balkema, Rotterdam.
64. Mather, P. & Bennett, I. 1993, *A Coral Reef Handbook: A guide to the Geology, Flora & Fauna of the Great Barrier Reef*, Surrey Beatty & Sons Pty Limited, Chipping North.
65. Miller, J. D., 1994, 'The hawksbill turtle, *Eretmochelys imbricata*: a perspective on the species', pp. 25-38, in *Proceedings of the Australian Marine Turtle Conservation Workshop, Sea World Nara Resort, Gold Coast, 14 - 17 November 1990*, compiler R. James, Queensland Department of Environment & Australian Nature Conservation Agency.
66. Miller, J. D. & Bell, I. P. 1997, 'Crocodiles in the Great Barrier Reef World Heritage Area', pp.248-255, in *State of the Great Barrier Reef World Heritage Area. Proceedings of a technical workshop held in Townsville, Queensland, Australia, 27-29 November 1995*, eds D. Wachenfeld, J. Oliver, & K. Davis, Workshop Series No. 23, Great Barrier Reef Marine Park Authority, Townsville.

67. Miller, J. D., Dobbs, K. A., Mattocks, N., Limpus, C. J. & Landry, A. M., Jr., 1998, 'Long-distance migrations by the hawksbill turtle, *Eretmochelys imbricata*, from north-eastern Australia', *Wildlife Research*, 25, 89-95.
68. Moller, L.M. and Beheregaray, L.B. 2001, 'Coastal bottlenose dolphins from southeastern Australia are *Tursiops aduncus* according to sequences of the mitochondrial DNA control region', *Marine Mammal Science*, 17(2) 249-263.
69. O'Neil, P., Minton, C., Ozaki, K. & White, R. 2003, 'Three populations of non-breeding Roseate Terns *Sterna dougallii* in the Swain Reefs, Southern Great Barrier Reef', In Press, *EMU*.
70. Parmenter, C. J. 1994, 'Species review: the flatback turtle – *Natator depressus*', pp. 60-62, in *Proceedings of the Australian Marine Turtle Conservation Workshop, Sea World Nara Resort, Gold Coast, 14 - 17 November 1990*, compiler R. James, Queensland Department of Environment & Australian Nature Conservation Agency.
71. Perrin, W.F., Reeves, R.R., Dolar, M.L.L., Jefferson, T.A., Marsh, H., Wang, J.Y., & Estacion, J. Report of the 2nd Workshop on the Biology & Conservation of Small Cetaceans & Dugongs of SE Asia. 24-26 July 2002 Siliman University, Dumaguete City, Philippines
72. Pogonoski, J. J., Pollard, D. A., & Paxton, J. R. 2002, [*Conservation Overview & Action Plan for Australian Threatened & Potentially Threatened Marine & Estuarine Fishes*](#), Environment Australia, Canberra.
73. Poiner, I., Glaister, J., Pitcher, R., Burrridge, C., Wassenberg, T., Gribble, N., Hill, B., Blaber, S., Milton, D., Brewer, D., & Ellis, N. 1998, *Final report on effects of trawling in the Far Northern Section of the Great Barrier Reef: 1991-1996*, CSIRO Division of Marine Research, Cleveland.
74. Powles, H., Bradford, M.J., Bradford, R.G., Doubleday, W.G., Innes, S., & Levings, C.D. 2000, 'Assessing and protecting endangered marine species', *ICES Journal of Marine Science*, 57, 669-676.
75. Preen, T. 2000, [*Dugongs, boats, dolphins and turtles in the Townsville – Cardwell region and recommendations for a boat traffic management plan for the Hinchinbrook Dugong Protection Area*](#), Research Publication No. 67, Great Barrier Reef Marine Park Authority, Townsville.
76. Queensland Parks and Wildlife Service, 2000, [*Marine protected areas in Queensland – a draft planning framework*](#), QPWS, Brisbane.
77. Ross, G.J.B., Weaver, K. & Greig, J.C. (eds). 1996, The Status of Australia's Seabirds: Proceedings of the National Seabird Workshop, Canberra, 1-2 November 1993, Environment Australia, Canberra. [Also in Technical Annex 1 of the 1996 [*State of the Marine Environment Report*](#)].
78. Shelley, C.C. 1981, Aspects of distribution, reproduction, growth & 'fishery' potential of holothurians (Bêche-de-mer) in the Papuan Coastal Lagoon, MSc Thesis, University of Papua New Guinea.

79. Smiley, S., McEuen, C., Chaffee, C., & Khrishnan, S. 1991, *Echinodermata: Holothuridae. Reproduction of Marine Invertebrates, Vol. VI*, The Boxwood Press, Pacific Grove, California.
80. Spawning Aggregations Working Group, 2002, *Transforming Coral Reef Conservation: Reef Fish Spawning Aggregations Component*, Working Group Report.
81. Stokes, T., Hulsman, K., Ogilurie, P. & O'Neill, P. 1996, '[Management of human visitation to seabird islands of the Great Barrier Reef Marine Park Region](#)', *Corella*, 20(1), 1-13.
82. Stokes, T., Dobbs, K. & Recchia, C. 2002, 'Management of Marine Mammal Tours on the Great Barrier Reef', *Australian Mammalogy*, 24, 39-49.
83. Vincent, A. 1996, *The International Trade in Seahorses*, TRAFFIC International, Cambridge.
84. Vincent, A. & Sadler, L. M. 1995, 'Faithful pair bonds in wild seahorses, *Hippocampus whitei*', *Animal Behaviour*, 50(6), 1557-1569.
85. Wachenfeld, D. 1998, [State of the Great Barrier Reef World Heritage Area 1998](#), Great Barrier Reef Marine Park Authority, Townsville.
86. Walker, T. A. 1994, 'Seabird distribution on the Great Barrier Reef'. pp. 24-36, in, *Workshop on Oiled Seabird Cleaning & Rehabilitation, GBRMPA Workshop Series No. 15*, eds J. Lash & S. Raaymakers, Great Barrier Reef Marine Park Authority, Townsville.
87. Wassenberg, T. J., Salini, J. P., Heatwole, H. & Kerr, J. D. 1994, 'Incidental capture of sea-snakes (Hydrophiidae) by prawn trawlers in the Gulf of Carpentaria', *Australian Journal of Marine and Freshwater Research*, 45, 429-443.
88. Wilkinson, C. R. & Cheshire, A. C. 1989, 'Patterns in the distribution of sponge populations across the central Great Barrier Reef', *Coral Reefs*, 8, 127-134.
89. Wood, E. J. F. 1940, 'The canning of fish & fish products in Australia' *Council of Scientific & Industrial Research Division of Fisheries Circular*, 2, 1-55.

APPENDIX 1 – IUCN LISTING OF MAJOR CATEGORIES OF THREAT

Adapted from the [IUCN Red List Categories](#) (IUCN Species Survival Commission 2002).

The nature of threats varies considerably, but where possible assessors of threatened species are asked to use the following major categories of threat (more than one can be indicated), with additional notes if necessary:

Human-Induced Habitat Loss

- Habitat removal (replaced by arable agriculture)
- Habitat removal (replaced by forestry plantations)
- Habitat removal (replaced by human settlements, industry, roads, coastal development)
- Habitat removal (replaced by livestock farming)
- Habitat removal (replaced by waste-ground)
- Mining activities

Decline in Habitat Quality

- Erosion
- Grazing
- Groundwater extraction
- Loss of prey base
- Selective removal of non-woody vegetation
- Selective removal of wood (commercial logging)
- Selective removal of wood (firewood collection)
- Selective removal of wood (other, including charcoal collection)
- Shifting agriculture fire

Direct Use of Taxon in Question

- Bycatch
- Illegal commercial use
- Legal commercial use
- Subsistence/traditional use

Invasives

- Habitat changes cause of invasives
- Invasive competitors Invasive hybridisers
- Invasive pathogens Invasive predators

Intrinsic Factors

- High juvenile mortality
- Poor dispersal/pollination
- Poor regeneration/recruitment/reproduction

Other

Climate change	Increased predation	Disease	Volcanoes
Intentional poisoning	Disturbance	Pollution	Explosives
Drought	Storms	Floods	

Not known

APPENDIX 2 - LISTED MARINE SPECIES

These species are categorised as '[listed marine species](#)' in the Commonwealth [*Environment Protection and Biodiversity Conservation Act 1999*](#).

- Sea snakes
- Seals
- Crocodiles
- Dugongs
- Marine turtles
- Seahorses, Sea-dragons, Pipefish
- Birds

SEA-SNAKES

(Families: Hydrophiidae, Laticaudidae)

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer p.187 of [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#) (Lucas *et al.* 1997)
 - 17 species in the Great Barrier Reef World Heritage Area (GBRWHA), although none are endemic to the Great Barrier Reef
 - Associated with benthic communities (except *Pelamis*, a pelagic species)
 - Distinct reefal and soft-bottom assemblages apparent
 - Patterns of abundance and distribution poorly known
- Refer p.62, [*State of the Great Barrier Reef World Heritage Area 1998*](#) (Wachenfeld 1998)
- Decreasing abundance with increasing latitude (Limpus 1975a)
- Take 3-4 years to reach sexual maturity (Heatwole and Burns 1987)
- Long lived (~10 years) (Heatwole 1987)
- Low fecundity (8-25 offspring) (Heatwole 1987, [Lucas *et al.* 1997](#))
- Abundant in shallow (<30m) or deep (30-50m), warm and turbid waters and inshore coral reefs (Heatwole 1987, [Lucas *et al.* 1997](#))
- Estimates of mortality from trawling range between 30 000 and 67 000 sea snakes in the Gulf of Carpentaria (Wassenberg *et al.* 1994)
- Trawling of breeding aggregations may be a problem (Fry *et al.* 2001). In the Gulf of Carpentaria trawling bycatch shows that female sea snakes are caught more often than males and a high proportion of mature snakes are caught, “*suggesting there is little impact on recruits*” (Fry *et al.* 2001).
- Under the [*Environment Protection and Biodiversity Conservation Act 1999*](#) (EPBC Act), export requires a licence issued by the Department of the Environment and Heritage (formerly Environment Australia), which is subject to an approved management plan. Currently no licences have been issued.
- CRC Reef/James Cook University student, V. Lukoschek, is currently studying the genetics and habits of Great Barrier Reef sea snakes.
<http://www.reef.crc.org.au/media/seasnakes.htm>

Conservation status

- Sea snakes are considered ‘common’ under Queensland’s [*Nature Conservation \(Wildlife\) Regulation 1994*](#), and are a [listed marine species](#) under the Commonwealth EPBC Act.
- None of the species listed in the [Red Data Book](#) of the World Conservation Union (IUCN) are known to occur in the GBRMP.
- ‘*No species of sea snakes are considered to be threatened*’ (Marsh *et al.* 1993 in [Lucas *et al.* 1997](#)).

Human Related Threats

- Fishing, shark control programs and aquaculture
- Hunting and collecting

Actions

- Introduction of bycatch reduction devices (BRDs) in the East Coast Trawl Fishery may assist in reducing sea snake mortality. However, there are concerns that BRDs may be less effective for sea snakes than for fishes because the snakes are morphologically dissimilar and behave differently to strongly swimming fishes that the BRDs are designed to exclude. The matter requires further investigation.
- The Species Conservation Program works with the [Fisheries Issues Group](#) of the GBRMPA to monitor and address concerns. [The East Coast Trawl Fishery Management Audit](#) recommends that there be further monitoring and research on the incidental bycatch of sea snakes in the East Coast Trawl Fishery.

SEALS

(Families: Otariidae, Phocidae)

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Rarely found in the Great Barrier Reef Marine Park (GBRMP)
- A few records from live [strandings or carcasses](#)

Conservation status

- Seals are listed as 'common' under Queensland's [Nature Conservation \(Wildlife\) Regulation 1994](#) and are a [listed marine species](#) under Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#). None of the species listed in the [Red Data Book](#) of the World Conservation Union (IUCN) are known to occur in the GBRMP (Table 3).

Human Related Threats

- None known within the GBRMP.
- Potentially fishing, competition for food with fishermen, shark control programs and aquaculture.

Actions

- Live [strandings and carcasses](#) are recovered whenever possible and examined in as much detail as possible.
- The [Queensland Environmental Protection Agency](#) is summarising all seal records for Queensland.

CROCODILES

(Genus *Crocodylus*)

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Following institution of a 1974 ban on hunting crocodiles in Queensland, crocodile numbers are thought to be increasing on the east coast of Queensland. However, a lack of nesting habitat on the developed coast is a limiting factor on population growth.
- Only estuarine crocodiles (*Crocodylus porosus*) commonly occur in the Great Barrier Reef World Heritage Area (GBRWHA). Freshwater crocodiles (*Crocodylus johnstoni*) are rarely recorded in the GBRWHA (Mark Read, Queensland Parks and Wildlife Service, personal communication 2000).
- Refer p.124 of [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997); which says that reefal island estuarine crocodiles are unlikely to have any significant contribution back to the main populations; however, they form part of the reefal ecosystem. See also Miller and Bell (1997).
- Refer p.59, [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998), which says that crocodiles are considered temporary migrants from coastal river systems. Although they are found over a wide area at low densities in the GBRWHA, no nesting in the GBRWHA has been reported.
- [Queensland Parks and Wildlife Service](#) records crocodile sighting information and conducts regular river surveys from Rockhampton north to the tip of Cape York Peninsula and west to the Northern Territory border.
- Queensland Parks and Wildlife Service is preparing a manuscript for publication on the estuarine crocodile census data it has collected mainly from coastal river surveys.

Conservation status

- Estuarine crocodiles are listed as 'vulnerable' wildlife and freshwater crocodiles are listed as 'common' wildlife under Queensland's [Nature Conservation \(Wildlife\) Regulation 1994](#) (Table 3).
- Neither species are listed as threatened under the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act) or in the [Red Data Book](#) of the World Conservation Union (IUCN) (Table 3).
- However, both species are [listed marine species](#), and the estuarine crocodile is a [listed migratory species](#) under the EPBC Act.

Human Related Threats

Little is known of processes that may threaten crocodiles within the GBRMP. However, they are likely to include:

- Coastal development and land-based practices
- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Tourism and recreation

Actions

- A GBRMPA *Reef Notes* Information sheet is available.
- The Northern Region of QPWS has established a crocodile management unit to respond to issues in the region.
- Significant sighting information is collated by the QPWS (e.g. attack on a person in the Far Northern Section of the GBRMP in 1999) and risk assessment approaches to crocodile management are being developed as required (e.g. [Burdekin Shire](#)).
- QPWS relocates problem crocodiles in accordance with the [Nature Conservation \(Problem Crocodiles\) Conservation Plan 1995](#) and the Procedural Guide 'Classification and Removal of Problem Crocodiles'. The purpose of the legislation is to ensure a level of protection for the public against crocodiles by allowing problem crocodiles to be taken under a permit and their taking monitored while maintaining wild populations of crocodiles across their current ranges. The legislation is administered with the **Management program for the conservation and management of *Crocodylus porosus* in Queensland**. This program is being reviewed in consultation with community interest groups. It currently specifies who can take problem crocodiles and associated restrictions and conditions.
- The Species Conservation Program provides advice upon request and liaises with the QPWS as required.

DUGONG

(Genus *Dugong*)

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer to recent IUCN report on [Dugong Status Report and Action Plans for Countries and Territories](#) (Marsh *et al.* 2002).
- Refer p.160 of [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997 and Marsh 1995);
- Dugong (*Dugong dugon*) is one of only four extant members of the mammalian Order Sirenia (sea cows)
- Only extant member of the family Dugongidae
- Long-lived (70 years or more)
- Low fecundity (1 calf every 3-5 years)
- Late maturing (between 9-17 years)
- Strictly herbivorous, foraging on seagrass almost exclusively
- The importance of episodic large-scale movements by individuals of the dugong population has only recently been recognised and is yet to be fully appraised
- Refer pages 65 and 101, [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998) and the [Dugong Information Kit](#) (4th Edition, 2002), published by the Great Barrier Reef Marine Park Authority (GBRMPA)
- Recent relevant GBRMPA Research Publications include:

Research Publication #58

A Dugong Research Strategy for the Great Barrier Reef World Heritage Area and Hervey Bay

Research Publication #64

Procedures for the Salvage and Necropsy of the Dugong (*Dugong dugon*)

Research Publication #66

A Review of Water Quality Issues Influencing Habitat Quality in Dugong Protection Areas

Research Publication #67

Dugongs, Boats, Dolphins and Turtles in the Townsville-Cardwell Region and Recommendations for a Boat Traffic Management Plan for the Hinchinbrook Dugong Protection Area

Research Publication #70

Shark Control Records Hindcast Serious Decline in Dugong Numbers off the Urban Coast of Queensland & Dugong Distribution and Abundance in the Southern Great Barrier Reef Marine Park and Hervey Bay: Results of an Aerial Survey in October–December 1999

Research Publication #72

Seagrass and Marine Resources in the Dugong Protection Areas of Upstart Bay, Newry Region, Sand Bay, Llewellyn Bay, Ince Bay and the Clairview Region April/May 1999 and October 1999

Research Publication #77 ☐

Dugong distribution and abundance in the northern Great Barrier Reef Marine Park - November 2000.

- GBRMPA reports are also available on:
 - [Seasonal distribution of the dugong in the southern Great Barrier Reef Marine Park](#)
 - [Analysis of stomach contents of dugongs stranded in the central region of the Great Barrier Reef Marine Park: May-August 2000](#)

Conservation Status

- Dugong are listed as 'vulnerable to extinction' under Queensland's [Nature Conservation \(Wildlife\) Regulation 1994](#) and both a [listed marine species](#) and a [listed migratory species](#) under the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#) (Table 3).
- Dugongs are listed as 'vulnerable' in the [IUCN Red Data Book](#).

Human related threats

- Boats, ships and other motorised machines
- Coastal development
- Declining water quality
- Defence exercises
- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Marine dredging and construction

Actions

- Declaration of [Dugong Protection Areas](#) in 1997 by the Great Barrier Reef Ministerial Council, implemented under [Queensland Fisheries legislation](#) and reinforced under the [Great Barrier Reef Marine Park Zoning Plan 2003](#).
- Moratorium on the issuing of permits for traditional hunting of dugongs south of Cooktown. Extension work with Indigenous communities to ensure that dugong hunting adjacent to Cape York, north of Cooktown, is sustainable.
- Summary of recommendations to the Great Barrier Reef Ministerial Council meeting on 30 July 1999 in relation to dugong recovery and conservation.
- A multi-media campaign has increased public awareness of dugong conservation issues, especially the need to go slow in boats and to report live stranded animals and carcasses. Media and products used include TV advertising, stickers distributed with boat registration certificates, Dugong Information Kits, brochures for Dugong Protection Areas, boat ramp signs, posters and fliers for shops etc., and notices printed on locality Tide Tables for free distribution.
- The GBRMPA has funded much of the research about dugongs in the Great Barrier Reef since the 1980's. See published reports detailed above.
- The [Department of Defence](#) is undertaking research on dugong auditory mechanisms and the effects of underwater acoustics on dugongs.
- The [Cairns Area](#), [Hinchinbrook](#) and [Whitsundays Plans of Management](#) provide for the conservation of dugongs by not allowing people to take or interfere with a dugong in those areas. This includes harassing, chasing, herding, tagging, marking or branding dugongs.
- A tri-agency (Queensland Parks and Wildlife Service, Department of Primary Industries, GBRMPA) approach is enabling close examination of dugong [carcasses](#) to establish the

causes of mortality and obtain further information.

- The GBRMPA website enables the general public to [subscribe to an Email Listserver](#) that posts notices about each stranding soon after they are investigated.
- QPWS publish [annual reports](#) summarising live-strandings and carcasses of dugongs.

MARINE TURTLES

(Families: Cheloniidae, Dermochelyidae)



- Knowledge
 - [Green Turtles](#)
 - [Loggerhead Turtles](#)
 - [Hawksbill Turtles](#)
 - [Flatback Turtles](#)
 - [Olive Ridley Turtles](#)
 - [Leatherback Turtles](#)
- [Conservation Status](#)
- Human related threats
- Actions

Knowledge

- Refer p.162 of [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997); which says the Great Barrier Reef World Heritage Area (GBRWA) contains globally important nesting and feeding grounds for loggerhead, green, hawksbill and flatback turtles.
- Refer pages 59, 63 and 102, [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998).
- Six of the world's seven species of sea turtle occur in the Great Barrier Reef Marine Park (GBRMP): loggerhead, green, hawksbill, flatback, leatherback and olive ridley.
- The eastern Australian loggerhead turtle nesting beaches support the only significant breeding stock for the species in the South Pacific Ocean.
- The world's largest population of nesting green turtles occurs at Raine Island, in the far northern part of the Marine Park.
- The Great Barrier Reef Marine Park hosts one of the world's largest hawksbill turtle nesting populations in the northern Great Barrier Reef, primarily at Milman Island.
- Flatback turtles are endemic to Australia and not known to venture off the Australian continental shelf.
- Little is known of the movements and key habitats of olive ridley and leatherback turtles in the Marine Park.
- Further information and publications about marine turtles can be found by clicking [here](#).

Conservation Status

All marine turtles occurring in the Great Barrier Reef Marine Park are listed as threatened under Queensland's [Nature Conservation \(Wildlife\) Regulation 1994](#), Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act)(Table 3) and the [IUCN Red Data Book](#).

Human Related Threats

- [The Recovery Plan for Marine Turtles in Australia](#) (Environment Australia 2003) outlines the major impacts associated with each turtle species in Australia. The information is based on impacts from various activities upon each genetic stock known for the species within Australia. Key human related mortality factors on the Great Barrier Reef include the following:
 - Boat strikes

- Coastal development and loss of habitat
 - Declining water quality
 - Defence exercises
 - Disease
 - Feral animals
 - Fishing activities and shark catching for bathers protection
 - Hunting and collecting
 - Illegal activities
 - Marine dredging and construction
 - Pollution and marine debris
- Key Threatening Processes that have been listed under the EPBC Act and that impact on marine turtles include:
 - [Predation by the European Red Fox](#) with impacts on green, loggerhead and leatherback turtle nests. A threat abatement plan has been developed for this key threatening process.
 - [Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs](#) with impacts on flatback turtle nests. A threat abatement plan is considered desirable, although one has yet to be developed.
 - [Incidental catch \(bycatch\) of sea turtles during coastal otter-trawling operations in Australian waters north of 28 degrees South](#). A threat abatement plan was not warranted at this stage given current actions by industry to implement bycatch mitigation devices (e.g. Turtle excluder devices). TED's are now mandatory in the Great Barrier Reef Marine Park.
 - [Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris](#) with impacts on marine turtles. A threat abatement plan is considered a feasible, effective and efficient way to abate the threatening process.

Actions

- A [Turtle Information Kit](#) (Second edition 2002) has been published by the GBRMPA.
- [Best Environmental Practices](#) for observing nesting turtles have been prepared and publicised.
- [Development of a population model for the southern Great Barrier Reef green turtle stock](#) (Research Publication #81) has provided new insights into the population status of the southern Great Barrier Reef green turtle breeding stock.
- Development of a Draft Policy for turtle management in the Great Barrier Reef Marine Park.
- Continuation of long-term monitoring of turtle numbers in Shoalwater Bay, a major foraging area for green turtles (GBRMPA contract with [Queensland Parks and Wildlife Service](#)).
- Extension work to ensure that traditional hunting of green turtles in the GBRMP is ecologically sustainable.
- The [Whitsundays Plan of Management](#) provides protection for the loggerhead turtle by prohibiting people from taking or interfering with the animals. This includes harassing, chasing, herding, tagging, marking and branding.
- A tri-agency (Queensland Parks and Wildlife Service, Department of Primary Industries and Fisheries, GBRMPA) approach is enabling close examination of marine turtle [stranding and carcasses incidents](#) to establish the causes of mortality and obtain further information.
 - The GBRMPA website enables the general public to [subscribe to an Email Listserver](#)

- that posts notices about each stranding soon after they are investigated.
- QPWS publish [annual reports](#) summarising live-strandings and carcasses of marine turtles.
 - The GBRMPA is represented on the National Turtle Recovery Group coordinated by the Department of the Environment and Heritage (formerly Environment Australia).
 - SEAMAP (Spatial Ecological Analysis of Megavertebrate Populations) seeks data on marine mammals, birds, and turtles for the Ocean Biogeographic Information System (OBIS). The datasets will be compiled for a publicly available web-based system that will allow analysis of the database. To learn more about the initiative, visit their website: <http://obismap.env.duke.edu/>

SEAHORSES, SEA-DRAGONS, PIPEFISH

(Families: Syngnathidae, Solenostomidae)

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Species in the Great Barrier Reef World Heritage Area (GBRWH) are as follows (Dr K. Martin-Smith, personal communication, 2003):
 - Pipefish: 49 species

Kuiter (2000)	
Common Name	Scientific Name
Short-pouch pygmy pipehorse	<i>Acentronura breviperula</i>
Davao pughead pipefish	<i>Bulbonaricus davaoensis</i>
Three-keel pipefish	<i>Campichthys tricarinatus</i>
Tryon's pipefish	<i>Campichthys tryoni</i>
Pacific short-bodied pipefish	<i>Choeroichthys brachysoma</i>
Barred short-bodied pipefish	<i>Choeroichthys cinctus</i>
Sculptured pipefish	<i>Choeroichthys sculptus</i>
Pig-snouted pipefish	<i>Choeroichthys suillus</i>
Broken-bands pipefish	<i>Corythoichthys</i> sp. 1
Red-spot pipefish	<i>Corythoichthys</i> sp. 2
White-faced pipefish	<i>Corythoichthys</i> sp. 3
Reticulated pipefish	<i>Corythoichthys conspicilatus</i>
Australian messmate pipefish	<i>Corythoichthys intestinalis</i>
Orange-spotted pipefish	<i>Corythoichthys ocellatus</i>
Paxton's pipefish	<i>Corythoichthys paxtoni</i>
Schultz's pipefish	<i>Corythoichthys schultzi</i>
D'Arros pipefish	<i>Cosmocampus darrosanus</i>
Maxweber's pipefish	<i>Cosmocampus maxweberi</i>
Banded pipefish	<i>Dunkerocampus dactyliphorus</i>
Barrier Reef pipefish	<i>Doryrhamphus</i> sp. 1
Cleaner pipefish	<i>Doryrhamphus janssi</i>
Qld flagtail pipefish	<i>Doryrhamphus malus</i>
Girdled pipefish	<i>Festucalex cinctus</i>
Gibb's pipefish	<i>Festucalex gibbsi</i>
Brock's pipefish	<i>Halicampus brocki</i>
Nose-ridge pipefish	<i>Halicampus</i> sp. 2
Mud pipefish	<i>Halicampus grayi</i>
Whiskered pipefish	<i>Halicampus macrorhynchus</i>
Samoa pipefish	<i>Halicampus mataafae</i>
Glittering pipefish	<i>Halicampus nitidis</i>
Spiny-snout pipefish	<i>Halicampus spinirostris</i>
Booth's pipefish	<i>Halicampus boothae</i>
Ribboned seadragon	<i>Haliichthys taeniophorus</i>

Blue-speckled pipefish	<i>Hippichthys cyanospilus</i>
Madura pipefish	<i>Hippichthys heptagonus</i>
Beady pipefish	<i>Hippichthys penicillus</i>
Belly-barred pipefish	<i>Hippichthys spicifer</i>
Anderson's pipefish	<i>Micrognathus andersoni</i>
Pygmy pipefish	<i>Micrognathus pygmaeus</i>
Offshore pipefish	<i>Micrognathus natans</i>
Short-tail river pipefish	<i>Microphis brachyurus</i>
Lindeman pipefish	<i>Nannocampus lindemanensis</i>
Pale-blotched pipefish	<i>Phoxocampus diacanthus</i>
Soft-coral pipefish	<i>Siokunichthys breviceps</i>
Dunker's pipehorse	<i>Solegnathus dunckeri</i>
Qld spiny pipehorse	<i>Solegnathus</i> sp. 1
Double-ended pipehorse	<i>Syngnathoides biaculeatus</i>
Bent stick pipefish	<i>Trachyrhamphus bicoarctatus</i>
Straight stick pipefish	<i>Trachyrhamphus longirostris</i>

- Seahorses: 9 species

Kuitert (2001)	
Common Name	Scientific Name
Eastern spiny seahorse	<i>Hippocampus hendricki</i>
Pygmy seahorse	<i>Hippocampus bargibanti</i>
Sad seahorse	<i>Hippocampus tristis</i>
Common seahorse	<i>Hippocampus taeniopterus</i>
Low-crown seahorse	<i>Hippocampus dahlia</i>
High-crown seahorse	<i>Hippocampus procerus</i>
Queensland seahorse	<i>Hippocampus queenslandicus</i>
Winged seahorse	<i>Hippocampus alatus</i>
Eastern spiny seahorse	<i>Hippocampus hendriki</i>

- About half of the world's syngnathid species live in Australian waters.
- Populations in Southeast Asia have declined by 15-50% (Vincent 1996).
- Although little research has been conducted into Queensland syngnathid species, following are general comments on their biology, primarily sourced from Lightowler (1998) and Vincent (1996):
 - Attach to seagrass, gorgonians, drifting debris after storms or floods, live coral and mangrove roots, with floating *Sargassum*, or swimming freely in midwater.
 - Exist in low densities, patchily distributed;
 - Low adult mortality
 - Small home range
 - Recolonise slowly
 - Low mobility
 - Typically found in water from 1 to 15m deep; however, some species occur at 45 to 60m.
 - Short-lived (1-4 years)
 - Feed on small crustaceans and small fish
 - Young seahorses are highly vulnerable to predatory fish
 - Form life-long monogamous pairs, with males brooding eggs (Vincent and Sadler 1995)

- Reproduction timed with environmental events
- Detailed information on world status and trade was provided in the proposal to the 12th Conference of Parties to CITES in November 2002 for listing Syngnathids on that Convention.
(See proposal at <http://www.cites.org/eng/cop/12/prop/E12-P37.pdf>)

Conservation status

- Queensland's [Nature Conservation \(Wildlife\) Regulation 1994](#): Syngnathids are not listed as threatened.
- Queensland [Fisheries Regulation 1995](#) lists species of fish that may be taken under each type of fishery (e.g. recreational, net, trawl, line). If the species is not listed, it cannot be taken. These lists do not contain information about the conservation status of any syngnathids.
- [Environment Protection and Biodiversity Conservation Act 1999](#): Syngnathids are not listed as threatened however both syngnathids and solenostomids are [listed marine species](#).
- [Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes](#): 12 species of syngnathids occurring in the GBRWHA are listed (Table 4).
- IUCN: Six (6) species known from the GBRWHA are listed (Table 3).
- CITES: In November 2002, the Genus: *Hippocampus* (seahorses) was listed under Appendix II, which came into effect on 15th May 2004.

Human Related Threats

- Fishing:
 - Two species of pipefish (*Solegnathus hardwickii* and *Solegnathus dunckeri*) are allowed to be kept for trade from trawling operations along the Queensland coast. This take was approved under the EPBC Act to operate from July 2002-July 2005 with a statement to the effect that it appears sustainable and accompanying provisions for its continued operation (Click [here](#) for report). The GBRMPA annually audits the sustainability of this trawl fishery in the Great Barrier Reef and has released the [Audit of the Management of the Queensland East Coast Trawl Fishery in the Great Barrier Reef Marine Park](#). The Department of the Environment and Heritage (formerly Environment Australia) is also required to audit the fisheries operation. Queensland Fisheries Service reported in 2001 that the annual recorded landing of these two species was 7394 individuals. Current level of take for other species of pipefish and seahorses is not available.
- Aquaculture
- Hunting and collecting
- Marine dredging and construction

Actions

- Bycatch reduction devices are now mandatory in the East Coast Trawl Fishery, although how effective these will be in preventing the capture of syngnathids is unknown.
- All syngnathids are subject to [export controls](#) under the EPBC Act and can be exported only under a permit issued by the Department of the Environment and Heritage (formerly Environment Australia). Permits are only granted for captive-bred specimens or those taken under an approved management plan. Permissions to export syngnathids derived as bycatch from the Queensland trawl fishery and the syngnathid aquarium fishery have been granted by the Department of the Environment and Heritage (formerly

Environment Australia) to exporters approved by the Queensland Department of Primary Industries and Fisheries under a management plan.

- ReefHQ aquarium, the Reef Education Centre of the GBRMPA, has studied nutritional requirements and general husbandry requirements of seahorses in captivity.
- The Species Conservation Program works with the [Fisheries Issues Group](#) of the GBRMPA to monitor and address concerns regarding fish conservation.

BIRDS

(Class Aves)

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer p.112 of [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#) (Lucas *et al.* 1997):
 - Low fecundity
 - Highly migratory with some foraging areas separated from breeding areas by 100's to 1000's of kilometres, linking with other countries in the Southwest Pacific region.
 - Breeding seasons coincide with seasons of food availability.
 - The Great Barrier Reef World Heritage Area (GBRWHA) is at the extremity of distribution for some species.
 - Areas that are of international importance to migratory shorebirds are adjacent to or included within the GBRWHA.
 - The GBRWHA contains populations of threatened species.
 - Birds play important roles in nutrient addition to cays, and the establishment of terrestrial flora.
 - Significant aesthetic value derived from large breeding colonies.
 - 25% of Great Barrier Reef islands have nesting seabirds. There are a number of very significant islands within the Great Barrier Reef including Raine Island, Moulter Cay, Bramble Cay, Michaelmas Cay North West Island, Lady Elliot Island, East Fairfax Island and several cays in the Swain Reefs.
- Between 1.4 and 1.7 million seabirds of 22 species breed in the GBRWHA (King 1993, Lucas *et al.* 1997).
- It has recently been found that most of South-East Asia's migratory population of Roseate Terns overwinter in the Swain Reefs (O'Neill *et al.* 2003).
- Refer pages 57 and 103, [*State of the Great Barrier Reef World Heritage Area 1998*](#) (Wachenfeld 1998).

Conservation status

- In 2002, two species of Great Barrier Reef-breeding bird species are listed under the Commonwealth [*Environment Protection and Biodiversity Conservation Act 1999*](#) (EPBC Act) as 'critically endangered':
 - Herald Petrel (*Pterodroma heraldica*), which has only been recorded breeding in Australia on Raine Island; and
 - Yellow Chat (Dawson sub-species), which is known to occur in an area of $\leq 25\text{km}^2$ of swamp vegetation on the north-east corner of Curtis Island, near Gladstone (Garnett & Crowley 2000). A recent survey on the island provided a population estimate of between 40 and 50, but only 30 of breeding age individuals. An additional small population has been discovered in the Broad Sound area in 2003 (P. O'Neill, QPWS, personal communication 2003; Refer also to Houston *et al.* 2003).
- Certain other land birds and shorebirds are listed in other categories of endangerment (Table 3). For example, under Queensland legislation the little tern

(*Sterna albifrons*) is endangered and the red-tailed tropicbird (*Phaethon rubricauda*) vulnerable.

- Table 2 lists birds recorded from the Great Barrier Reef that are included on the Japan-Australia Migratory Birds Agreement ([JAMBA](#)) and the Chinese-Australia Migratory Birds Agreement ([CAMBA](#)). The Roseate Tern has recently been submitted for inclusion in both of these lists.
- [Predation by Feral Cats](#) has been listed as a Key Threatening Processes under the EPBC Act as a known threat to the Little Tern. A threat abatement plan has been developed for this key threatening process.
- [Pelagic long-line fishing](#) appears to be a minimal threat to Great Barrier Reef birds, however some wedge-tailed shearwaters may be taken. The fishery is also listed as a key threatening process and a threat abatement plan has been developed.
- Over the past decade there have been significant declines in the breeding populations of the Sooty Tern (25% decline), Common Noddy (45% decline) and the Crested Tern at Michaelmas Cay. Declines have also been reported ([CRC Reef Technical Report No. 12](#) Heatwole *et al.* 1996) in the Brown Booby nesting population of the Swain Reefs. However, more recent census information for this species in the Swain Reefs, and for Black Noddys and Wedge-tailed Shearwaters breeding on the Capricorn-Bunker islands of the Great Barrier Reef, suggest that they may undergo a cyclical population change possibly related to changes in food availability due to varying climatic conditions (P. O'Neill & R. White, Queensland Coastal Bird Atlas).
- Recent research may have recognised a new species of bird unique to the Great Barrier Reef. Studies of the Capricorn white-eye reveal its distinctive morphology and genetic isolation from other forms of the white-eye, indicating its treatment as a separate species (Kikkawa 2003).
- Two internationally recognised significant areas for shorebirds occur in the GBRWHA (Bowling Green Bay and Shoalwater Bay); land birds found on islands and cays in the GBRWHA are similar in composition to those found on the adjacent mainland. However, the GBRWHA is particularly important to populations of pied imperial pigeons, silvereyes (an endemic sub-species occurs in the Capricorn-Bunker group), and an endemic sub-species of the Yellow Chat that occurs only on Curtis Island and on some marine plains in the Broad Sound area.

Human Related Threats

- Tourism and recreation (refer Stokes *et al.* 1996 for an overview of these impacts on Great Barrier Reef seabirds; Ikuta and Blumstein 2003)
- Defence exercises
- Fishing, shark control programs and aquaculture
- Traditional egg collecting

Actions

- An [Action Plan for Australian Birds 2000](#) (Garnett and Crowley 2000) has been developed to provide a national overview of the conservation status of all Australian birds, identify threats and recommend actions to minimise those threats.
- Annual and seasonal closures to visitation as well as restrictions on the number of visitors are instituted for many Great Barrier Reef islands and cays to protect breeding seabirds.
- The GBRMPA networks with other agencies and interested persons (Queensland Parks and Wildlife Service, Department of the Environment and Heritage, scientists,

conservationists) for seabird monitoring and to review seabird information and management.

- Advice is provided in regard to the seabird-island monitoring program conducted by Day-to-Day Management staff. The high level of natural variability in seabird numbers necessitates a high frequency of monitoring in order to detect trends (Wachenfeld 1998, p.58).
- The GBRMPA (1997) funded the preparation and publication of the world's first [*Guidelines for Managing Visitation to Seabird Breeding Islands*](#), and the proceedings of a [*Workshop on Oiled Seabird Cleaning and Rehabilitation*](#) (Workshop Series 15) (Walker 1994), as well as seabird-information leaflets and *Reef Notes*.
- [*Best Environmental Practices*](#) for observing seabirds have also been prepared and publicised.
- The [*Cairns Area*](#), [*Whitsundays*](#) and [*Hinchinbrook*](#) Plans of Management and the [*State Management Plans for National Parks in the Capricornia Cays*](#), [*Brook Islands*](#) and Family Islands provide for the conservation of birds in the GBRWHA by setting minimum approach distances and speeds for vessels and aircraft to significant bird sites.
- Queensland Parks and Wildlife Service (Rockhampton office) maintains a Queensland Coastal Bird Atlas, including all seabird records from islands of the GBRWHA.(refer P. O'Neill, QPWS, Rockhampton).
- SEAMAP (Spatial Ecological Analysis of Megavertebrate Populations) seeks data on marine mammals, birds, and turtles for the Ocean Biogeographic Information System (OBIS). The datasets will be compiled for a publicly available web-based system that will allow analysis of the database. To learn more about the initiative, visit their website: <http://obismap.env.duke.edu/>
- A. Lashko is undertaking a PhD study at CRC Reef and James Cook University to investigate the genetic composition of Roseate tern flocks on the Great Barrier Reef and elsewhere.
- P. O'Neill is undertaking a PhD study at Griffith University to investigate genetic composition of Brown and Masked Bobby breeding populations on the long eastern seaboard of Australia.

APPENDIX 3 - SPECIES OF SPECIAL INTEREST

Cetaceans require special consideration in view of the requirements for their management under Division 3 of the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#). The [Policy Document for Whale and Dolphin Conservation in the Great Barrier Reef Marine Park](#) (Great Barrier Reef Marine Park Authority 2000) provides a comprehensive review of cetaceans in the Great Barrier Reef.

WHALES AND DOLPHINS

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer p.159 of [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997), which says that the Great Barrier Reef World Heritage Area (GBRWhA) is a significant refuge for cetacean biodiversity in the tropical Indo-Pacific as coastal species such as the Irrawaddy dolphin (*Orcaella brevirostris*) and the Indo-Pacific hump-backed dolphin (*Sousa chinensis*) are unlikely to survive outside Australia.
- Refer p. 67 and 103, [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998).
- As per the Great Barrier Reef Marine Park Authority's (GBRMPA's) *Policy Document on Whale and Dolphin Conservation in the Great Barrier Reef Marine Park* (GBRMPA 2000), priority species for management are:
 - Humpback whale (*Megaptera novaeangliae*)
 - Irrawaddy dolphin (*Orcaella brevirostris*)
 - Indo-Pacific humpbacked dolphin (*Sousa chinensis*)
 - Dwarf minke whales (*Balaenoptera acutorostrata*), considered a separate species for the purposes of management.
- The GBRMPA staff recently summarised information on marine mammal watching on the Great Barrier Reef (Stokes *et al.* 2002).
- 'The most recent genetic studies indicate that coastal bottlenose dolphins from southeastern Australia are *Tursiops aduncus* (Moller & Beheregaray 2001), like those of Western Australia (Connors *et al.* 2000). There are no genetically confirmed records of *T. truncatus* from Australia.' (Perrin *et al.* 2002).
- Reports are available on the sustainable management of the swimming with dwarf minke whale industry on the Great Barrier Reef.
 - Refer [Birtles *et al.* \(2002\)](#), and [Arnold & Birtles \(1999\)](#)

Conservation status

- The Irrawaddy and Indo-Pacific humpbacked dolphin are listed as 'rare' and the humpback whale as 'vulnerable' under the Queensland [Nature Conservation \(Wildlife\) Regulation 1994](#) (Table 3).
- A 1996 [Action Plan for Australian Cetaceans](#) summarises information then available on the biology and status of all species (Bannister *et al.* 1996).
- Hale (1997) and Corkeron *et al.* (1997) summarise existing data on the distribution, status and conservation of inshore dolphins in Australia.

Human Related Threats

- Human activities likely to adversely impact on cetaceans are listed in the supporting document to the GBRMPA's *Whale and Dolphin Conservation Policy*.

Actions

- The GBRMPA's *Whale and Dolphin Conservation Policy* was approved and published in February 2000.
 - Implementation of the Policy is proceeding, especially in regard to whale watching and swimming-with-whale requirements.
- Liaison continues with researchers studying dwarf minke whales and inshore dolphins.
- [*Best Environmental Practices*](#) for whale watching have been prepared and publicised.
- Both the [Cairns Area](#) and the [Whitsundays](#) Plans of Management provide for the protection of whales by establishing minimum approach distances to whales and regulating the amount of whalewatching and swimming-with-whales activities occurring in the planning areas.
- A tri-agency (Queensland Parks and Wildlife Service, Department of Primary Industries and Fisheries, GBRMPA) approach is enabling close examination of cetacean [carcasses](#) to establish the causes of mortality and obtain further information.
 - The GBRMPA website enables the general public to [subscribe to an Email Listserver](#) that posts notices about each stranding soon after they are investigated.
- QPWS publish [annual reports](#) summarising live-strandings and carcasses of cetaceans.
- SEAMAP (Spatial Ecological Analysis of Megavertebrate Populations) seeks data on marine mammals, birds, and turtles for the Ocean Biogeographic Information System (OBIS). The datasets will be compiled for a publicly available web-based system that will allow analysis of the database. To learn more about the initiative, visit their website: <http://obismap.env.duke.edu/>
- In 2003 the Department of the Environment and Heritage (formerly Environment Australia) commissioned the preparation of a national recovery plan for Humpback whales, and a national review of the conservation status of smaller whales and dolphins.
- The GBRMPA is represented on the National Whale Recovery Group coordinated by the Department of the Environment and Heritage (formerly Environment Australia).

APPENDIX 4 - OTHER SPECIES OF CONSERVATION CONCERN

Whilst not included in the previous two categories of listed threatened or marine species, or species of special interest, these marine species are of conservation concern within the Great Barrier Reef Marine Park (GBRMP).

SHARKS, RAYS AND SKATES

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer p.132 of [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#) (Lucas *et al.* 1997), which notes that ‘specific locations of importance for the fishes of the Great Barrier Reef World Heritage Area are difficult to identify’.
- Refer p.53 of the [*State of the Great Barrier Reef World Heritage Area 1998*](#) (Wachenfeld 1998), which notes that ‘information on the state of populations of pelagic fishes is scarce, even for those that are commercially exploited’.
- From Last and Stevens (1994):
 - Australian species diversity
 - Sharks: 166
 - Rays/Skates: 117
 - More than 50% of Australian sharks and rays are endemic to Australia
 - Long-lived (10-70 years)
 - Late maturing (6-7 years)
 - Low fecundity (2-50 pups)
 - Occupy broad range of habitats, from inshore, shallow waters to depths greater than 2000m
 - Carnivores and scavengers
- [Pogonoski *et al.* \(2002\)](#) list 28 sharks and rays in the Great Barrier Reef.
- Taronga Zoo (NSW) maintains an [Australian Shark Attack File](#) that provides up to date facts, statistics and advice about attacks. As of February 2003, there had been 70 fatal attacks recorded since Europeans arrived in Queensland: 9 in the last 20 years, 13 in the last 30 years, 14 in the last 40 years, and 21 in the last 50 years. Statistics at the website show clearly that compared to fatalities from other forms of water activity, the risk from shark attack is very low.

Conservation status

- The Commonwealth’s [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act) lists the Grey Nurse shark (East Coast population) as ‘critically endangered’ and the Great White shark as ‘vulnerable’ and a [listed migratory species](#). Queensland [Nature Conservation \(Wildlife\) Regulation 1994](#) does not list any shark, ray or skate species as threatened.
- [The Conservation Status of Australasian Chondrichthyans](#) - A report of the IUCN Shark Specialist Group Australia and Oceania Regional Red List Workshop.
- Queensland [Fisheries Regulation 1995](#) lists species of fish that may be taken under each type of fishery (e.g. recreational, net, trawl, line). If the species is not listed, it cannot be

taken. These lists do not contain information about the conservation status of any species.

- EPBC Act: The great white shark and whale shark are listed as 'vulnerable', and the east coast population of the grey nurse shark as 'critically endangered' (Table 3). All appear to be rare in the GBRWHA in that their range does not generally extend that far north.
- [Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes](#) (Pogonoski *et al.* 2002) lists the 28 shark and ray species occurring in the Great Barrier Reef, a number of them are 'data-deficient' (Table 5).
- IUCN: Several species are listed in Table 3.
- The deliberations of the IUCN Shark Specialist Group regarding the world conservation status of sharks are available at the website:
<http://www.flmnh.ufl.edu/fish/Organizations/SSG/SSG.htm>

Human Related Threats

- Defence exercises
- Fishing, shark control programs (e.g. shark netting) and aquaculture
- Hunting and collecting
- Tourism and recreation

Actions

- The *Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes* compiled for Environment Australia (now Department of the Environment and Heritage) by the Australian Museum and NSW Fisheries was finalised in 2000.
- The World Conservation Union (IUCN) has developed [guidelines](#) for applying Red List Criteria to marine fishes.
- A [National Plan of Action for Sharks in Australia](#) was released in May 2004.
- In March 2003, a regional workshop in Brisbane of the IUCN Shark Specialist Group (SSG) assessed the conservation status of 201 species of Chondrichthyans (156 sharks, 41 batoids and 4 chimaeras) occurring in Australia and Oceania. 14 were classified as threatened using [IUCN criteria](#) (4 critically endangered, 1 endangered and 9 vulnerable), 66 as Near Threatened, 84 as Least Concern and 37 as Data Deficient. The results are to be considered by the global SSG before submission to the [IUCN Red List](#). The workshop report is available [here](#).
- National Recovery Plans have been finalised for [Great White shark](#) and the [Grey Nurse shark](#).
- The GBRMPA routinely liaises with the [Queensland Shark Control Program](#).
- Conditions in scientific collecting permits prevent the capture of great white, grey nurse, and whale sharks. The Species Conservation Program also recommends to researchers that as few specimens should be collected as possible of species listed as threatened in the *Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes*.
- The GBRMPA's [Fisheries Issues Group](#) liaises with the [Queensland Department of Primary Industries and Fisheries](#) and fishers on the sustainability of shark catches in Queensland.
- The Species Conservation Program works with the [Fisheries Issues Group](#) of the GBRMPA to monitor and address concerns regarding fish conservation.

OTHER MARINE FISHES

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer p.131-133 of [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#) (Lucas *et al.* 1997) which says, 'there are no Great Barrier Reef World Heritage Area fishes recognised as threatened (Williams, D. 1996, pers. comm.) p.132'.
- [*Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes*](#) (Pogonoski *et al.* 2002) details 114 species of the approximately 4,100 marine and estuarine fish species known to occur in Australian waters. The main causes of declines in marine and estuarine fishes have included overfishing (of both target and non-target or by-catch species), habitat degradation (from urban development and related activities, trawling, dredging, water pollution, etc.), and, to a much lesser extent, exotic species introductions.
- Several fish species in the Great Barrier Reef are known to form large spawning aggregations, however much remains to be learned about different species aggregation characteristics (Spawning Aggregations Working Group, 2002).
- Commercial and recreational fishers target reef fish species directly and incidentally on fish spawning aggregation sites (FSAS).
- Approximately 1500 fish species in the Great Barrier Reef World Heritage Area (GBRWhA).
 - Low endemism as most fish are distributed throughout the Indo-West Pacific region
 - Cross-shelf, temporal and latitudinal variation in species richness: greatest on mid-shelf reefs; lowest on inshore reefs.
 - Abundance and diversity of fishes changes over a range of spatial and temporal scales.
 - Occupy all habitats (benthic, pelagic, hard and soft substrate, mangroves, seagrass beds).
 - Greatest species richness in coral reef habitats, followed by mangrove and estuarine environments.
 - Large and small home ranges.
 - Range of reproductive strategies: broadcast spawners, brooders
 - High fecundity.
 - Range of feeding strategies: planktivores, herbivores, omnivores, carnivores.
 - Migration to near shore or offshore areas for spawning show connectivity between habitats.
- Refer p.51-56, [*State of the Great Barrier Reef World Heritage Area 1998*](#) (Wachenfeld 1998), which notes that 'reef fish numbers vary considerably from reef to reef and from year to year as a result of fluctuations in recruitment'.
- There are regular ontogenetic shifts (life-stage related) and daily movement into and out of epibenthos. During the day, large numbers of coral reef fish are in the water column over benthic habitats (Lucas *et al.* 1997).

Conservation status

- Queensland [Nature Conservation \(Wildlife\) Regulation 1994](#): No marine fish species in the Great Barrier Reef is listed as threatened. However several are protected under Queensland fisheries legislation.
- Queensland [Fisheries Regulation 1995](#) lists species of fish that may be taken under each type of fishery (e.g. recreational, net, trawl, line) and specifies maximum and minimum sizes for some cod species. If the species is not listed, it cannot be taken. However, incidental take occurs, and in some fisheries, the amount taken exceeds that of the target species. These lists do not contain information about the conservation status of any species.
- [Environment Protection and Biodiversity Conservation Act 1999](#): No marine fish species in the Great Barrier Reef is listed as threatened.
- *Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes*: 16 of the fish (non-sharks, rays, and syngnathids) occur in the Great Barrier Reef. A number of them are 'lower risk' (Table 6) and the majority are cod and groupers from the Family Serranidae.
- IUCN: several bony fish species are listed by the IUCN [Red Data Book](#) (Table 3).

Human Related Threats

- Boats, ships and other motorised machines
- Coastal development
- Declining water quality
- Defence exercises
- Fishing (overfishing), shark control programs and aquaculture
- Hunting and collecting
- Tourism and recreation

Actions

- A *Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes* (Pogonoski *et al.* 2002) was compiled for Environment Australia (now Department of the Environment and Heritage) by the Australian Museum and NSW Fisheries. The Species Conservation Program recommends to researchers that as few specimens as possible should be collected of species listed in the Conservation Overview.
- The World Conservation Union has developed [guidelines](#) for applying the IUCN Red List Criteria to marine fishes.
- The Queensland Government has introduced the [Fisheries \(Coral Reef Fin Fish Fishery\) Management Plan 2003](#) to provide for the long-term sustainability of coral reef finfish stocks.
- The Zoning Plan for the GBRMP prohibits the take of potato cod, barramundi cod and maori wrasse without prior permission from the GBRMPA. This mirrors regulations by the Queensland Department of Primary Industries and Fisheries. The Zoning Plan also bans the take without the written permission of the Authority of all *Epinephelus* spp. fish (ie: cod) greater than 100cm.
- The GBRMPA also provides for the protection of threatened fish species through conditions on research permits, prohibiting the collection of some species via the [Great Barrier Reef Marine Park Regulations 1983](#) and the protection of individual species at some high use locations (e.g. Cod Hole at Ribbon Reefs).
- The location and protection of spawning grounds is now also being investigated.

- The Species Conservation Program works with the [Fisheries Issues Group](#) of the GBRMPA to monitor and address concerns regarding fish conservation.

MARINE INVERTEBRATES

- Knowledge
 - Ascidians
 - Bryozoans
 - Crustaceans
 - Echinoderms
 - Fringing reef corals and other reef elements
 - Hard Corals
 - Molluscs
 - Octocorals
 - Platyhelminths
 - Polychaete worms
 - Sponges
- Conservation Status
- Human related threats
- Actions

Knowledge

- Refer p.71-75 of [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998) which notes that '*despite the geographical extent and biological importance of --- [inter-reefal and lagoonal benthos]---, only a small number of descriptive studies have been carried out.*
- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) is a source of taxonomic and biological information on all Australian wildlife. Refer to the tables titled 'Estimated Numbers of the Australian Fauna' and 'Details of Taxa Databased'.

Conservation status

- Marine invertebrates are not listed under Queensland's [Nature Conservation \(Wildlife\) Regulation 1994](#) and are not listed under the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#).
- The [Queensland Fisheries Act 1994](#) includes some marine invertebrates as "fish" for the purposes of the Act. The associated [Fisheries Regulation 1995](#) lists species of fish that may be taken under each type of fishery (e.g. recreational, net, trawl, line). If the species is not listed, it cannot be taken (e.g. tritons, helmet shells). However, incidental take occurs, and in some fisheries, the amount taken exceeds that of the target species. These lists do not contain information about the conservation status of any species.
- Brautigam (2001) notes that 'although most marine organisms are invertebrates, only a few ... have been assessed and included in the [Red List](#) (for example, the giant clams *Tridacna* spp.)'. The giant clams are also listed under the *Convention on International Trade in Endangered Species of Wildlife Flora and Fauna (CITES)*.
- A [conservation overview of marine invertebrates](#) in Australia was finalised in 2002 and published on the Australian Museum website. A summary of the main findings are:
 - **Crustacea:** for the majority of species, there is insufficient information to determine whether any species are threatened.
 - Taxa dependent on other groups of invertebrates or vertebrates:

- Pyrgomatidae (dependent on hard tropical corals)
- Archaeobalanidae (dependent on sponges, gorgonians)
- Chelonibiidae, Coronulidae, Platylepadidae (epizoitic on turtles, whales, dolphins, dugongs)
- **Molluscs:**
 - Pearl oysters (*Pinctada maxima*, *P. margaritifera*) may be regarded as commercially threatened.
 - Overexploited: Tridacnidae, scallops
 - Potentially vulnerable through shell collecting: Cypraeidae (cowries), Volutidae (volutes), Conidae (Cones), Muricidae (muricids)
 - Taxa dependent on other groups of invertebrates:
 - Eulimidae (on echinoderms),
 - Magilidae (on hard and soft corals),
 - Cerithiopsidae and Triphoridae (on sponges),
 - Mitridae (on sipunculans)
- **Sponges:** Neptune's Cup Sponge (*Poerion neptuni* also known as *Cliona patera*), was recently re-discovered off Cape York, after it was believed to have become extinct in the early 1900's. The species is uncommon and very susceptible to benthic trawling. Status is considered threatened.
- **Other phyla:** Insufficiently known to make an assessment

Human Related Threats

- Coastal development
- Declining water quality
- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Introduced species
- Marine dredging and construction
- Tourism and recreation

Actions

- Provisions within the GBRMP Act and the [Cairns Area](#), [Whitsundays](#) and [Hinchinbrook Plans of Management](#) prohibit people from damaging coral. 'No Anchoring' areas have been established at the following locations:
 - [Whitsundays](#): Manta Ray Bay, Bait Reef, Blue Pearl Bay, Langford Island, Butterfly Bay, Maureen's Cove, Luncheon Bay, Pinnacle Bay, Cateran Bay, Sunlover's Bay, North Stonehaven Bay, South Stonehaven Bay and False Nara (Schedule 5, Whitsundays Plan of Management)
 - [Hinchinbrook](#) Area: Brook Islands
 - [Cairns](#) Area: Plan of Management Schedule 8 lists reef anchorages that are intended to encourage the use of places that are least likely to cause damage to coral.
 - Moorings have been installed in many Great Barrier Reef areas to also minimise anchor damage.
- [Best Environmental Practices for Anchoring](#) have been prepared and publicised.
- The conservation of marine invertebrates is being addressed through permit requirements.
- Habitat conservation initiatives, such as the recently implemented [Representative Areas Program](#), protects a representative network of a range of habitats under the revised reef-wide zoning system.

- Marine pests are a threat to marine biodiversity and to marine industries such as fishing and aquaculture (Australian State of the Environment Committee 2001). There are a number of ways in which marine pests can be introduced into Australian waters including discharge of ship ballast water and fouling organisms on the ship hull and anchor chain. Since July 2001, mandatory ballast water management arrangements are in place for international vessels entering Australian waters. A baseline survey of the Port of Townsville and adjacent marine areas was carried out by James Cook University & CRC Reef scientists in November 2000. No target pest species have been identified to date. Further information can be obtained by emailing < info@townsville-port.com.au >.
- The Department of the Environment and Heritage (formerly Environment Australia) is considering regulations for the access to biological resources in Commonwealth areas including access permits and benefit-sharing arrangements.
- Since 1st January 2003, a global ban on the use of organotin compounds in ship anti-fouling systems has been in place through the [*International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001*](#).
- The Australian Institute of Marine Science is undertaking a [seabed biodiversity assessment project](#) to improve knowledge of marine biodiversity in northern Australia.
- Additional information regarding marine invertebrates is available at the following websites:
 - <http://www.austmus.gov.au/invertebrates>
 - <http://www.qmuseum.qld.gov.au/search/thesaurus.asp?subject=Invertebrates>

Ascidians

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) has identified 736 species of ascidians that occur in Australia of which 536 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from p.110:
 - At least 330 species of ascidians (also known as sea squirts) occur on the Great Barrier Reef, mostly over a vast range with the Great Barrier Reef acting as a bridge for gene flow from temperate to tropical areas. Gene flow probably occurs by a complex web of recruitment between the crowded populations occupying the profusion of habitats in the vast Indo-West Pacific coralline region.
 - From Barnes (1987): ascidians are encountered in all types of tropical marine habitats attached to rocks, shells, and pilings in shallow water, and on ship bottoms or sometimes fixed in mud and sand by filaments or a stalk. They exist as both solitary and colonial forms with body sizes ranging from 1mm-10cm in diameter.
 - They are non-selective filter feeders and strain large quantities of water for suitable food particles.
 - Ascidians are hermaphrodites (with a few exceptions), however cross-fertilisation is more typical than self-fertilisation. Reproduction occurs either through budding (a small replica of the parent form that eventually frees itself from the parent) or through the release of sperm and egg into the water column (Barnes 1987, Kott 1982). The fertilised egg develops into a free-swimming tadpole larva with a notochord and neural tube, structures that show its linkage to the chordates. Within a short period of time (ranging from minutes to hours depending on the species) the tadpole larvae attach themselves to a substrate and metamorphose into miniature ascidians. The metamorphosed ascidian loses the notochord and the neural tube (Colin and Arneson 1995).



Bryozoans



- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 2,500 species of bryozoans occur in Australia of which 1,000 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from *p.118*:
 - Poorly known group, approximately 300-500 species occur on the Great Barrier Reef (8-12% of world fauna) forming natural 'isolates' that provide important structure and habitats for other species. It is likely that bryozoan fauna of reefal and shelf environments are distinct and that the Indo-West Pacific contains the highest diversity of bryozoans.
 - Cross-shelf variation is evident in the central Great Barrier Reef Marine Park (Birtles and Arnold 1988).
 - From Barnes (1987): bryozoans are sessile colonial animals composed of zooids. They are benthic, occurring in cryptic environments, in caves and under coral plates and generally found in reef and soft sediment shelf areas. Bryozoans are either encrusting, mobile epifauna, or anchored colonies attached to hard, stable substratum. They are inconspicuous, forming relatively small colonies ranging from millimetres to tens of centimetres in diameter.
 - Bryozoans are suspension feeders filtering the water column for small phytoplanktonic organisms.
 - Reproduction occurs either through the release of egg and sperm into the water column or fertilised eggs are brooded internally. A larval stage is usually present with settlement occurring on hard surfaces (rock, shells, coral and wood) with some species boring in calcareous substrates.

Crustaceans

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 9,871 species of crustaceans occur in Australia of which 7,111 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from p.126:
 - Poorly studied group with high diversity and low endemism. The extensive range of habitats occurring on the Great Barrier Reef is important for crustacean diversity. They live within all habitats in the Great Barrier Reef World Heritage Area (GBRWHa), from reefal environments to the inshore intertidal mangrove and seagrass habitats.
 - Endemism is low in reef fauna, but other habitats might have higher levels.
 - Highly diverse within most groups with a cosmopolitan Indo-West Pacific fauna.
 - GBRWHa species diversity reported as follows:
 - Barnacles: 100 species from more than 50 genera
 - Isopods: more than 150 species
 - Mysids: 50 species
 - Amphipods: more than 6000 known species from more than 1100 genera
 - Mantis shrimp, Krill and Crabs: 1030 species from 358 genera in 81 families; this represents about 50% of the Australian fauna
 - Anecdotal evidence suggests that inner-shelf reefs might have greater diversity than outer-shelf reefs.
 - Crustaceans are ecologically important as grazers, scavengers, predators and prey (Australian State of the Environment Committee, 2001).
 - From Barnes (1987): crustaceans have a great range of diets and possess a variety of feeding mechanisms including suspension feeding, predation or picking up food.
 - Reproduction occurs through copulation, and eggs are brooded for different lengths of time depending on the species. Crustaceans have free-swimming planktonic larvae that undergo several larval stages before developing into adult crustaceans.



Echinoderms



- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 1,406 species of echinoderms occur in Australia of which 1,165 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from p.128:
 - 630 species including many rare taxa of echinoderms occur in the Great Barrier Reef with high phylogenetic diversity well expressed. The Great Barrier Reef is likely to have the greatest species diversity of echinoderms for any marine protected area in the world. The group contains distinct reefal and non-reefal suites of species with very strong zonation patterns that are associated with physical characteristics of the environment. They occupy all habitats and have an important role in structuring certain communities. For example, holothurians bioturbate sediments, resulting in destabilisation of sediment stratification, enhanced aeration and the release of organic material and nutrients from the interstitial water into the water column.
 - Echinoderms possess a range of feeding strategies:
 - Most feed by scraping algae, encrusting organisms and detritus from hard surfaces however some echinoderms, like urchins, are mobile, benthic grazers (Barnes 1987).
 - Crinoids are nocturnal plankton feeders, asteroids are carnivorous, opportunistic and scavengers and ophiuroids are filter-feeders (Gosliner *et al.* 1996).
 - Holothurians are restricted to hard substrate bottom sediments (Birtles and Arnold 1988) including clean sand (not mud based sand), coral reefs, silty sediments, seagrass and reef flats. They are found in waters 10 m to 40 m deep and their main food source is reported to be bacteria and detritus (Bakus 1973, Massin 1982, Poiner *et al.* 1998).
 - Echinoderms exhibit sexual reproduction (Smiley *et al.* 1991); larvae are plankton feeders that settle onto suitable substrate where they develop to young adults. Juvenile echinoderms are believed to be highly cryptic, with high numbers reported in seagrass habitats (Shelley 1981).

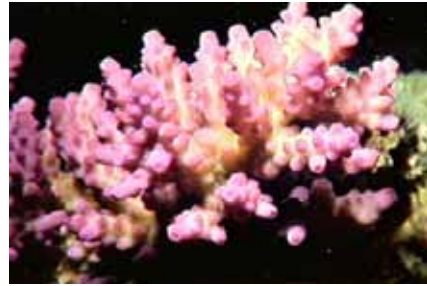
Fringing reef corals and other reef elements

- Refer to [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#) (Lucas *et al.* 1997). Summary follows from *p.137*:
 - The majority of fringing reefs in the Great Barrier Reef World Heritage Area are found around continental islands with important sites located around complex island archipelagos, such as the Whitsunday Island group and the Palm Island group. A smaller number of fringing reefs border the mainland coast.
 - Fringing reefs exhibit high species diversity and contain some of the largest and oldest coral colonies in the Great Barrier Reef; genotype of some colonies may have been present on the reef for 1000s of years. Inshore coral communities in the southern Great Barrier Reef may offer new insights into coral reef formation and evolution.
 - Fringing reefs have a very high aesthetic value, in particular those areas that exhibit a high degree of heterogeneity, high coral diversity and high coral cover.
- Refer to [reefED](#) for an overview about [fringing reefs](#) and [other reef types](#).



Hard Corals

- For an overview on corals, visit [reefED-GBR Explorer](#).
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from p.152:
 - High diversity of habitats in the Great Barrier Reef World Heritage Area allows for the high diversity of hard corals encountered in the area; 359 hard coral species have been recorded, however endemism of the group is low.
 - Long-lived massive corals can provide historical information of environmental conditions.
 - Hard corals play an important role in the ecology of tropical seas by building highly productive and massive reefs (Colin and Arneson 1995).
 - From Barnes (1987): most hard corals feed at night, however many species also feed during the day using their tentacles to capture anything from zooplankton to small fish. The tentacles are also used during competitive encounters with other corals. Corals lacking tentacles are suspension feeders capturing prey in mucous strands. Reef-dwelling (hermatypic) corals contain symbiotic zooxanthellae algae that transfer a large portion of their fixed carbon (produced during photosynthesis) to the coral for use in growth. The coral in turn, probably supplies the zooxanthellae with nitrogen obtained from particles captured by the coral.
 - Hard corals exhibit both asexual and sexual reproduction with several variations depending on the species. They can be hermaphrodites or have separate sexes, with fertilisation being either internal (sperm is released into the water column where it locates a female with eggs) or external (both eggs and sperm are released into the water column). A planulae larva is produced and is capable of long distance dispersal before it settles to the bottom, where it starts to create a calcium carbonate skeleton (Colin and Arneson 1995). This skeleton later serves as protection and support for the coral.



Molluscs

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 12,472 species of molluscs occur in Australia of which 9,512 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from *p.165*:
 - 5000-8000 species of molluscs occur in the Great Barrier Reef representing a significant proportion of the world molluscan diversity. There are four main components of molluscan fauna with the most speciose being the shallow reefal fauna with very low endemism.
 - Endemism is highest in components shared with southern Qld and NSW; the volute family has the highest degree of endemism.
 - Some bivalves play an important role in bioerosion of coral substrates.
 - Poorly known groups, especially smaller taxa, exist in coastal waters with largest terrigenous inputs and attenuate with increasing latitude.
 - Most gastropods have a single shell and occupy most niches in the marine environment.
 - They exhibit a wide array of feeding strategies (deposit feeding, herbivorous, carnivorous, parasitism); bivalves are predominantly filter feeders and have two shells, many are infaunal burrowers or attach themselves to substrate; cephalopods are efficient swimmers, predators (carnivores) and some have a full shell (nautilus) while others have no shell (octopus).
 - From Barnes (1987): Modes of reproduction vary among classes; some are hermaphrodites whereas others release sperm in the water current with fertilisation occurring in the sea or in the mantle cavity of the females. A free-swimming larva is typical of some molluscs (e.g. bivalves).



Octocorals

- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from p.174:
 - Poorly investigated group, 80 genera likely to occur on the Great Barrier Reef of 270 worldwide. The group consists of sea pens, soft corals and gorgonians and they occur in all habitats; in the Great Barrier Reef World Heritage Area they are known to occupy both reefal and inter-reefal habitats. Soft corals are a major component of sessile benthic fauna and contribute significantly to the aesthetic value of the reefal environment.
 - From Colin and Arneson (1995): Octocorals possess eight tentacles and calcareous spicules (often used for identification) that aid the support and maintenance of shape in large colonies.
 - They are opportunistic competitors of space on the reef and rapidly cover available substrate. They are filter feeders of plankton and inhabit areas where currents flow. Several species contain symbiotic zooxanthellae that augment nutrient intake.
- Octocorals exhibit both asexual and sexual reproduction strategies including broadcast spawning, internal fertilisation, and brooding (P. Alderslade personal communication as cited by [Conservation overview of marine invertebrates 2002](#)).
- [ReefED](#) provides an overview on [soft corals](#) and [gorgonians](#).



Platyhelminths

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 10,806 species of platyhelminths occur in Australia of which 1,506 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from *p.135*:
 - Thousands of species of platyhelminths occur in the Great Barrier Reef with low endemism, high diversity in free-living macro and meiofaunal forms and very high diversity in parasitic forms. There are likely to be distinct reefal and inter-reefal faunas across the shelf.
 - Polyclad turbellarians with vivid colours and patterns contribute to the Reef's aesthetic value and cosmopolitan composition with Indo-West Pacific environments.
 - Four groups of flatworms: macrofaunal (large free-living), meiofaunal (small free-living), interstitial (less than 1 mm) and symbiotic (Cannon 1993).
 - From Barnes (1987): Platyhelminths can be predators, scavengers, herbivores, commensals or parasites and they feed on a wide range of prey.
 - Most platyhelminths are hermaphrodites, with the exception of a few specialised parasitic species. Reproduction occurs through copulation and internal fertilisation. Development of eggs is either direct or can in some species develop indirectly into planktotrophic larvae.



Polychaete worms

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 3,239 species of polychaetes occur in Australia of which 1,139 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from p.178:
 - Tropical fauna is poorly known. Polychaetes are dominant macrofauna in reefal sediments and coral substrates with 80 species recorded in the Great Barrier Reef, however >500 species may occur. Diversity is a product of latitudinal extent, habitat diversity and good condition of the Great Barrier Reef.
 - Polychaete worms play important roles in the ecosystem, for example, they are important in the food chain both as a predator and prey; they dominate macrofauna both in terms of numbers of individuals and number of species. They bioturbate sediments and are one of the first colonisers of dead coral colonies, facilitating settlement of other invertebrates.
 - Polychaetes probably exhibit latitudinal and cross shelf variations; some with restricted distributions.
 - Polychaetes occur in all habitats from mangroves, seagrass beds, inter-reefal sediments and within reef structure as borers, nestlers and encrusters; some are pelagic. Species composition is determined by sediment characteristics, water movement and stability of sediments.
 - Feeding strategies include: deposit feeders, herbivores, filter feeders, suspension feeders and omnivores. Polychaetes are either opportunistic, selective or non-selective, feeding on bacteria, algae, detritus, other invertebrates and carrion (Barnes 1987, Lucas *et al.* 1997).
 - Polychaetes have a range of reproductive strategies, including brooders and broadcast spawners, exhibiting sexual and asexual reproduction. Life cycles last from a few weeks to several years.



Sponges

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) estimates that 3,500 species of sponges occur in Australia of which 1,416 have been described.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997). Summary follows from *p.191*:
 - 1500 species of sponges occur in the Great Barrier Reef (c. 30% of Australian sponge fauna), endemism is likely to be low, but lacks study. Relicts of reef-building sponges from Ordovician Period have been recorded and cross shelf trends in sponge abundance and diversity are exhibited.
 - Sponges play a significant role in ecosystem processes; some sponges live off the products produced by symbiotic cyanobacteria while other sponges live off the detritus and waste products that filter down in the water column. They are an important food source for the threatened hawksbill turtle and also function as a host to multitudes of other organisms including crustaceans, molluscs, worms, echinoderms and microorganisms (Australian State of the Environment Committee 2001).
 - Species richness decreases with increasing distance from the shore (Wilkinson and Cheshire 1989).
 - From Barnes (1987): Sponges are sessile, occurring on benthic substrate wherever rocks, shells, submerged timbers or coral provide a suitable substratum, even on soft sand or mud bottoms. Availability of space, inclination of the substrate and current velocity influence the growth of sponges. A variety of growth forms exists from burrowing to encrusting to those that attach to a relatively small area and grow upright with branches or into large urn shapes. Sponges inhabit shallow coastal waters to depths of 200 and 1000m.
 - Sponges are sedentary filter feeders; water enters the sponge through inhalent canals and is filtered for food particles and oxygen (Colin and Arneson 1995).
 - Exhibit both sexual and asexual reproduction, with many sponges being hermaphrodites producing both eggs and sperm. A free-swimming larva develops from the fertilised egg. Asexual reproduction can occur through budding or fragmentation from the adult sponge.



MARINE PLANTS

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- Refer to [*The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*](#) (Lucas *et al.* 1997) as follows for summaries relating to Great Barrier Reef:
 - **Algae** (p.108) and *Halimeda* banks (p.149): 400-500 species of macroalgae (20 species of *Halimeda*), high diversity and low endemism, highly variable showing latitudinal, cross-shelf and within-reef variation in composition and abundance, important in cementing reef structures, contributors to sediments, primary producers and as a food. Red algae are the most diverse group, and are more abundant and diverse inshore, as are the brown algae. Green and red algae dominate offshore areas. The Great Barrier Reef has the most extensive, actively accumulating *Halimeda* beds in the world.
 - The [*Australian Marine Algae Name Index*](#) (AMANI) is a joint project of the [*Australian Biological Resources Study*](#) (ABRS) and Murdoch University. Its aim is to provide simple access to information on the currently accepted names for Australian marine algae, their synonyms and broad-scale distribution.
 - **Mangroves** (p.155): 37 species (54% of world flora), comparable and complementary diversity to other areas of high diversity, important contributor to ecological processes.
 - **Seagrasses** (p.183): 15 species and others undescribed, at least two appear to be endemic, several species are at latitudinal limits, extensive deep water meadows, important in ecological processes and as fish and prawn nurseries; typically found in localities sheltered from prevailing south-easterly trade winds; found in intertidal and subtidal locations, from 2.2m above to 60m below mean sea level. Important food resource for many animals, especially fishes, and threatened dugong and green turtle; diversity decreases with increasing latitude (Leis and Rennis 1983).
- Refer also to pages 35-36 of [*State of the Great Barrier Reef World Heritage Area 1998*](#) (Wachenfeld 1998), which notes that '*despite concerns that algae may be taking over some inshore reefs, there is no strong evidence as to whether macroalgal cover is generally increasing on these reefs*' p.36.

Conservation status

- Marine plants are not listed under Queensland's [*Nature Conservation \(Wildlife\) Regulation 1994*](#) and are not listed under the Commonwealth [*Environment Protection and Biodiversity Conservation Act 1999*](#).
- A [*Conservation Overview of Macroalgae*](#) in Australia has been completed (Cheshire *et al.* 2000). IUCN 1994 Red List categories were used to identify conservation status of species as follows:
 - **Vulnerable**
 - 26 species occur within the Great Barrier Reef World Heritage Area (GBRWHA) (Table 7).
 - **Vulnerable with narrow range** - recorded from five or fewer locations not more than 500 km apart;

- 10 species occur within the GBRWHA (Table 8).
- ***Vulnerable, potentially endangered*** - found at only one location or alternatively over a series of locations separated by 50 km or less;
 - nil species within the GBRWHA.
- Marine plants are protected under the Queensland [Fisheries Act 1994](#).

Human Related Threats

- Boats, ships and other motorised machines
- Coastal development
- Declining water quality
- Defence exercises
- Fishing
- Marine dredging and construction
- Tourism and recreation

Actions

- [Dugong Protection Areas](#) were established for conservation of dugongs and the protection of seagrass habitats.
- [Fish Habitat Areas](#) established under the Queensland *Fisheries Act 1994* provide a high level of protection for marine plants and associated habitats.
- The GBRMPA and the [CRC Reef](#) have funded baseline [seagrass surveys](#) in many areas of the Great Barrier Reef.
- A recent Fisheries Research and Development Corporation review of seagrass in Australia (Butler and Jernakoff 1999) resulted in the formulation of a seagrass research and development (R&D) plan. One important aspect of the R&D plan was to form an inter-agency network '*to facilitate co-operation between the agencies in the funding and coordination of research, the effective use of research outcomes and the improvement of management*'. This network would then facilitate research projects identified in the review.
- [The Queensland Department of Primary Industries and Fisheries](#) manages seagrass, mangroves and other marine plants. The Queensland Department of Primary Industries and Fisheries requires permits be obtained before the removal of marine plants.
- The conservation of marine plants in the GBRWHA will be achieved mainly through habitat conservation initiatives, such as the [Representative Areas Program](#), which will ensure comprehensive, adequate and representative protection of examples of the entire range of habitats including associated marine plants.

APPENDIX 5 - ISLAND FLORA AND FAUNA

These non-marine species occur on continental islands and coral cays in the Great Barrier Reef World Heritage Area. Most islands and cays are outside of the Great Barrier Reef Marine Park and many are Queensland National Parks. Management is primarily the role of the Queensland Parks and Wildlife Service (QPWS) through the [day-to-day management program](#).

- Island Flora
- Island Fauna

ISLAND FLORA

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- The [Australian Plant Name Index](#) (APNI), by the [Centre for Plant Biodiversity Research and Australian National Botanic Gardens](#), is a list of all published names of Australian vascular plants and their bibliographic and typification details.
- [Families of Flowering Plants of Australia](#): An Interactive Identification Guide (Revised Edition) is an identification and information package for all of the plant families, native and naturalised, in Australia.
- Refer to p.193-194 of [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997) for summaries relating to the Great Barrier Reef:
 - 2195 plant species known on continental islands; three endemic
 - Some continental islands represent type localities for botanical collections
 - 300-350 species known on coral cays in the northern Great Barrier Reef – two endemic; ~120 species in the southern Great Barrier Reef
 - Whitsundays area the most diverse region (1141 plant species recorded)
 - Southern limits of world distribution for a number of pantropical species (e.g *Pisonia grandis* found at Lady Elliot Island)
 - Species composition changes from more woody plants in the north to more herbaceous plants in the south.
 - Birds important in the dispersal of some species on coral cays and continental islands.
- Refer also to pages 29-30 of [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998).

Conservation status

- More than 70 Great Barrier Reef island plant species are listed as rare or threatened under Queensland and Commonwealth legislation and in the IUCN [Red Data Book](#) (Table 3).

Human Related Threats

- Coastal development
- Controlled fire regimes (e.g. remnant patch of Hoop Pine on Lizard Island; [Lucas *et al.* 1997](#))
- Introduced plant species: 15% of species found in the northern Great Barrier Reef, 55% in the southern Great Barrier Reef ([Wachenfeld 1998](#)).
- Pollution
- Tourism

Actions

- Queensland Parks and Wildlife Service are responsible for the [day-to-day management](#) of Island National Parks in the Great Barrier Reef World Heritage Area (GBRWhA)

- The GBRMPA's Species Conservation Program keeps a watching brief on information published about GBRWHA terrestrial flora and works with the day-to-day management Unit.

ISLAND FAUNA

- Knowledge
- Conservation Status
- Human related threats
- Actions



Knowledge

- The [Australian Faunal Directory](#) of the [Australian Biological Resources Study](#) (ABRS) serves as a source of taxonomic and biological information on all species known to occur in Australia. Refer to the tables titled 'Estimated Numbers of the Australian Fauna' and 'Details of Taxa Databased'.
- Refer to [The Outstanding Universal Value of the Great Barrier Reef World Heritage Area](#) (Lucas *et al.* 1997) as follows for summaries relating to the Great Barrier Reef:
 - **Amphibians:** At least seven species of frogs are known from the Great Barrier Reef World Heritage Area (GBRWhA), although the actual number is probably higher.
 - **Butterflies** (p.121): 118 species in the GBRWhA– 2 endemic subspecies; this represents 30% of all known species in Australia; several rare or little-known species occur.
 - **Other invertebrates** (Mather and Bennett 1993): Studies have found the invertebrates on Great Barrier Reef coral cays and continental islands include: pseudoscorpions, mites, spiders, centipedes, isopods and 36 families of insects in ten orders. However many taxa have not been identified and there have been few systematic surveys.
 - **Mammals:** Proserpine rock wallaby (*Petrogale persephone*) (p.182). Known only from Proserpine area and a few offshore islands in the Whitsundays. Queensland Parks and Wildlife Service (QPWS) have been studying the Proserpine rock wallaby for several years. Koalas (*Phascolarctos cinereus*), echidnas, possums, water rats and fruit bats are also known from islands in the GBRWhA.
 - **Reptiles** (p.124, Mather and Bennett 1993): Nine snake and 31 lizard species are known from islands/cays of the GBRWhA; species richness decreases with increasing latitude and increasing distance from the mainland. Snake species include: amethystine python (*Morelia amethystina*), death adder (*Acanthophis* sp.), a blind snake (*Ramphotyphlops polygrammicus*), two tree snakes (Brown tree snake - *Boiga irregularis*, Common tree snake - *Dendrelaphis punctulata*), slaty-grey snake (*Stegonotus cucullatus*), yellow-faced whip snake (*Demansia psammophis*), collared whip snake (*D. torquata*), brown headed snake (*Furina tristis*) and an undescribed *Cacophis* sp. Lizards include six species of gecko, one legless lizard, two goannas and 22 species of skinks. However many taxa have not been identified and there have been few systematic surveys.
- Refer also to page 57, of [State of the Great Barrier Reef World Heritage Area 1998](#) (Wachenfeld 1998).

Conservation status

- Table 1
- Table 3

Human Related Threats

- Coastal development
- Invasive species
- Pollution
- Tourism

Actions

- Queensland Parks and Wildlife Service are responsible for the day-to-day management of island [National Parks](#) in the GBRWHA.
- The Great Barrier Reef Marine Park Authority's Species Conservation Program keeps a watching brief on information published about GBRWHA island fauna and works with the day-to-day management unit.
- Captive-bred Proserpine rock wallabies from QPWS in Townsville have since 1998 been successfully released onto Hayman Island (as part of their recovery plan) where breeding has continued. Further actions of the recovery plan include habitat mapping and protection, roadside reflectors and monitoring of colony sites. The recovery plan for Proserpine rock wallaby is available from the following website:
<http://www.epa.qld.gov.au/>

TABLE 1. THREATENED SPECIES KNOWN TO OCCUR IN THE GREAT BARRIER REEF WORLD HERITAGE AREA AND LISTED UNDER THE BONN CONVENTION OR CITES AGREEMENT (INCLUDES EXPLANATORY NOTES)

Disclaimer Whilst every attempt has been made to include Great Barrier Reef species that are listed under the Bonn Convention or CITES agreement, for certainty the original source documents should be examined.

Common Name	Scientific Name	Bonn Convention		CITES	
		App I*	App II**	App I	App II
Reptiles					
Flatback turtle	<i>Natator depressus</i>			X	
Green turtle	<i>Chelonia mydas</i>	X	X	X	
Hawksbill turtle	<i>Eretmochelys imbricata</i>	X	X	X	
Leatherback turtle	<i>Dermochelys coriacea</i>	X	X	X	
Loggerhead turtle	<i>Caretta caretta</i>	X	X	X	
Olive ridley turtle	<i>Lepidochelys olivacea</i>	X	X	X	
Estuarine crocodile	<i>Crocodylus porosus</i>		X	X	
Freshwater crocodile	<i>Crocodylus johnstoni</i>				X
Seabirds					
Grey-headed albatross	<i>Dionedeia chrysostoma</i>		X		
Little tern	<i>Sterna albifrons</i>		X		
Sooty albatross	<i>Phoebetria fusca</i>		X		
Southern giant petrel	<i>Macronectes giganteus</i>		X		
Wandering albatross	<i>Diomedea exulans</i>		X		
Marine Mammals					
Subantarctic fur seal	<i>Arctocephalus tropicalis</i>				X
Dugong	<i>Dugong dugon</i>		X	X	
Blue whale	<i>Balaenoptera musculus</i>	X		X	
Bottlenose dolphin	<i>Tursiops truncatus</i>				X
Bryde’s whale	<i>Balaenoptera edeni</i>		X	X	
Cuvier’s beaked whale	<i>Ziphius cavirostris</i>				X
Dwarf sperm whale	<i>Kogia simus</i>				X
False killer whale	<i>Pseudorca crassidens</i>				X
Fin whale	<i>Balaenoptera physalus</i>	X	X	X	
Fraser’s dolphin	<i>Lagenodelphis hosei</i>				X
Humpback whale	<i>Megaptera novaeangliae</i>	X		X	
Indo-pacific hump-backed dolphin	<i>Sousa chinensis</i>		X	X	
Irrawaddy dolphin	<i>Orcaella brevirostris</i>		X		X
Killer whale (Orca)	<i>Orcinus orca</i>				X
Long-finned pilot whale	<i>Globicephala melas</i>				X
Longman’s beaked whale	<i>Indopacetus pacificus</i>				X
Melon-headed whale	<i>Peponocephala electra</i>				X
Minke whale	<i>Balaenoptera acutorostrata</i>			X	
Pantropical spotted dolphin	<i>Stenella attenuata</i>				X
Pygmy killer whale	<i>Feresa attenuata</i>				X
Pygmy sperm whale	<i>Kogia breviceps</i>				X
Risso’s dolphin	<i>Grampus griseus</i>				X
Sei whale	<i>Balaenoptera borealis</i>	X	X	X	
Short-beaked common dolphin	<i>Delphinus delphis</i>				X
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>				X
Sperm whale	<i>Physeter macrocephalus</i>	X	X	X	

Common Name	Scientific Name	Bonn Convention		CITES	
		App I*	App II**	App I	App II
Spinner dolphin	<i>Stenella longirostris</i>				X
Striped dolphin	<i>Stenella coeruleoalba</i>				X
Sharks, Skates and Rays					
Whale shark	<i>Rhincodon typus</i>		X		X
Great white shark	<i>Carcharias carcharas</i>	X	X		
Fish					
Maori wrass	<i>Cheilinus undulatus</i>				X
Seahorses					
	<i>Hippocampus spp.</i>				X
Marine Invertebrates					
	<i>Hippopus hippopus</i>				X
	<i>Tridacna crocea</i>				X
	<i>Tridacna derasa</i>				X
	<i>Tridacna gigas</i>				X
	<i>Tridacna maxima</i>				X
	<i>Tridacna squamosa</i>				X
Stony corals					X
Island Fauna					
Australian bustard	<i>Ardeotis australis</i>				X
Australian hobby	<i>Falco longipennis</i>				X
Australian kestrel	<i>Falco cenchroides</i>				X
Australian masked-owl	<i>Tyto novaehollandiae</i>				X
Barn owl	<i>Tyto alba</i>				X
Black-shouldered kite	<i>Elanus axillaris</i>				X
Brahminy kite	<i>Haliastur indus</i>				X
Brolga	<i>Grus rubicunda</i>				X
Brown falcon	<i>Falco berigora</i>				X
Brown goshawk	<i>Accipiter fasciatus</i>				X
Butterfly	<i>Danaus plexippus</i>		X		
Grey falcon	<i>Falco hypoleucos</i>				X
Grey goshawk	<i>Accipiter novaehollandiae</i>				X
Gurney's eagle	<i>Aquila gurneyi</i>				X
Magnificent riflebird	<i>Ptiloris magnificus</i>				X
Osprey	<i>Pandion haliaetus</i>		X		X
Pacific Baza	<i>Aviceda subcristata</i>				X
Peregrine falcon	<i>Falco peregrinus</i>		X		
Rainbow lorikeet	<i>Trichoglossus haematodus</i>				X
Rastern grass-owl	<i>Tyto capensis</i>				X
Red-tailed black cockatoo	<i>Calyptorhynchus banksii</i>				X
Rufous owl	<i>Ninox rufa</i>				X
Southern boobook	<i>Ninox novaeseelandiae</i>				X
Sulphur-crested cockatoo	<i>Cacatua galerita</i>				X
Swamp harrier	<i>Circus approximans</i>				X
Trumpet manucode	<i>Manucodia keraudrenii</i>				X
Victoria's riflebird	<i>Ptiloris victoriae</i>				X
Wedge-tailed eagle	<i>Aquila audax</i>				X
Whistling kite	<i>Haliastur sphenurus</i>				X
White-eyed buzzard	<i>Butastur teesa</i>				X

¹ Appendix III - CITES: cattle egret (*Ardea ibis*), great egret (*Ardea alba*), little egret (*Egretta garzetta*)

Appendix I* of the Bonn Convention lists migratory species that are endangered. Appendix II** lists migratory species that have an unfavourable conservation status and that require international agreements for their conservation and management, as well as those that have a conservation status that would benefit significantly from international co-operation and agreement.

Species listed on Appendix I of CITES include those threatened with extinction that are or may be affected by trade. Trade in specimens of these species is subject to particularly strict regulation in order not to endanger further their survival and can only be authorised in exceptional circumstances. Species listed on Appendix II include: (a) species which, although not necessarily now threatened with extinction, may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilisation incompatible with their survival; and (b) other species which must be subject to regulation in order that trade in specimens of certain species referred to in sub-paragraph (a) of this paragraph may be brought under effective control.

TABLE 2. BIRDS KNOWN TO OCCUR IN THE GREAT BARRIER REEF WORLD HERITAGE AREA AND LISTED UNDER THE JAMBA AND CAMBA AGREEMENTS

Disclaimer Whilst every attempt has been made to include Great Barrier Reef species that are listed under the JAMBA and CAMBA agreements, for certainty the original source documents should be examined.

Species	Scientific Name	JAMBA	CAMBA
Asiatic common tern	<i>Sterna hirundo</i>	X	X
Bar-tailed godwit	<i>Limosa lapponica</i>	X	X
Black tern	<i>Chlidonias niger</i>		X
Black-naped tern	<i>Sterna sumatrana</i>	X	X
Black-tailed godwit	<i>Limosa limosa</i>	X	X
Bridled tern	<i>Sterna anaethetus</i>		X
Brown booby	<i>Sula leucogaster</i>	X	X
Caspian plover	<i>Charadrius asiaticus</i>	X	
Caspian tern	<i>Sterna caspia</i>		X
Cattle egret	<i>Ardea ibis</i>	X	X
Common noddy	<i>Anous stolidus</i>	X	X
Common sandpiper	<i>Actitis hypoleucos</i>	X	X
Crested tern	<i>Sterna bergii</i>	X	
Curlew sandpiper	<i>Calidris ferruginea</i>	X	X
Eastern curlew	<i>Numenius madagascariensis</i>	X	X
Eastern reef egret	<i>Egretta sacra</i>	X	
Fleshy-footed shearwater	<i>Puffinus carneipes</i>	X	
Glossy ibis	<i>Plegadis falcinellus</i>		X
Great egret	<i>Ardea alba</i>		X
Great knot	<i>Calidris tenuirostris</i>	X	X
Greater frigatebird	<i>Fregata minor</i>	X	X
Greater sand dotterel	<i>Charadrius leschenaultii</i>	X	X
Greenshank	<i>Tringa nebularia</i>	X	X
Grey plover	<i>Pluvialis squatarola</i>	X	X
Grey-tailed tattler	<i>Heteroscelus brevipes</i>	X	X
Lesser crested tern	<i>Sterna bengalensis</i>		X
Lesser frigatebird	<i>Fregata ariel</i>	X	X
Lesser golden plover	<i>Pluvialis dominica</i>	X	X
Lesser sand plover	<i>Charadrius mongolus</i>	X	X
Little curlew	<i>Numenius minutus</i>	X	X
Little tern	<i>Sterna albifrons</i>	X	X
Marsh sandpiper	<i>Tringa stagnatillis</i>	X	X
Masked booby	<i>Sula dactylatra</i>	X	
Oriental cuckoo	<i>Cuculus saturatus</i>	X	X
Pin-tailed snipe	<i>Gallinago stenura</i>	X	
Red knot	<i>Calidris canutus</i>	X	X
Red-footed booby	<i>Sula sula</i>	X	X
Red-necked stint	<i>Calidris ruficollis</i>	X	X
Ruddy turnstone	<i>Arenaria interpres</i>	X	X
Sanderling	<i>Calidris alba</i>	X	X
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	X	X

Species	Scientific Name	JAMBA	CAMBA
Swinhoe's snipe	<i>Gallinago megala</i>		X
Terek sandpiper	<i>Xenus cinereus</i>	X	X
Wandering tattler	<i>Heteroscelus brevipes</i>	X	
Wedge-tailed shearwater	<i>Puffinus pacificus</i>	X	
Whimbrel	<i>Numenius phaeopus</i>	X	X
White egret	<i>Egretta alba</i>	X	
White-bellied sea eagle	<i>Haliaeetus leucogaster</i>		X
White-tailed tropicbird	<i>Phaethon lepturus</i>	X	X
White-throated needletail	<i>Hirundapus caudacutus</i>	X	X
White-winged black tern	<i>Chlidonias leucopterus</i>	X	X
Wilson's storm petrel	<i>Oceanites oceanicus</i>	X	
Wood sandpiper	<i>Tringa glareola</i>	X	X

TABLE 3. THREATENED SPECIES KNOWN TO OCCUR IN THE GREAT BARRIER REEF WORLD HERITAGE AREA AND LISTED BY THE [IUCN RED DATA BOOK](#), OR UNDER QUEENSLAND OR COMMONWEALTH LEGISLATION

Disclaimer. Whilst every attempt has been made to include Great Barrier Reef species that are listed by the IUCN Red Data Book or under Queensland or Commonwealth legislation, for certainty the original source documents should be examined.

DD - Data deficient; LMa-Listed marine species; NS-Not Scheduled; LR (cd) - Lower risk, conservation dependent; LR (nt) - Lower risk, near threatened.

Common Name	Scientific Name	Commonwealth Environment Protection and Biodiversity Conservation Act 1999	Queensland Nature Conservation (Wildlife) Regulation 1994	The World Conservation Union (IUCN) Red Data Book
Reptiles				
Flatback turtle	<i>Natator depressus</i>	Vulnerable	Vulnerable	DD
Green turtle	<i>Chelonia mydas</i>	Vulnerable	Vulnerable	Endangered
Hawksbill turtle	<i>Eretmochelys imbricata</i>	Vulnerable	Vulnerable	Critically Endangered
Leatherback turtle	<i>Dermochelys coriacea</i>	Vulnerable	Endangered	Endangered
Loggerhead turtle	<i>Caretta caretta</i>	Endangered	Endangered	Endangered
Olive ridley turtle	<i>Lepidochelys olivacea</i>	Endangered	Endangered	Endangered
Estuarine crocodile	<i>Crocodylus porosus</i>	LMa	Vulnerable	NS
Seabirds				
Grey-headed albatross	<i>Dionedeia chrysostoma</i>	Vulnerable	Common	LR (nt)
Herald petrel	<i>Pterodroma heraldica</i>	Critically endangered	Endangered	NS
Little tern	<i>Sterna albifrons</i>	LMa	Endangered	NS
Northern giant petrel	<i>Macronectes halli</i>	Vulnerable	Common	NS
Red-tailed tropicbird	<i>Phaethon rubricauda</i>	LMa	Vulnerable	NS
Sooty albatross	<i>Phoebastria fusca</i>	Vulnerable	Common	NS
Southern giant petrel	<i>Macronectes giganteus</i>	Endangered	Common	NS
Wandering albatross	<i>Diomedea exulans</i>	Vulnerable	Common	Vulnerable
Marine Mammals				
Blue whale	<i>Balaenoptera musculus</i>	Endangered	Common	Endangered
Bottlenose dolphin	<i>Tursiops truncatus</i>	NS	Common	DD
Bryde's whale	<i>Balaenoptera edeni</i>	NS	Common	DD
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	NS	Common	DD
Dense-beaked whale	<i>Mesoplodon densirostris</i>	NS	Common	DD
Dugong	<i>Dugong dugon</i>	NS	Vulnerable	Vulnerable

Common Name	Scientific Name	Commonwealth <u>Environment Protection and Biodiversity Conservation Act 1999</u>	Queensland <u>Nature Conservation (Wildlife) Regulation 1994</u>	The World Conservation Union (IUCN) Red Data Book
Fin whale	<i>Balaenoptera physalus</i>	Vulnerable	Common	Endangered
Fraser's dolphin	<i>Lagenodelphis hosei</i>	NS	Common	DD
Humpback whale	<i>Megaptera novaeangliae</i>	Vulnerable	Vulnerable	Vulnerable
Indo-pacific hump-backed dolphin	<i>Sousa chinensis</i>	NS	Rare	DD
Irrawaddy dolphin	<i>Orcaella brevirostris</i>	NS	Rare	DD
Killer whale (Orca)	<i>Orcinus orca</i>	NS	Common	LR (cd)
Longman's beaked whale	<i>Mesoplodon pacificus</i>	NS	Common	DD
Minke whale	<i>Balaenoptera acutorostrata</i>	NS	Common	LR (nt)
Pantropical spotted dolphin	<i>Stenella attenuata</i>	NS	Common	LR (cd)
Pygmy killer whale	<i>Feresa attenuata</i>	NS	Common	DD
Risso's dolphin	<i>Grampus griseus</i>	NS	Common	DD
Rough-toothed dolphin	<i>Steno bredanensis</i>	NS	Common	DD
Sei whale	<i>Balaenoptera borealis</i>	Vulnerable	Common	Endangered
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	NS	Common	LR (cd)
Sperm whale	<i>Physeter macrocephalus</i>	NS	Common	Vulnerable
Spinner dolphin	<i>Stenella longirostris</i>	NS	Common	LR (cd)
Strap-toothed beaked whale	<i>Mesoplodon layardii</i>	NS	Common	DD
Striped dolphin	<i>Stenella coeruleoalba</i>	NS	Common	LR (cd)
Subantarctic fur seal	<i>Arctocephalus tropicalis</i>	Vulnerable	NS	NS
Whale shark	<i>Rhincodon typus</i>	Vulnerable	NS	NS
Sharks, Skates and Rays				
Banded wobbegong	<i>Orectolobus ornatus</i>	NS	NS	DD
Black shark	<i>Dalatias licha</i>	NS	NS	DD
Blacktip tope shark	<i>Hypogaleus hyugaensis</i>	NS	NS	LR (lc)
Bluespotted ribbontail ray	<i>Taeniura lymma</i>	NS	NS	LR (lc)
Bull shark	<i>Carcharhinus leucas</i>	NS	NS	LR (lc)
Colclough's shark	<i>Brachaelurus colcloughi</i>	NS	NS	Vulnerable
Common blacktip shark	<i>Carcharhinus limbatus</i>	NS	NS	DD
Crocodile shark	<i>Psudocarcharias kamoharai</i>	NS	NS	LR (lc)
Estuary stingray	<i>Dasyatis fluviorum</i>	NS	NS	LR (nt)

Common Name	Scientific Name	Commonwealth <u>Environment Protection and Biodiversity Conservation Act 1999</u>	Queensland <u>Nature Conservation (Wildlife) Regulation 1994</u>	The World Conservation Union (IUCN) Red Data Book
Great hammerhead	<i>Sphyrna mokarran</i>	NS	NS	LR (lc)
Great white shark	<i>Carcharias carcharias</i>	Vulnerable	NS	Vulnerable
Grey nurse shark	<i>Carcharias Taurus</i>	Critically endangered	NS	Vulnerable
Grey reef shark	<i>Carcharinus amblyrhynchos</i>	NS	NS	LR (lc)
Manta ray	<i>Manta birostris</i>	NS	NS	LR (lc)
Porcupine ray	<i>Urogygnus asperrimus</i>	NS	NS	LR (nt)
Sandbar shark	<i>Carcharhinus plumbeus</i>	NS	NS	LR (nt)
Scalloped hammerhead	<i>Sphyrna lewini</i>	NS	NS	LR (lc)
Shortfin mako	<i>Isurus oxyrinchus</i>	NS	NS	LR (lc)
Silky shark	<i>Carcharinu sfalciformis</i>	NS	NS	LR (lc)
Spinner shark	<i>Carcharinu brevipinnas</i>	NS	NS	LR (lc)
Spotted eagle ray	<i>Aetobatus narinari</i>	NS	NS	LR (lc)
Tiger shark	<i>Galeocерdo cuvier</i>	NS	NS	LR (lc)
Whale shark	<i>Rhincodon typus</i>	NS	NS	DD
Whitespot giant guitarfish	<i>Rhynchobatus djiddensis</i>	NS	NS	LR (lc)
Whitetip reef shark	<i>Triaenodon obesus</i>	NS	NS	LR (lc)
Syngnathids				
Dunker's pipehorse	<i>Solegnathus dunckeri</i>	LMa	NS	Vulnerable
Qld spiny pipehorse	<i>Solegnathus hardwickii</i>	LMa	NS	Vulnerable
Hedge hog seahorse	<i>Hippocampus spinosissimus</i>	LMa	NS	Vulnerable
Narrow-bellied seahorse	<i>Hippicampus angustus</i>	LMa	NS	Vulnerable
Yellow seashores	<i>Hippocampus kuda</i>	LMa	NS	Vulnerable
Three spot seahorse	<i>Hippocampus trimaculatus</i>	LMa	NS	Vulnerable
White's seahorse	<i>Hippocampus whitei</i>	LMa	NS	Vulnerable
Double-ended pipehorse	<i>Syngnathoides biaculeatus</i>	LMa	NS	DD
Banded pipefish	<i>Doryrhamphus dactyliophorus</i>	LMa	NS	DD
Pygmy seahorse	<i>Hippocampus bargibanti</i>	LMa	NS	DD
Marine Fishes				
Bar cod	<i>Epinephelus ergastularius</i>	NS	NS	DD
Barramundi cod	<i>Cromileptes altivelis</i>	NS	NS	LR (cd)
Black rockcod	<i>Epinephelus daemeli</i>	NS	NS	Vulnerable

Common Name	Scientific Name	Commonwealth <u>Environment Protection and Biodiversity Conservation Act 1999</u>	Queensland <u>Nature Conservation (Wildlife) Regulation 1994</u>	The World Conservation Union (IUCN) Red Data Book
Camouflage grouper	<i>Epinephelus polyphedakion</i>	NS	NS	LR (lc)
Estuary rockcod	<i>Epinephelus coioides</i>	NS	NS	LR (lc)
Flowery cod	<i>Epinephelus fuscoguttatus</i>	NS	NS	LR (lc)
Greasy grouper	<i>Epinephelus tauvina</i>	NS	NS	LR (lc)
Humphead maori wrasse	<i>Cheilinus undulatus</i>	NS	NS	LR (cd)
Humpheaded parrotfish	<i>Bolbometopon muricatum</i>	NS	NS	DD
Malabar grouper	<i>Epinephelus malabaricus</i>	NS	NS	LR (lc)
Multicolour dottyback	<i>Ogilbrynna novaehollandiae</i>	NS	NS	DD
Potato cod	<i>Epinephelus tukula</i>	NS	NS	LR (cd)
Purple rockcod	<i>Epinephelus cyanopodus</i>	NS	NS	LR (lc)
Queensland grouper	<i>Epinephelus lanceolatus</i>	NS	NS	LR (cd)
Sculptured frogfish	<i>Halophryne queenslandiae</i>	NS	NS	LR (nt)
Swordfish	<i>Xiphias gladius</i>	NS	NS	DD
Island Fauna				
Beach stone-curlew	<i>Esacus neglectus</i>	LMa	Vulnerable	NS
Black-necked stork	<i>Ephipporhynchus asiaticus</i>	LMa	Rare	NS
Blue-faced parrot-finch	<i>Erythrura trichroa</i>	LMa	Rare	NS
Bower's shrike-thrush	<i>Colluricincla boweri</i>	LMa	Common	LR (nt)
Eastern curlew	<i>Numenius madagascariensis</i>	LMa	Rare	LR (nt)
Grey falcon	<i>Falco hypoleucos</i>	LMa	Rare	Vulnerable
Grey goshawk	<i>Accipiter novaehollandiae</i>	LMa	Rare	NS
Grey-headed robin	<i>Heteromyias albispectus</i>	LMa	Common	LR (nt)
Lewin's rail	<i>Rallus pectoralis</i>	LMa	Rare	NS
Proserpine rock wallaby	<i>Petrogale persephone</i>	Endangered	Endangered	Endangered
Radjah shelduck	<i>Tadorna radjah</i>	LMa	Rare	NS
Rufous owl southern subspecies	<i>Ninox rufa</i>	LMa	Vulnerable	NS
Sooty oystercatcher	<i>Haematopus fuliginosus</i>	LMa	Rare	NS
Southern cassowary	<i>Casuaris casuaris</i>	Endangered	Endangered	Vulnerable
White-rumped swiftlet	<i>Collocalia spodiopygius</i>	LMa	Rare	NS
Yellow chat (Dawson)	<i>Epthianura crocea macgregori</i>	Critically endangered	Vulnerable	LR (nt)
Island Flora				

Common Name	Scientific Name	Commonwealth <u>Environment Protection and Biodiversity Conservation Act 1999</u>	Queensland <u>Nature Conservation (Wildlife) Regulation 1994</u>	The World Conservation Union (IUCN) Red Data Book
	<i>Acacia homaloclada</i>	NS	Rare	Rare
	<i>Acacia jackesiana</i>	NS	Rare	Rare
	<i>Acacia polyadenia</i>	NS	Rare	Rare
	<i>Acmenosperma pringlei</i>	NS	Rare	Rare
	<i>Actephila sessilifolia</i>	NS	Rare	Rare
	<i>Albizia retusa</i> subsp. <i>retusa</i>	NS	Rare	NS
	<i>Amaranthus pallidiflorus</i>	NS	Rare	NS
	<i>Aphyllorchis queenslandica</i>	NS	Rare	NS
	<i>Archidendron hirsutum</i>	NS	Rare	Rare
Australian Arenga Palm	<i>Arenga australasica</i>	Vulnerable	Vulnerable	NS
	<i>Aristolochia chalmersii</i>	NS	Rare	NS
	<i>Atalaya rigida</i>	NS	Rare	Rare
	<i>Austromyrtus lucida</i>	NS	Rare	Rare
	<i>Austromyrtus pubiflora</i>	NS	Rare	Rare
	<i>Banksia plagiocarpa</i>	NS	Rare	Rae
	<i>Berrya rotundifolia</i>	NS	Rare	NS
	<i>Bonamia dietrichiana</i>	NS	Rare	NS
	<i>Brachychiton compactus</i>	NS	Rare	Rare
	<i>Buchanania mangoides</i>	NS	Rare	NS
	<i>Capparis</i> sp. (Gloucester Island, Batianoff 920912)	NS	Rare	NS
	<i>Cassia queenslandica</i>	NS	Rare	Rare
	<i>Cassia</i> sp. (Paluma Range G., Sankoswky+ 450)	NS	Rare	NS
	<i>Cerbera dumicola</i>	NS	Rare	Rare
	<i>Cerbera inflata</i>	NS	Rare	Rare
	<i>Cleistanthus myrtianthus</i>	NS	Rare	NS
	<i>Combretum trifoliatum</i>	NS	Rare	NS
	<i>Comesperma praecelesum</i>	NS	Rare	Rare
	<i>Corchorus hygrophilus</i>	NS	Rare	NS
	<i>Croton magneticus</i>	Vulnerable	Vulnerable	Vulnerable

Common Name	Scientific Name	Commonwealth <u>Environment Protection and Biodiversity Conservation Act 1999</u>	Queensland <u>Nature Conservation (Wildlife) Regulation 1994</u>	The World Conservation Union (IUCN) Red Data Book
	<i>Ctenopteris blechnoides</i>	Vulnerable	Rare	NS
	<i>Dendrobium johannis</i>	Vulnerable	Vulnerable	Vulnerable
	<i>Dendrobium phalaenopsis</i>	Vulnerable	Vulnerable	Vulnerable
	<i>Didymoplexus pallenscrystal bells</i>	NS	Rare	NS
	<i>Dipodium ensifolium</i>	NS	Rare	Rare
	<i>Dischidia littoralis</i>	Vulnerable	Vulnerable	NS
	<i>Drosera adela</i>	NS	Rare	Rare
	<i>Ehretia grahamii</i>	NS	Rare	Rare
	<i>Elaeocarpus carolinae</i>	NS	Rare	Rare
	<i>Eucalyptus xanthope</i>	Vulnerable	Vulnerable	Vulnerable
	<i>Gahnia insignis</i>	NS	Rare	Rare
	<i>Grewia graniticola</i>	NS	Rare	NS
	<i>Gymnema brevifolium</i>	NS	Vulnerable	Vulnerable
	<i>Gymnostoma australianum</i>	NS	Rare	Rare
	<i>Habenaria divaricata</i>	NS	Endangered	Endangered
	<i>Habenaria xanthantha</i>	NS	Rare	Rare
	<i>Huperzia phlegmaria</i>	NS	Rare	NS
	<i>Ipomoea saintronanensis</i>	NS	Rare	NS
	<i>Kunzea graniticola</i>	NS	Rare	Rare
	<i>Larsenaikia jardinei</i>	NS	Rare	NS
	<i>Leucopogon cuspidatus</i>	Vulnerable	Vulnerable	Vulnerable
	<i>Livistona drudei</i>	NS	Vulnerable	Vulnerable
	<i>Macaranga polyadenia</i>	NS	Vulnerable	NS
	<i>Macropteranthes fitzalanii</i>	NS	Rare	Rare
	<i>Muellerargia timorensis</i>	NS	Endangered	NS
	<i>Myrmecodia beccarii</i>	Vulnerable	Vulnerable	NS
	<i>Omphalea celata</i>	Vulnerable	Vulnerable	NS
	<i>Ozothamnus eriocephalus</i>	Vulnerable	Vulnerable	Vulnerable
	<i>Peripleura scabra</i>	NS	Rare	NS
	<i>Peristylus banfieldii</i>	NS	Rare	NS
	<i>Psychotria coelospermum</i>	NS	Rare	NS

Common Name	Scientific Name	Commonwealth <u>Environment Protection and Biodiversity Conservation Act 1999</u>	Queensland <u>Nature Conservation (Wildlife) Regulation 1994</u>	The World Conservation Union (IUCN) Red Data Book
	<i>Psychotria lorentzii</i>	NS	Rare	NS
Quassia	<i>Quassia bidwillii</i>	Vulnerable	Rare	Rare
	<i>Rhodamnia pauciovulata</i>	NS	Rare	Rare
	<i>Solanum sporadotrichum</i>	NS	Rare	Rare
	<i>Spathoglottis plicata</i>	Vulnerable	Vulnerable	NS
	<i>Stackhousia tryonii</i>	NS	Rare	Rare
	<i>Stenocarpus cryptocarpus</i>	NS	Rare	Rare
	<i>Syzygium alatoramulum</i>	NS	Rare	Rare
	<i>Tephrosia savannicola</i>	NS	Rare	NS
	<i>Tetramolopium</i> sp. (Mt Bowen, G.D. Fell 1224)	NS	Rare	NS
	<i>Tiliacora australiana</i>	NS	Rare	Rare
	<i>Tinospora angusta</i>	NS	Rare	NS
	<i>Wrightia versicolor</i>	NS	Rare	Rare
	<i>Xylosma ovatum</i>	NS	Rare	Rare

TABLE 4 CONSERVATION STATUS SUGGESTED BY [POGONOSKI ET AL. \(2002\)](#) FOR SYNGNATHIDS FOUND IN THE GREAT BARRIER REEF

Disclaimer. Conservation status is according to IUCN categories and criteria.

Common Name	Scientific Name	Status
Banded pipefish	<i>Doryrhamphus dactyliophorus</i>	Lower risk, least concern
Low-crown seahorse	<i>Hippocampus dahli</i>	Lower risk, near threatened
Winged seahorse	<i>Hippocampus alatus</i>	Data deficient
Gorgonian seahorse	<i>Hippocampus bargibanti</i>	Data deficient
Eastern spiny seahorse	<i>Hippocampus hendriki</i>	Data deficient
Highcrown seahorse	<i>Hippocampus procerus</i>	Data deficient
Queensland seahorse	<i>Hippocampus queenslandicus</i>	Data deficient
Common seahorse	<i>Hippocampus taeniopterus</i>	Data deficient
Zebra seahorse	<i>Hippocampus zebra</i>	Data deficient
Duncker's pipefish	<i>Solegnathus dunckeri</i>	Data deficient
Pallid pipefish	<i>Solegnathus hardwickii</i>	Data deficient
Alligator pipefish	<i>Syngnathoides biaculeatus</i>	Data deficient

TABLE 5 CONSERVATION STATUS SUGGESTED BY [POGONOSKI ET AL. \(2002\)](#) FOR SHARKS AND RAYS FOUND IN THE GREAT BARRIER REEF

Disclaimer. Conservation status is according to IUCN categories and criteria.

Common name	Scientific Name	Status
Grey nurse shark	<i>Carcharias taurus</i>	Endangered
Great white shark	<i>Carcharias carcharias</i>	Vulnerable
Colclough's shark	<i>Brachaelurus colcloughi</i>	Vulnerable
Crocodile shark	<i>Pseudocarcharias kamoharai</i>	Lower risk – least concern
Shortfin Mako	<i>Isurus oxyrinchus</i>	Lower risk – least concern
Blacktip Topeshark	<i>Hypogaleus hyagaensis</i>	Lower risk – least concern
Grey Reef shark	<i>Carcharhinus amblyrhynchos</i>	Lower risk – least concern
Spinner shark	<i>Carcharias brevipinna</i>	Lower risk – least concern
Silky shark	<i>Carcharias falciformis</i>	Lower risk – least concern
Bull shark	<i>Carcharias leucas</i>	Lower risk – least concern
Tiger shark	<i>Galeocerdo cuvier</i>	Lower risk – least concern
Whitetip reef shark	<i>Triaenodon obesus</i>	Lower risk – least concern
Scalloped Hammerhead	<i>Sphyrna lewini</i>	Lower risk – least concern
Great Hammerhead	<i>Sphyrna mokarran</i>	Lower risk – least concern
Whitespot Giant Guitarfish	<i>Rhynchobatus djiddensis</i>	Lower risk – least concern
Bluespotted Ribbontail ray	<i>Taeniura lymna</i>	Lower risk – least concern
Spotted Eagle ray	<i>Aetobatus narinari</i>	Lower risk – least concern
Manta ray	<i>Manta birostris</i>	Lower risk – least concern
Estuary stingray	<i>Dasyatis fluviorum</i>	Lower risk- near threatened
Porcupine ray	<i>Urogymnus asperrimus</i>	Lower risk- near threatened
Sandbar shark	<i>Carcharhinus plumbeus</i>	Lower risk - near threatened
Black whaler	<i>Carcharhinus obscurus</i>	Lower risk - near threatened
Banded wobbegong	<i>Orectolobus ornatus</i>	Data deficient
Whale shark	<i>Rhincodon typus</i>	Data deficient
Blacktip shark	<i>Carcharhinus limbatus</i>	Data deficient
Gulper shark	<i>Centrophorus granulosus</i>	Data deficient
Black shark	<i>Dalatias licha</i>	Data deficient

TABLE 6 CONSERVATION STATUS SUGGESTED BY [POGONOSKI ET AL. \(2002\)](#) FOR BONY FISH FOUND IN THE GREAT BARRIER REEF

Disclaimer. Conservation status is according to IUCN categories and criteria.

Common Name	Scientific Name	Status
Freshwater sawfish	<i>Pristis microdon</i>	Critically endangered
Dwarf sawfish	<i>Pristis clavata</i>	Endangered
Narrow sawfish	<i>Anoxypristis cuspidata</i>	Vulnerable
Black rockcod	<i>Epinephelus daemeli</i>	Vulnerable
Barramundi cod	<i>Cromileptes altivelis</i>	Lower risk, conservation dependent
Queensland grouper	<i>Epinephelus lanceolatus</i>	Lower risk, conservation dependent
Potato cod	<i>Epinephelus tukula</i>	Lower risk, conservation dependent
Humphead maori wrasse	<i>Cheilinus undulatus</i>	Lower risk, conservation dependent
Sculptured frogfish	<i>Halophryne queenslandiae</i>	Lower risk, near threatened
Estuary cod	<i>Epinephelus coioides</i>	Lower risk, least concern
Purple Rockcod	<i>Epinephelus cyanopodus</i>	Lower risk, least concern
Multicolour dottyback	<i>Ogilbyina novaehollandiae</i>	Lower risk, least concern
Flowery cod	<i>Epinephelus fuscoguttatus</i>	Lower risk, least concern
Malabar grouper	<i>Epinephelus malabaricus</i>	Lower risk, least concern
Camouflage cod	<i>Epinephelus polyphekadion</i>	Lower risk, least concern
Greasy cod	<i>Epinephelus tauvina</i>	Lower risk, least concern
Humpheaded parrotfish	<i>Bolbometopon muricatum</i>	Data deficient
Bar rockcod	<i>Epinephelus ergastularius</i>	Data deficient
Swordfish	<i>Xiphias gladius</i>	Data deficient

TABLE 7. 'VULNERABLE' MARINE MACROALGAE IN THE GREAT BARRIER REEF AS DERIVED FROM A NATIONAL ASSESSMENT BY [CHESHIRE ET AL. \(2000\)](#)

Family	Scientific Name	# Locations in Australia	Range (km)	Locations in the GBRWHA
Division: Chlorophyta				
Udoteaceae	<i>Avrainvillea ridleyi</i>	2	1793	Capricornia
Cladophoraceae	<i>Cladophorella calcicola</i>	4	1224	Capricornia, Hinchinbrook Island
Halimedaceae	<i>Halimeda magnidisca</i>	2	967	Heron Island, Green Island
Cladophoraceae	<i>Rhizoclonium capillare</i>	5	1392	Capricornia, Townsville, Hinchinbrook Island, Cape Tribulation
Division: Heterokontophyta; Class Phaeophyceae				
Dictyotaceae	<i>Dictyopteris crassinervia</i>	4	2074	Keswick Island
Dictyotaceae	<i>Dictyota bifurca</i>	2	2178	Port Denison
Ralfsiaceae	<i>Mesopora schmidtii</i>	2	808	Capricornia, Hinchinbrook Island
Dictyotaceae	<i>Padina tetrastromatica</i>	4	1866	Townsville, Hinchinbrook Island, Cooktown
Division: Rhodophyta				
Areschougaceae	<i>Eucheuma sonderi</i>	2	968	Dunk Island
Ceramaceae	<i>Balliella grandis</i>	5	1166	One Tree Island, Heron Island, North West Island, Wistari Reef
Ceramaceae	<i>Gymnophycus hapsiphorus</i>	2	1124	One Tree Island
Ceramaceae	<i>Rhipidothamnion secundum</i>	3	1759	One Tree Island
Ceramaceae	<i>Seirospora orientalis</i>	3	3848	One Tree Island
Corallinaceae	<i>Amphiroa crassa</i>	3	2589	Lady Elliot Island, Lizard Island
Dumontiaceae	<i>Dudresnaya capricornia</i>	4	4333	One Tree Island
Halymeniaceae	<i>Cryptonemia caliculata</i>	2	1716	Heron Island
Halymeniaceae	<i>Halymenia lacerata</i>	2	558	Cape York
Halymeniaceae	<i>Thamnoclonium tissotii</i>	2	922	Dunk Island
Hypneaceae	<i>Hypnea rugulosa</i>	2	1561	Port Denison
Rhodomelaceae	<i>Bostrychia binderi</i>	4	2088	Townsville, Hinchinbrook Island, Cooktown
Rhodomelaceae	<i>Laurencia moretonensis</i>	3	1224	Ball Bay, Hinchinbrook Island
Rhodomelaceae	<i>Laurencia pinnatifida</i>	2	1222	Cape Upstart
Rhodomelaceae	<i>Melanamansia daemelii</i>	2	2455	Cape York
Rhodomelaceae	<i>Polysiphonia opaca</i>	2	907	Cannonvale
Rhodymeniaceae	<i>Gelidiopsis acrocarpa</i>	3	1443	Port Denison, Cape York
Uncertain Affinity	<i>Dicranemarosaliae</i>	2	1833	Townsville

TABLE 8. 'VULNERABLE WITH A NARROW RANGE' MARINE MACROALGAE IN THE GREAT BARRIER REEF AS DERIVED FROM A NATIONAL ASSESSMENT BY [CHESHIRE ET AL. 2000](#)

Family	Scientific Name	# Locations in Australia	Range (km)	Locations in the GBRWHA
Division: Rhodophyta				
Cladophoraceae	<i>Cladophora aokii</i>	2	266	Hinchinbrook Island, Cape Tribulation
Udoteaceae	<i>Rhipiliopsis echinocaulis</i>	2	392	Heron Island
Division: Rhodophyta				
Rhodomelaceae	<i>Chondria rainfordii</i>	2	117	Townsville, Hinchinbrook Island
Rhodymeniaceae	<i>Gelidiopsis scoparia</i>	3	189	Townsville, Magnetic Island, North Barnard Island
Gelidiaceae	<i>Gelidium crinale var perpusillum</i>	2	117	Townsville, Hinchinbrook Island
Gracilariaceae	<i>Gracilaria purpurascens</i>	3	117	Townsville, Magnetic Island, Hinchinbrook Island
Gracilariaceae	<i>Gracilaria rhodotricha</i>	2	116	Townsville, Britomart Reef
Corallinaceae	<i>Mesophyllum mesomorphum</i>	4	55	Lady Elliot Island
Corallinaceae	<i>Neogoniolithon laccadavicum</i>	2	191	Low Island, Lizard Island
Sebdeniaceae	<i>Sebdenia ceylanica</i>	3	280	Port Denison, Brampton island, Port Bowen