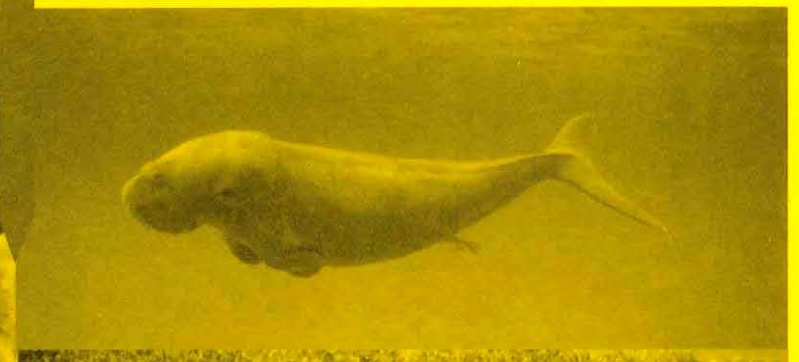
FAUNA and FLORA of the GREAT BARRIER REEF WORLD HERITAGE AREA



FIRST EDITION

Tony Stokes and **Kirstin Dobbs**
Species Conservation Program
Conservation, Biodiversity and World Heritage Group
Great Barrier Reef Marine Park Authority

GREAT BARRIER REEF
MARINE PARK AUTHORITY

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

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Notes:

1. **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.**
2. **Appendix 6 provides a list of abbreviations and acronyms used in this paper.**

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1. INTRODUCTION

The Great Barrier Reef is the world's largest coral reef ecosystem and one of just a few World Heritage Areas that meet all four natural World Heritage criteria. It is also the world's largest marine protected area. The Great Barrier Reef incorporates a large number of different habitats and environmental regimes because of its large 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. In part, because of all these attributes, the Great Barrier Reef Marine Park Authority (GBRMPA) has a responsibility to conserve species for the future.

The way in which GBRMPA manages for the conservation of species in the Great Barrier Reef World Heritage Area (GBRWHA) is determined mainly by legislative instrument and policy decisions. This Report has been prepared to explain the rationale behind the work priorities of the Species Conservation Program of GBRMPA. The Report will be reviewed and updated as additional information becomes available and in the light of changes to work priorities and budgets.

2. OBLIGATIONS TO RARE AND THREATENED SPECIES

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'*. Under the *Great Barrier Reef Marine Park Act 1975*, zoning plans are a principal tool for managing the Marine Park. In preparing zoning plans, 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 refinement of zoning plans, 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 park management tool is the requirement that a permission be acquired from the Authority prior to the undertaking of certain activities. In considering applications for relevant permissions, the Authority must have regard under s.18 (4) 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.18 (5) in relation to traditional fishing, hunting and gathering, *'the need for conservation of endangered species and, in particular, the capability of the relevant population of that species to sustain harvesting'*.

In addition to 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 provided that involve the identification of endangered species and threats to their survival, and the development and implementation of appropriate coordinated management actions. Logically, perhaps, the identification of species and threats would be expected to precede management actions for their conservation. But 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 GBRMPA must consider in determining its response to species conservation issues. This list is not exhaustive but rather gives a context for some of GBRMPA's obligations to various conventions and pieces of legislation.

2.1. INTERNATIONAL

- **Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)**

  By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory but also to protect its national heritage.

- **Convention on Biological Diversity**

  The Convention contains guiding concepts, such as the precautionary principle and each country is responsible for the conservation and sustainable use of its

biological resources. The Convention provides a framework for global action to conserve and use in a sustainable manner, biological diversity. It addresses the full range of biological diversity at genetic, species and ecosystem levels in all environments, both within and outside protected areas.

- **Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)**

  As signatory to this Convention, Australia acknowledges the importance of conservation of migratory species. The Government agrees to take action to this end whenever possible and appropriate, paying special attention to migratory species with an unfavourable conservation status. It also agrees to take appropriate and necessary steps to conserve such species and their habitat and to take action to avoid any migratory species becoming endangered. In particular, signatory countries are required to promote, co-operate in and support research relating to migratory species; to endeavour to provide immediate protection for migratory species included in Appendix I; and to endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II.

  Appendix I 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 the international co-operation and agreement.

  Species occurring in the 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)**

  This Convention regulates international trade in certain protected species. It is an international agreement that monitors global trade in many species of wildlife and plants. 151 countries co-operate through a system of permits and certificates, similar to 'eco-labels', to censure that trade in listed wildlife and plants including parts and derived products, is legal and does not threaten their survival in the wild. CITES is designed to assist with the prevention of further decline of wild populations and to ensure that trade is based on sustainable use and management of wild and captive populations.

  Species listed on Appendix I 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.

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

TABLE 1 - Species known to occur in the Great Barrier Reef World Heritage Area and listed under the Bonn Convention or CITES agreement (includes explanatory notes)

Common Name	Scientific Name	Bonn Convention		CITES	
		App I	App II	App I	App II
Reptiles					
flatback turtle	*Natator depressus*			X	
green turtle	*Chelonia mydas*	X	X	X	
hawksbill turtle	*Eretmochelys imbricata*	X	X	X	
leatherback turtle	*Dermochelys coriacea*	X	X	X	
loggerhead turtle	*Caretta caretta*	X	X	X	
olive ridley turtle	*Lepidochelys olivacea*	X	X	X	
estuarine crocodile	*Crocodylus porosus*		X	X	
freshwater crocodile	*Crocodylus johnstoni*				X
Seabirds					
grey-headed albatross	*Dionedea chrysostoma*		X		
little tern	*Sterna albifrons*		X		
sooty albatross	*Phoebetria fusca*		X		
southern giant petrel	*Macronectes giganteus*		X		
wandering albatross	*Diomedea exulans*		X		
Marine Mammals					
Seals	*Phocidae, Otariidae*				X[1]
dugong	*Dugong dugon*		X	X	
blue whale	*Balaenoptera musculus*	X		X	
bottlenose dolphin	*Tursiops truncatus*				X
Bryde's whale	*Balaenoptera edeni*			X	
Cuvier's beaked whale	*Ziphius cavirostris*				X
dwarf sperm whale	*Kogia simus*				X
false killer whale	*Pseudorca crassidens*				X
fin whale	*Balaenoptera physalus*			X	
Fraser's dolphin	*Lagenodelphis hosei*				X
humpback whale	*Megaptera novaeangliae*	X		X	
Indo-pacific hump-backed dolphin	*Sousa chinensis*		X	X	
Irrawaddy dolphin	*Orcaella brevirostris*		X		X
killer whale (Orca)	*Orcinus orca*				X
long-finned pilot whale	*Globicephala melas*				X
Longman's beaked whale	*Mesoplodon pacificus*				X
melon-headed whale	*Peponocephala electra*				X
minke whale	*Balaenoptera acutorostrata*			X	
pantropical spotted dolphin	*Stenella attenuata*				X
pygmy killer whale	*Feresa attenuata*				X
pygmy sperm whale	*Kogia breviceps*				X
Risso's dolphin	*Grampus griseus*				X
sei whale	*Balaenoptera borealis*			X	
short-beaked common dolphin	*Delphinus delphis*				X
short-finned pilot whale	*Globicephala macrorhynchus*				X
sperm whale	*Physeter macrocephalus*			X	
spinner dolphin	*Stenella longirostris*				X
striped dolphin	*Stenella coeruleoalba*				X
Sharks, Skates and Rays			X[2]		
Marine Invertebrates					X[3]
Island Fauna			X[4]		X[5], X[6]

[1] – Subantarctic fur seal (*Arctocephalus tropicalis*)

[2] - *Rhincodon typus*

[3] - *Hippopus hippopus, Tridacna crocea, Tridacna derasa, Tridacna gigas, Tridacna maxima, Tridacna squamosa*

[4] – **Birds:** Osprey (*Pandion haliaetus*), Peregrine falcon (*Falco peregrinus*), **Butterfly:** *Danaus plexippus*

[5] – **Birds**: Australian bustard (*Ardeotis australis*), Australian hobby (*Falco longipennis*), Australian kestrel (*Falco cenchroides*), Australian masked-owl (*Tyto novaehollandiae*), Barn owl (*Tyto alba*), Black-shouldered kite (*Elanus axillaris*), Brahminy kite (*Haliastur indus*), Brolga (*Grus rubicunda*), Brown falcon (*Falco berigora*), Brown goshawk (*Acciptiter fasciatus*), Eastern grass-owl (*Tyto capensis*), Grey falcon (*Falco hypoleucos*), Grey goshawk (*Accipiter novaehollandiae*), Gurney's eagle (*Aquila gurneyi*), Magnificent riflebird (*Ptiloris magnificus*), Osprey (*Pandion haliaetus*), Pacific Baza (*Aviceda subcristata*), Rainbow lorikeet (*Trichoglossus haematodus*), Red-tailed black cockatoo (*Calyptorhynchus banksii*), Rufous owl (*Ninox rufa*), Southern boobook (*Ninox novaeseelandiae*), Sulphur-crested cockatoo (*Cacatua galerita*), Swamp Harrier (*Circus approximans*), Trumpet manucode (*Manucodia keraudrenii*), Victoria's riflebird (*Ptiloris victoriae*), Wedge-tailed eagle (*Aquila audax*), Whistling kite (*Haliastur sphenurus*), White-eyed buzzard (*Butastur teesa*)

[6] – Appendix III of CITES: Cattle egret (*Ardea ibis*), Great egret (*Ardea alba*), Little egret (*Egretta garzetta*)

- **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, CAMBA, respectively)**

  These two agreements further co-operation with Japan and China in measures for the management and protection of migratory birds and birds in danger of extinction and also for the management and protection of their environments. Table 2 lists birds occurring in the GBRWHA included on the JAMBA and CAMBA agreements.

- **The World Conservation Union (IUCN)**

  The IUCN's mission is *to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.* The main expectation of members is active participation in the Union's affairs, such as formulating and advocating its policies, and developing and implementing its programs. One of the most important 'obligations' of a member is to participate in the 'World Conservation Congress'. Important decisions are taken there which have a direct influence on the running and the structure of the Secretariat and, as a result, on the Union as a whole. The IUCN does not operate by legal instrument rather it acts as a forum for policy development with respect to species threatened with extinction. An important function of IUCN is to compile lists of internationally threatened species in Red Data Books (Table 3).

Table 2 - Birds known to occur in the Great Barrier Reef World Heritage Area and listed under the JAMBA and CAMBA agreements

Species	Scientific Name	JAMBA	CAMBA
Asiatic common tern	*Sterna hirundo*	X	X
Bar-tailed godwit	*Limosa lapponica*	X	X
Black tern	*Chlidonias niger*		X
Black-naped tern	*Sterna sumatrana*	X	X
Black-tailed godwit	*Limosa limosa*	X	X
Bridled tern	*Sterna anaethetus*		X
Brown booby	*Sula leucogaster*	X	X
Caspian Plover	*Charadrius asiaticus*	X	
Caspian tern	*Sterna caspia*		X
Cattle egret	*Ardea ibis*	X	X
Common noddy	*Anous stolidus*	X	X
Common sandpiper	*Actitus hypoleucos*	X	X
Crested tern	*Sterna bergii*	X	
Curlew sandpiper	*Calidris ferruginea*	X	X
Eastern curlew	*Numenius madagascariensis*	X	X
Eastern reef egret	*Egretta sacra*	X	
Fleshy-footed shearwater	*Puffinus carneipes*	X	
Glossy ibis	*Plegadis falcinellus*		X
Great egret	*Ardea alba*		X
Great knot	*Calidris tenuirostris*	X	X
Greater frigatebird	*Fregata minor*	X	X
Greater sand dotterel	*Charadrius leschenaultii*	X	X
Greenshank	*Tringa nebularia*	X	X
Grey plover	*Pluvialis squatarola*	X	X
Grey-tailed tattler	*Heteroscelus brevipes*	X	X
Lesser crested tern	*Sterna bengalensis*		X
Lesser frigatebird	*Fregata ariel*	X	X
Lesser golden plover	*Pluvialis dominica*	X	X
Lesser sand plover	*Charadrius mongolus*	X	X
Little curlew	*Numenius minutus*	X	X
Little tern	*Sterna albifrons*	X	X
Marsh sandpiper	*Tringa stagnatillis*	X	X
Masked booby	*Sula dactylatra*	X	
Oriental cuckoo	*Cuculus saturatus*	X	X
Pin-tailed snipe	*Gallinago stenura*	X	
Red Knot	*Calidris canutus*	X	X
Red-footed booby	*Sula sula*	X	X
Red-necked stint	*Calidris ruficollis*	X	X
Ruddy turnstone	*Arenaria interpres*	X	X
Sanderling	*Calidris alba*	X	X
Sharp-tailed sandpiper	*Calidris acuminata*	X	X
Swinhoe's snipe	*Gallinago megala*		X
Terek sandpiper	*Xenus cinereus*	X	X
Wandering tattler	*Heteroscelus brevipes*	X	
Wedge-tailed shearwater	*Puffinus pacificus*	X	
Whimbrel	*Numenius phaeopus*	X	X
White egret	*Egretta alba*	X	
White-bellied sea eagle	*Haliaeetus leucogaster*		X
White-tailed tropicbird	*Phaethon lepturus*	X	X
White-throated needletail	*Hirundapus caudacutus*	X	X
White-winged black tern	*Chlidonias leucopterus*	X	X
Wilson's storm petrel	*Oceanites oceanicus*	X	
Wood sandpiper	*Tringa glareola*	X	X

Table 3 - Species known to occur in the Great Barrier Reef World Heritage Area and listed by the IUCN Red Data Books (includes explanatory notes).

DD - Data deficient; LR-CD - Lower risk, conservation dependent; LR-NT - Lower risk, near threatened; R - Rare, V - Vulnerable

Common Name	Scientific Name	Status
Reptiles		
flatback turtle	*Natator depressus*	Vulnerable
green turtle	*Chelonia mydas*	Endangered
hawksbill turtle	*Eretmochelys imbricata*	Critically Endangered
leatherback turtle	*Dermochelys coriacea*	Endangered
loggerhead turtle	*Caretta caretta*	Endangered
olive ridley turtle	*Lepidochelys olivacea*	Endangered
Seabirds		
grey-headed albatross	*Diomedea chrysostoma*	LR-NT
wandering albatross	*Diomedea exulans*	Vulnerable
Syngnathids	Syngnathidae Solenostomidae	 X[1]
Marine Mammals		
dugong	*Dugong dugon*	Vulnerable
blue whale	*Balaenoptera musculus*	Endangered
bottlenose dolphin	*Tursiops truncatus*	DD
Bryde's whale	*Balaenoptera edeni*	DD
Cuvier's beaked whale	*Ziphius cavirostris*	DD
dense-beaked whale	*Mesoplodon densirostris*	DD
fin whale	*Balaenoptera physalus*	Endangered
Fraser's dolphin	*Lagenodelphis hosei*	DD
humpback whale	*Megaptera novaeangliae*	Vulnerable
Indo-pacific hump-backed dolphin	*Sousa chinensis*	DD
Irrawaddy dolphin	*Orcaella brevirostris*	DD
killer whale (Orca)	*Orcinus orca*	LR-CD
Longman's beaked whale	*Mesoplodon pacificus*	DD
minke whale	*Balaenoptera acutorostrata*	LR-NT
pantropical spotted dolphin	*Stenella attenuata*	LR-CD
pygmy killer whale	*Feresa attenuata*	DD
Risso's dolphin	*Grampus griseus*	DD
rough-toothed dolphin	*Steno bredanensis*	DD
sei whale	*Balaenoptera borealis*	Endangered
short-finned pilot whale	*Globicephala macrorhynchus*	LR-CD
sperm whale	*Physeter macrocephalus*	Vulnerable
spinner dolphin	*Stenella longirostris*	LR-CD
strap-toothed beaked whale	*Mesoplodon layardii*	DD
striped dolphin	*Stenella coeruleoalba*	LR-CD
Sharks, Skates and Rays		X[2]
Marine Fishes		X[3]
Island Flora		X[4]
Island Fauna		X[5]

1 – *Doryrhamphus dactyliophorus* (DD), *Hippocampus bargibanti* (DD), *Solegnathus spinossissimus* (V), *Solegnathus dunckeri* (V), *Solegnathus hardwickii* (V), *Syngnathoides biaculeatus* (DD).

2 - *Carcharias taurus* (V), *Carcharias carcharias* (V), *Rhincodon typus* (V), *Dalatias licha*I (DD)

3 – *Xiphias gladius* (DD).

4 – *Acacia homaloclada* (R), *Acacia jackesiana* (R), *Acacia polyadenia* (R), *Acmenosperma pringlei* (R), *Actephila sessilifolia* (R), *Archidendron hirsutum* (R), *Atalaya rigida* (R), *Austromyrtus lucida* (R), *Austromyrtus pubiflora* (R), *Banksia plagiocarpa* (R), *Brachychiton compactus* (R), *Cassia queenslandica* (R), *Cerbera dumicola* (R), *Cerbera inflata* (R), *Comesperma praecelsum* (R), *Croton magneticus* (V) , *Dendrobium johannis* (V), *Dendrobium phalaenopsis* (V), *Dipodium ensifolium* (R), *Drosera adelae* (V), *Ehretia grahamii* (R), *Elaeocarpus carolinae* (R), *Eucalyptus xanthope* (V), *Gahnia insignis* (R), *Gymnema brevifolium* (V), *Gymnostoma australianum* (R), *Habenaria divaricata* (E), *Habenaria xanthantha* (R), *Kunzea graniticola* (R), *Leucopogon cuspidatus* (V), *Livistona drudei* (V), *Macropteranthes fitzalanii* (R), *Ozothamnus eriocephalus* (V), *Quassia bidwillii* (V), *Rhodamnia pauciovulata* (R), *Solanum sporadotrichum* (R), *Stackhousia tryonii* (R), *Stenocarpus cryptocarpus* (R), *Syzygium alatoramulum* (R), *Tiliacora australiana* (R), *Wrightia versicolor* (R), *Xylosma ovatum* (R).

5 – **Mammal:** Proserpine rock wallaby (*Petrogale persephone*) (E),
Birds: Bower's shrike-thrush (*Colluricincla boweri*) (LR-NT), Eastern curlew (*Numenius madagascariensis*) (LR-NT), Grey falcon (*Falco hypoleucos*) (V), Grey-headed robin (*Heteromyias albispecularis*) (LR-NT), Southern cassowary (*Casuarius casuarius*) (V), Yellow chat (*Epthianura crocea*) (LR-NT).

2.2. NATIONAL

- **The *Great Barrier Reef Marine Park Act 1975* established the Great Barrier Reef Marine Park 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 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 Authority.

The Act provides for the protection of species within the Marine Park through zoning, issuing of permits, and implementation of plans of management that collectively enable management of human activities. The Act establishes the requirement to obtain permits to undertake a range of activities in both zoned and unzoned areas of the Marine Park. Under the Regulations, the Authority must not grant a permit to enter, use or carry on an activity in the Marine Park unless an assessment has been made of the impact that entry, use or activity is likely to have on the Marine Park.

In addition, as stated previously, the Act in s.39Y requires that in developing plans of management, threatened species be managed for their 'recovery and continued protection and conservation'. Similarly, under the GBRMP Regulations 1983, in considering the issue of traditional hunting and gathering permits the Authority is required to have regard to the conservation of threatened species.

Under the Act, the Authority must have regard to the protection of World Heritage values of the Marine Park and the precautionary principle in preparing management plans. The 'precautionary principle' in the Act is defined 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 Protection Act 1999***

An object of this Act is *'to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance'*. The Commonwealth marine environment, world heritage areas, nationally threatened species, and migratory species protected under international agreements (such as the Bonn Convention) are considered to be matters of national environmental significance. Another object of the Act is to 'promote the conservation of biodiversity'. As a Commonwealth agency, GBRMPA must not take any action that contravenes a recovery plan or threat abatement plan.

Species that are nationally listed as threatened species (Table 4) or are listed under certain Conventions protecting migratory species (including the Bonn Convention) receive additional protection under the corresponding provisions of the Act. Further, within 10 years of the commencement of the Act on 16 July 2000, inventories must be prepared that identify and state the abundance of these species in Commonwealth marine areas.

GBRMPA also must have regard for Australia's:

- **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 indigenous biological diversity. The goal of this strategy is *'to protect biological diversity and maintain ecological processes and systems'*.
- **Ocean's Policy**. This 1998 Commonwealth Government Policy 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.

2.3. QUEENSLAND

Under the Queensland *Nature Conservation (Wildlife) Regulation 1994*, the Queensland Government's proposed management intention for threatened wildlife is:

2.3.1 For those species listed as *endangered, vulnerable* or *rare*, the proposed management intention 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.

2.3.2 Additional to 2.3.1, for *endangered* or *vulnerable* wildlife the proposed management intention 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; and
- to start education programs for the community and managers of public land on extinction processes and threatened species conservation and habitat.

2.3.3 Additional to 2.3.1, for *rare* wildlife the proposed management intention 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.

Species listed under this legislation and occurring in the GBRWHA are listed in Table 4.

Table 4 - Species in the Great Barrier Reef World Heritage Area and listed as threatened under Queensland or Commonwealth legislation (includes explanatory notes).

NS - Not scheduled, V – vulnerable, R – rare, E - endangered

Common Name	Scientific Name	Commonwealth *EPBC Act 1999*	Queensland *Nature Conservation (Wildlife) Regulation 1994*
Reptiles			
flatback turtle	*Natator depressus*	Vulnerable	Vulnerable
green turtle	*Chelonia mydas*	Vulnerable	Vulnerable
hawksbill turtle	*Eretmochelys imbricata*	Vulnerable	Vulnerable
leatherback turtle	*Dermochelys coriacea*	Vulnerable	Endangered
loggerhead turtle	*Caretta caretta*	Endangered	Endangered
olive ridley turtle	*Lepidochelys olivacea*	Endangered	Endangered
estuarine crocodile	*Crocodylus porosus*	NS	Vulnerable
Seabirds			
grey-headed albatross	*Dionedea chrysostoma*	Vulnerable	Common
herald petrel	*Pterodroma arminjoniana*	NS	Endangered
little tern	*Sterna albifrons*	NS	Vulnerable
red-tailed tropicbird	*Phaethon rubricauda*	NS	Vulnerable
sooty albatross	*Phoebetria fusca*	Vulnerable	Common
wandering albatross	*Diomedea exulans*	Vulnerable	Common
Syngnathids	Syngnathidae Solenostomidae	A Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes has been commissioned by Environment Australia.	
Marine Mammals			
dugong	*Dugong dugon*	NS	Vulnerable
blue whale	*Balaenoptera musculus*	Endangered	Common
fin whale	*Balaenoptera physalus*	Vulnerable	Common
humpback whale	*Megaptera novaeangliae*	Vulnerable	Vulnerable
Indo-pacific hump-backed dolphin	*Sousa chinensis*	NS	Rare
Irrawaddy dolphin	*Orcaella brevirostris*	NS	Rare
sei whale	*Balaenoptera borealis*	Vulnerable	Common
Sharks, Skates and Rays	A Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes has been commissioned by Environment Australia.		
Marine Fishes	A Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes has been commissioned by Environment Australia.		
Marine Invertebrates	Environment Australia has commissioned a conservation overview of marine invertebrates.		
Marine Plants	Environment Australia has commissioned a conservation overview of marine algae		
Island Flora		X[1]	X[2]
Island Fauna		X[3]	X[4]

1 - *Arenga australasica* (V), *Croton magneticus* (V), *Ctenopteris blechnoides* (v), *Dendrobium johannis* (V), *Dendrobium phalaenopsis* (V), *Dischidia littoralis* (V), *Eucalyptus xanthope* (V), *Leucopogon cuspidatus* (V), *Myrmecodia beccarii* (V), *Omphalea celata* (V), *Ozothamnus eriocephalus* (V), Quassia bidwillii (v), *Spathoglottis plicata* (V)

2 – P - species proposed for inclusion in schedules. (Lucas *et al.* 1997). *Acacia homaloclada* (R), *Elaeocarpus carolinae* (R), *Acacia jackesiana* (R), *Eucalyptus xanthope* (V), *Acacia polyadenia* (R), *Gahnia insignis* (R), *Acmenosperma pringlei* (R), *Grewia graniticola* (R), *Actephila sessilifolia* (R), *Gymnema brevifolium* (V), *Albizia retusa subsp. retusa* (R), *Gymnostoma australianum* (R), *Albizia* sp. (South Percy Island G.N., Batianoff+ 14444) (P), *Habenaria divaricata* (E), *Amaranthus pallidiflorus* (R), *Habenaria xanthantha* (R), *Aphyllorchis queenslandica* (P), *Homalium* sp. (South Molle Island, J.A. Gresty AQ208995) (P), *Archidendron hirsutum* (P), *Huperzia phlegmaria* (R), *Arenga australasica* (V), *Ipomoea saintronanensis* (R), *Argyrodendron* sp. (Whitsunday, McDonald+ 5831) (P), *Kunzea graniticola* (R), *Aristolochia chalmersii* (R), *Larsenaikia jardinei* (R), *Atalaya rigida* (R), *Leucopogon cuspidatus* (V), *Austromyrtus lucida* (R), *Livistona drudei* (V), *Austromyrtus pubiflora* (R), *Macaranga polyadenia* (V), *Banksia plagiocarpa* (R) *Macropteranthes fitzalanii* (R), *Berrya rotundifolia* (R), *Muellerargia timorensis* (E), *Bonamia dietichiana* (R), *Myrmecodia beccarii* (V), *Brachychiton compactus* (R), *Omphalea celata* (V), *Buchanania mangoides* (P), *Ozothamnus eriocephalus* (V), *Canthium* sp. (Thornton Peak, H. Flecker NQNC76110) (P), *Peripleura scabra* (R), *Capparis* sp. (Gloucester Island, Batianoff 920912) (R), *Peristylus banfieldii* (R), *Cassia* sp. (Paluma Range G., Sankoswky+ 450) (R), *Psychotria coelospermum* (R), *Cassia queenslandica* (R), *Psychotria lorentzii* (P), *Cerbera dumicola* (R), *Quassia bidwillii* (R), *Cerbera inflata* (R), *Rhodamnia pauciovulata* (R), *Cleistanthus myrtianthus* (R), *Solanum sporadotrichum* (R), *Combretum trifoliatum* (R) *Spathoglottis plicata* (V), *Comesperma praecelsum* (R), *Stackhousia tryonii* (R), *Corchorus hygrophilus* (P), *Stenocarpus cryptocarpus* (R), *Croton magneticus* (V) *Syzygium alatoramulum* (R), *Ctenopteris blechnoides* (R), *Tephrosia savannicola* (R), *Dendrobium johannis* (V,) *Tetramolopium* sp. (Mt Bowen, G.D. Fell 1224) (P), *Dendrobium phalaenopsis* (V), *Tiliacora australiana* (R), *Dipodium ensifolium* (R,) *Tinospora angusta* (R), *Dischidia littoralis* (V), *Wrightia versicolor* (R), *Drosera adelae* (R), *Xylosma ovatum* (R), *Didymoplexu pallens* (P), *Zanthoxylum rhetsa* (P), *Ehretia grahamii* (R) (Source: Batianoff and Dillewaard 1995).

3 – **Mammal:** Proserpine rock wallaby (*Petrogale persephone*) (E)

Bird: Southern cassowary (*Casuarius casuarius*) (E)

4 – **Mammal:** Proserpine rock wallaby (*Petrogale persephone*) (E

Birds: Beach stone-curlew (*Esacus neglectus*) (V), Black-necked stork (*Ephipporhynchus asiaticus*) (R), Blue-faced parrot-finch (*Erythrura trichroa*) (R), Eastern curlew (*Numemius madagascariensis*) (R), Grey falcon (*Falco hypoleucos*) (R), Grey goshwak (*Accipiter novaehollandiae*) (R), Lewin's rail (*Rallus pectoralis*) (R), Radjah shelduck (*Tadorna radjah*) (R), Rufous owl (southern subspecies) (*Ninox rufa*) (V), Sooty oystercatcher (*Haematopus fuliginosus*) (R), Southern cassowary (*Casuarius casuarius*) (E), White-rumped swiftlet (*Collocalia spodiopygius*) (R), Yellow chat (*Epthianura crocea*) (V),

3. TERMINOLOGY: Adverse Impacts, Effects and 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 threats. These terms are used throughout this report and are defined as follows:

- **Adverse impact** – 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. permanent injury or death).

  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 are 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 or breeding. Species may also be more vulnerable to certain impacts because of physiological, behavioural, or other factors.

  Further, exposure to some impacts may lead to habituation, so that the effect of an impact on the animal declines with time as animals become '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 GBRMPA. Some activities that may threaten species within the GBRWHA occur outside its boundary and responsibility for reacting to them rests with other 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 or through local government plans (Wachenfeld 1997). Alternatively, some issues are global in nature and require international co-operation (e.g. global warming). Global-level impacts are no less serious than those operating at a smaller scale and, indeed they may be more so. However, the intent of this paper is to provide a basis for the Species Conservation Program of 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
- Pollution
- Predation by feral animals
- Prey depletion
- Vessel strikes

- **Effect** – 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 or tolerate the impacts), this could have serious consequences for a population.

  Taking into account the wide variety of impacts and effects, and in accordance with the precautionary principle[1] 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.

- **Threat** – 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.

[1] The 'precautionary principle' is defined as in 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.

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.

At Appendix 1 is a list of threats to species that was adopted by The World Conservation Union 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 threats to species within the GBRWHA are, alphabetically:

- Aircraft, boats, ships and other motorised machines
- Coastal development and land-based practices
- Declining water quality
- Defence exercises
- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Marine dredging and construction
- Research and monitoring
- Tourism and recreation

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

4. SPECIES IN THE GREAT BARRIER REEF WORLD HERITAGE AREA

For ease of consideration of all the species in the GBRWHA, the Species Conservation Program has grouped species in this report according to the following divisions:

- **'Listed Threatened, Migratory and Marine Species'**

  These species given special conservation protection by the Environment Protection Biodiversity Act 1999 (EPBC Act).

  Species listed as threatened under the EPBC Act, as set out in Chapter 5, Part 13, Division 1, Subdivision A, Section 178, Subsection 1 (a-f), have a conservation status classified as either extinct, extinct in the wild, critically endangered, endangered, vulnerable, lower risk, or data deficient (see Table 4).

  Listed migratory species, as set out in Chapter 5, Part 13, Division 2, Subdivision A, 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 listed in Tables 1 and 2.

  Species are also categorised as 'listed marine species' in the EPBC Act, Chapter 5, Part 13, Division 4, Subdivision A, Section 248, Subsection 2 (a-k). The listed marine species, described in detail in Appendix 2, include:

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

  An object of the 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 Commonwealth marine environment, world heritage areas, nationally threatened species, and migratory species protected under international agreements (such as the Bonn Convention) are considered to be matters of national environmental significance.

  Another object of the EPBC Act is to *'promote the conservation of biodiversity'*. The Act requires that within 10 years of its commencement, 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 Act provides for the preparation of recovery plans for all scheduled species and ecological communities. Each recovery plan 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 Authority must not take any action that contravenes a recovery plan or threat abatement plan. It also establishes a number of offences relating to, for example, killing, injuring, or taking listed threatened, migratory or marine species, and provides for issuing permits for these species.

- **Species of special interest**

  Cetaceans require special consideration under Division 3 of the EPBC Act, and their conservation status within the Great Barrier Reef, as considered in the *Policy Document for Whale and Dolphin Conservation Policy* in the Marine Park (Great Barrier Reef Marine Park Authority 2000) (Appendix 3).

  A Division of the EPBC Act applies specifically to whales and other cetaceans. This Division establishes the 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.

- **Other marine species of conservation concern**

  Although not included in the previous two categories, these marine species are considered to be of conservation concern within the Marine Park (Appendix 4).

- **Island flora and fauna**

  These non-marine species occur on continental islands and coral cays in the GBRWHA (Appendix 5). 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.

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

- **extent of knowledge** known 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 World Heritage Area 1998* (Wachenfeld 1998).
- **conservation status** of individual species This is the species' status as listed under Queensland and Commonwealth legislation and international agreements and noted in Tables 1-4 and Appendix 2.
- **threats to populations** The threats listed include both potential and actual threats and those listed as Key Threatening Processes under the Environment Protection and Biodiversity Protection Act; and
- **actions currently underway** or proposed by the Species Conservation Program of GBRMPA and by associated agencies and stakeholders to address conservation concerns for the species/species groups.

5. DISCUSSION

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, which 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

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.

More recently, in 1998, a global marine policy was adopted jointly by the World Wildlife Fund and the World Conservation Union (IUCN) [full text available at website www.panda.org/resources/publications/water/seachange]. 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.

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. A broadscale habitat protection approach can help:

- maintain biological diversity at the ecosystem, habitat, species, population and genetic levels;
- allow species to evolve and function undisturbed;
- provide an ecological safety margin against human-induced and natural disasters;
- provide a solid ecological base from which threatened species or habitats can recover or repair themselves;
- 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.

GBRMPA is working on a Representative Areas Program to enhance protection of the biodiversity of the GBRWHA. This Program is part of Australia's national Marine Protected Areas Program and builds on previous work conducted from 1996 to 1998 at the Authority and with stakeholders.

6. ELEMENTS FOR PRIORITISING WORK PROGRAM

Elements that are considered in developing the Species Conservation Program of 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)?

- **Knowledge –**

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

- **Community perception –**

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

- **Political profile –**

  Is the species or taxon of special interest in the political arena?

- **Environmental indicator status –**

  Is the species or taxon useful as an indicator of health of the GBR?

- **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 GBR?

7. THE SPECIES CONSERVATION PROGRAM OF GBRMPA

The Species Conservation Program is presently focussed 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.

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. 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 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. As a result of extraordinary research since the 1970s, the QPWS has acquired a large database on the turtles of Queensland which can be used as a basis for management decisions. There is scientific evidence that the Queensland populations of at least 3 turtle species are in trouble and all species are threatened with extinction.

Whales and dolphin policy issues have been addressed in the recently finalised *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, and the implementation of a capped permit system for tourist operators conducting swimming activities with dwarf minke whales in the vicinity of the Ribbon Reefs.

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 becomes 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, and 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 efficacy of such conservation will be assisted immeasurably by the Representative Areas Program of GBRMPA that is now underway. It will result in rigorous re-assessment of zoning within the Great Barrier Reef Marine Park.

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APPENDIX 1 – IUCN listing of major categories of threat

Adapted from the IUCN Red List Categories (IUCN Species Survival Commission, February 2000)

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:

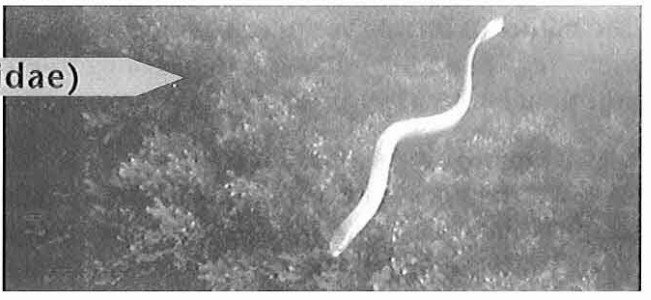
- **Human-Induced Habitat Loss**
  Habitat removal (replaced by arable agriculture)
  Habitat removal (replaced by forestry plantations)
  Habitat removal (replaced by human settlements, industry, roads, etc.)
  Habitat removal (replaced by livestock farming)
  Habitat removal (replaced by waste-ground)
  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
  Disease
  Disturbance
  Drought
  Floods
  Increased predation
  Intentional poisoning
  Pollution
  Storms
  Volcanoes
- **Not known**

APPENDIX 2 - LISTED MARINE SPECIES

These species are categorised as 'listed marine species' in the Commonwealth *EPBC Act 1999*, Chapter 5, Part 13, Division 4, Subdivision A, Section 248, Subsection 2 (a-k).

SEA-SNAKES

(Families: Hydrophiidae, Laticaudidae)



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 GBRWHA, although none are endemic to the Great Barrier Reef
  - Distinct reefal and soft-bottom assemblages apparent
  - Patterns of abundance and distribution poorly known
  - Associated with benthic communities (except Pelamis, a pelagic species)
- 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 range between 30 000 and 67 000 sea snakes from trawling the Gulf of Carpentaria (Wassenberg et al. 1994).
- Trawling of breeding aggregations may be a problem
- Under the *Wildlife Protection (Regulation of Imports and Exports) Act 1982*, export requires a licence issued by Environment Australia, which is subject to an approved management plan. Currently no licences have been issued.

Conservation status

- Sea snakes are considered 'common wildlife' under Queensland's NC(W)R , are not listed as threatened by the Commonwealth Environment Protection and Biodiversity Protection Act (Table 4).
- None of the species listed in the Red Data Book of the World Conservation Union (IUCN) are known to occur in the Marine Park (Table 3).
- *'No species of sea snakes are considered to be threatened'* (Marsh et al. 1993 in Lucas et al. 1997).

Threats

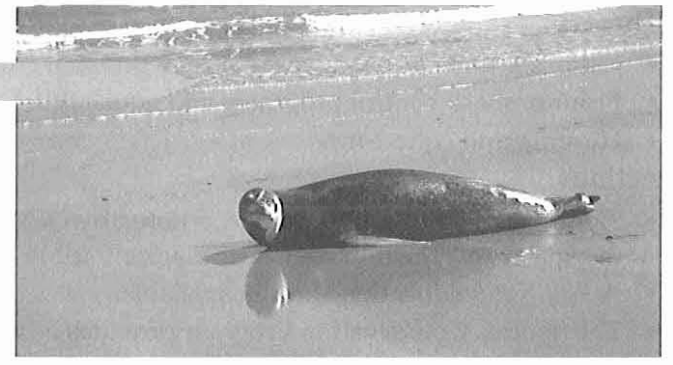
- Fishing, shark control programs and aquaculture
- Hunting and collecting

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 Group of GBRMPA to monitor and address concerns.

SEALS

(Families: Otariidae, Phocidae)



Knowledge

- Rarely found in the GBRMP
- A few records from live strandings or carcasses

Conservation status

- Seals are listed as 'common' under Queensland's NC(W)R and are not listed under Commonwealth Environment Protection and Biodiversity Act. None of the species listed in the Red Data Book of the World Conservation Union (IUCN) are known to occur in the Great Barrier Reef Marine Park (Tables 3, 4).

Threats

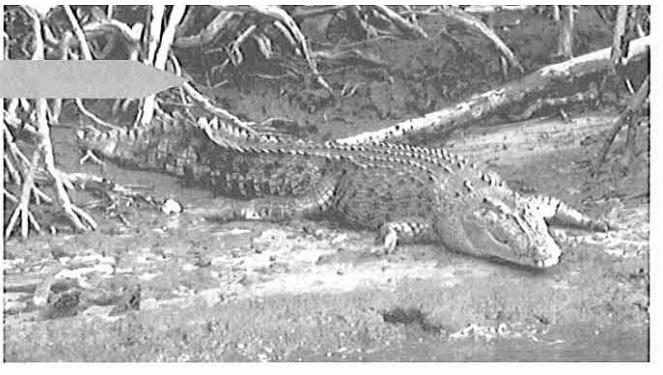
- None known within the Marine Park.
- Potentially fishing, shark control programs and aquaculture

Actions

- Live strandings and carcasses are recovered whenever possible and rehabilitated or examined in as great detail as possible.
- QPWS is summarising all seal records for Queensland.

CROCODILES

(Genus *Crocodylus*)



Knowledge

- Only estuarine crocodiles (*Crocodylus porosus*) commonly occur in the GBRWHA. Freshwater crocodiles (*Crocodylus johnstoni*) are rarely recorded in the GBRWHA (Mark Read, QPWS, 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.
- QPWS 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.
- QPWS is preparing a manuscript for publication on estuarine crocodile census data it has collected from mainly coastal river surveys.

Conservation status

- Estuarine crocodiles are listed as 'vulnerable' wildlife under Queensland's NC(W)R and are not listed under the Commonwealth EPBC Act or in the Red Data Book of the World Conservation Union (IUCN) (Tables 3, 4).
- Freshwater crocodiles are listed as 'common' wildlife under the Queensland NC(W)R 1994, and are not listed as threatened under the Commonwealth EPBC Act or in the Red Data Book of the World Conservation Union (IUCN) (Table 3).

Threats

- Little is known of processes that may threaten crocodiles within the Marine Park.
- Fishing, shark control programs and aquaculture
- Hunting and collecting

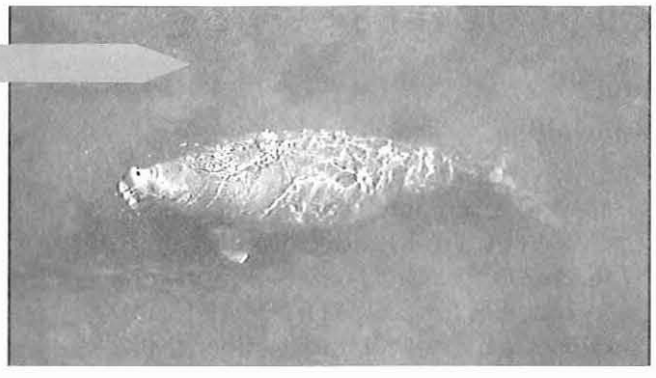
Actions

- Significant sighting information is noted by QPWS (e.g. attack on a person in the Far Northern Section of the Great Barrier Reef Marine Park in 1999).
- A *Reef Notes* education sheet is available.
- The Species Conservation Program provides advice upon request.
- GBRMPA liaises with QPWS as required.
- QPWS relocates problem crocodiles in accordance with the *Nature Conservation (Problem Crocodiles) Conservation Plan 1995*. This states that a crocodile in the wild is a 'problem crocodile' if it is or is likely to be a source of danger to humans, stock or dogs. 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 on consultation with community interest groups. It currently specifies who can take problem crocodiles and associated restrictions and conditions.

DUGONG

(Genus *Dugong*)



Knowledge

- 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 themammalian 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)
  - Do not breed every year
  - Late maturing (between 9 and 17 years)
  - Strictly herbivorous, foraging on seagrass almost exclusively
  - Calving thought to occur in shallow waters away from seagrass beds
- Refer pages 65 and 101, *State of the Great Barrier Reef World Heritage Area 1998* (Wachenfeld 1998) and the *Dugong Information Kit (3rd Edition, 1999)*, published by GBRMPA
- There has been a reported 50% decline in the southern Great Barrier Reef dugong population (south of Cooktown) from 1986/7-1994 (Marsh et al. 1996). However, preliminary results of a 1999 survey indicate similar numbers to 1986/7 (Marsh and Lawler, unpublished). The return of numbers to the 1986 level could only have occurred through migration of animals. Preliminary results of a second study strongly suggest that the southern Great Barrier Reef population has declined to about 3% of numbers present in the early 1960s (Marsh et al. unpublished). Both reports are currently being peer-reviewed in preparation for publication by GBRMPA when finalised and accepted.
- The northern Great Barrier Reef dugong population (north of Cooktown) does not exhibit signs of a population decline to date.

Conservation status

- Dugongs are listed as 'vulnerable' under Queensland's NC(W)R and in the Red Data Book of the World Conservation Union (IUCN) (Tables 3, 4).

Threats

- Aircraft, 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

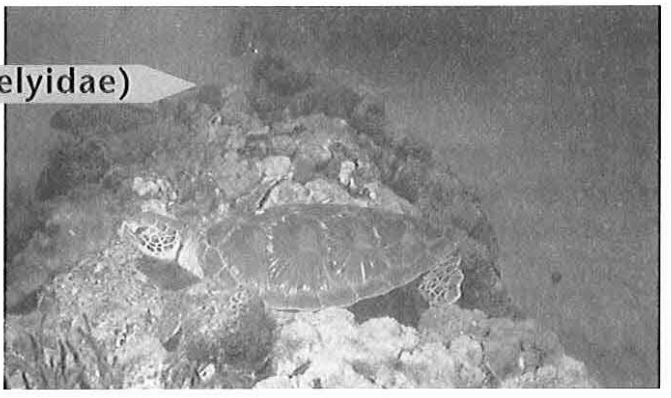
Actions

- Declaration of Dugong Protection Areas in 1997
- Moratorium on the issuing of permits for traditional hunting of dugongs south of Cooktown.
- Summary of recommendations to the Great Barrier Reef Ministerial Council meeting on 30 July 1999 in relation to dugong recovery and conservation (also available through the GBRMPA website http://www.gbrmpa.gov.au).
  - Enhance restriction on fisheries (including surveillance and enforcement)
  - Consolidate and re-arrange fishery regulations related to the use of nets in Dugong Protected Areas (DPAs);
  - Implementation of improvements to responses to live strandings and carcasses (with QPWS, DPI, DDM).
  - Implementation of a public awareness and education program about dugongs (with QPWS and DDM).
  - Review of dugong deaths in the Queensland Shark Control Program
  - Request government officials to urgently prepare a multi-agency strategy with costings for the development and implementation of co-operative agreements with Indigenous peoples for natural resource management, especially of dugong and turtles, to be submitted for Council's consideration.
  - Request the Queensland Department of Transport to ensure that vessel speed limits in Hinchinbrook Channel are restricted to a maximum of 40 knots and that this include boat races and associated practices; and request the QPWS to refuse requests for permits to conduct boat races in excess of 40 knots in the Hinchinbrook Zone A DPA.
  - Endorse negotiations to secure a phasing out of Defence's use of high explosive ordnance within the GBRWHA.
  - Request Queensland to implement Integrated Catchment Management strategies; request Queensland to progress Codes of Practice for certain land management practices from voluntary to mandatory; support studies into habitat quality issues related to seagrass and land run-off; and request GBRMPA to make the report on water quality issues influencing DPAs generally available subject to favourable peer review.
- A major multi-media campaign is occurring to increase public awareness of dugong conservation issues, especially the need to go slow in boats and report live stranded animals and carcasses. Media and products used include TV advertising, stickers distributed with boat registration certificates, *Dugong Information Kits*, DPA brochures, boat ramp signs, posters and fliers for shops etc., and notices printed on locality Tide Tables for free distribution.
- Desktop study of seasonal changes in dugong distribution (contract with JCU).
- Dugong movements in the Townsville – Cardwell region with recommendations for boat traffic management (contract with CRC).
- Surveys of seagrass distribution in DPAs (contract with DPI).
- Assessment of dugong mortality in shark nets (contract with JCU).
- Aerial surveys of dugong populations (contract with JCU).
- Dugong necropsy manual (contract with JCU).
- Townsville region dugong carcass stomach contents study (contract with JCU).

- The Department of Defence is undertaking research on dugong auditory mechanisms and the effects of underwater acoustics on dugongs.
- Both the Cairns Area 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.
- GBRMPA staff assist when time permits at local (e.g. Townsville Region) stranding and carcass incidents.

MARINE TURTLES

(Families: Cheloniidae, Dermochelyidae)



Knowledge

- Refer p.162 of *The Outstanding Universal Value of the Great Barrier Reef World Heritage Area* (Lucas *et al.* 1997); which says the GBRWHA 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 GBRMP: loggerhead, green, hawksbill, flatback, leatherback and olive ridley.
- Some turtles that forage and nest within the Great Barrier Reef Marine Park migrate to places outside the GBRMP, such as Papua New Guinea, Indonesia, Solomon Islands, Vanuatu, New Caledonia, Fiji (Limpus *et al.* 1992, Miller *et al.* 1998).
- **Loggerhead Turtles,** *Caretta caretta* (Limpus and Limpus 1999, Limpus and Reimer 1994)
  - The eastern Australian loggerhead turtle nesting beaches support the only significant breeding stock for the species in the South Pacific Ocean.
  - This population has declined by 70-90% over the last 30 years. It is estimated that fewer than 300 nesting females now nest annually in Queensland. An annual loss of only a few hundred loggerhead turtles could lead to the extinction of the Queensland population (Heppell *et al.* 1996).
  - Major factors in the decline of the loggerhead turtles include intense fox predation along the Bundaberg coast (outside the GBRMP) and incidental catch in commercial (trawling, gill netting, pelagic long line, crab) fisheries.
- **Green Turtles** (*Chelonia mydas*)
  - The world's largest population of nesting green turtles occurs at Raine Island, Far Northern Section of the Marine Park.
  - There are 3 genetic breeding stocks in Queensland: southern Great Barrier Reef stock breed in the Capricorn/Bunker Group breed; northern Great Barrier Reef stock breed at Raine Island and surrounding cays; Gulf of Carpentaria breed in the Wellesley Islands. These stocks are considered separate management units (Moritz *et al.* 1998a, b).
  - There are indications that the southern and northern Great Barrier Reef stocks may be in the early stages of a decline (Limpus 1999):
    i) The size of nesting turtles is reducing as evidenced from average curved carapace length. Although size is not an indication of maturity, random measurements of hundreds of animals each year over 20 years should encapsulate 'smaller' and 'larger' turtles at a nesting beach. Why 'larger' turtles are not nesting is unknown, but could suggest that large adult females are disappearing more rapidly than previously from the stock, and more frequently than smaller turtles.
    ii) An increase is occurring in the remigration interval (years between breeding seasons) as evidenced from average remigration intervals. Experienced breeders (animals with a

past breeding history) re-nest at shorter remigration intervals than first time breeders. Therefore, fewer experienced breeders are nesting.

iii) The recruitment rate (percentage of first-time breeders per annum) is increasing and in the southern Great Barrier Reef genetic stock is approaching 40% for the annual nesting population at Heron Island. This may be indicative of an excessive loss of experienced breeders.

- **Hawksbill Turtles** (*Eretmochelys imbricata*) (Miller 1994)
  - The Great Barrier Reef Marine Park hosts one of the world's largest nesting populations in the northern Great Barrier Reef, primarily at Milman Island
  - Preliminary analysis of 10 years nesting census data from Milman Island, the largest rookery on the Great Barrier Reef, suggests that the number of breeding females may be in decline (Limpus and Miller 2000).
- **Flatback Turtles** (*Natator depressus*) (Parmenter 1994)
  - The species is endemic to Australia and is not known to venture off the Australian continental shelf.
  - No population declines have been recorded, although some population biology indicators suggest that that there may be a management issue in the near future.
- **Olive Ridley** (*Lepidochelys olivacea*) and **Leatherback** (*Dermochelys coriacea*) **Turtles** (Harris 1994, Limpus and McLachlan 1994)
  - Little is known of the movements and key habitats of olive ridley and leatherback turtles in the Marine Park. Leatherback turtles nest infrequently in the southern Great Barrier Reef. Olive ridleys are known from trawl captures throughout the length of the Reef and from a few live strandings and carcasses washed ashore in Queensland.

Conservation status

- All marine turtles occurring in the Great Barrier Reef Marine Park are listed as threatened under Queensland and Commonwealth legislation and the IUCN Red Data Book (Tables 3, 4).

Threats

- The unpublished *National Recovery Plan for Marine Turtles in Australia* (Environment Australia 2000) 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.
- Predation by the European Red Fox has been listed under the EPBC Act as a Key Threatening Process to green, loggerhead and leatherback turtle nests.
- Other human activities that can impact on marine turtles in the GBRWHA include:
  - Aircraft, 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
  - Tourism and recreation

Actions

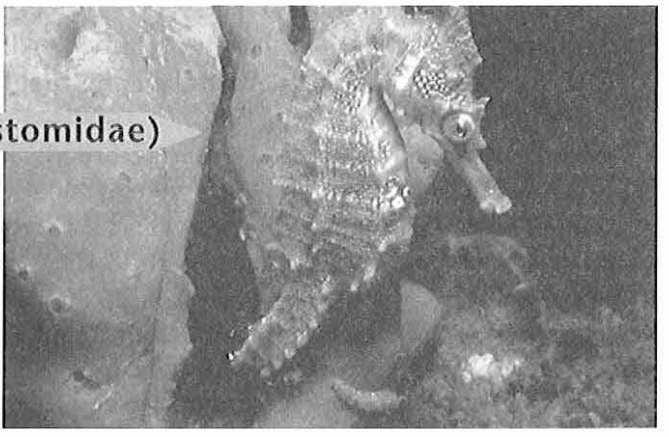
- A **Draft Marine Turtle Conservation Policy for the Great Barrier Reef World Heritage Area** is being developed by GBRMPA in consultation with Indigenous people, stakeholders and other agencies.
- A *Turtle Information Kit* has been published by GBRMPA.
- *Best Environmental Practices* for observing nesting turtles have been prepared and publicised.
- Continuation of long-term monitoring of turtle numbers in Shoalwater Bay, a major foraging area for green turtles (contract with QPWS).
- Conduct of a turtle tag buyback project within Indigenous communities (contract with QPWS).
- Development of a population model for the southern Great Barrier Reef green turtle stock

based upon the extensive QPWS data set in collaboration with EA and QPWS (contract with QPWS).

- Extension work with Indigenous communities to ensure that traditional hunting of green turtles in the Great Barrier Reef Marine Park 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 loggerhead turtles.
- GBRMPA staff assist when time permits at local (e.g. Townsville Region) turtle stranding and carcass incidents.

SEAHORSES, SEA-DRAGONS, PIPEFISH

(Families: Syngnathidae, Solenostomidae)



Knowledge

- Species diversity in Queensland as follows (Lightowler 1998)
  - Pipefish: 47 species
  - Seahorses: 9 species
- About half of the world's syngnathid species live in Australian waters
- Although little research has been conducted into Queensland syngnathid species, following are general comments on their biology, primarily sourced from Lightowler 1998, 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

Conservation status

- Syngnathids are not listed under Queensland's NC(W)R and are not listed under the Commonwealth EPBC Act.
- The 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 can not be taken. These lists do not contain information about the conservation status of any of the species. Syngnathids are not listed as a species that can be taken under Queensland's fisheries legislation.
- Populations in southeast Asia have declined by 15-50% (Vincent 1996).
- Six (6) species known from the GBRWHA are listed by the IUCN Red Data Book (Table 3).
- In a recent set of draft summaries of the biology of more 'threatened', or 'potentially threatened', marine and estuarine fishes developed by experts on Australian fish, 11 species of syngnathids occur in the GBRWHA. A number of them are 'data-deficient' (Table 5).

Table 5. - Conservation status suggested for syngnathids found in the Great Barrier Reef World Heritage Area.

Adapted from information for the Draft *Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes* (Pogonoski *et al.* 2000). LR-NT – Lower risk, near threatened; LR-LC = Lower risk, least concern; DD = Data deficient

• Banded pipefish, *Doryrhamphus dactyliophorus* (LR-LC)	• Zebra seahorse, *Hippocampus zebra* DD
• Gorgonian seahorse, *Hippocampus bargibanti* DD	• Duncker's pipefish, *Solegnathus dunckeri* DD
• Low-crown seahorse, *Hippocampus dahli* (LR-NT)	• Pallid pipefish, *Solegnathus hardwickii* DD
• Highcrown seahorse, *Hippocampus new species* P (DD)	• Spiny pipehorse, *Solegnathus spinosissmus* DD
• Queensland seahorse, *Hippocampus new species* Q (DD)	• Alligator pipefish, *Syngnathoides biaculeatus* (LR-LC)
• Common seahorse, *Hippocampus taeniopterus* DD	

Threats

- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Marine dredging and construction

Actions

- Introduction of bycatch reduction devices 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 the export controls of the Commonwealth Wildlife Protection (Regulation of Exports and Imports) Act from 1 January 1998 and can be exported only under a permit issued by Environment Australia. Permits are only granted for captive-bred specimens or those taken under an approved management plan. However, authorities to export syngnathids derived as bycatch from the Queensland trawl fishery and the syngnathid aquarium fishery have been granted to exporters because the Queensland Fisheries Service is developing a syngnathid management arrangement document for approval under the Wildlife Protection (Regulation of Exports and Imports) Act.
- ReefHQ, the Reed Education Centre of GBRMPA, has studied nutritional requirements and general husbandry requirements of seahorses in captivity.
- The Species Conservation Program works with the Fisheries Critical Issues Group of GBRMPA to monitor and address concerns.
- Conditions in GBRMPA's scientific collecting permits excludes the collecting of syngnathids.

BIRDS

(Class Aves)

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 or food availability
  - The 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 islands have nesting seabirds.
- 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 in the Brown Booby nesting population of the Swain Reefs, and in nesting Black Noddies and Wedge-tailed Shearwaters on the Capricorn-Bunker Islands. It remains to be determined whether these declines are maintained over several breeding seasons.
- Seven internationally recognised significant areas for shorebirds occur in the GBRWHA (e.g. Bowling Green Bay, 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 and silvereyes (an endemic sub-population occurs in the Capricorn-Bunker group).

- Refer pages 57 and 103, *State of the Great Barrier Reef World Heritage Area 1998* (Wachenfeld 1998).
- Between 1.4 and 1.7 million seabirds of 22 species breed in the GBRWHA (King 1993, Lucas *et al.* 1997)

Conservation status

- No species of GBR-breeding seabirds are listed as threatened under the Commonwealth EPBC Act 1999, although some land birds and shorebirds are listed. However under Queensland legislation the herald petrel is listed as endangered, and the little tern and red-tailed tropicbird are listed as vulnerable (Table 4).
- Table 2 (page 6) 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).

Threats

- Defence exercises
- Fishing, shark control programs and aquaculture
  - Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations has been listed as a Key Threatening Process under the *Endangered Species Protection Act 1992.*
- Hunting and collecting
- Tourism and recreation

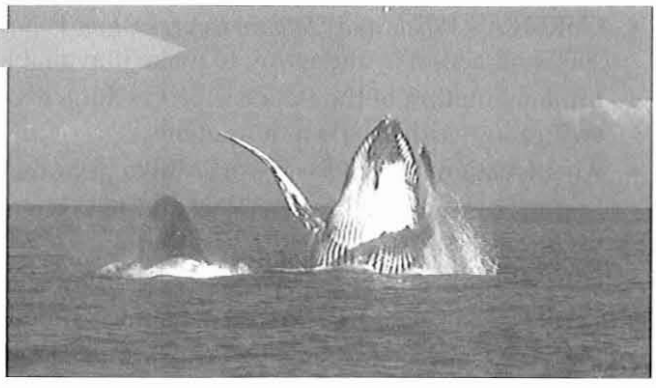
Actions

- Annual and seasonal closures to visitation are instituted for many Great Barrier Reef islands and cays to protect breeding seabirds.
- GBRMPA facilitates Inter-agency (QPWS, GBRMPA, EA, scientists, conservationists) networking and monitoring for seabirds and convenes biannual meetings to review seabird information and management.
- Advice is provided in regard to the seabird-island monitoring program conducted by DDM 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).
- GBRMPA (1997) funded the preparation and publication of the world's first *'Guidelines for Managing Visitation to Seabird Breeding Islands'* (also available at website <http://www.gbrmpa.gov.au/corp_site/info_services/publications/_seabirds/index.html>), 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.
- Both the Cairns Area and the Whitsundays Plans of Management provide for the conservation of birds in the GBRWHA by setting minimum approach distances and speeds for vessels and aircraft to significant bird sites.

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 Protection Act 1999*. The Policy Document for *Whale and Dolphin Conservation Policy in the Marine Park* (Great Barrier Reef Marine Park Authority 2000) provides a comprehensive review of Great Barrier Reef cetaceans.

WHALES AND DOLPHINS



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 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.
  - Long lived
  - Low fecundity
  - Late maturing
  - Planktivorous, piscivorous, scavengers
  - Undertake large breeding migrations (Antarctic to tropics)
  - Little is known about movement, distribution, behaviour, and key habitats.
  - 31 species occur in GBRWHA
  - Significant breeding area and northern terminus for humpback whales
  - Important dwarf minke habitat
  - Longman's beaked whale, considered the rarest whale in the world, has been recorded
- Refer p. 67 and 103, *State of the Great Barrier Reef World Heritage Area 1998* (Wachenfeld 1998).
- There are indications that the Irrawaddy dolphin and the Indo-pacific humpback dolphin populations within the Great Barrier Reef Marine Park have declined (Wachenfeld 1998).
- As per GBRMPA's *Whale and Dolphin Conservation Policy* and Supporting Document (Great Barrier Reef Marine Park Authority 2000), priority species for management are:
  - humpback whale (*Megaptera novaeangliae*)
  - Irrawaddy dolphin
  - Indo-Pacific Humpback dolphin
  - dwarf minke whales (*Balaenoptera acutorostrata*, considered a separate species for the purposes of management.

Conservation status

- The Irrawaddy and Indo-pacific humpback dolphin are listed as rare and the humpback whale as vulnerable under the Queensland Nature Conservation Act 1992 (Table 4, see also Table 3). Hale (1997) and Corkeron et. al (1997) summarise existing data on the distribution, status and conservation of inshore dolphins in Australia.

Threats

- Human activities that impact or that are likely to impact on cetaceans, as listed in the supporting document to GBRMPA's *Whale and Dolphin Conservation Policy*, are:
  - Defence activities

- Deliberate feeding
- Fishing, shark control programs and aquaculture
- Land-based activities
- Marine construction
- Professional filming and photography
- Research
- Use of vessels and aircraft
- Whalewatching and whalewatching including swimming, snorkelling, or scuba diving

- Impacts associated with the above-mentioned activities are described in the Supporting Document to GBRMPA's *Whale and Dolphin Conservation Policy*.

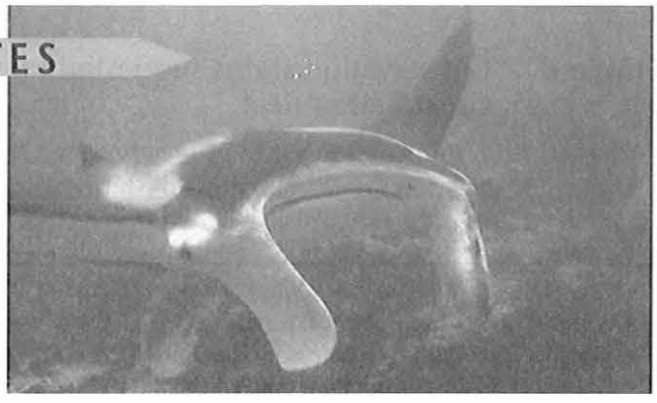
Actions

- GBRMPA's *Whale and Dolphin Conservation Policy* was approved and published in February 2000 and action is underway to make it available on the Authority's web site.
- Implementation of the Policy is proceeding, especially in regard to whale-watching and swimming-with-whale requirements.
- An allocation system for Dwarf Minke permits for the Ribbon Reefs vicinity is in preparation.
- Liaison continues with CRC Reef and JCU scientists studying dwarf minke whales and inshore dolphins.
- GBRMPA, through the CRC Reef is funding studies on inshore dolphins.
- *Best Environmental Practices* for whalewatching 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 occurring in the planning areas.
- GBRMPA staff assist when time permits at local (e.g. Townsville Region) cetacean stranding and carcass incidents.

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 considered to be of conservation concern within the Marine Park.

SHARKS, RAYS AND SKATES



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

Conservation status

- The great white shark and the grey nurse shark are listed as 'vulnerable' under the Commonwealth EPBC Act (Table 4). Both appear to be rare in the GBRWHA. Sharks are not listed under Queensland's NC(W)R.
- Of the species listed within the GBRWHA and in Table 6 below, four are listed by the IUCN Red Data Book (Table 3).
- The *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 of the species.
- In a recent set of summaries of the biology of more 'threatened', or 'potentially threatened', marine and estuarine fishes developed by experts on Australian fish, 28 of the sharks and rays occur in the Great Barrier Reef. A number of them are 'data-deficient' (Table 6, over page).

Threats

- Defence exercises
- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Tourism and recreation

Actions

- GBRMPA provided comments on the draft report Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes (Pogonoski *et al.*

2000) compiled for Environment Australia by the Australian Museum and NSW Fisheries.

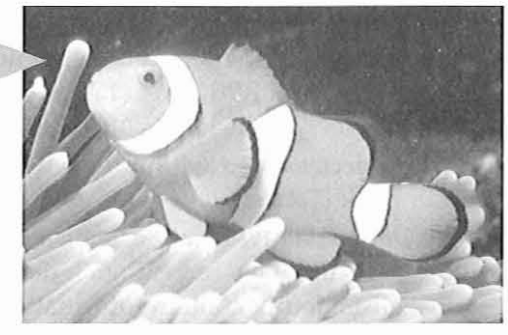
- The Species Conservation Program will consider the implications of the Action Plan for the Great Barrier Reef when it is finalised.
- The World Conservation Union has developed guidelines for applying the IUCN Red List Criteria to marine fishes.
- GBRMPA was represented in the 1997-99 review of the Queensland Shark Control Program, and routinely liaises with the Program.
- Conditions in scientific collecting permits prevent the capture of great white and grey nurse sharks.

Table 6. - Conservation status suggested for sharks and rays found in the Great Barrier Reef.

Adapted from information for the Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes (Pogonoski *et al.* 2000). DD = Data deficient; LR = Lower risk.

• Crocodile Shark *Pseudocarcharias kamoharai* (LR) • Shortfin Mako *Isurus oxyrinchus* (LR) • Blacktip Topeshark *Hypogaleus hyagaensis* (LR) • Gray Reef Shark *Carcharhinus amblyrhyncos* (LR) • Spinner Shark *C. brevipinna* (LR) • Silky Shark *C. falciformis* (LR) • Bull Shark *C. leucas* (LR) • Tiger Shark *Galeocerdo cuvier* (LR) • Whitetip Reef Shark *Triaenodon obesus* (LR) • Scalloped Hammerhead *Sphyrna lewini* (LR) • Great Hammerhead *S. mokarran* (LR) • Whitespot Giant Guitarfish *Rhynchobatus djiddensis* (LR) • Bluespotted Ribbontail Ray *Taeniura lymna* (LR) • Spotted Eagle Ray *Aetobatus narinari* (LR)	• Manta Ray *Manta birostris* (LR) • Grey nurse shark, *Carcharias taurus* (Endangered) • Great white shark, *Carcharias carcharias* (Vulnerable) • Colclough's shark, *Brachaelurus colcloughi* (Vulnerable) • Banded wobbegong; *Orectolobus ornatus* (DD) • Whale shark *Rhincodon typus* (DD) • Blacktip shark; *Carcharhinus limbatus* (DD) • Black whaler, *Carcharhinus obscurus* (DD or LR) • Sandbar shark; *Carcharhinus plumbeus* (DD) • Gulper shark *Centrophorus granulosus* (DD) • Black shark, *Dalatias licha* (DD) • Estuary stingray; *Dasyatis fluviorum* (LR) • Procupine Ray, *Urogymnus asperrimus* (LR) • Sandbar shark, *Carcharhinus plumbeus* (LR)

OTHER MARINE FISHES



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'.
  - Approximately 1500 species in the GBRWHA
  - Low endemism as most fish distributed throughout Indo-West Pacific
  - 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 diel (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

- Marine fish are not listed under Queensland's NC(W)R, and no species found in the Great Barrier Reef is listed under the Commonwealth EPBC Act.
- The 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 can not 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 of the species.
- Of the species listed within the GBRWHA and in Table 7 below, only the Humpheaded maori wrasse is listed by the IUCN Red Data Book (Table 3).
- The draft Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes (Pogonoski *et al.* 2000) contains species synopses of more 'threatened', or 'potentially threatened', marine and estuarine fishes. Sixteen of the fish (non-sharks, rays, and syngnathids) occur in the Great Barrier Reef. A number of them are 'lower risk' (Table 7) and the majority are cod and groupers from the Family Serranidae.

Table 7. - Conservation status suggested for bony fish found in the Great Barrier Reef.

Adapted from the Draft Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes (Pogonoski *et al.* 2000). LR-CD – Lower risk, conservation dependent; LR-LC = Lower risk, least concern; DD = Data deficient

• Sculptured frogfish *Halophryne queenslandiae* (DD) • Barramundi cod, *Cromileptes altivelis* (LR-CD) • Estuary cod, *Epinephelus coioides* (LR-LC) • Purple Rockcod, *Epinephelus cyanopodus* (LR-LC) • Black Rockcod, *Epinephelus daemelii* (Vulnerable) • Bar Rockcod, *Epinephelus ergastularius* (DD) • Flowery cod, *Epinephelus fuscoguttatus* (LR-LC) • Queensland grouper, *Epinephelus lanceolatus* (LR-CD) • Malabar grouper, *Epinephelus malabaricus* (LR-LC)	• Camouflage cod, *Epinephelus polyphekadion* (LR-LC) • Greasy cod, *Epinephelus tauvina* (LR-LC) • Potato cod, *Epinephelus tukula* (LR-CD) • Multicolour dottyback, *Ogilbyina novaehollandiae* (LR-LC) • Humphead maori wrasse, *Cheilinus undulatus* (LR-CD) • Humpheaded parrotfish, *Bolbometopon muricatum* DD • Swordfish, *Xiphias gladius* DD

Threats

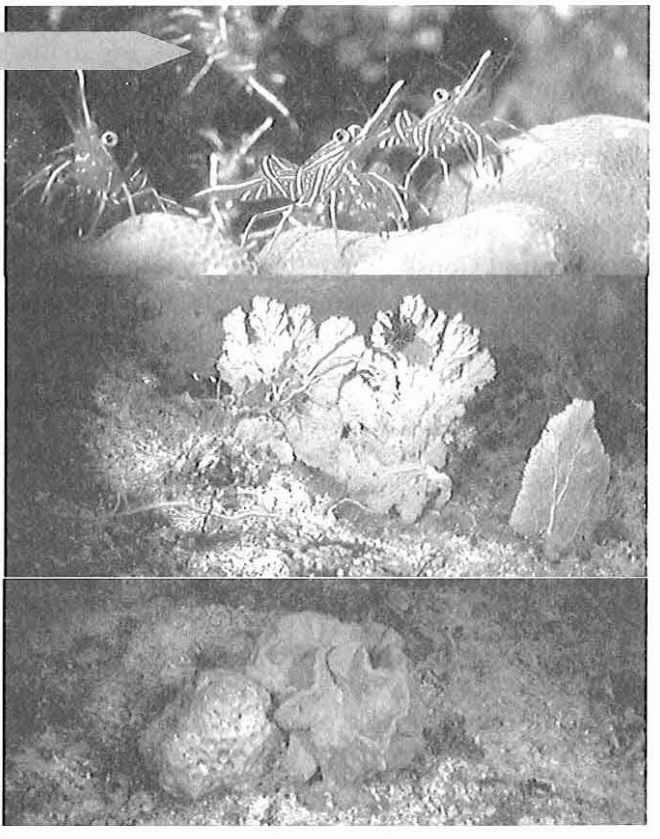
- Aircraft, boats, ships and other motorised machines
- Coastal development
- Declining water quality
- Defence exercises
- Fishing, shark control programs and aquaculture
- Hunting and collecting
- Tourism and recreation

Actions

- GBRMPA provided comments on the draft Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes (Pogonoski *et al.* 2000) compiled for Environment Australia by the Australian Museum and NSW Fisheries.

- The Species Conservation Program will consider the implications of the Action Plan for the Great Barrier Reef when it is finalised.
- The World Conservation Union is developing guidelines for applying the IUCN Red List Criteria to marine fishes.
- A joint DPI/AIMS study on the bycatch associated with the commercial net fisheries has been completed and the final report is in preparation. GBRMPA will consider the implications when it is finalised.
- GBRMPA provides for the protection of threatened fish species through conditions on research permits, prohibiting the collection of some species via the GBRMP Regulations 1983 and the protection of individual species at some locations (e.g. Cod Hole at Ribbon Reefs). The location and protection of spawning grounds is now also being investigated.

MARINE INVERTEBRATES



Knowledge

- Refer to 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. There is no history of scientific monitoring available to describe how the seabed communities have changed over time'* p.72.
- Refer also to *The Outstanding Universal Value of the Great Barrier Reef World Heritage Area* (Lucas *et al.* 1997). Summaries follow:
- **Ascidians** (*p.110*): At least 330 species occur on Great Barrier Reef, mostly over a vast range; the Great Barrier Reef acts as a bridge for gene flow from temperate to tropical areas; Free-swimming larvae for only a short period of time. 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 found attached to rocks, shells, and pilings in shallow water, and on ship bottoms or are sometimes fixed in mud and sand by filaments or a stalk; although deep sea species inhabit soft bottoms; exist as both solitary and colonial forms; body sizes range from 1mm-10cm in diameter; filter feeders
  - Reproduction occurs either through budding (a small replica of the parent forms and eventually frees itself from the parent) or through the release of sperm and egg into the water column (Barnes 1987, Kott 1982)
- **Bryozoans** (*p.118*): 300-500 species on Great Barrier Reef (8-12% of world fauna), form natural 'isolates' that provide important structure and habitats for other species, likely that bryozoan fauna of reefal and shelf environments are distinct; Indo-West Pacific contains the highest diversity of bryozoans;
  - Cross-shelf variation evident in the central Great Barrier Reef Marine Park (Birtles and Arnold 1988)
  - From Barnes (1987): bryozoans are colonial; benthic, occur in cryptic environments, in caves and under coral plates; found in reef and soft sediment shelf areas; encrusting, mobile epifauna, or anchored colonies attached to hard, stable substratum; generally inconspicuous,

forming relatively small colonies (millimetres to tens of centimetres in diameter); suspension feeders ; reproduction occurs either through the release of egg and sperm into the water column or fertilised eggs are brooded internally; larval stage is usually present with settlement occurring on hard surfaces (rock, shells, coral and wood) with some species boring in calcareous substrates

- **Crustaceans** (*p.126*): poorly studied, high diversity, endemism low; extensive range of habitats important; live within all habitats in the 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
- **Echinoderms** (*p.128*): 800+ species, many rare taxa, higher phylogenetic diversity well expressed, likely to have greatest species diversity for any marine protected area in world, distinct reefal and non-reefal suites of species with very strong zonation; 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
  - Most feed by scraping algae, encrusting organisms and detritus from hard surfaces and 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; found in waters 10 m to 40 m deep; main food source reported to be bacteria and detritus (Bakus 1973, Massin 1982, Poiner *et al.* 1998); exhibit sexual reproduction (Smiley *et al.* 1991); larvae are plankton feeders which settle onto suitable substrate where they develop to young adults; juveniles believed to be highly cryptic, with high numbers reported in seagrass habitats (Shelley 1981)
- **Platyhelminths** (*p.135*): 1000's of species, low endemism, high diversity in free-living macro and meiofaunal forms and very high diversity in parasitic forms, polyclad turbellarians with vivid colours and patterns contribute to the Reef's aesthetic value, cosmopolitan composition with Indo-West Pacific environments
  - 4 groups of flatworms: macrofaunal (large free-living), meiofaunal (small free-living), interstitial (less than 1 mm) and symbiotic (Cannon 1993)
- **Fringing Reef corals and other reef elements** (*p. 137*): exhibit high species diversity, contain some of largest and oldest coral colonies, genotype of some colonies may have been present on Reef for 1000s of years, inshore coral communities in the southern Great Barrier Reef may offer new insights into coral reef formation and evolution, high aesthetic value;
- **Hard Corals** (*p.152)* : high habitat diversity, 359 hard coral species recorded, low endemism, long-lived massive corals provide historical information,
- **Molluscs** (*p.165*): 5000-8000 species, represents a significant proportion of the world molluscan diversity, 4 main components of molluscan fauna with the most speciose being the shallow reefal fauna with very low endemism, endemism highest in components shared with southern Qld and NSW, volute family has highest degree of endemism, some bivalves are important in bioerosion of coral substrates, poorly known; exist in coastal waters with largest terrigenous inputs and attenuate with increasing latitude, small endemic element; most gastropods have a

single shell, occupy most niches in the marine environment and have a wide array of feeding strategies (deposit feeding, herbivorous, carnivorous, parasitism); bivalves are predominantly filter feeders, have 2 shells, many are infaunal burrowers or attach themselves to substrate; cephalopods are efficient swimmers, predators (carnivores) and some have a full shell (nautilus) while other have no shell (octopus)

- **Octocorals** (*p.174*): 80 genera likely to occur on Great Barrier Reef of 270 worldwide; occur in all habitats; soft corals are a major component of sessile benthic fauna;
- **Polychaete worms** (*p.178*): dominant macrofauna in reefal sediments and coral substrates, 80 species recorded in Great Barrier Reef, however >500 may occur, diversity is product of latitudinal extent, habitat diversity and good condition of Great Barrier Reef, play important roles in ecosystem, tropical fauna is poorly known; important in food chain both as a predator and prey; dominate macrofauna both in terms of numbers of individuals and number of species; probably exhibit latitudinal and cross shelf variations; some with restricted distributions; bioturbate sediments, one of the first colonisers of dead coral colonies; facilitate settlement of other invertebrates
  - 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 determined by sediment characteristics, water movement and stability of sediments; exhibit range of reproductive strategies: brooders, broadcast spawners, sexual and asexual reproduction; exhibit range of feeding strategies (deposit, herbivores, filter feeders, suspension feeders, omnivores, and opportunistic/selective/non-selective) feeding on bacteria, algae, detritus, other invertebrates and carrion; life cycle from a few weeks to several years (Barnes 1987, Lucas *et al.* 1997)
- **Sponges** (*p.191*): 1500 species in Great Barrier Reef (c. 30% of Aust. sponge fauna), endemism likely low but lacks study, relicts of reef-building sponges from Ordovician Period have been recorded, cross shelf trends in sponge abundance and diversity, play 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; important food source for threatened hawksbill turtle.
  - Species richness decreases with increasing distance from the shore (Wilkinson and Cheshire 1989)
  - From Barnes (1987): Sessile; occur 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; variety of growth forms from burrowing to encrusting those that attach to a relatively small area and grow upright with branches or into large urn shapes; shallow coastal waters to depths of 200 and 1000m

Conservation status

- Marine invertebrates are not listed under Queensland's NC(W)R and are not listed under the Commonwealth EPBC Act.
- The 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 can not 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 of the species.
  - Fish, as defined under the Queensland *Fisheries Act 1994* section 5(2), includes prawns, crayfish, rock lobsters, crabs and other crustaceans, scallops, oysters, pearl oysters and other molluscs, and sponges, annelid worms, bêche-de-mer and other holothurians ad trochus and green snails.
- Environment Australia has commissioned a conservation overview of marine invertebrates.

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 and Whitsundays 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.
- *Best Environmental Practices for Anchoring* have been prepared and publicised.
- GBRMPA's Species Conservation Unit commented on a survey regarding the 'Conservation Status of Marine Invertebrates' conducted by the Australian Museum as part of a consultancy to develop a **Conservation Overview on Marine Invertebrates** for Environment Australia.
- The Species Conservation Program will consider the implications for the Great Barrier Reef of the conservation overview when it is finalised. In the meantime, conservation of marine invertebrates is addressed through habitat conservation initiatives, such as the Representative Areas Program, which should ensure comprehensive, adequate and representative protection.
- Further protection is provided on the GBR through zoning plans and permit conditions.

MARINE PLANTS

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 GBR:
  - **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 GBR has the most extensive, actively accumulating *Halimeda* beds in the world.
  - **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, intensive 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 28m 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 NC(W)R and are not listed under the Commonwealth EPBC Act.
- Environment Australia has commissioned a report on the conservation status of marine algae.
- Marine plants are protected under the Queensland *Fisheries Act 1994*.

Threats

- Aircraft, boats, ships and other motorised machines
- Coastal development
- Declining water quality
- Defence exercises
- Fishing, shark control programs and aquaculture
- Marine dredging and construction
- Tourism and recreation

Actions

- Dugong Protection Areas established for conservation of dugongs will also assist in the protection of seagrass habitats.
- GBRMPA has funded baseline seagrass surveys in many areas of the Great Barrier Reef (contract with QDPI).
- The Species Conservation Program will consider the implications for the Great Barrier Reef of the conservation status of marine algae report commissioned by Environment Australia when it is finalised
- A recent FRDC 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.
- QDPI manages seagrass, mangroves and other marine plants. QDPI 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 should ensure comprehensive, adequate and representative protection.

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.

FLORA

Knowledge

- 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 GBR:
  - 2195 plant species known on continental islands; 3 endemic
  - some continental islands represent type localities for botanical collections
  - 300-350 species known on coral cays in the northern Great Barrier Reef – 2 endemic; ~120 species in the southern GBR
  - 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 plant species are listed as rare or threatened under Queensland and Commonwealth legislation and on the IUCN Red Data Book (Tables 3, 4).

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

- QPWS are responsible for the day-to-day management of island National Parks in the GBRWHA
- GBRMPA's Species Conservation Program keeps a watching brief on information published about GBRWHA terrestrial flora.

FAUNA

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 GBR:
  - **Amphibians**: At least 7 species of frogs are known from the 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 coral cays and continental islands include: pseudoscorpions, mites, spiders, centipedes, isopods and 36 families of insects in 10 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. 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): 9 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 amethistina*), 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

- The Proserpine rock wallaby is listed under Queensland NC(W)R and Commonwealth EPBC Act (Table 4).

Threats

- Coastal development
- Invasive species
- Pollution
- Tourism

Actions

- QPWS are responsible for the day-to-day management of island National Parks in the GBRWHA
- GBRMPA's Species Conservation Program keeps a watching brief is kept on information published about GBRWHA terrestrial fauna.

APPENDIX 6 – List of Abbreviations

AFMA	Australian Fisheries Management Authority
ANCA	Australian Nature Conservation Agency
BRDs	Bycatch reduction devices
CBWH	Conservation, Biodiversity and World Heritage Group
CIG	Critical Issues Group
DDM	Day-to-day Management Coordination Unit
EA	Environment Australia
EPBC Act	*Environment Protection and Biodiversity Act 1999*
FRDC	Fisheries Research and Development Corporation
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
NC(W)R	*Nature Conservation (Wildlife) Regulation 1994*
QDEH	Queensland Department of Environment and Heritage
QDOE	Queensland Department of Environment
QDPI	Queensland Department of Primary Industries
QEPA	Queensland Environmental Protection Agency
QPWS	Queensland Parks and Wildlife Service
RAC	Reef Advisory Committee
TEDs	Turtle excluder devices; trawling efficiency devices