



**Australian Government**

**Great Barrier Reef  
Marine Park Authority**

**Published March 2005**

# Environmental Status:

## *Marine Reptiles*

***let's keep it great***



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ISBN 1 876945 34 6

Published March 2005 by the Great Barrier Reef Marine Park Authority

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**National Library of Australia Cataloguing-in-Publication data:**

Bibliography.  
ISBN 1 876945 34 6

1. Conservation of natural resources – Queensland – Great Barrier Reef. 2. Marine parks and reserves – Queensland – Great Barrier Reef. 3. Environmental management – Queensland – Great Barrier Reef. 4. Great Barrier Reef (Qld). I. Great Barrier Reef Marine Park Authority

551.42409943

**Chapter name:** **Marine Reptiles**  
**Section:** *Environmental Status*  
**Last update:** *March 2005*  
**Primary Author:** *Kirstin Dobbs and Sarah Pierce*

***This document should be referenced as:***

Dobbs, K. and Pierce, S., March 2005, 'Marine Reptiles' in Chin. A, (ed) *The State of the Great Barrier Reef On-line*, Great Barrier Reef Marine Park Authority, Townsville. Viewed on (enter date viewed),  
[http://www.gbrmpa.gov.au/corp\\_site/info\\_services/publications/sotr/marine\\_reptiles/index.html](http://www.gbrmpa.gov.au/corp_site/info_services/publications/sotr/marine_reptiles/index.html)

## Marine Reptiles

Marine reptiles found in the waters of the Great Barrier Reef fall into three major groups: crocodiles, marine turtles and sea snakes.

### Crocodiles

The primary habitats for [crocodiles](#) are coastal and estuarine systems of the Queensland coast outside the boundaries of the Great Barrier Reef Marine Park. Nevertheless, [satellite tracking](#) data show that crocodiles do enter the Great Barrier Reef Marine Park when moving between these coastal habitats. As such, they are considered to be temporary migrants in the Great Barrier Reef. There is widespread perception that crocodile numbers have significantly increased since the crocodile gained protected species status in 1974. However, recent population surveys suggest that crocodile populations have only marginally increased since they were protected. Many human activities such as coastal development, mesh netting of tidal rivers and removal of riparian vegetation are believed to reduce the capacity for crocodile numbers to increase.



Crocodiles do occur in the Great Barrier Reef World Heritage Area but they occur predominantly in coastal and estuarine areas adjacent to the Great Barrier Reef Marine Park.

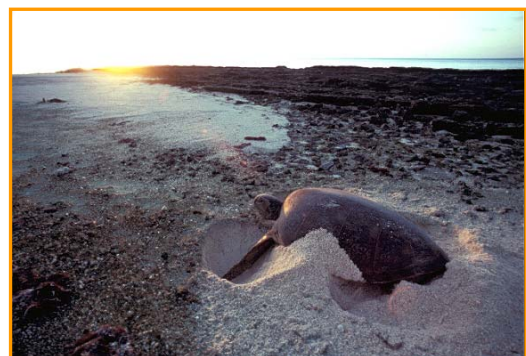
Although records indicate that crocodiles are found over a wide area of Queensland, they only occur at low densities along the northeast coast of Queensland and no crocodile nesting in the Great Barrier Reef has been reported. Because their primary habitat is coastal river and estuarine systems outside of the Great Barrier Reef Marine Park, crocodiles are not considered further in this report. For more information about crocodiles, see *Further Reading*.

### Marine Turtles

#### Condition

#### **Marine turtles of the Great Barrier Reef**

Of the world's seven species of marine turtles, six are found in the waters of the Great Barrier Reef: namely the [green](#), [hawksbill](#), [loggerhead](#), [flatback](#), [olive ridley](#) and [leatherback](#) turtles. The Great Barrier Reef is one of the remaining havens for marine turtles in the world. Four of these six species (green, loggerhead, hawksbill and flatback) have internationally significant populations in the Great Barrier Reef. The flatback turtle is endemic<sup>1</sup> to Australia and only nests on Australian beaches.



Individual female turtles return to nest at beaches in the same area in which they were born.

All marine turtle species have the same general [life cycle](#). Most are slow growing and take decades to reach sexual maturity: 20-25 years for flatback and loggerhead turtles, 30-50 years for green turtles. Females do not breed every year and have non-breeding periods of between 5-8 years for green turtles and 2-3 years for flatback turtles. This means that marine

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<sup>1</sup> Only occurs within a particular region. An endemic species is not found anywhere else.

turtles require high annual survivorship of adults and near-adults in order for populations to be maintained.

Marine turtles aggregate to [breed](#) at a limited number of nesting sites, with individual females returning to nest at beaches in the same area in which they were born. Such areas include:

- Raine Island and Heron Island which are both internationally significant green turtle nesting beaches;
- Milman Island which is an internationally significant hawksbill turtle nesting beach;
- Peak Island which is a major flatback turtle nesting site; and
- Wreck Island, a major loggerhead nesting site.

Marine turtles can [migrate](#) as far as 2600 km between nesting beaches and feeding areas, but repeatedly return to the same feeding and nesting sites throughout their lives.



Marine turtles breed at a limited number of nesting beaches. Many turtles travel thousands of kilometres between foraging and breeding grounds.

### **The conservation status of marine turtles**

Globally, marine turtle populations are under threat (see Table 1). The [hawksbill](#) is listed as 'critically endangered' on the [2002 IUCN Red List of Threatened Species](#). This means that the species is at 'extremely high risk of extinction in the immediate future'. [Green](#), [olive ridley](#), [loggerhead](#) and [leatherback](#) turtles are listed as 'endangered', meaning that they are at 'high risk of extinction in the near future'. In Australia, marine turtles are also considered [threatened](#) and are listed in Australia's [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act 1999) and the Queensland [Nature Conservation Act 1992](#). Collectively, these Acts and Regulations reduce the pressure on marine turtles through a variety of mechanisms (see *Response*).

**Table 1: The conservation status of marine turtles found within the Great Barrier Reef Marine Park**

Common Name	Scientific Name	IUCN ( <a href="#">World Conservation Union</a> ) <sup>1</sup>	Commonwealth <a href="#">Environment Protection and Biodiversity Conservation Act 1999</a> <sup>2</sup>	Queensland <a href="#">Nature Conservation (Wildlife) Regulation 1994</a> <sup>3</sup>
Family: Cheloniidae				
<a href="#">Loggerhead</a>	<i>Caretta caretta</i>	Endangered	Endangered	Endangered
<a href="#">Green</a>	<i>Chelonia mydas</i>	Endangered	Vulnerable	Vulnerable
<a href="#">Hawksbill</a>	<i>Eretmochelys imbricata</i>	Critically Endangered	Vulnerable	Vulnerable
<a href="#">Flatback</a>	<i>Natator depressus</i>	Data deficient	Vulnerable	Vulnerable
<a href="#">Olive Ridley</a>	<i>Lepidochelys olivacea</i>	Endangered	Endangered	Endangered
Family: Dermochelidae				
<a href="#">Leatherback</a>	<i>Dermochelys coriacea</i>	Endangered	Vulnerable	Endangered

<sup>1</sup>.IUCN Red List categories: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Lower Risk, Data Deficient (Source: 2002 IUCN Red List of Threatened Animals).

<sup>2</sup>.Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* categories: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Lower Risk, Data Deficient.

<sup>3</sup>.Queensland *Nature Conservation (Wildlife) Regulation 1994* schedules: Presumed Extinct, Endangered, Vulnerable, Rare, Common.

## ***The current condition of marine turtles in the Great Barrier Reef***

In the Great Barrier Reef, most scientific studies of marine turtle populations have been focused on green, loggerhead, hawksbill and flatback turtles and long term survey data are available for some species. Nevertheless, the long lifespan of marine turtles means that even these long term studies do not cover a single generation, so that the impacts of current pressures may not become evident for decades.

### **Condition: [loggerhead turtles](#)**

Since surveys began in the late 1970s the number of nesting females has steadily declined by 50-80% from about 1000 breeding females to a few hundred. The east Australian population of loggerhead turtles used to represent the bulk of the South Pacific stock (one of about eight loggerhead stocks globally). If this population disappears, it will mean the effective removal of the South Pacific stock. As female turtles return to nest in the area where they hatched, it is highly unlikely that a population that has 'died out' would be recolonised by turtles from another population somewhere else in the world.

### **Condition: [green turtles](#)**

There are two genetically distinct breeding stocks of green turtles in the Great Barrier Reef. Nesting sites for the southern stock are concentrated in the Capricorn/Bunker group of islands, with an average annual nesting population of 8,000 females. The northern green turtle stock predominantly nests around Raine Island and Moulter Cay, with an average annual nesting population of 30,000 females. To date, there have been no detectable declines in the number of nesting green turtles at these sites. However, the 20-25 years of data for the key sites (Raine Island, Heron Island) do not cover a single generation for green turtles, and trends are difficult to determine with the large fluctuations in nesting numbers that can occur because of the El Niño Southern Oscillation<sup>2</sup>. Additionally, population models using accumulated demographic data suggest that the northern and southern stocks may be exhibiting characteristics of a population under threat, including a decline in the size of nesting adults, increases in the non-breeding periods and a lack of expected increases of turtle numbers in dispersed feeding areas.

### **Condition: [hawksbill turtles](#)**

Hawksbill turtles are found all over the world but tend to nest in low numbers. Around the Great Barrier Reef region, hawksbill turtle nesting areas are only found north of Princess Charlotte Bay and in the Torres Strait. The only nesting population for which there is sufficient information is at Milman Island, where data indicates a decline in the number of nesting females of about 3% per year. Tagging studies show that hawksbill turtles migrate to neighbouring countries where they may be harvested (see *Pressure*).



Numbers of nesting female hawksbill turtles are continuing to decline.

### **Condition: [flatback](#), [olive ridley](#) and [leatherback](#) turtles**

There are no indications that the east Australian flatback turtle stock is in decline with surveys showing relatively stable numbers of nesting flatback turtles. Olive ridley and leatherback turtles are uncommon in the Great Barrier Reef and have received little scientific

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<sup>2</sup> A global climate phenomenon with a wide range of effects, including changes to oceanic current circulation patterns and sea temperatures that subsequently affect marine plants and plants.

attention. The long-term trends in the populations of these species are unknown. However, given the broad scale decline in the South Pacific leatherback turtle stock, the animals that occur in the Great Barrier Reef are likely to be part of that declining population, which raises concerns for this species in the Great Barrier Reef.

## Pressure

Many [human activities](#) are known, or thought likely to have, negative impacts on marine turtle populations. The [Recovery Plan for Marine Turtles in Australia](#) outlines the major impacts associated with each turtle species in Australia. This information is based on impacts from various activities upon each genetic stock<sup>3</sup> known for the species within Australia. While marine turtles are relatively well protected in Australian waters, they regularly make [migrations](#) of up to thousands of kilometres and subsequently are exposed to significant pressures in overseas waters (e.g. harvesting of green turtles in Indonesia).

Within Australia, the [Environment Protection and Biodiversity Conservation Act 1999](#) lists the following factors as [Key Threatening Processes](#):

- [Predation by the European Red Fox](#) which affects green, loggerhead and leatherback turtle nests. A threat abatement plan has been developed for this key threatening process.
- [Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs](#) which affects flatback turtle nests. A threat abatement plan is considered desirable, although one has yet to be developed.
- [Incidental catch \(bycatch\) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28 degrees South](#). A threat abatement plan was not warranted at this stage given current actions by industry to implement bycatch mitigation devices (e.g. Turtle Excluder Devices - TEDs). TEDs are now mandatory in the Great Barrier Reef Marine Park (see [Response](#)).
- [Injury or fatality to marine vertebrates caused by marine debris](#). A coordinated threat abatement plan could be an effective and efficient means of abating the threatening process by incorporating action to address both land-based and shipping and boating sources of marine debris.



Entanglement in fishing gear is one of many human pressures on turtles. This turtle is entangled in a crab pot. © QPWS

Within the Great Barrier Reef Marine Park, direct human pressures on turtle populations include bycatch in commercial fishing gear (e.g. trawl nets), traditional hunting, boat strike, habitat degradation, incidental catch in shark control gear, and ingestion of, or entanglement in, floating rubbish such as plastic bags and fishing line which can block guts after being eaten.

### **Pressure: boat strike**

In 1996, the [Marine Wildlife Stranding and Mortality Database](#) was established by the Queensland Parks and Wildlife Service (QPWS) to record information on marine wildlife

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<sup>3</sup> Marine turtles return to the region of their birth; therefore, they are classified as management units based upon their genetic differences between breeding areas. For example, there is only one genetic breeding stock of loggerhead turtles in the GBRWHA, but two genetic breeding stock of green turtles (northern GBR and southern GBR).

strandings. For the years 1999 and 2000, the data show that human activities accounted for between 78% and 81% of mortality where the cause of death could be identified. Boat strike was the primary cause of mortality accounting for up to 60% of the known and reported human caused deaths. The increasing number of high speed vessels in the Great Barrier Reef will increase the risk of boat strike in areas frequented by turtles. Green turtles are especially at risk because of their habit of basking at the surface of the water.

**Pressure: marine debris**

Marine debris consists of a variety of objects including litter and rubbish from boats and ships, items washed into the Great Barrier Reef from coastal waterways and lost fishing gear. As turtle hatchlings associate with converging zones of ocean currents, they come into close proximity to floating marine debris and consequently risk becoming entangled. Turtles may also mistake marine debris for food and ingest foreign objects, which may result in stomach and intestinal blockages. Entanglement in marine debris such as discarded fishing line may cause turtles to drown or become so encumbered that they cannot swim and feed properly. Debris washed up on nesting beaches may interfere with nesting turtles and prevent hatchlings from reaching the sea.

**Pressure: incidental catch**

Prior to the introduction of Turtle Excluder Devices (TEDs), a large number of marine turtles were drowned in trawl nets. Research suggests that some 5295 (± 1231) turtles were caught every year by trawlers operating in the waters off the East Coast of Queensland and the Great Barrier Reef, with between 1.1% and 7.8% of the turtles caught drowning. The full adoption of TEDs in the trawl fleet has progressed slowly, due in part to ambiguities in guidelines and definitions relating to the use and design of TEDs, although this has been addressed (see *Response*). Turtles are also taken as bycatch<sup>4</sup> in the [Queensland Shark Control Program](#) (QSCP) which sets nets and baited 'drum lines' along popular swimming beaches. Currently, six nets and 127 drum lines are deployed within the Great Barrier Reef Marine Park. Research has showed that nets result in higher bycatch of marine turtles and the replacement of nets with drum lines has significantly reduced turtle bycatch. Relatively few turtles are now killed by QSCP gear (see *Response*). Nevertheless, these changes have not completely eliminated bycatch of turtles, with loggerhead turtles still being caught on drum lines in southern Queensland.



Boat strike is a major human pressure on turtles. © QPWS



Ingestion of fishing line is another human pressure on turtles. © QPWS



Prior to the introduction of TEDs, a large number of turtles were captured as bycatch in trawl nets.

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<sup>4</sup> Bycatch or incidental catch is that unintentional catch of animals in fishing gear set to catch other species.



### **Pressure: traditional hunting**

The direct take of turtles in the Great Barrier Reef is legally restricted to [traditional hunting](#) by Aboriginal peoples and Torres Strait Islanders living adjacent to the Marine Park. Turtle meat and eggs are an important traditional element of the diet of Australia's Indigenous peoples, particularly for celebrations and family gatherings.

The Great Barrier Reef Marine Park Authority (GBRMPA) is aware that illegal take occurs by non-Traditional Owners without appropriate permission and without following cultural protocols. The level of this take is unknown but may be high in certain areas of the Great Barrier Reef.

A recent [survey](#) of Indigenous fishing in northern Australia estimates that over a one year period in 2000-01, 3851 marine turtles (species unspecified) were taken by Indigenous hunters in north Queensland waters excluding the Torres Strait. Whilst the GBRMPA has reservations about the survey methodology, the current level of marine turtle hunting (constituting traditional and illegal catch) on the Great Barrier Reef appears to be unsustainable. Turtles are also hunted in neighbouring countries that share turtle stocks with the Great Barrier Reef. This combined direct mortality is thought to exceed the capacity to replace losses particularly for the northern Great Barrier Reef green turtle stock and hawksbill turtles.

### **Pressure: habitat degradation and disturbance**

A variety of human activities can destroy or damage beach habitats that are nesting sites for marine turtles. Coastal developments may totally remove beach sand and restrict access to nesting areas. Lights from buildings and in particular, street lights, can confuse turtle hatchlings, causing them to move inland instead of moving out to sea. Additionally, unrestricted camping and vehicle traffic on beaches can cause damage to turtle nesting areas by compacting the sand, increasing dune erosion and by creating wheel ruts that can trap turtle hatchlings. Uncontrolled camping may disrupt nesting turtles and disturb or damage nests. Disturbance through noise, direct harassment of turtles and increasing vessel traffic may displace turtles from their normal nesting or foraging grounds.

Habitats such as seagrass meadows and coral reefs are also under increasing pressure from human impacts such as pollution. Seagrass and coral reef habitats are important foraging grounds for species such as green turtles that feed on seagrasses, or loggerhead turtles that feed on coral reef animals. A national review by an [independent panel of scientists](#) concluded that the runoff of sediments from the land into the Great Barrier Reef has greatly increased since European settlement and that declining water quality poses a serious threat to the Great Barrier Reef. The increasing runoff of nutrients, pesticides and increasingly fine sediments can smother turtle habitats such as coral reefs and seagrass meadows, cause algal blooms and decrease the amount of light reaching seagrasses and corals. Declining water quality may also directly affect marine turtles by increasing the incidence of disease. For more information about the impacts of declining water quality on turtle habitats, see [Environmental status – water quality](#), [Environmental status - seagrass](#) and [Environmental status - corals](#).

### **Pressure: climate change**

While there is little information about the specific effects of climate change on marine turtles, these impacts can be predicted by examining sea turtle biology and ecology. The changing temperatures and weather patterns associated with climate change are likely to have both



direct physiological impacts on marine turtles, as well as indirect effects through impacts on critical turtle habitats.

The sex of marine turtle hatchlings is determined by the incubation temperature of the eggs, with warmer incubation temperatures giving rise to higher numbers of female hatchlings. Climate change may alter beach sand temperatures and thus, cause changes in the male/female sex ratio in marine turtle populations. Once hatched, changing sea temperatures may affect the growth rate of hatchlings and juvenile turtles.

Climate change may also affect critical turtle habitats. Rising sea levels and an increase in the frequency and intensity of severe storms may erode critical nesting beaches and reduce the availability of suitable nesting sites. Climate change may also alter ocean circulation patterns and disrupt marine food webs, both of which would have significant impacts on turtles during pelagic phases of their lifecycle. For example, the El Niño Southern Oscillation is thought to have a significant impact on the numbers of green turtles nesting in the Great Barrier Reef. Higher than normal sea temperatures have resulted in major coral bleaching episodes in 1998 and 2002, as well as seagrass burning. Continued increases in sea temperatures may lead to an increasing frequency and intensity of coral bleaching and seagrass burning events (see [Environmental status – corals](#) and [Environmental status – seagrass](#), reducing the amount and/or quality of both shelter and food for marine turtles. The long life span and generation times of marine turtles reduces the ability of these animals to cope with rapidly changing climatic conditions.



Climate change may alter the sex ratio of sea turtle populations, and changes to sea level and an increase in the frequency and intensity of storms may destroy critical nesting sites.

## Response

### **Response: international and national strategies**

Marine turtles are considered to be [threatened](#) species. Internationally, all of the turtle species found in the Great Barrier Reef are protected under [Appendix I](#) of the [Convention on International Trade in Endangered Species](#) (CITES). Within Australia, all marine turtles are listed in the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act 1999). Within Queensland and the Great Barrier Reef Marine Park, marine turtles are listed as protected species under the Queensland [Nature Conservation Act 1992](#), and the [Great Barrier Reef Marine Park Act \(1975\)](#) which prohibits interference with these animals without a specific permit or an agreement for traditional use.

Collectively, these arrangements are aimed at reducing the pressure on turtles from harvest and trade, but also include provisions to reduce pressure on these species from a wide variety of human impacts such as bycatch in fisheries. Under CITES, international trade in turtle products (such as shells or items made from turtle shell) is heavily regulated and illegal without special permits. Commercial trade in turtle products within Australia also is prohibited under the [EPBC Act 1999](#) and the [Nature Conservation Act 1992](#). Under the [EPBC Act 1999](#), the management of fishing activities such as trawling are being [assessed](#) for environmental sustainability including effects on bycatch species such as marine turtles.

In Australia, a national Marine Turtle Recovery Team has been formed with representatives from federal and state nature conservation and fisheries agencies, and other stakeholders. The Team recently finalised a [Recovery Plan for Marine Turtles in Australia](#) that identifies the objectives, criteria and actions to promote the recovery of these turtle species. In particular, the Plan identifies the loggerhead turtle as a species of particular concern and urges lead management and fisheries agencies to reduce loggerhead mortality to almost zero.

Because of long migrations between feeding and breeding grounds, some turtles swim through the waters of more than one country during their lives. Consequently, conservation efforts for turtles must be coordinated at an international level if they are to be successful. Australia is a signatory to the [Convention on Migratory Species](#) and the [Convention on Conservation of Nature in the South Pacific](#), regional agreements that relate to turtle conservation in the [South Pacific](#) and [Indian Ocean/South East Asian](#) regions.

### **Response: boat strike**

The Great Barrier Reef Marine Park Authority (GBRMPA) is working with other agencies to collect information about the risks and incidence of boat strikes on marine turtles. A tri-agency ([Queensland Parks and Wildlife Service](#), [Department of Primary Industries and Fisheries](#), [GBRMPA](#)) program facilitates [public reporting](#) of [marine wildlife strandings](#), recording of data and detailed examinations of turtle [carcasses](#) to identify causes of mortality. Data from the program are released in [annual reports](#). The GBRMPA website enables the general public to [subscribe to an E-mail Listserver](#) that posts notices about each stranding soon after it is investigated.


The GBRMPA has also implemented an education program to educate Reef users about the risks boat traffic poses to marine turtles, particularly in inshore areas. This community education program includes television community service announcements, publications, stickers and signage at boat ramps to encourage boaters to 'Go Slow' in shallow waters and to follow [Best Environmental Practices](#). Voluntary speed restrictions and vessel transit lanes are also being used in areas such as Missionary Bay off Hinchinbrook Island to reduce the incidence of boat strike in this area. Additionally, access to the waters surrounding critical nesting sites may be restricted under the Great Barrier Reef Marine Park Zoning Plan (see *Response: habitat degradation and disturbance*).



Fast moving boats may collide with turtles and cause serious injury. The GBRMPA is educating boaters about the threats boats pose to turtles and encouraging them to "go slow".

### **Response: marine debris**

One of the most common ways for litter to enter the Great Barrier Reef is from [commercial ships](#) and recreational vessels. Litter can accidentally fall, blow or wash off boats, or in some cases be dumped overboard on purpose. It is illegal to dump litter into the Great Barrier Reef Marine Park and the disposal of plastics into the sea is prohibited anywhere in the world under the [International Convention for the Prevention of Pollution from Ships](#). This prohibits the dumping of garbage within 12 nautical miles from the nearest land. Offenders may be fined up to \$1.3 million for companies and up to \$260,000 for individuals. For more information about shipping and marine debris in the Great Barrier Reef, see [Management status – shipping and oil spills](#).

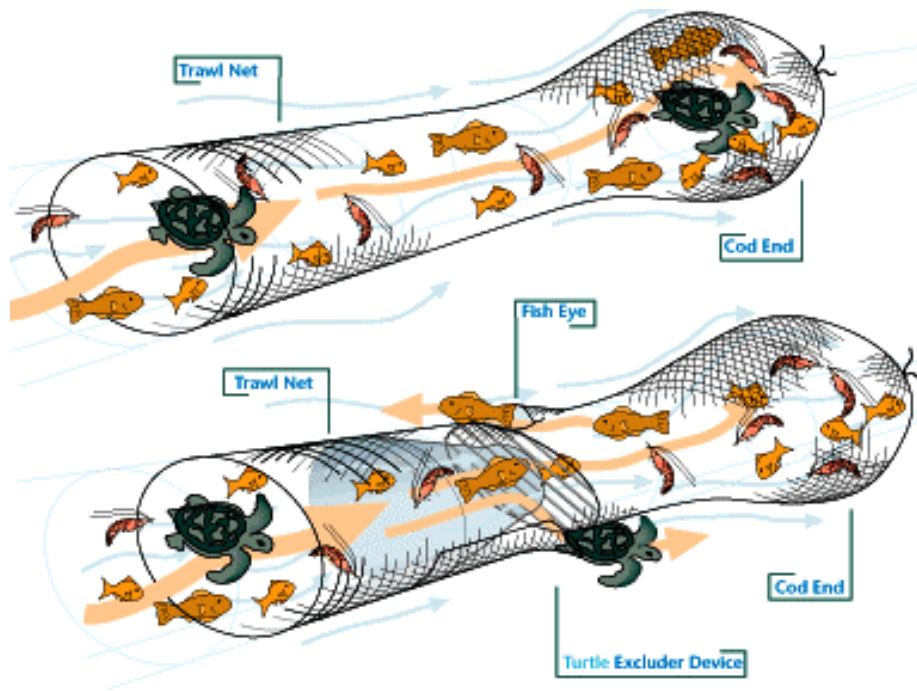


The dumping of litter in the Great Barrier Reef Marine Park is prohibited and in recent years some local councils have taken steps to reduce the amount of litter washing into the Great Barrier Reef from local waterways and storm water drains. The runoff of litter into the Great Barrier Reef Marine Park from the land is regulated by State and local government and is outside the jurisdiction of the GBRMPA. Nevertheless, the GBRMPA is working with State and local governments on a wide range of water quality issues specifically designed to minimise the impacts of pollution and runoff from the land on the marine environment (see [Environmental status – water quality](#)). The GBRMPA has also produced [Best Environmental Practices](#) to educate reef users about the correct disposal of waste, and has implemented education programs such as the [Reef Guardians](#) Program. These programs encourage students and communities to reduce the amount of litter and pollution entering the Great Barrier Reef from their local areas.

### **Response: reducing incidental catch**

With the commencement of the [East Coast Trawl Fishery Management Plan](#) in 2000, it became mandatory to use Turtle Excluder Devices (TEDs) and Bycatch Reduction Devices (BRDs) throughout the east coast trawl fishery. This measure was introduced to reduce the incidence of turtle mortality through drowning in trawl nets. Initially there was some concern regarding the uptake and use of TEDs by the industry and concerns regarding compliance with TED and BRD requirements (For more information, see the [Audit of the management of the Queensland East Coast Trawl Fishery in the Great Barrier Reef Marine Park](#)). However, in 2003 the Queensland Department of Primary Industries and Fisheries (QDPI&F) amended the Trawl Plan to clarify the requirements relating to the use of TEDs and BRDs, and implemented tighter provisions on their use. No information is available yet on how well these new provisions have been adopted by the industry. Research suggests that TEDs are very effective in allowing turtles and other large marine fauna to escape trawl nets given that certain design standards are met. There are numerous TED designs, each with specific performance characteristics. Research into the effectiveness of TEDs and BRDs in reducing bycatch levels is currently underway (see *Further Reading*). More information on the Great Barrier Reef trawl fishery and its management can be found in [Management Status - Fisheries](#) and [Environmental status – Inter-reefal and Lagoonal benthos](#).

The trawl fishery has also been [assessed](#) under the [Environment Protection and Biodiversity Conservation Act 1999](#) and the Commonwealth Government's [Guidelines for the Ecologically Sustainable Management of Fisheries](#). This assessment considers the overall impacts of the fishery including impacts on bycatch species such as turtles. In December 2004, the fishery was declared as an approved [Wildlife Trade Operation \(WTO\)](#) until December 2007. This means that the fishery is currently considered to be consistent with the EPBC Act and is unlikely to have an unacceptable impact in the short term. Nevertheless, listing as a WTO signifies that uncertainties remain, and the Commonwealth [assessment report](#) contains a series of recommendations for the fishery. Further information about the management of trawling in the Great Barrier Reef Marine Park can be found in [Environmental status – inter-reefal and lagoonal benthos](#) and [Management status – fisheries](#).



#### How TEDs and BRDs work

In the top diagram the trawl net has no BRD fitted. All animals that enter the net are caught in the cod end, including prawns, turtles and unwanted fish species.

In the bottom diagram, the trawl net has two types of BRD fitted. The turtle excluder device stops turtles from entering the cod end and forces them out through a flap on the trawl net. Because fish have a tendency to swim against a current, the fish eye allows them to swim out through the top of the net and avoid capture in the cod end. Even with BRDs fitted, prawns are still caught in the cod end.

Since 1993, catches of marine turtles in Queensland Shark Control Program gear have been significantly reduced because of changes to the program, including the replacement of some nets with baited hooks (known as 'drum lines'). Shark nets are now only deployed at six locations within the Great Barrier Reef Marine Park near Cairns and Mackay. QDPI&F<sup>5</sup> shark control contractors are provided with training to release live animals such as turtles taken by QSCP<sup>6</sup> gear. However, there is little information on the post-release survival rates of released turtles.

#### **Response: traditional hunting**

The GBRMPA works collaboratively with Traditional Owners and other agencies [to manage the traditional use of marine resources](#). In July 2004, a [new system](#) for managing traditional use of marine resources in the GBRMP came into effect as part of the [new zoning](#) provisions for the GBRMP. Under the new management system, some traditional use of marine resources will continue to be 'as of right'. Other traditional use of marine resources may be conducted in accordance with a Traditional Owner-developed and GBRMPA-accredited 'Traditional Use of Marine Resources Agreement' (TUMRAs), or with a permit. A population model has also been developed that will provide better information about human-related mortality impacts, such as traditional hunting, on the southern Great Barrier Reef green turtle stock.

The GBRMPA is currently working closely with Traditional Owner groups to assist the implementation of the TUMRAs. It is thought that cooperation among the 70 tribal groups should lead to the implementation of about 27 TUMRAs. Staff are also ensuring collaboration and coordination with relevant Queensland and Australian Government organisations and better informing local communities about the program. For more information on TUMRAs, see [Management status – Indigenous connections with the Great Barrier Reef](#).

<sup>5</sup> Queensland Department of Primary Industries and Fisheries.

<sup>6</sup> Queensland Shark Control Program.

## **Response: habitat degradation and disturbance**

Marine turtle habitats such as seagrass meadows, coral reefs and the waters around islands lie within the Great Barrier Reef Marine Park and are managed under the [Great Barrier Reef Marine Park Act \(1975\)](#) and zoning plans. However, marine turtles nest in areas of the beach well above the mean low water mark<sup>7</sup> and therefore, most nesting sites come under the jurisdiction of the Queensland Government. Critical turtle nesting sites have been designated as National Parks through the Queensland [Nature Conservation Act 1992](#), and are managed by the [Queensland Parks and Wildlife Service](#) (QPWS). National Parks restrict the access and use of these areas to protect their natural values, including their value as turtle nesting sites.

Within the Great Barrier Reef Marine Park, the importance of turtle habitats is reflected through zoning provisions established through the [Great Barrier Reef Marine Park Act \(1975\)](#). The [zoning plans](#) ensure protection of important turtle habitats by prohibiting activities that could degrade these habitats (see *Environmental status – seagrasses*, and [Environmental status – corals](#)). Additionally, many seagrass beds are also protected as [Fish Habitat Areas](#) under the [Queensland Fisheries Act \(1994\)](#). These areas allow for multiple use and entry but prohibit activities that may disturb or degrade the seagrass habitat. There are currently 68 Fish Habitat Areas in Queensland covering 7,210 km<sup>2</sup>.

In July 2004, the new [Zoning Plan](#) for the Great Barrier Reef Marine Park came into effect to better protect the biodiversity and ecological functions of the Great Barrier Reef ecosystem. The Zoning Plan also provides protection for the waters around key turtle foraging and nesting sites, including restrictions on access to, and the types of activities that may occur in these areas. For example, the waters around critical nesting sites such as Wreck Island and Milman Island are designated as Preservation Zones, which generally prohibit all access. The reefs around Raine Island, Moulter Cay and MacLennan Cay are listed as [Special Management Areas](#) that also restrict access to these areas. Collectively, the new Zoning Plan includes some 2087 km<sup>2</sup> of identified nesting and mating habitat, and some 12,603 km<sup>2</sup> of identified turtle foraging habitat, as highly protected Marine National Park and Preservation Zones.

To address the issue of declining water quality in the Great Barrier Reef, the Commonwealth and Queensland Governments released the final [Reef Water Quality Protection Plan](#) in October 2003 with the aim to halt and reverse declining water quality within ten years. Regional Natural Resource Management Boards throughout Queensland will work to establish catchment specific water quality targets and address land use practices to reduce the runoff of sediments, nutrients and pesticides. Progress on the Plan's implementation will be reported to the Prime Minister and Queensland Premier in 2005, with a follow up report in 2010. For more information about the Plan and the GBRMPA's actions to address water quality issues, see [Environmental Status - water quality](#).



Critical turtle nesting sites are included in National Parks, and the waters surrounding these sites managed through the zoning provisions of the Great Barrier Reef Marine Park.

<sup>7</sup> The Great Barrier Reef Marine Park extends to the mean low water mark. The area above this line and internal waters are under the jurisdiction of the Queensland Government.

### **Response: climate change**

Climate change is a global issue that is beyond the scope of the GBRMPA to manage directly, nevertheless the GBRMPA is committed to addressing climate change issues as they relate to the Great Barrier Reef. The GBRMPA has developed a [Climate Change Response Program](#) to investigate the potential impacts of climate change on the animals, plants and habitats of the Great Barrier Reef, and to identify strategies to mitigate these impacts. Maintaining the Great Barrier Reef ecosystem's resilience<sup>8</sup> to climate change is the focal point of the GBRMPA's response to climate change. Maintaining the resilience of key habitats will be vital to maintaining the capacity of the organisms such as marine turtles, to cope with pressure from climate change.

In July 2004 the GBRMPA [rezoned the Great Barrier Reef Marine Park](#) to ensure that there is adequate protection for the Great Barrier Reef ecosystem. The [new zoning](#) plan increased the area of 'no-take' zones from less than 5% to some 33% of the area of the Marine Park and in line with the best available scientific advice, has ensured that at least 20% of the area of every region of biodiversity (or bioregions) is zoned as a 'no-take' area. By preserving an adequate portion of the Great Barrier Reef ecosystem in a network of protected areas, the new zoning plan will help maintain the biodiversity, ecological functions and biological connections between habitats of the Great Barrier Reef. In doing so, the new zoning plan will help to maintain the resilience of the larger Great Barrier Reef ecosystem in coping with the pressure from climate change. The GBRMPA is also working to reduce pressure from declining water quality through the [Reef Water Quality Protection Plan](#) and to improve fisheries management. Efforts to reduce direct pressures on marine turtles by reducing bycatch in fisheries, boat strike and improving water quality will help to maintain the resilience of marine turtle populations to cope with the effects of climate change.

### **Response: research and monitoring**

The long-term monitoring of turtle populations is critical to providing scientific data that can be used to develop management strategies and inform management decisions. Annual monitoring of some green, loggerhead, flatback and hawksbill turtle nesting and/or foraging populations is carried out principally by the Queensland Parks and Wildlife Service, but with assistance from the GBRMPA and local community turtle conservation groups. The GBRMPA has developed a list of [research priorities](#) to identify management information needs, and a variety of marine turtle research programs are undertaken by the [Cooperative Research Centre for Reef Research](#) (CRC Reef).



Monitoring the number of nesting turtles provides important information on the status of marine turtle populations.

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<sup>8</sup> The ability to withstand and/or recover from disturbances.

## Sea Snakes

### Condition

#### Diversity, distribution and population status

The waters of northern Australia support a wide diversity of sea snakes with 31 species recorded from the area, approximately half of which are endemic to the region. Seventeen species of sea snakes have been reported from the Great Barrier Reef, but none are endemic to the Great Barrier Reef World Heritage Area. Sea snakes occur in a wide variety of habitats with some species found mostly on coral reefs, whereas others are found over sandy and muddy areas of seabed. Many species are specialist feeders that are restricted to the specific habitats used by their prey. Research conducted in the Gulf of Carpentaria suggests that some species use shallow, inshore habitats as nursery grounds.

The distribution of sea snake species is highly variable and thought to be influenced by seasonal factors. There are also records of sea snakes forming mating or breeding aggregations. However, there have been few studies conducted on sea snakes in the Great Barrier Reef and the status and distribution of populations is unknown. Nevertheless, sea snakes are known to be relatively long-lived animals with low reproductive outputs. This means that as the number of breeding adults in a population declines, the number of young replenishing the population may also decline rapidly. This also means that populations may take a long time to recover once depleted. Collectively, these traits make sea snakes more vulnerable to pressures than shorter-lived species that produce plenty of young.



Seventeen species of sea snakes have been reported from the Great Barrier Reef but the status of their populations is not known.

#### Conservation status

None of the sea snake species found in the Great Barrier Reef are listed in the [2002 Red List of Threatened Species](#) of the World Conservation Union (IUCN). However, sea snakes are a [listed marine species](#) under the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#), meaning that it is an offence to kill, injure, take, trade, keep or move sea snakes without a specific [permit](#). The lack of information about the population status of sea snakes in the Great Barrier Reef is of concern to Reef managers, especially since their long life spans and low reproductive outputs make them especially vulnerable to impacts.

#### Pressure

The limited information available suggests that the main pressure on sea snakes is incidental catch in trawl nets (bycatch). However, pressures that affect habitats such as coral reefs and benthic communities may have indirect effects on sea snakes. Disturbance from vessel noise and boat strike have also been listed as pressures on sea snakes in Northern Australia but no scientific studies have been conducted on the effects of these activities.

### **Pressure: incidental catch**

In the Great Barrier Reef, sea snakes that roam over the seabed away from coral reefs may be accidentally caught in trawl nets. However, most of the research about sea snake bycatch in trawl nets has been conducted in the [Northern Prawn Fishery](#) that operates in the Gulf of Carpentaria and Northern Australia. These studies have shown that sea snake bycatch varies between different areas, depth ranges and seasons and that some species are more susceptible to capture than others. The survival rate of captured sea snakes also differs between species, but survival is also dependent on the duration of the trawl and the weight of the catch contained in the net. Research has also shown that female sea snakes are caught more often than males, and that mature snakes are caught more often than juveniles. Overall, it is thought that up to 33% of sea snakes caught in trawl nets die either by drowning<sup>9</sup> or from injuries sustained during capture. The species most at risk from trawling are those that are most easily captured, are rare, and/or have lower capacities to recover. Trawling in areas where sea snakes aggregate can significantly increase the incidental catch of these animals and could have significant impacts on sea snake populations.



The limited information available suggests that the main pressure on sea snakes in the Great Barrier Reef is incidental catch in trawl nets.

Estimates from the Northern Prawn Fishery indicate that in 1991, between 30,000 and 67,000 sea snakes were killed as a result of commercial prawn trawling, although the actual impact of this mortality on the populations is not known. Unfortunately, there are no figures available for the number of sea snakes killed by trawling in Great Barrier Reef and comparisons with the Northern Prawn Fishery are complicated as the trawl fishers in the Great Barrier Reef generally use shorter trawl "shots"<sup>10</sup> than fishers in the Northern Prawn Fishery. Nevertheless, it is recognised that sea snakes are taken as bycatch in the Great Barrier Reef, and that the impact of trawling on Great Barrier Reef sea snake populations requires further attention. More information about trawling in the Great Barrier Reef can be found in [Environmental status – inter-reefal and lagoonal benthos](#) and [Management status – fisheries](#).

### **Pressure: habitat degradation**

The sea snake species associated with coral reef habitats are thought to be more or less free from direct human pressures. However, pressures that affect sea snake habitats such as coral reefs are likely to indirectly affect the sea snake populations that rely on these habitats. Coral reefs, seagrass meadows and benthic habitats may be affected by large-scale pressures such as declining water quality and climate change, as well as localised pressures such as anchor damage and dredging. In inter-reefal and lagoonal areas, repeated bottom trawling may remove up to 90% of the seabed biomass, effectively removing benthic habitats that may be important sources of food or shelter for sea snakes.

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<sup>9</sup> Like marine turtles, sea snakes are air breathing reptiles that need to surface at regular intervals to breathe.

<sup>10</sup> A trawl "shot" includes the deployment of the net, dragging and retrieval of the trawl net.



Nevertheless, without information on the ecology and habitat use of sea snakes, or the status of their populations, the extent to which habitat degradation could potentially affect sea snake populations is unknown and more research in this area is required. The condition of these habitats and the pressures acting on them are complex issues in their own right, and are considered in detail in other chapters. For more information about known sea snake habitats, see:

- [Environmental status – corals](#)
- [Environmental status – inter-reefal and lagoonal benthos](#)
- [Environmental status - seagrasses](#)

## Response

There are currently few management responses specifically directed at sea snake conservation in the Great Barrier Reef. The lack of information on sea snake populations presents a challenge to Reef managers in identifying the most appropriate management response. Nevertheless, given the vulnerability of some sea snake species due to their life history traits and the potential for sea snakes to be caught in trawl nets, the most appropriate management response is to minimise the pressure from known human activities while initiating research programs to inform a long term management approach. In recognition of their vulnerability, sea snakes are [listed marine species](#) under the [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act 1999) meaning that it is an offence to kill, injure, take, trade, keep or move sea snakes in Commonwealth waters without a specific [permit](#). In the Great Barrier Reef, sea snakes are also protected under the [Great Barrier Reef Marine Park Zoning Plan 2003](#). [Research](#)



Sea snakes are protected under the Environment Biodiversity and Conservation Act (1999) and the GBRMP Zoning Plan (2003). However, more information is needed to assess management priorities for these animals.

on the population traits and gene flow between sea snakes in different regions of the Great Barrier Reef is currently being conducted through the [Cooperative Research Centre for Reef Research](#), however more information on the abundance, population dynamics, distribution and impacts of human activities is required to comprehensively assess the pressure, risks and management priorities for sea snakes on the Great Barrier Reef.

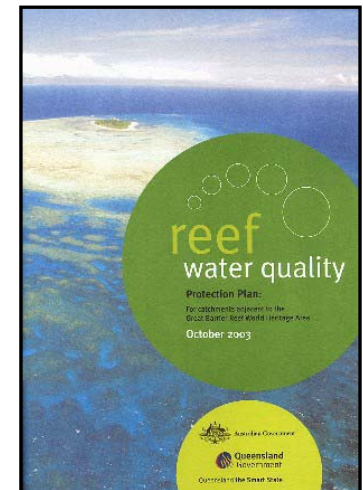
### **Response: incidental catch**

Concern about the long-term sustainability of the trawl fishery and impacts on bycatch species, including sea snakes, has led to the introduction of new management arrangements for the fishery. In 2000, the [East Coast Trawl Fishery Management Plan](#) came into effect, under which the Bycatch Reduction Devices (BRD's) became mandatory. The overall effectiveness of Bycatch Reduction devices in reducing bycatch (including sea snakes) in the Great Barrier Reef trawl fishery is still being [assessed](#). From research conducted in the Northern Prawn Fishery in the Northern Territory, it appears that the square mesh net BRDs are the most successful of the BRD designs in allowing sea snakes to escape. However, these devices are not commonly used by trawlers in the Great Barrier Reef. There have been concerns regarding the adoption of BRDs in the trawl fleet (see the [Audit of the management of the Queensland East Coast Trawl Fishery in the Great Barrier Reef Marine Park](#)) but the Queensland Department of Primary Industries and Fisheries has since amended the Trawl Plan to address these concerns (see [Marine turtles, Response: reducing incidental catch](#)).

Under the [EPBC Act 1999](#), the Great Barrier Reef trawl fishery was [assessed](#) against the Commonwealth Government's [Guidelines for the Ecologically Sustainable Management of Fisheries](#). In December 2004, the trawl fishery was declared as an approved [Wildlife Trade Operation \(WTO\)](#) until December 2007. For more information on this assessment, see [Marine turtles, Response: reducing incidental catch](#), and the Department of Environment and Heritage's [assessment report](#). Further information about the management of trawling in the GBRMP can be found in [Environmental status – inter-reefal and lagoonal benthos](#) and [Management status – fisheries](#).

### **Response: habitat degradation**

While the Great Barrier Reef has not experienced the level of habitat degradation evident in coastal and marine regions elsewhere in the world, the pressures on habitats within the Great Barrier Reef are increasing. The large-scale pressures most likely to affect sea snake habitats are declining water quality and climate change. In 2002, the Commonwealth Government and Queensland Government signed a Memorandum of Understanding to develop a [Reef Water Quality Protection Plan](#) aimed at halting and reverse declining water quality in the Great Barrier Reef within 10 years. The [Reef Water Quality Protection Plan](#) will be developed with regional Natural Resource Management bodies to ensure that water quality programs are appropriate for each region. For more information on water quality issues in the Great Barrier Reef see [Environmental status – water quality](#).



The Reef Water Quality protection Plan has been introduced to improve water quality on the Great Barrier Reef

Throughout the Great Barrier Reef, sea snake habitats such as coral reefs, seagrass meadows and benthic habitats in inter-reefal and lagoonal regions have been provided with increased protection under the new [Great Barrier Reef Marine Park Zoning Plan 2003](#) that came into effect on 1 July 2004. The new zoning plan has increased the area of 'no-take' zones from less than 5% to approximately 33% of the Great Barrier Reef Marine Park and has been designed to provide adequate protection for the range of biodiversity found in the Great Barrier Reef. The new plan is also designed to preserve the ecological functions and maintain the biological connections between the different habitats of the Great Barrier Reef. In doing so, the new Zoning Plan will help to support species such as sea snakes that use the various habitats of the Great Barrier Reef, and increase the resilience of the entire Reef ecosystem to cope with multiple localised pressures and large scale pressures such as declining water quality and climate change.

Sea snake habitats are also affected by a wide range of specific and/or localised pressures, each of which is addressed by specific management responses. These specific pressures and responses are considered in detail in individual chapters and thus, are not considered further in this chapter. For more information on sea snake habitats such as coral reefs, seagrass meadows and benthic habitats in the inter-reefal and lagoonal regions, please refer to the following chapters:

- [Environmental status – corals](#)
- [Environmental status – inter-reefal and lagoonal benthos](#)
- [Environmental status - seagrasses](#)



## Summary

### Crocodiles

- The primary crocodile habitats are estuarine and coastal river systems outside of the Great Barrier Reef Marine Park. However, crocodiles do occur within the Marine Park when moving between these coastal habitats.
- Crocodiles were protected in 1974 but surveys show that crocodile populations have only marginally increased since that time.
- Pressures such as coastal development and the loss of coastal habitats are thought to limit the growth of crocodile populations.
- Crocodiles are not considered in great detail in this report as they occur largely outside the boundaries of the Great Barrier Reef Marine Park.

### Marine Turtles

- The Great Barrier Reef contains six of the world's seven species of marine turtles. One of these, the flatback turtle, nests only on Australian beaches.
- Marine turtles live for a long time and reproduce slowly, making them vulnerable to human pressures.
- All six species of [marine turtles](#) are threatened by a variety of human activities and are protected by Commonwealth and State Government legislation.
- Of the species for which population trends are known, the loggerhead has exhibited significant declines since 1977 and the green and hawksbill show indications of decline.
- Significant pressures on marine turtles within the Great Barrier Reef include bycatch in commercial fishing gear, traditional hunting, illegal take, ingestion of and entanglement in marine debris, and boat strike.
- Climate change will have both direct and indirect effects on marine turtle populations.
- Management efforts have been focused on the protection of nesting and foraging sites through National Parks, and the [rezoning of the Great Barrier Reef Marine Park](#), on the development of methods to reduce mortality in trawl fisheries and shark control programs and on the continuation of status monitoring.
- Under the [new Zoning Plan](#), traditional hunting of marine turtles will be managed in collaboration with [Traditional Owners](#) and other agencies. Turtle harvesting will be managed through permits or *Traditional Use of Marine Resource Agreements* developed by the Traditional Owners and accredited by the GBRMPA.
- Continued research and monitoring is being undertaken to inform management strategies.
- [Best environmental practices](#) have been developed and Marine Park users are being educated about how to minimise the impacts of their activities. This includes educating boaters about how to minimise their impacts on marine animals such as turtles.

### Sea Snakes

- The status of sea snakes is virtually unknown. Nevertheless, they are long lived and slow to reproduce, making them vulnerable to pressures.
- The main pressure on sea snake populations in the Great Barrier Reef appears to be incidental capture and mortality in trawl nets. The impacts of habitat degradation on sea snake populations are unknown.
- In the absence of population status and trend information, management requirements are uncertain. The current management approach is to reduce the pressure from identified human activities such as trawling.

- Sea snakes are listed marine species under the Commonwealth [Environment Protection and Biodiversity Conservation Act 1999](#).
- Initiatives to address water quality and to preserve the biodiversity and ecological health of the Great Barrier Reef will help to maintain sea snake habitats.
- More research is required to clarify the status of sea snakes and to inform a long-term management strategy. The effect of Bycatch Reduction Devices in reducing capture and mortality in trawl nets is currently being investigated.

## Further Reading

### About Queensland reptiles and crocodiles:

- [Directory for Australian herpetological \(reptile\) research at James Cook University](#).
- [Information about crocodiles](#) (Queensland Environmental Protection Agency)

### About marine turtles:

- [Compendium of information on marine turtles in the Great Barrier Reef](#) (Great Barrier Reef Marine Park Authority)
- [Information about marine turtles in the Great Barrier Reef](#) (Great Barrier Reef Marine Park Authority)
- [General information about marine turtles](#) (ReefED)
- [Information about marine turtles in Australia](#) (Commonwealth Department of Environment and Heritage)
- [Information on marine turtles and turtle watching](#) (Queensland Environmental Protection Agency)

### About sea-snakes:

- [General information about sea snakes](#) (ReefED)
- [General information about sea snakes](#) (Cooperative Research Centre for Reef Research)

### International agreements and conventions on marine turtles

- [Convention on the Conservation of Nature in the South Pacific](#)
- [Convention on Migratory Species](#)

### About trawling in the Great Barrier Reef and bycatch

- [Trawl](#) Audit report (Great Barrier Reef Marine Park Authority)
- [Draft Assessment report prepared by the Queensland Fisheries Service for the Department of Environment and Heritage](#)
- [Status of the Queensland east coast otter trawl fishery 2002](#) (Queensland Department of Primary Industries and Fisheries)
- [About Turtle Excluder Devices \(TEDs\)](#) (Queensland Department of Primary Industries and Fisheries)
- [Current research on TEDs and BRDs](#) (Queensland Department of Primary Industries and Fisheries)

### About strandings, boat strike and entanglement

- [Threats to marines species](#) (Great Barrier Reef Marine Park Authority)
- [The Marine Strandings database and annual reports](#) (Queensland Environmental Protection Agency)

## Protecting biodiversity and maintaining ecological function of the Great Barrier Reef

- [Rezoning of the Great Barrier Reef Marine Park](#)
- [Background to the Representative Areas Program](#)

## Research publications about marine turtles and the Great Barrier Reef are available at:

- [Great Barrier Reef Marine Park Authority Research Publications Series](#)
- [CRC Reef Research Centre Technical Reports](#)

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