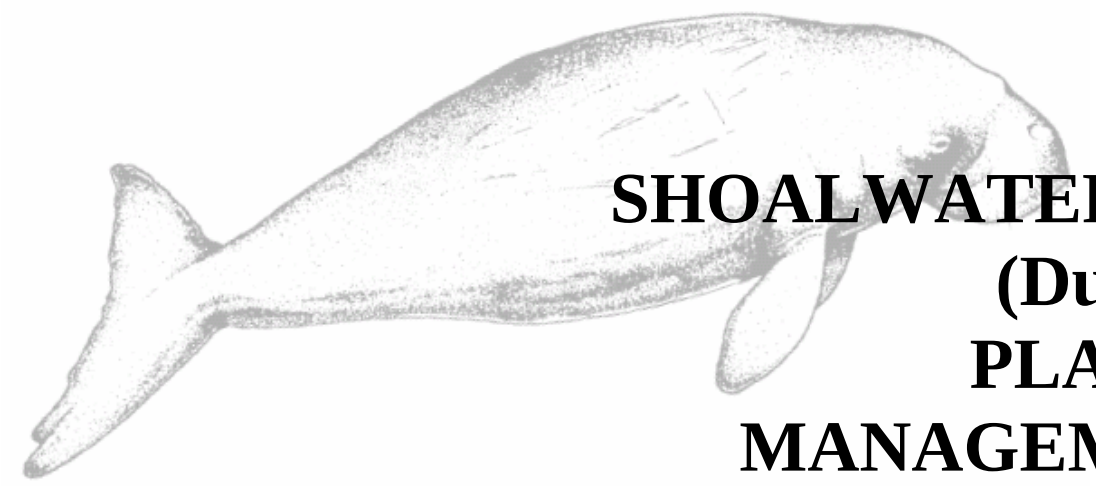
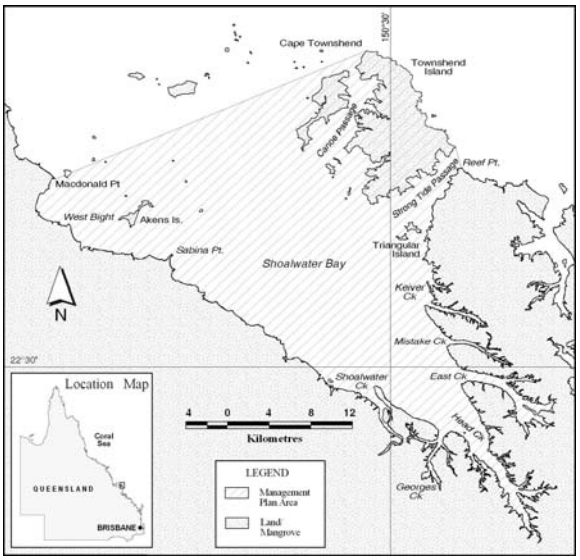
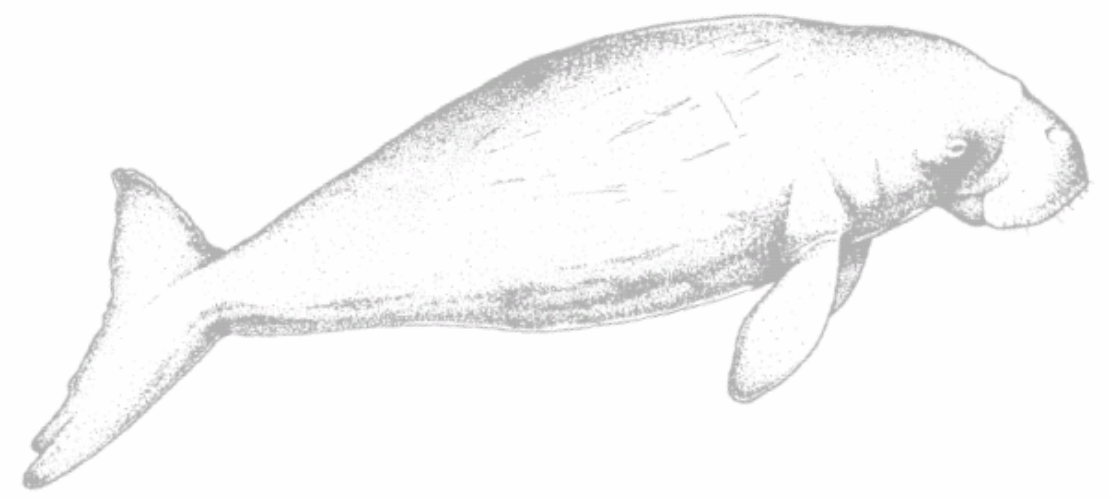


SHOALWATER BAY (Dugong) PLAN OF MANAGEMENT



GREAT BARRIER REEF
MARINE PARK AUTHORITY

SHOALWATER BAY
(Dugong)
PLAN OF MANAGEMENT



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How to read this Plan of Management

This Plan has two parts: the **Preface** and the **Table of Provisions**.

- The **Preface** introduces the reader to life history and biological information about dugongs, and presents actions for the recovery of the species in Shoalwater Bay.

- The **Table of Provisions** sets out the legal provisions which are enforced under the Great *Barrier Reef Marine Park Act 1975* and Regulations.

Commonwealth of Australia

Great Barrier Reef Marine Park Act 1975

Shoalwater Bay (Dugong) Plan of Management

SB01/97

C O N T E N T S

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PREFACE

RECOVERY PLAN FOR DUGONGS IN SHOALWATER BAY

PART 1 INFORMATION ABOUT DUGONGS

Division 1—General

1.1 Description

The dugong, commonly known as the sea cow, is a plant eating (herbivorous) marine mammal belonging to the Order *Sirenia*. It is the only species remaining in the family *Dugongidae*. Its closest relative, Steller's sea cow, was hunted to extinction within 27 years of its discovery in 1741.

The dugong is rotund and spindle-shaped with smooth grey skin covered by sparse hair. The average adult weighs between 250-300 kilograms and measures 2.5 metres long. Dugongs have a dolphin-like tail used for propulsion, and rounded forelimbs. The head is broad with a large down-turned muzzle adapted for bottom feeding. Dugongs have molar teeth for grinding seagrass and males have two tusks. Nostrils at the top of the snout allow dugongs to breathe at the surface while minimising exposure of the body.

1.2 Distribution

Dugongs are found in tropical waters of 43 countries of the western Pacific and Indian Oceans. In Australia, they are found in the northern waters between Shark Bay in the west and Moreton Bay in south-east Queensland.

1.3 Habitat

Dugongs require seagrass meadows of particular species for feeding, as well

as places for resting, calving and transiting. They prefer areas that are sheltered from rough seas because of their need to surface often to breathe. Seagrass meadows occur in shallow coastal waters throughout the *Marine Park* and in some areas of deepwater (up to 30 metres) north of Cooktown. Dugongs tend to use regular routes to move between feeding meadows and resting places.

Recent satellite tracking studies of dugongs in the *Area* provide some data on the use of transiting habitat, and suggest that dugongs roam widely and frequently in the *Area* to access food.

Dugongs appear to select sheltered areas for calving to maximise protection against sharks and disturbance. Calving has been recorded on sandbars or in channels between them, and on sandy beaches adjacent to shallow, protected bays.

1.4 Diet

Dugongs feed predominantly on seagrasses and show a preference for species of the genera *Halophila* and *Halodule* which are "pioneer species" that are low in fibre and high in available nitrogen and digestibility. Dugong grazing promotes sparse meadows of nutritious pioneer species such as *Halophila* ovalis and has also been shown to promote prolific regeneration. An average adult consumes an estimated 25 kilograms a day. Marine algae is also consumed when seagrass is scarce. Studies have also found that dugongs consume species of macro-invertebrates, particularly ascidians (commonly known as sea squirts) in the southern part of their range (for example, in Moreton Bay).

1.5 Behaviour

Dugongs are recorded as feeding during the day and night. They tend to select areas close to deepwater to avoid stranding. Feeding involves a cycle of short dives (for up to 3 minutes) and surfacing for air (for 1 or 2 seconds). Dugongs are able to hold their breath only for a maximum of 8 minutes and will drown within that time if kept submerged. Their hearing is acute and they communicate by a variety of sounds including soft squeaks or chirps (1-8 kilohertz) and louder barking sounds (around 1200 hertz). The chirps and squeaks are associated with territorial behaviour and mother-calf bonding, and the barks with warding off intruders. Dugongs are slow moving and are capable of only short bursts of fast swimming. Although at times they form groups, they are mostly solitary, except for mothers and calves which stay together for up to 18 months. Dugongs live for about 70 years.

1.6 Reproduction

Dugongs breed slowly, producing one calf every 3 to 7 years. Pregnancy lasts 13 months. Even under ideal conditions, a dugong population cannot increase by more than 5% a year.

1.7 Population estimates

The Australian dugong population is estimated at 80,000. About 12,000 live in the *Marine Park* of which about 1,700 are found in the southern region of the Park.

1.8 Reasons for concern about dugong numbers in the Marine Park

Dugongs are vulnerable to extinction because they have a low reproductive capability and live close to the shore where they are susceptible to human activities, for example, commercial netting (within the meaning of the *zoning plan*), *traditional hunting and gathering* and the use of *vessels*. A slight fall in adult numbers can cause a long-term decline in the population.

In the southern region of the *Marine Park*, the dugong population has declined from an estimated 3479 +/- 459 animals in 1987 to 1682 +/- 236 animals in 1994 (population estimate +/- standard error) making the species critically endangered in that region under standards set by the World Conservation Union. (A similar decline has occurred in the *Area* over the same period from an estimated 765 +/- 161 animals to 406 +/- 78 animals (population estimate +/- standard error)). Population models suggest that the sustainable loss of dugongs from human causes is around 1% of females a year.

Division 2—Dugongs in Shoalwater Bay

1.9 Location and description

Shoalwater Bay is a large estuarine area approximately 50 kilometres north of Rockhampton. 37% of the *Area* is shallow open water (less than 10 metres deep) supporting seagrass meadows, and 35% is mangrove communities. An extensive network of creeks and rivers drain into the *Area*, and a number of islands are scattered across the northern area.

The *Area* supports the most important dugong seagrass habitat in the southern region of the *Marine Park*, and the largest dugong population in the Park south of Cardwell. It is remote from human settlement.

1.10 Distribution of dugongs in the *Area*

Recent satellite tracking research indicates that dugongs roam widely and frequently in the *Area* to gain access to the seagrass meadows of the inshore coast, rivers and creeks. The majority of seagrass meadows occur on intertidal banks at depths of between 0.5 and 8 metres. Most meadows are a mixture of *Halophila ovalis, Halodule uninervis* and *Zostera capricorni*, which are species favoured by dugongs. In the southern reaches of the *Area*, seagrass meadows tend to form narrow strips, while more extensive meadows are found in the northern reaches of the *Area*.

Important seagrass meadows are located from West Bight to south of Sabina Point, around Triangular and Akens Islands, in Canoe Passage and Strong Tide Passage and in rivers and creeks. A small area of subtidal seagrass meadows (at depths exceeding 15 metres) is located in Canoe Passage, and adjacent to the south-western corner of Townshend Island. These meadows may provide important feeding opportunities for dugongs during low and neap tides.

Port Clinton, an area to the east of the southern section of the *Area* that is not currently included within the boundaries of the *Marine Park*, also supports extensive seagrass meadows including species favoured by dugongs. Aerial surveys of the *Area* conducted since 1975 indicate that dugongs use Port Clinton, and recent tracking of dugongs fitted with satellite transmitters indicate that Port Clinton is one of several important feeding areas in the region for dugongs.

1.11 Human use of the *Area*

The main human use of the *Area* is under naval training operations which commenced in 1965. Naval activities are permitted in the *Area* under the *zoning plan*.

Commercial fishing is the main non-defence use of the *Area* (although limited recreational fishing also occurs from base camps at Macdonald's Point and other mainland locations).

The *Area* is also of cultural significance to indigenous inhabitants as it is part of the territory of the Darumbal Aboriginal language group, which extends from the Styx River in the north to Raglan Creek in the south, and west to the Broad Sound-Boomer Range.

PART 2 MANAGEMENT RESPONSES TO THREATS

Division 1—Introductory

2.1 Introduction

Any unnatural dugong mortality in the *Area* is unsustainable. Management responses to the threats to dugong in the *Area* are set out below. The success of these actions will be monitored through surveillance, enforcement and research. If further dugong mortality occurs in the *Area*, and is shown, or is reasonably suspected, to be related to human activity, further action will be taken to remove the cause or causes.

Division 2—Commercial fishing threats

2.2 Mesh netting—general

Mesh netting is a significant cause of injury and mortality to dugongs. Studies undertaken in Cleveland Bay show that dugongs are highly susceptible to becoming entangled in nets.

It is difficult to obtain data on dugong mortality in mesh nets in the *Marine Park* for a variety of reasons, some of which include remoteness, the tendency for fishers to set nets at night and the lack of resources and staff to adequately oversee netting practices.

Many of the nets used in the *Area* have large meshes which can easily catch a dugong by its tail or pectoral flippers. Mesh nets are also invisible to dugongs (and many other marine taxa) which do not possess sonar mechanisms to locate obstacles.

A dugong may die in a mesh net as a result of drowning or stress, or may be killed by a fisher to enable its removal from the net. The *Authority* is particularly concerned about the practices of cutting the tail off an entangled living dugong in order to remove it from a net, and sinking a dugong carcass by slitting its abdomen and removing its internal organs.

Studies show that dugongs are susceptible to death from the stress of becoming entangled in a net, and may subsequently die despite being released alive from the net. The rescue of entangled dugongs is also known to be difficult and mostly unsuccessful.

2.3 Mesh netting in the *Area*

A number of kinds of mesh net are permitted in the *Area*, including river set

nets, drift nets, shark nets and ring nets. Potentially, these nets are a risk to dugongs wherever they are used because of the species' propensity to roam widely.

About 10 mesh net fishers are beleived to regularly harvest blue salmon, shark, barramundi, mullet and grey mackerel in the *Area* as a supplement to their crab fishery. The number of occasional commercial or recreational fishers in the *Area* is unknown.

2.4 River set mesh nets

An assessment of the threat of river set mesh nets to dugongs was undertaken by the *Authority* in 1996. The assessment determined that, by their design and deployment, river set mesh nets are able to entrap and drown dugongs in the same way as set foreshore and set offshore mesh nets.

River set mesh nets have a mesh size of 150-215 millimetres, a drop depth of 50 meshes and a permitted length of 120 metres. A licensed commercial fisher is permitted to use 3 nets at any particular time, and is required by law to remain in attendance (that is, within 800 metres) of the nets. The nets may not be set more than one nautical mile apart, and the upstream limit for their use is the top of the tidal influence or freshwater. The nets may be used throughout the year, except during the barramundi closure from November to January. River set mesh nets are placed from a bank to halfway across a river, usually one hour before high tide (about the time that dugongs move into creeks and rivers to feed).

Studies have found that dugongs use rivers and creeks flowing into the *Area* and it is considered that river set mesh nets are a risk to the species. These rivers and creeks are located outside the *Marine Park* and are managed by the Queensland Department of the Environment.

2.5 Management response

The Shoalwater Bay (Dugong) Plan of Management has been prepared in response to mesh netting threats.

Division 3—Defence threats

2.6 Interpretation

In this Division:

"Defence Area" means the Shoalwater Bay Defence Area, as described in item 7 in the Schedule to the *zoning plan*.

2.7 Introduction

The Royal Australian Navy conducts various exercises in the *Area* involving surface and underwater detonation of explosive charges, amphibious landings and naval gunfire support. Mine disposal training does not currently occur but may resume in the future. Operations occur in 3 regions: near Townshend Island, near Sabina Point and within a 2 kilometre radius of Triangular Island.

2.8 Underwater demolition training

Underwater demolition training involves the detonation of a range of explosive charges (5 to 500 kilogram devices) during regular training sessions of several weeks duration each year. In the year to March 1996, the Royal Australian Navy Diving School undertook 4 training exercises. During each of these exercises up to 40 detonations occurred (100 to 500 kilogram devices). These exercises were conducted underwater mainly in the vicinity of Triangular Island, although some surface detonations were also conducted. The Navy maintains records of exercises conducted in the Defence *Area*.

2.9 Procedures for detonation

At Triangular Island, explosive charges are set at low tide and detonated at high tide. Detonation must comply with special conditions relating to an Environmental Certificate of Compliance issued by the Department of Defence for the Defence *Area*.

If endangered species are detected, provision is made for either small explosive charges (0.5 kilogram devices) to be detonated in the water, or larger scare charges to be fired from the land, within 15 minutes of the planned detonation.

2.10 Mine disposal

Mine countermeasure *vessels* of the Navy may need to use the Defence *Area* in the future if operations are relocated from near Townsville. A maximum of 8 charges (105 kilogram devices) are expected to be detonated each year at a depth of between 5 and 35 metres. Precautions before detonation will include an area search using a ship mine-hunter sonar that is capable of detecting marine mammals.

2.11 Effects of underwater explosions on marine life

The use of explosives in the marine environment is potentially harmful to

both fish and marine mammals, and can cause dieback in some seagrass communities. Species of fur seals, sea lions, sea otters, turtles, manatees, whales and dolphins are recorded as having been killed or injured by the detonation of 5 kilogram explosive devices. There are no data on the impact of underwater explosions on dugongs in the *Marine Park*, but the *Authority* considers that, if carried out intensively, explosions could kill or injure dugongs and change local distribution patterns.

Explosions have two main components that affect marine animals:

Shock waves

- Shock waves create a rapid change of pressure that can cause damage to internal air spaces (for example, swim bladders of fish, or the lungs, ears and intestinal spaces in marine mammals), and can shatter bones of marine mammals. Effects can be direct (death) or indirect through injuries which lead to cardiac arrest, stroke and lung haemorrhaging. Behavioural changes leading to separation of mothers and young and abandonment of areas may also occur.

- The region of shock wave injury has been calculated for some marine mammals. For example, it has been recorded that manatees (a species of herbivorous mammal related to dugongs) will be injured from a small explosive charge up to 40 metres away for adults and to up 85 metres for calves.

- There have been no reports to date of direct mortality of dugongs from underwater detonations. Skeletal remains of a male dugong were found behind a detonation channel on Triangular Island in April 1996. There is no evidence linking these remains to Defence operations. The *Authority* considers it likely that dugongs may be at risk of death, injury and social disruption from detonations in the vicinity of seagrass meadows because the animals move in to feed at high tide when the explosions occur.

Noise

- The ability to communicate by sound is important for marine mammals that inhabit murky waters (such as exist in the Area), where sub-surface visibility is usually less than 10 metres. Sound is an efficient form of communication for these animals because it spreads quickly in water. Noise from underwater explosions may interfere with this communication and may cause deafness, hearing damage and social disruption. In mammals, the bond between mother and young can be weakened or destroyed, resulting in death of the young.

2.12 Use of explosives as wildlife deterrents

Scare charges and thunder flashes have proved to be ineffective in frightening species of pinniped and cetaceans, and can be harmful to them. There is no data on their effectiveness in scaring dugongs or other sirenian species. Dugongs are difficult to detect by boat searches in the *Area* because of the poor water clarity and shyness of the animals.

2.13 Impacts on seagrass meadows

Explosives can cause dieback in seagrass by damaging cells in the rhizomes. Increased sedimentation is also created, which can smother meadows and reduce light penetration to the plants. Nutrient changes may also occur, resulting in increased algal growth which can smother seagrass meadows.

An unusual coverage of filamentous green algae was recorded in meadows around Triangular Island, in Hideaway Bay and Little Bang Bay in 1995 and 1996. This growth may be indicative of seasonal growth patterns or nutrient enhancement. Because algal growth was not recorded in any other sites surveyed in the *Area*, the Authority believes that the occurrence at Triangular Island may be related to increased amounts of phosphates from explosives.

2.14 Management response

The *Authority* has agreed with the Royal Australian Navy that the Navy will take the following actions to ensure the safety of dugong during exercises involving underwater detonations:

(a) future underwater detonations in the Triangular Island area will be restricted to Little Bang Bay, Big Bang Bay, and Barricade Passage with naval activities ceasing in Hideaway Bay (on the south east corner of the island);

(b) boat searches for dugongs will be conducted before detonations.

Division 4—Indigenous threats

2.15 Traditional hunting and gathering

Although *traditional hunting and gathering* has not contributed to the recent decline in the dugong population in the *Area*, the elders of the Darumbal-Noolar Murree Corporation for Land and Culture have decided that it is not appropriate to hunt dugongs in the *Area* while the species is endangered.

2.16 Management response

Under subsection 39ZA (1) of the Act, the *Authority* entered into an agreement with the Darumbal-Noolar Murree Aboriginal Corporation for Land and Culture on 1 August 1996, to the effect that:

(a) it would be inappropriate for indigenous hunting to occur in the Area for the time being; and

(b) the appropriateness of hunting dugong will be reviewed by the Authority and the Corporation after considering recommendations made following a survey of dugong populations in 1999; and

(c) the Authority and the Corporation will seek to inform other people of the Agreement and to explain its rationale; and

(d) the Authority will liaise with the Corporation to enhance a cooperative approach to the conservation and management of the dugong population and other marine resources in the Marine Park.

Division 5—Threats from the use of vessels

2.17 Collisions with vessels

Vessels are a known cause of mortality to sirenian species, for example, the West Indian manatee (*Trichechus manatus*) off the coast of Florida, USA. The *Authority* is aware that vessels have collided previously with dugongs in the *Marine Park*. The *Authority* considers that increasing vessel activity in the *Area*, particularly in shallow areas of importance to local dugong populations, may threaten the safety of the animals. *Vessel* activity in the *Area* includes naval ships and commercial fishing boats, as well as recreational *vessels* (for example cruising yachts and motor boats).

Studies on the incidence of watercraft collision with manatees off the coast of Florida have found that medium to large watercraft are more likely to kill or injure manatees than small boats. Motors with more than 10 horsepower are the most dangerous and there is also an increasing risk to manatees from personal motorised watercraft (for example, jet skis). Most injuries are caused by blows from the hull of a vessel or from propeller cuts. Collisions may cause death or debilitating injuries and may reduce breeding capability. The *Authority* considers that similar risks may apply to dugongs in the *Area*.

2.18 Management response

If required, the *Authority* will consider amending the Shoalwater Bay

(Dugong) Plan of Management to restrict the use of *vessels* in the *Area*, and to require the use of propeller guards.

PART 3 RESEARCH

3.1 Introduction

Current research programs in the *Area* include seagrass monitoring and satellite tracking of dugongs to provide information on their movement and behaviour.

3.2 Proposed research programs

The *Authority* has proposed that the following research be undertaken in the *Area* in relation to dugongs, and their habitat:

(a) a 5 year survey of seagrass meadows;

(b) the inclusion of the Area in the aerial survey of Marine Park dugong populations proposed to occur in 1999;

(c) as agreed between the Authority and the Royal Australian Navy—an investigation into:

  (i) effective methods of deterring dugongs from detonation sites; and

  (ii) the impact of underwater detonations on seagrass meadows and dugon