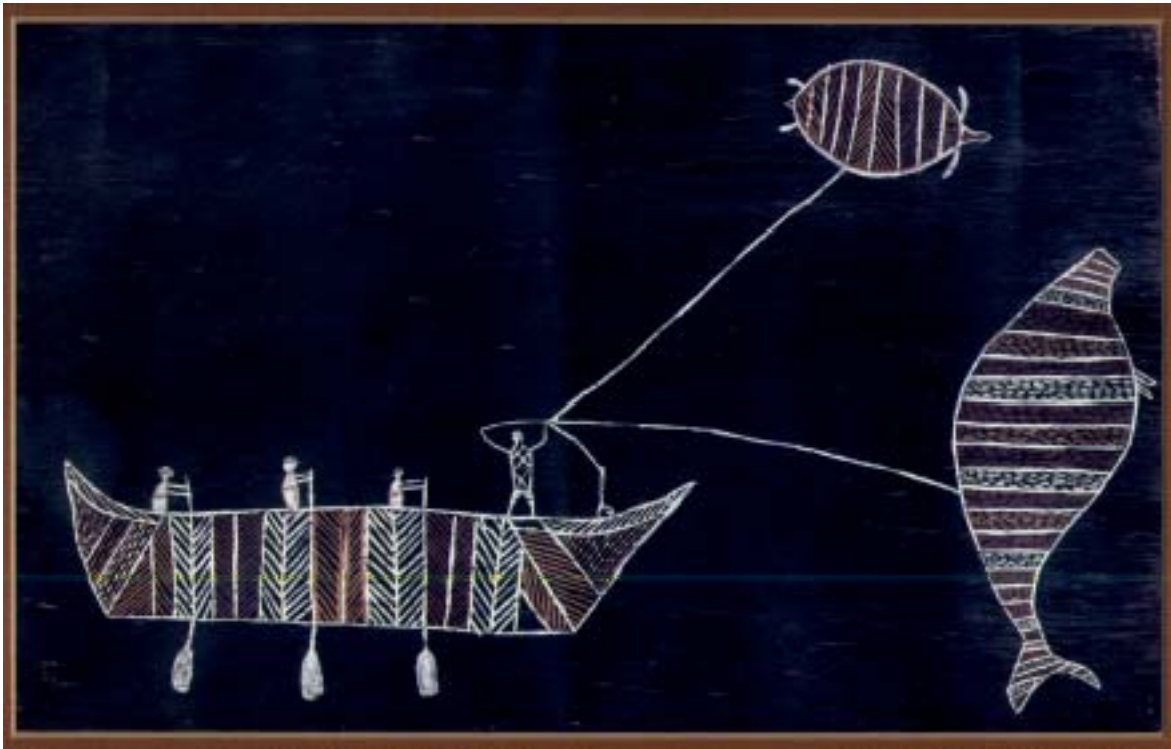


**DRAFT**  
**MANAGEMENT PROGRAM FOR**  
**THE DUGONG**  
*(Dugong dugon)*  
**IN THE**  
**NORTHERN TERRITORY OF AUSTRALIA**



**2003-2008**

**PARKS AND WILDLIFE SERVICE**  
**DEPARTMENT OF INFRASTRUCTURE, PLANNING AND ENVIRONMENT**

Frontispiece:

In the spare but highly effective style of early works from Groote Eylandt, Ancestral Beings hunt for Dugong, or sea cow, and turtle. The dugout canoe is dragged through the water by the Dugong as it twists and turns to dislodge the harpoon head from its body.

Collected by the American-Australian Expedition to Arnhem Land, 1948, from Groote Eylandt. 86 x 57cm. Artist: Wurrabadalumba clan elder. Collection: National Museum of Australia.

Please note that Groote Eylandt aboriginal law requires that a deceased persons name not be repeated as a mark of respect to that person.

## EXECUTIVE SUMMARY

Australia supports a significant proportion of the world's Dugong stocks, with the Dugong being the most abundant marine mammal in inshore waters of northern Australia. The Dugong is listed as vulnerable to extinction internationally, however, it is not listed as endangered in Australia. It is fully protected from any commercial or recreational utilisation within its range in Australian waters.

The Dugong has a significant cultural and dietary role for many indigenous Australian peoples and is subject to indigenous utilisation within these roles. This significance stems from the high community status of Dugong hunting and hunters, the essential role of Dugong in Aboriginal traditional culture and religion and quality of Dugong as a food source. Maintenance of this important part of Aboriginal culture underlies much of this Management program.

Additionally, the Dugong is subject to mortality associated with non-indigenous fishing activities and coastal development.

This management program has been developed to provide for the long-term conservation of the Dugong within the Northern Territory. A number of objectives have been identified to accomplish this.

### Objectives

Maintain viable wild populations of Dugong and conserve the marine habitat upon which they depend, by:

- i. Identifying and encouraging protection of important Dugong habitats.
- ii. Identifying anthropogenic sources of Dugong mortality.
- iii. Managing and mitigating identified direct and indirect threats to Dugong and Dugong habitat.
- iv. Developing a monitoring program on Dugong in Northern Territory waters for monitoring of both populations and habitat at all scales.

These objectives will be accomplished through a number of management actions.

### Actions

#### *Management*

- establish the need for declaration under Section 37 *Territory Parks and Wildlife Conservation Act 2001 (TPWCA)* of areas of essential habitat for Dugong conservation;
- consult with Aboriginal people regarding the need for protected areas for Dugong, within which indigenous requirements in relation to Dugong protection are addressed;
- cooperate with the Commonwealth in the protection of Dugong habitat in Commonwealth waters;
- consult with professional fishers, the Department of Business, Industry and Resource Development (DBIRD), the Northern Territory Seafood Council (NTSC) and Aboriginal people to identify those areas of Dugong habitat where mesh nets are used;
- consult with professional fishers, DBIRD, NTSC and Aboriginal people to determine a range of management options that may be implemented if monitoring indicates a

requirement to regulate fishing in an area to reduce incidental catch. Management options to be considered may include:

- i. use of fishing gear and fishing practices that reduce incidental catch, and
- ii. zonal closures (total and/or seasonal);
- in consultation with professional fishers, DBIRD, NTSC and Aboriginal people, develop an education program for professional fishers on aspects of Dugong conservation biology and management, and on methods to minimise the incidental catch of Dugong; and

### ***Monitoring***

- consult with Aboriginal communities to establish culturally acceptable mechanisms to monitor traditional harvest;
- consult with professional fishers, local communities, DBIRD and NTSC to establish mechanisms to monitor incidental catch;
- monitor Northern Territory Dugong population distribution and abundance using aerial surveys;
- continue mapping of seagrass distribution as part of the marine habitat mapping program; and

### ***Sustainable Utilisation***

- consult with Aboriginal communities regarding co-management arrangements which, subject to need, may include:
  - i. issue of permits under Section 73(1B) of the *TPWCA* for the taking of Dugong in accordance with Aboriginal tradition,
  - ii. closed areas where hunting is not permitted,
  - iii. seasonally closed areas where hunting is not permitted,
  - iv. annual harvest limits for specific hunting areas, and
  - v. annual harvest limits for individual hunters and/or communities;
- consult with Aboriginal communities to develop culturally appropriate education programs to ensure that Aboriginal people are aware of:
  - i. the need for Dugong conservation,
  - ii. the potential impacts of traditional hunting, and
  - iii. the need to take responsibility for conservatively managing their Dugong harvest.

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# 1. INTRODUCTION

## 1.1 Species subject to management

Class: Mammalia  
Sub-class: Eutheria  
Order: Sirenia  
Family: Dugongidae  
Species: *Dugong dugon* (Müller)

## 1.2 Responsible authority

Department of Infrastructure, Planning and Environment  
Parks and Wildlife Service  
PO Box 496  
Palmerston NT 0831  
Australia

Telephone: (08) 8999 4401  
Facsimile: (08) 8999 4793

## 1.3 Overview

The Dugong (*Dugong dugon*) is a large herbivorous exclusively marine mammal and is the only living member of the family Dugongidae. It is listed as vulnerable to extinction in the International Union for the Conservation of Nature and Natural Resources Red Data Book of Threatened Species (IUCN 2000). The Dugong is listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

While not listed as a threatened species in Australia under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBCA)*, the Dugong is fully protected from any form of commercial or recreational exploitation within Australian waters.

The Dugong has significant cultural and dietary roles for many indigenous peoples and is subject to indigenous utilisation within these roles. This significance stems from the high community status of Dugong hunting and hunters, the essential role of Dugong in Aboriginal traditional culture and religion and quality of Dugong as a food source. Maintenance of this important part of Aboriginal culture underlies much of this Management program.

Additionally, the Dugong is subject to mortality associated with non-indigenous fishing activities and coastal development.

Surveys of the distribution and abundance of Dugongs within the Northern Territory have indicated that a significant population exists. There is no evidence of a decline in abundance or acute or chronic damage to Dugong habitats. However, little or no quantitative information is available on the sources and impacts of mortality, giving rise to concerns about the long-term status of the species within Northern Territory waters.

This management program has been developed to provide for the long-term conservation of the Dugong within the Northern Territory.

## **1.4 Legislation**

### **1.4.1 Northern Territory**

*Dugong dugon* is protected wildlife in the Northern Territory under Section 43 of the *Territory Parks and Wildlife Conservation Act 2001 (TPWCA)*. Section 66 of the Act prohibits the taking, interference with, possession, control or movement of protected wildlife, unless authorised to do so under the Act. The maximum penalty for breaches of these provisions is 500 penalty units (currently \$50,000) or five (5) years imprisonment for a person or 2500 penalty units (currently \$250,000) for a body corporate.

Authorisation to take or interfere with Dugongs, in whole or in part, is by a permit issued by the Director of the Parks and Wildlife Commission of the Northern Territory or his delegate (Sections 55 to 63). The maximum penalty for breaches of the provisions of a permit is 50 penalty units or six (6) months imprisonment for a person or 250 penalty units for a body corporate.

Transportation of Dugongs between the Northern Territory and other States and Territories within the Commonwealth can only be undertaken with a permit issued under Sections 55 to 63 of the Act.

Section 122 of the Act recognises the rights of Aboriginal peoples who have traditionally used an area of land or water to continue to use that area for traditional hunting, food gathering (other than for sale) and for ceremonial and religious purposes. Traditional hunting of Dugongs by Aboriginal people is covered by Section 122 and is therefore authorised under Section 66 of the Act. Such authorisation does not permit the utilisation of Dugongs in other than and in accordance with Aboriginal tradition.

Under Section 35 of the Act the Commission may negotiate and enter into agreements to implement cooperative schemes for the protection, conservation, sustainable use, control and management of wildlife and the management, preservation, maintenance or care of areas of habitat, ecosystem, vegetation or landscape, in accordance with a management program. Section 36 of the Act states that a cooperative management agreement is to refer to a management program and may relate to areas of essential habitat. Areas of essential habitat may be declared under Section 37 of the Act.

Under Sections 73 and 74 of the Act the Commission may enter into agreements with Aboriginal Land Councils and other landowners for the protection and conservation of wildlife.

Parks and Reserves may be declared under Section 12 of the Act and plans of management are prescribed under Sections 18 and 19. The management of Dugong populations may be addressed through specific park plans of management.

Section 27 of the *Cobourg Peninsula Aboriginal Land, Sanctuary and Marine Park Act 2000 (CPALSMPA)* requires that a plan of management for the sanctuary and/or marine park be prepared, that plan giving regard to the protection, conservation and management

of native flora and fauna within the sanctuary and/or marine park and the natural environment generally.

Enforcement of the *TPWCA* and the *CPALSMPA* is undertaken by Conservation Officers appointed under the *TPWCA*, and by officers of the Northern Territory Police Force.

#### **1.4.2 Commonwealth**

The *EPBCA* provides that the import or export of an animal of the species *Dugong dugon*, or any part of such animal is prohibited unless carried out in accordance with a permit or authority issued under the Act.

Enforcement of the *EPBCA* is undertaken by Environment Australia, Australian Customs Service and the Federal Police.

The *EPBCA* provides for the establishment and management of Commonwealth reserves in the Australian coastal and continental seas (Section 344). Such reserves may be established in areas of coastal and continental sea in which no interest is invested in a person other than the Commonwealth (Section 345). Such reserves may be declared for a specific purpose (Sections 346 and 347) such as the conservation of Dugong.

Additionally, the Commonwealth and the Northern Territory may enter into joint plans of management for areas of habitat under Sections 35 of the *TPWCA* and Sections 45 and 46 of the *EPBCA*.

#### **1.4.3 International**

Dugong are listed on Appendix I of CITES. Australia is a Party to CITES and the *EPBCA* enables its obligations under the convention to be discharged. The Australian population(s) of Dugong are listed on Appendix I of CITES, which prohibits international trade in live-caught and captive-bred specimens and products.

## **2. OBJECTIVES**

The management program seeks to maintain viable wild populations of Dugong and conserve the marine habitat upon which they depend, by:

- i. Identifying and encouraging protection of important Dugong habitats.
- ii. Identifying anthropogenic sources of Dugong mortality.
- iii. Managing and mitigating identified direct and indirect threats to Dugong and Dugong habitat.
- iv. Developing a monitoring program for Dugong in Northern Territory waters for monitoring of both populations and habitat at all scales.

### 3. MANAGEMENT

#### 3.1 Habitat conservation areas

Aerial surveys (Bayliss 1986, Bayliss and Freeland 1989, Saalfeld 2000) have identified coastal marine areas that support extensive, high density populations of Dugong. Sections of coast that contain extensive areas of seagrass have been identified by Poiner *et al.* (1987), Coles *et al.* (1989) and Smit (in prep.). A number of these coastal areas that support high density Dugong populations (greater than 1 Dugong per square kilometre and greater than 1000 Dugong estimated in the area) with extensive areas of seagrass; have been identified as priority areas for Dugong conservation and seagrass habitat protection. Areas that meet this criteria are indicated in Figures 1, 2(a) & (b) and Table 1.

**Table 1: Key areas for Dugong conservation and seagrass habitat protection.**

The total area of Territory waters surveyed for Dugong is included for comparative purposes.

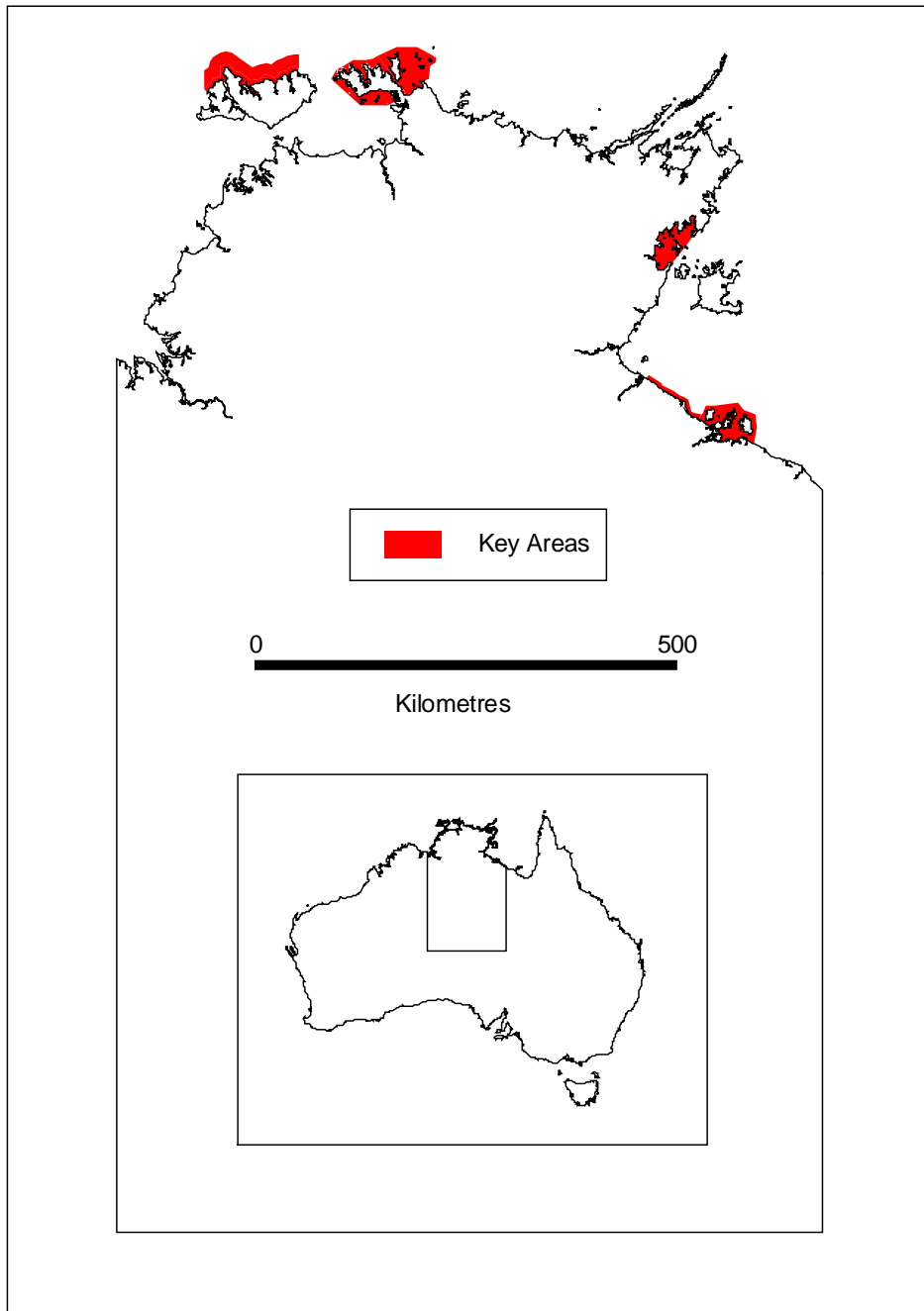
Area	Area (km <sup>2</sup> )	Dugong density (km <sup>2</sup> )	Area of seagrass (km <sup>2</sup> )
Tiwi Islands Territory Waters	1160	0.80	Unknown
Commonwealth Waters	2660	1.10	
Total	3820	1.00	
Garig Gunak Barlu National Park	2240	1.77	Unknown
Croker Island Territory Water	2830	0.64	
Total	5070	1.34	
Blue Mud Bay	2070	1.49	81
Limmen Bight to Sir Edward Pellew Group	540	2.75	183
Sir Edward Pellew Group	2330	1.37	100
Total surveyed Territory waters	77600	0.43	Unknown

Currently, the only area of Northern Territory coastal marine waters represented as a marine park is the marine component of Garig Gunak Barlu National Park. The park contains less than 10% of the Territory's available Dugong habitat (as indicated by the distribution of Dugong).

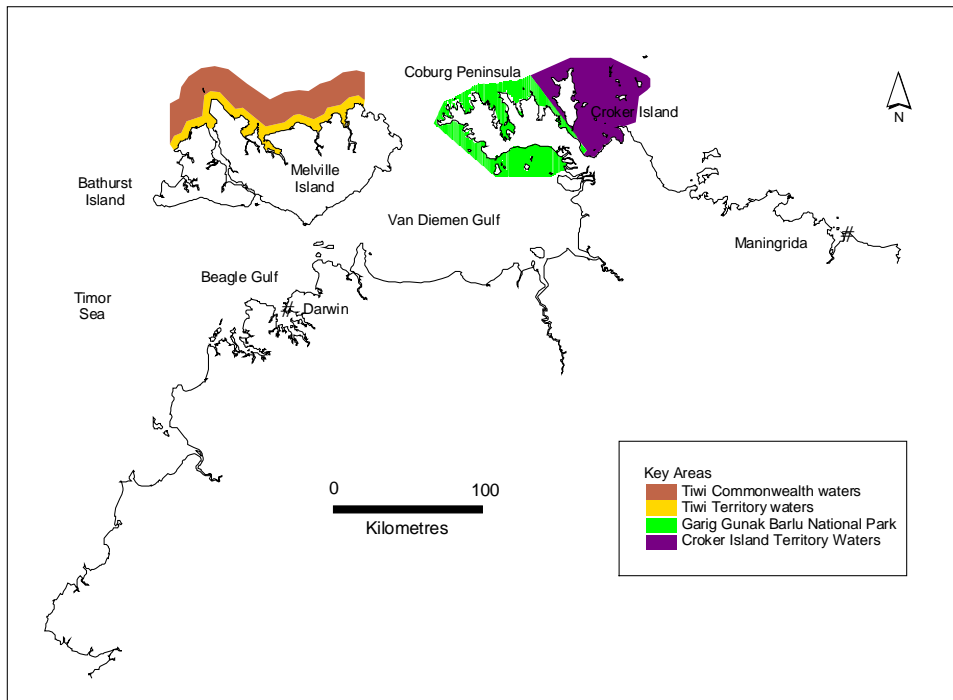
Conservation of areas of Dugong habitat may be accomplished through a variety of actions. These include:

- establish the need, if any, for declaration under Section 37 *TPWCA* of areas of essential habitat for Dugong conservation;
- establish the need for indigenous protected areas for Dugong, within which indigenous requirements in relation to Dugong protection are addressed; and
- engage the Commonwealth's cooperative involvement in the protection of Dugong habitat in Commonwealth waters.

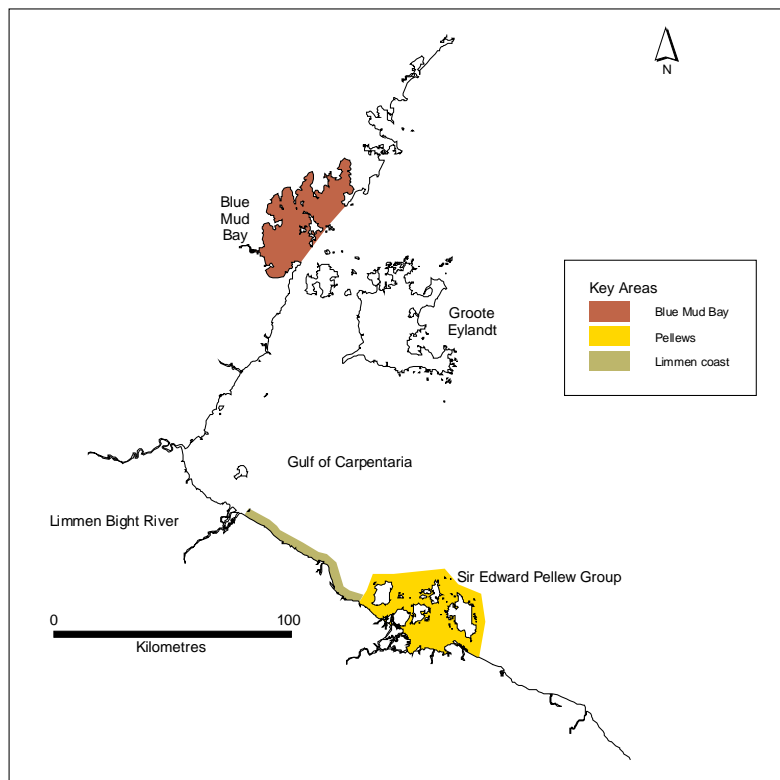
**Figure 1: Key areas for the conservation of Dugong and seagrass habitat in the Northern Territory.**



**Figure 2(a): Key areas for the conservation of Dugong and protection of seagrass habitat in the Tiwi Islands.**



**Figure 2(b): Key areas for the conservation of Dugong and protection of seagrass habitat in the western Gulf of Carpentaria.**



### 3.2 Incidental catch

Entanglement in large mesh (150mm and greater) fishing nets is a documented source of mortality for Dugong. However, the data necessary to determine the magnitude of the impact of incidental catch on Dugong populations in Territory waters is not readily available.

Coates (2002) reported for the Borroloola region that during the course of a 15 month study a minimum of 40 Dugong were subject to non-indigenous mortality. This represented some 42% of the total mortality reported for the region (Coates 2002). Of this minimum some 15 % (6 animals) could be directly attributable to commercial barramundi fishing and this proportion was predicted to be much higher (Coates 2002).

Management actions necessary to reduce the impact of incidental catch on Dugong populations whilst minimising impact on commercial mesh fishing activities include:

- i. consultation with professional fishers, the Department of Business, Industry and Resource Development (DBIRD), the Northern Territory Seafood Council (NTSC) and Aboriginal people to identify those areas of Dugong habitat where mesh nets are used;
- ii. consultation with professional fishers, local communities, DBIRD and NTSC to establish mechanisms to monitor incidental catch;
- iii. consultation with professional fishers, DBIRD, NTSC and Aboriginal people to determine a range of management options that may be implemented to reduce incidental catch. Management options to be considered may include:
  - use of fishing gear and fishing practices that reduce incidental catch
  - zonal closures (total and/or seasonal);
- iv. in consultation with DBIRD, NTSC and Aboriginal people, develop an education program for professional fishers on aspects of Dugong conservation biology and management, and on methods to minimise the incidental catch of Dugong.

The priority action above is the establishment of a mechanism for monitoring the incidental catch of Dugong to quantify its impact and determine what management actions are appropriate.

### 3.3 Traditional hunting

Current levels of offtake of Dugong for the Northern Territory through traditional hunting are poorly known and the sustainability of this harvest has not been adequately determined. Recent work by Bradley (1997) and Coates (2002) in the Borroloola region has obtained quantitative data for traditional harvest levels and these levels are well below the projected maximum sustainable harvest (maximum sustainable harvest levels are likely to be less than 5%, Marsh 1995). Current harvest levels for the Borroloola region are of the order of 40 to 50 animals per year (Bradley 1997, Coates 2002) which is less than 20% of the projected maximum sustainable harvest for the region of 400 animals based on an estimated population of 8000 (Saalfeld, 2000) and a maximum sustainable harvest of 5% per annum (Marsh, 1995).

While information from the Borroloola area indicates that current traditional harvest is within sustainable harvest levels, little or no data is available for elsewhere in the Northern Territory and a statement to the effect “that current traditional harvest levels in the Territory are within sustainable harvest levels” cannot be made categorically.

To ensure that traditional hunting is maintained at a sustainable level a number of management actions will need to be undertaken:

- i. consultation with Aboriginal communities to establish culturally acceptable mechanisms to monitor traditional harvest;
- ii. consult with Aboriginal communities to develop culturally appropriate education programs to ensure that Aboriginal people are aware of:
  - the need for Dugong conservation
  - the potential impacts of traditional hunting
  - the need to take responsibility for conservatively managing their Dugong harvest.
- iii. if monitoring indicates that traditional harvest exceeds sustainable levels after mortality from all other sources has been reduced to the maximum acceptable level, consultation with Aboriginal communities will be undertaken to consider management options that may include:
  - issue of permits under Section 73(1B) of the *TPWCA* for the taking of Dugong in accordance with Aboriginal tradition
  - closed areas where hunting is not permitted
  - seasonally closed areas where hunting is not permitted at specific times of the year
  - annual harvest limits for specific hunting areas
  - annual harvest limits for individual hunters and/or communities;

Action i. is a priority. Obtaining information on traditional hunting underpins the determination of whether any management actions need to be considered to maintain traditional hunting at the presumed currently sustainable levels.

Initial monitoring of traditional harvest levels of Dugong around the Sir Edward Pellew Islands by the Mabunji Aboriginal Resource Centre at Borroloola was recently undertaken with funding under the Coastcare Program. This monitoring is the basis of the statement that traditional harvest in the Borroloola region is sustainable and the presumption that traditional harvest on a Territory scale is sustainable.

### **3.4 Other Threats**

Other than mortality associated with incidental catch and indigenous harvest, a number of other threats, direct and indirect, to Dugong populations have been identified. These include direct mortality associated with boat strikes, illegal harvest and natural causes, e.g. disease, and indirect mortality associated with habitat degradation resulting from coastal development and catastrophic events such as cyclones and “big” wet seasons. Habitat degradation is mainly the loss of seagrass beds through increased siltation, mechanical damage and freshwater influx. It is probable that indirect mortality is likely to have the

largest impact on population levels over time as it is the most difficult to assess and in some cases is not subject to management.

Coates (2002) reported that traditional owners from the Borroloola region were particularly concerned about the impacts of these “other threats” on the Dugong population and habitat in the region. Of particular concern was the impact of increased boat traffic (Coates 2002) leading to significant changes in Dugong behaviour. Increased boat traffic was of concern due to boat strike and damage to seagrass beds (Coates 2002). Much of the damage to seagrass beds is attributed to the activity of professional crabbers rather than increased recreational boat traffic (anonymous sources). Additionally, direct impact arising from both legal and illegal netting activity by professional crabbers was of concern (Coates, 2002).

Indirect mortality arising from habitat degradation, primarily loss or destruction of inshore seagrass beds, associated with coastal development such as spills and dredging associated with mining activity or increased siltation associated with pastoral and agricultural developments along the coast is considered to be minor at present.

The Borroloola area specifically and the western Gulf of Carpentaria in general is currently the only area of coast that has been identified as likely to be impacted by these sources of threat in the near future. The coincidence of large Dugong population and extensive habitat coupled with high level of boat traffic and major coastal development, does not presently occur in any of the other areas identified in Section 3.1 as areas for Dugong conservation and habitat protection.

As with incidental and indigenous harvest, the first priority in addressing the threat from other sources is to obtain quantitative data as to the actual impact these threats are having, most readily accomplished through mortality monitoring (Sections 3.2 and 3.3) and population and habitat monitoring (Section 4). If monitoring indicates a need for intervention to reduce mortality associated with these “other threats” the first priority will be the establishment of a consultative process involving all stakeholders to determine appropriate and acceptable management actions.

In the case of illegal harvest, e.g., for use as bait in crab pots, the acceptable level is zero harvest. To achieve this it will be necessary to develop a code of practice for crabbers to: i. not use Dugong for bait, and ii. minimise impact on seagrass beds. There is also a need to increase education about Dugong conservation requirements and to significantly increase enforcement in the area of illegal harvest of Dugong.

### **3.5 Community Arrangements**

Much of the community consultation required under this program will be conducted through discussion with interested and involved individuals, organisations and community groups. However the *TPWCA* provides several mechanisms for developing management agreements tailored to the needs of specific situations, communities and interests.

Whether formal arrangements are required in any particular situation will depend upon the significance of the Dugong population and habitat in the area, the nature of the threats to the population and/or habitat, the management actions required to ameliorate those threats, and the level of interest by the local community.

One option is for cooperative management arrangements under Section 35 of the Act. This is appropriate for fostering cooperation among members of a particular non-Aboriginal community group, or for cooperation among a mixture of Aboriginal and non-Aboriginal interests.

Aboriginal interests may potentially be best served by an arrangement under Section 73 of the Act, that would provide the community with mechanisms for developing systems for the take of Dugong according to Aboriginal tradition, as well as other matters pertaining to the management of the species.

The intention with formal community management arrangements is to empower communities and interest groups to responsibly manage Dugong populations in their self-interest, by regulating their impacts on local populations.

DBIRD Fisheries Group is developing an indigenous 'Sea Ranger' program for the Northern Territory. The program is being established to facilitate indigenous peoples monitoring and management of their marine resources and to provide a mechanism for the advocacy of indigenous peoples perceptions in relation to their marine resources to the broader community. The program is currently established on the Tiwi Islands and at Borroloola and is being established at a number of coastal communities across the Top End. Monitoring of Dugong harvest, both traditional and incidental, would be a logical extension of the activities of the 'Sea Rangers' and their participation in any monitoring programs will greatly enhance the implementation of the monitoring programs. Additionally, it is likely that 'Sea Rangers' could have a significant role in monitoring and enforcement in relation to illegal harvest of Dugong.

## **4. MONITORING AND RESEARCH**

### **4.1 Monitoring of Dugong populations**

Dugong distribution and abundance will be monitored using an ongoing program of aerial surveys replicated at five year intervals, or as otherwise indicated by monitoring of hunting and incidental catch. This frequency of surveys has been selected based on the minimum length of time of 9 to 10 years to detect a chronic decline in Dugong population (Marsh 1989a and 1995) using annual surveys. Marsh (1989a) identifies annual surveys as inappropriate for a Dugong population that is changing slowly and indicates that two Dugong surveys 10 years apart could establish with 95% confidence that a population decreasing at 5% per year is declining (Marsh 1989a). The five year interval between surveys proposed is an adequate compromise between the cost of annual surveys and the paucity of information that 10 yearly surveys would provide and falls within the review interval of five years for the management program.

The current survey methodology (Bayliss 1985, Bayliss and Freeland 1989 and Saalfeld 2000) is considered appropriate to detect any broad-scale changes in Dugong population in Northern Territory waters. This methodology will be maintained as the standard, with modification to incorporate areas not yet surveyed. This methodology is particularly

appropriate to the Northern Territory, which has extensive areas of remote, sparsely inhabited coastline.

Detection of localised chronic decline in Dugong population within a suitable time frame using present aerial survey and analytical techniques is all but impossible (Marsh *et al.* 1994). Marsh (1995) has shown that the minimum detectable rate of decline for a population of 1000 Dugong by 10 annual surveys (9 years) is 8.1% per year ( $\alpha = 0.05$ ). After 10 surveys the population would have declined to 47% of its size at the time of the first survey. Hence, broad-scale aerial survey is inappropriate to detect a localised chronic population decline in a short time frame.

Given the potential for a localised chronic decline in a Dugong population to occur and remain undetected by aerial survey, information from all sources, particularly that of knowledgeable Dugong hunters, indicating evidence of population declines will be treated seriously and investigated. Such evidence will be taken as prima-facie case to trigger management actions. As previously indicated, it is likely that indigenous 'Sea Rangers' would play a significant role in localised monitoring and recording of changes in Dugong populations.

New GPS and data recording technology has greatly improved the accuracy with which Dugong distribution can be mapped. This allows changes in the distribution of relative density to be examined at local scales using broad-scale aerial survey data. Comparison of changes in the distribution of relative density at the local level with available data in relation to habitat change and Dugong mortality may be able to be used to identify areas where Dugong populations are declining at the local scale.

Efforts will be made to establish programs to collect and/or collate data on the take of Dugongs by commercial fishing and traditional hunting. The data to be collected should include:

- i. location and number of animals caught;
- ii. date and circumstances of catch;
- iii. size and sex of animals caught (if possible);
- iv. total fishing effort; and
- v. fate of animals.

## **4.2 Seagrass monitoring**

Little is known about the distribution and abundance of seagrass in the western Top End, but is well known for the waters of the western Gulf of Carpentaria.

A marine habitat mapping program for Territory waters has commenced and the mapping of seagrass distribution and abundance is a component of this program.

Given the importance of seagrass to the long-term maintenance of Dugong habitat a dedicated survey of seagrass distribution and abundance in the coastal waters of the Northern Territory is a priority, and should be carried out as soon as resources allow, rather than being constrained by the timeline of the marine habitat mapping program.

## 5. MANAGEMENT STRATEGIES

Should monitoring results (Section 4), or any other information, indicate that management goals are not being met, management activities may be altered or other actions taken in accordance with the objectives of this Management Program.

## 6. REPORTS

Progress with this Management Program will be reported in the annual report of the Commission. This will include, but not be limited to:

- i. any change in the conservation status of the Dugong in the Northern Territory;
- ii. progress with listed actions for management of the Dugong in the Northern Territory;
- iii. summaries of the results of the monitoring and research programs.

## 7. COMPLIANCE

Wildlife regulations and permit or licence conditions will be enforced by Conservation Officers appointed under the *TPWCA* and officers of the Northern Territory Police Force.

## 8. REVIEW OF PROGRAM

A full review of the program, as required under Section 75 of the *TPWCA*, will be carried out within five years of the Management Program being approved.

## 9. BACKGROUND

### 9.1 Historical background

The Dugong (*Dugong dugon*) is a large herbivorous marine mammal that plays a significant cultural and dietary role in the lives of the Aboriginal and Torres Strait Island peoples of northern Australia (Smith and Marsh 1990; Johannes and MacFarlane 1991). Dugong hunting is a high status activity and the Dugong has great significance for cultural celebrations (Bradley 1997). Australia's responsibility for the conservation and management of the species includes the maintenance of this important part of indigenous culture.

Non-indigenous utilisation of the Dugong has occurred in Australia, with commercial utilisation taking place in Queensland early last century (Smith and Marsh 1990; Peterken 1994). No legal non-indigenous utilisation occurs currently in Australian waters.

## **9.2 Conservation status**

The Dugong is listed as vulnerable to extinction in the IUCN Red Data Book of Threatened Species. The Australian population(s) of Dugong are listed in Appendix I of CITES.

The Dugong is not listed as endangered or vulnerable in Australia under EPBCA, however, it is fully protected throughout its range in Australia by State, Territory and Commonwealth legislation. In the Northern Territory the Dugong is protected wildlife under *TPWCA* and the Dugong's conservation status is listed as lower risk – near threatened under that Act.

## **9.3 Taxonomy and description**

The Dugong is the only extant member of the Family Dugongidae and one of only four extant species of the Order Sirenia (the other three species being the manatees, *Trichechus* spp.). Descended from terrestrial mammals that browsed in shallow grassy swamps during the Eocene, the closest modern relative of the Sirenians is the elephant.

Adult Dugong grow to more than three metres in length and up to 420 kilograms (Spain and Heinsohn 1975) and have a rotund body with a horizontal tail and forward pectoral fins. Dugong eyes are set laterally and cover a broad field of. The auditory opening is small and set laterally behind the eyes; however hearing is reported to be acute.

## **9.4 Life history and reproductive ecology**

Marsh *et al.* (1984) have developed life history models for the Dugong. Dugongs are long-lived animals with a low reproductive rate, long generation time and high investment in each offspring.

Age has been estimated by counting seasonally deposited growth layers in the tusks (Marsh 1980). Longevity is approximately seventy years. Marsh *et al.* (1984) predicts that Dugongs over 2.5 metres are mature, while male and female Dugong less than 2.2 metres are probably immature. The pre-reproductive interval is at least nine years and sometimes as long as seventeen years (Marsh *et al.* 1984).

Female Dugongs usually bear a single calf every three to five years. The gestation period is about thirteen months and the calf suckles for at least eighteen months. Calving occurs in the shallow waters of tidal sandbanks (Marsh *et al.* 1984) and estuaries (Hughes and Oxely-Oxford 1971); possibly a strategy to avoid shark attacks (Anderson 1981). Breeding is seasonal, with breeding activity occurring in the second half of the year (Marsh 1995).

Population simulations indicate that even with the most optimistic combinations of life history parameters (e.g. low natural mortality and no human-induced mortality) a Dugong population is unlikely to increase at more than 5% per year (Marsh 1995).

## 9.5 Diet and habitat

Dugong feed on seagrasses found in the shallow tidal and sub-tidal coastal marine environment. Originally believed to feed opportunistically on available seagrasses (Marsh *et al.* 1982, Lanyon *et al.* 1989), recent work by Preen (1993) indicates that preferential grazing occurs, apparently based on the nutritional quality of the seagrass. Lanyon (1991) found that the most frequently selected seagrass species are lowest in fibre and highest in available nitrogen and presumed digestibility. In many areas seagrass species of the genera *Halophila* and *Halodule* are favoured.

Marine algae are also eaten (Spain and Heinsohn 1973, Marsh *et al.* 1982), as are macro-invertebrates (Heinsohn and Spain 1974, Anderson 1989 and Preen 1995a). Algal feeding is believed to occur only when seagrass is scarce (Spain and Heinsohn 1973).

When feeding on the preferred seagrasses, Dugongs dig up the whole plant including the nutrient rich rhizomes (Heinsohn and Marsh 1978). This produces the distinctive feeding trails that are seen in the preferred seagrass beds. Dugongs consume between 21 – 36 kilograms of seagrass each day.

Dugongs have also been reported from deeper water further offshore. Large numbers have been sighted in waters more than 10 m deep (Marsh and Saalfeld 1988, 1991) and Marsh and Saalfeld (1989) sighted Dugongs up to 58 km from the north Queensland coast in water up to 37 m deep. This distribution reflects that of deeper seagrasses such as *Halophila spinulosa* (Lee Long *et al.* 1993).

## 9.6 Movements

Dugong movements have been tracked in a number of studies using VHF or satellite transmitters. Of the more than 30 Dugong that have been tracked most had movements localised to within the vicinity of seagrass beds (Marsh and Rathbun 1990 and Preen 1993). Six animals were observed to travel large distances, ranging between 100 and 600 km (Marsh and Rathbun 1990 and Preen 1995b).

## 9.7 Distribution and abundance

The range of the Dugong spans more than 40 countries throughout the tropical and sub-tropical coastal and island waters of the Indo-West Pacific from east Africa to the Solomon Islands and between about 26° and 27° north and south of the equator (Nishiwaki and Marsh 1985). Over much of its range the Dugong is believed to be represented by relict populations separated by large areas where they are close to extinction or extinct (Marsh 1988).

A significant proportion of the world's Dugong stocks is found in northern Australian waters between Shark Bay in Western Australia and Moreton Bay in Queensland (Marsh and Lefebvre 1994). It is generally accepted that Australia is the stronghold for the species, with the Dugong being the most abundant marine mammal in inshore waters (Marsh unpublished data). Current estimates put the Australian population at more than 80,000 Dugong (Preen *et al.* 1995, Saalfeld 2000 and Anon 1997). This estimate is likely to be an

underestimate as aerial surveys generally underestimate actual abundance (Marsh and Sinclair 1989a and b) and some areas of suitable habitat have not been surveyed.

Table 2 summarises the population estimates of Dugong in Northern Territory waters based on aerial surveys. Figures 4 and 5 show the distribution of Dugong in Territory waters based on the most recent aerial surveys.

**Table 2: Numbers and density ( $\pm$  standard errors) of Dugong in Northern Territory coastal waters.**

Location	Date	Area (km <sup>2</sup> )	Number $\pm$ s.e	Density $\pm$ s.e. (km <sup>-2</sup> )
Western Top End coast	December 1983 <sup>1</sup>	28746	13800 $\pm$ 2683	0.48 $\pm$ 0.09
	December 1995 <sup>2</sup>	46570	12610 $\pm$ 2135	0.27 $\pm$ 0.05
Western Gulf of Carpentaria	February 1985 <sup>1</sup>	27216	16846 $\pm$ 3259	0.62 $\pm$ 0.12
	November 1994 <sup>2</sup>	24770	23336 $\pm$ 3040	0.94 $\pm$ 0.12

<sup>1</sup> Bayliss and Freeland (1989)

<sup>2</sup> Saalfeld (2000).

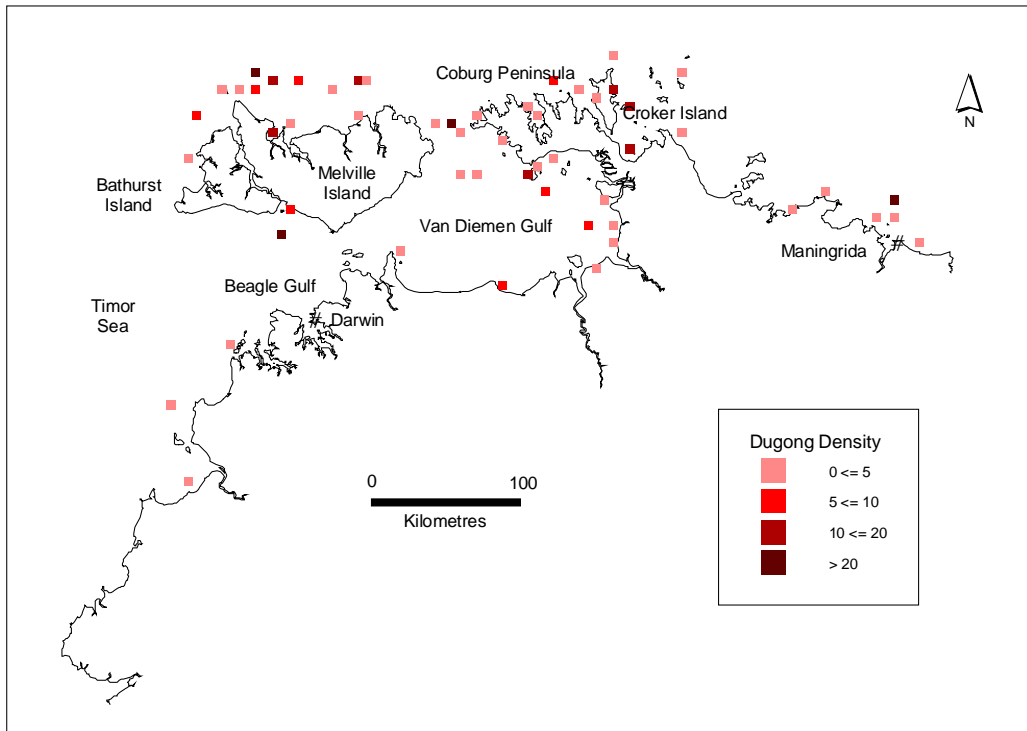
The distribution of Dugong along the western Top End coast was patchy, with higher densities generally associated with shallow water, larger islands and bays. Major aggregations of Dugong occurred seaward of the Tiwi Islands and surrounding Cobourg Peninsula and Croker Island, and a smaller aggregation offshore from Maningrida (Figure 4). Few animals were sighted along the mainland coast of the Timor Sea, Beagle Gulf or Van Diemen Gulf.

Except for the large aggregation of Dugong seaward of the Tiwi Islands, the majority of sightings occurred within the Territorial Waters of the Northern Territory.

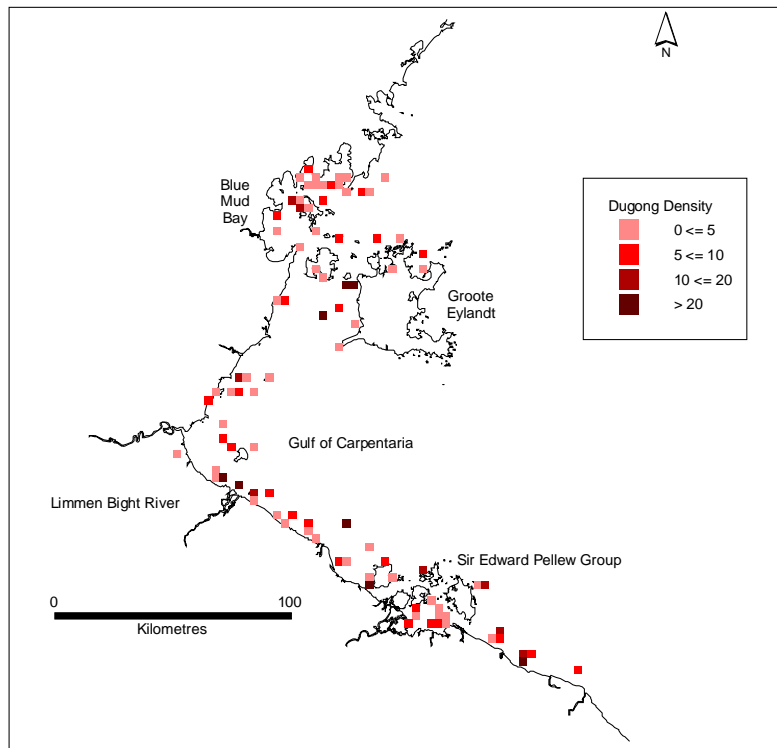
The aggregation seaward of the Tiwi Islands was estimated to be approximately 4,400 Dugong. This area has the third largest population of Dugongs in the Northern Territory (Saalfeld 2000). Cobourg Peninsula and Croker Island were estimated to have a population of 5,500 Dugong, giving this area the second largest population of Dugong in the Northern Territory (Saalfeld 2000). Both of these areas rank in the top eight Dugong population areas in Australia.

Distribution of Dugong along the western Gulf of Carpentaria coastline was much more uniform, with Dugong occurring along almost the entire length of coastline at medium to high densities (Figure 5). Within this relatively uniform distribution four areas stand out as being of great significance with respect to Dugong abundance: the top half of Blue Mud Bay, the mouth of the Limmen Bight and the Sir Edward Pellew Group of islands. The coastal strip from the mouth of the Limmen Bight River to east of the Sir Edward Pellew Group has the largest population of Dugong in the Northern Territory and ranks in the top four Dugong areas in Australia. Saalfeld (2000) estimates that some 8,000 Dugong occur along this strip of coast and within the island group. Blue Mud Bay was estimated to have some 4,200 Dugong, giving it the fourth largest population of Dugong in the Northern Territory (Saalfeld 2000) and also ranking in the top eight Dugong areas in Australia.

**Figure 4: Distribution of corrected Dugong density by cells in the western Top End coastal waters, December 1995.** Cell size equals 25 km<sup>2</sup> and density is number of animals per km<sup>2</sup>.



**Figure 5: Distribution of corrected Dugong density by cells in the western Gulf of Carpentaria coastal waters, November 1994.** Cell size equals 25 km<sup>2</sup> and density is number of animals per km<sup>2</sup>.



Almost all sightings of Dugong in the western Gulf of Carpentaria occurred within the shallow coastal territorial waters of the Northern Territory. Few sightings occurred within Commonwealth waters.

## 9.8 Threats

### 9.8.1 Direct threats

Direct threats to Dugong include incidental mortality in fishing nets, boat strike, stranding events and traditional hunting. Current population models indicate that even a slight increase in adult mortality can cause a critical decline in a Dugong population.

Accidental entanglement in gill nets is a documented cause of Dugong mortality (Heinsohn *et al.* 1976). However, no data have been collected in the Northern Territory on the impact of incidental catch on Dugong populations. This lack of information on incidental catch has long been recognised as a serious deficiency in Dugong management in the Northern Territory (Saalfeld 2000.). Coates (2002) reported on Dugong mortality in the Borrooloola region during the course of a 15 month study. A minimum of 40 Dugong deaths during the study period were attributed to causes other than indigenous harvest.

This represents some 42% of all mortality reported by Coates (2002) and 15% of this mortality was directly attributable to incidental catch by commercial barramundi fishing, with the final estimate attributable to incidental catch expected to be much higher (Coates 2002).

Stranding events due to tidal surges associated with tropical storms have been reported (Marsh 1989b). The extent of mortality associated with these events can be high in a localised area. Marsh (1989b) reported the stranding of at least 27 Dugong by a tropical cyclone. Of the 27 Dugong 23 were returned to the sea in a rescue operation; however, the potential existed for all the animals to have perished due to injuries sustained during the stranding.

As with incidental catch, little or no data exist on the extent of traditional hunting in the Northern Territory. On the basis of interviews with local people, Hastings (*pers. comm.*) reported a catch of between one Dugong per week and one per month for the Tiwi Islands. Bertram and Bertram (1973) reported that an average of 62 Dugongs were harvested per year at Numbulwar during the 1960s. Bayliss and Freeland (1989) reported that this had reduced to approximately 10 per year in the 1980s. Local hunters attributed the decrease to a decline in Dugong abundance. However, no data were available to determine whether this perceived decline was due to an actual decline or avoidance behaviour.

Catches of between eight and 16 Dugong per year between 1980 and 1993 have been reported for Borrooloola (Marsh *et al.* 1994). Coates (2002) has reported an annual harvest of 45 Dugong per year for the Borrooloola region (the Limmen River to Weayran River including the Sir Edward Pellew Islands group), representing in excess of 50% of the reported mortality for the region Coates (2002). Bradley (1997) has reported a gradual decline in Dugong hunting in the region, particularly from pre 1960 (Coates, 2002).

It is understood that customary Aboriginal law imposes restrictions on traditional hunting of Dugong in the northern minor bays of Blue Mud Bay during calving (unidentified traditional owners *pers. comm.*).

Extrapolating a harvest of up to 50 Dugong per year for each of the major coastal Dugong hunting areas (Borroloola area, including Limmen, Roper to Numbulwar and Groote Eylandt/Blue Mud Bay area) and 10 Dugong per year for each of the minor Dugong hunting areas (Nhulunbuy area, Elcho Island area, Millingimbi and Ramingining area, Maningrida area, including Golbourn, Croker Island/Cobourg Peninsula area and Wadeye area) and 20 Dugong per year for the Tiwi area, a traditional harvest for the Northern Territory of 230 Dugong per year is possible. This would represent an annual mortality of less than 2% of the estimated total Northern Territory population. A traditional hunting mortality of this magnitude would appear sustainable on a Territory wide basis; however, no actual data are available on local mortality levels across the Territory. Such data are essential to assess the potential for localised declines or extinctions.

### 9.8.2 Indirect threats

Disease, stress, harassment and habitat loss are the main indirect threats to Dugong populations. Little information exists on disease, stress or harassment of Dugong.

Habitat loss has been identified as a potential source of localised declines in Dugong populations (Thorogood *et al.* 1990, Johannes and MacFarlane 1991, Preen *et al.* 1993 and Preen and Marsh 1995).

Natural events such as cyclones and floods can cause extensive damage to seagrass communities through severe wave action, shifting sand, adverse salinity changes and light reduction (Heinsohn and Spain 1974, Kenyon and Poiner 1987, Thorogood *et al.* 1990 and Preen *et al.* 1993).

Seagrass communities are also subject to human impact through mining, trawling, dredging, inland and coastal clearing and land reclamation. These activities either directly remove seagrass or result in community degradation through increased sedimentation and turbidity.

### 9.9 Parks and Reserves

Much of the habitat of the second largest population of Dugong occurring in Territory waters falls within the boundaries of Garig Gunak Barlu National Park. Within the park boundaries, Dugong are protected from most forms of non-indigenous impact, i.e., habitat degradation. Indigenous hunting is allowed and currently is neither monitored nor actively regulated.

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## 11. MILESTONE MATRIX

**Table 3: Milestone matrix for Dugong management program.**

Milestone		Action Officer	Year				
			2003/4	2004/5	2005/6	2006/7	2007/8
1	Mapping of seagrass distribution as part of marine habitat mapping program.	Principal Marine Scientist	Ongoing, reported annually in Annual Report and individual habitat reports.				
2	Consultation to identify Dugong habitat where mesh nets are used.	Senior Wildlife Management Officer		Dec04			
3	Consultation to establish culturally acceptable mechanisms to monitor traditional harvest.	Senior Wildlife Management Officer			Jun06		
4	Consultation to establish mechanisms to monitor incidental catch.	Senior Wildlife Management Officer			Jun06		
5	Consultation to develop education program for professional fishers to reduce incidental catch.	Senior Wildlife Management Officer				Jun07	
6	Consult to establish culturally appropriate education programs to increase Aboriginal people's awareness of the broader requirements for Dugong conservation.	Senior Wildlife Management Officer				Jun07	
7	Broad-scale Dugong population monitoring survey.	Senior Wildlife Management Officer				Jun07	
8	Consultation to determine range of management options to reduce impact of incidental catch.	Senior Wildlife Management Officer					Dec07
9	Consultation regarding culturally acceptable co-management arrangements directed at Dugong conservation outcomes.	Senior Wildlife Management Officer					Dec07
10	Determine need for establishment of areas of essential habitat for Dugong conservation.	Senior Wildlife Management Officer				Jun07	
11	Negotiation with Aboriginal people regarding need for protected areas for Dugong in indigenous waters.	Senior Wildlife Management Officer					Jun08
12	Negotiation with Commonwealth for protection of Dugong habitat in Commonwealth waters.	Senior Wildlife Management Officer					Jun08
13	Review of program.	Senior Wildlife Management Officer					Dec08