



Australian Government

Department of Sustainability, Environment,  
Water, Population and Communities



# Species group report card – dugong

Supporting the marine bioregional plan  
for the North Marine Region

prepared under the *Environment Protection and Biodiversity Conservation Act 1999*

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## **Images:**

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# SPECIES GROUP REPORT CARD – DUGONG

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## Report cards

The primary objective of the report cards is to provide accessible information on the conservation values found in Commonwealth marine regions. This information is maintained by the Department of Sustainability, Environment, Water, Population and Communities and is available online through the department's website ([www.environment.gov.au](http://www.environment.gov.au)). A glossary of terms relevant to marine bioregional planning is located at [www.environment.gov.au/marineplans](http://www.environment.gov.au/marineplans).

Reflecting the categories of conservation values, there are three types of report cards:

- species group report cards
- marine environment report cards
- protected places report cards.

While the focus of these report cards is the Commonwealth marine environment, in some instances pressures and ecological processes occurring in state waters are referred to where there is connectivity between pressures and ecological processes in state and Commonwealth waters.





## Species group report cards

Species group report cards are prepared for large taxonomic groups that include species identified as conservation values in a region; that is, species that are listed under Part 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and live in the Commonwealth marine area for all or part of their lifecycle. All listed threatened, migratory and marine species and all cetaceans occurring in Commonwealth waters are protected under the EPBC Act and are identified in the relevant marine bioregional plans as conservation values.

Species group report cards focus on species for which the region is important from a conservation perspective; for example, species of which a significant proportion of the population or an important life stage occurs in the region's waters.

For these species, the report cards:

- outline the conservation status of the species and the current state of knowledge about its ecology in the region
- define biologically important areas; that is, areas where aggregations of individuals of a species display biologically important behaviours
- assess the level of concern in relation to different pressures.



## 1. Dugong of the North Marine Region

The dugong (*Dugong dugon*) is the only living member of the family Dugongidae and is one of only four living species of the order Sirenia. A significant proportion of the world's dugong populations occur in northern Australia's coastal waters from Shark Bay in Western Australia to Moreton Bay in Queensland. Current dugong distributions are believed to represent relict populations separated by large areas where they are either extinct or close to extinction.

The waters of the North Marine Region and adjacent areas support significant populations of dugongs. In a 2007 aerial survey of waters adjacent to the Northern Territory coast of the Gulf of Carpentaria (Marsh et al. 2008), almost 40 per cent of dugongs sighted were in the Commonwealth waters of the North Marine Region. The aerial survey indicated that some 5000 dugongs use habitats extending from the Sir Edward Pellew Islands through to Groote Eylandt. Other aerial surveys indicate that the distribution of dugongs along the Arnhem Land coast is patchy (Saalfeld & Marsh 2004) with a major population of some 4400 animals occurring in waters seaward of the Tiwi Islands (PWS 2003). The Cobourg Peninsula/Croker Island area also supports at least 5500 animals (Saalfeld 2000, cited in PWS 2003; Saalfeld & Marsh 2004). The 2007 survey also showed that the eastern Gulf of Carpentaria, especially the Wellesley Island area, supports Queensland's third-largest population of dugongs (approximately 7000 animals), and is one of the most important dugong habitats in Australia (Marsh et al. 2008, 2011). Around 32 per cent of the dugongs sighted along the Queensland coast of the Gulf of Carpentaria were in Commonwealth waters within the North Marine Region.

The dugong is listed as a migratory and marine protected species under section 248 of the EPBC Act. The dugong was selected for analysis following consideration of its conservation status, distribution and population structure within the region, and life history characteristics.

### Biologically important areas

Biologically important areas are areas that are particularly important for the conservation of the protected species and where aggregations of individuals display biologically important behaviour such as breeding, foraging, resting or migration. The presence of the observed behaviour is assumed to indicate that the habitat required for the behaviour is also present. Biologically important areas have been identified for some EPBC Act listed species found in the North Marine Region, using expert scientific knowledge about species' distribution, abundance and behaviour in the region. The selection of species was informed by the availability of scientific information, the conservation status of listed species and the importance of the region for the species. The range of species for which biologically important areas are identified will continue to expand as reliable spatial and scientific information becomes available.

Biologically important areas have not yet been identified for dugongs in the North Marine Region.



## 2. Vulnerabilities and pressures

### Vulnerabilities

The population biology of dugongs makes them particularly vulnerable to mortality as adults (Marsh et al. 2011). Unexploited dugong populations are characterised by long lifespans (greater than 70 years), long gestation (12–14 months), single offspring, long intervals between births (more than 2.5 years), prolonged periods until sexual maturity (6–17 years), and high and temporally stable adult survival (Marsh et al. 1984). Adult survival is the most important determinant of population growth. The maximum rate of population increase under optimum conditions when natural mortality is low is approximately 5 per cent per year. The maximum sustainable mortality rate of adult females killed by human activities is approximately 1 or 2 per cent (Heinsohn et al. 2004; Marsh et al. 1997, 2004), and lower when food supplies are low (Marsh et al. 2002; Marsh & Kwan 2008). Pressures that cause dugong mortality are therefore of *potential concern* if such pressures occur over a wide geographic area, even if the magnitude of the pressures is uncertain.

### Analysis of pressures

On the basis of current information, pressures have been analysed for dugong discussed in this report card. A summary of the pressure analysis for dugong is provided in Table 1. Only those pressures identified as *of concern* or *of potential concern* are discussed in further detail below. An explanation of the pressure analysis process, including the definition of substantial impact used in this analysis, is provided in Part 3 and Section 1.1 of Schedule 1 of the plan.

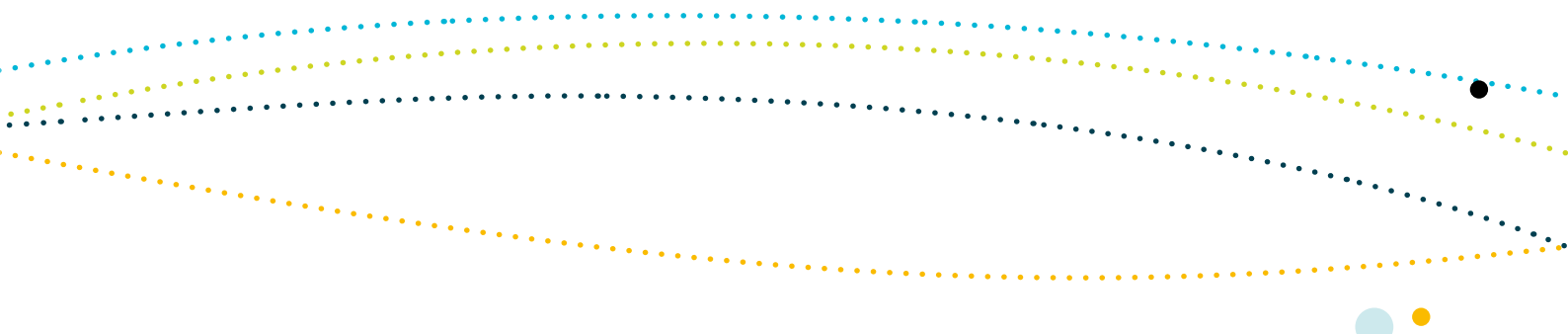
**Table 1: Outputs of the dugong pressure analysis for the North Marine Region**

Pressure	Source	Level of concern
Sea level rise	Climate change	of potential concern
Changes in sea temperature	Climate change	of potential concern
Ocean acidification	Climate change	not of concern
Chemical pollution/contaminants	Shipping	not of concern
	Vessels (other)	not of concern
	Urban development (urban and/or industrial infrastructure)	not of concern
	Agricultural activities	not of concern
	Onshore and offshore mining operations	of less concern
Nutrient pollution	Agricultural activities	not of concern
	Urban development	not of concern
Changes in turbidity	Dredging	of less concern
Marine debris	Fishing boats	of potential concern
	Land-based activities	of potential concern
	Shipping	of potential concern
	Vessels (other)	of potential concern
Noise pollution	Seismic exploration	not of concern
	Urban development	of less concern
	Shipping	of less concern
	Vessels (other)	of less concern
	Onshore and offshore mining operations	of less concern
Physical habitat modification	Fishing gear (active and derelict)	of less concern
	Dredging and/or Dredge spoil	of less concern
	Climate change (changes in storm frequency etc)	of potential concern
Human presence at sensitive sites	Tourism	not of concern
	Recreational and charter fishing (burleying)	not of concern
	Research	not of concern
Extraction of living resources	IUU (domestic or non-domestic)	of potential concern
	Indigenous harvest	of potential concern
Bycatch	Commercial fishing	of potential concern
Oil pollution	Shipping	not of concern
	Vessels (other)	not of concern
Collision with vessels	Oil rigs	not of concern
	Shipping	of less concern
	Fishing	of less concern
Disease	Tourism	of less concern
	Fishing	data deficient or not assessed
	Shipping	data deficient or not assessed
Invasive species	Tourism	data deficient or not assessed
	Shipping	not of concern
	Fishing vessels	not of concern
	Land-based activities	not of concern

**Legend** ■ of concern ■ of potential concern ■ of less concern ■ not of concern  data deficient or not assessed







There is a general deficiency of data regarding the impacts of many of the pressures on dugongs in the North Marine Region. In addition, the cumulative impacts of several pressures acting simultaneously is likely to be considerable, but is poorly understood. The pressures identified as *of potential concern* are considered in two groups: pressures associated with habitat loss due to climate change and pressures associated with human-induced mortality of dugongs.

### Pressures associated with habitat loss due to climate change

Climate change is predicted to adversely affect the shallow seagrass communities on which dugongs depend in the North Marine Region. The effect of seagrass loss or dieback on dugongs is twofold—some dugongs remain in the affected area but lose body condition, reduce breeding and are less likely to survive, while others must move hundreds of kilometres to find alternative food sources (Preen & Marsh 1995; Marsh & Kwan 2008). Seagrass dieback is known to significantly decrease dugong reproductive rates (Marsh & Kwan 2008). Dugong habitat loss is likely to become more widespread with climate change. Therefore, pressures associated with climate change are assessed as *of potential concern* for dugongs in the North Marine Region because such pressures are likely to lead to the loss of dugong habitat and, consequently, dugong population decline.

#### Sea level rise—climate change

Global sea levels have risen by 20 centimetres between 1870 and 2004 and predictions estimate a further rise of 5–15 centimetres by 2030, relative to 1990 levels (Church et al. 2009). Longer term predictions estimate increases of 0.5 – 1 metres by 2100, relative to 2000 levels (Climate Commission 2011). As a consequence, the possible decreases in available light to the seagrass canopy may cause reduced growth, reduced productivity or loss of seagrass. Sea level rise is also likely to lead to erosion of coastlines, which will increase turbidity of coastal waters and affect seagrass survival. Although it is possible that new seagrass habitats will develop as low-lying coastal areas become intertidal, the overall effect of sea level rise on dugong habitats in the North Marine Region is uncertain and therefore *of potential concern*.





## Changes in sea temperature—climate change

Waycott et al. (2007) argue that elevated temperatures will have the greatest impact on seagrasses, particularly in shallow habitats. Sea temperatures have warmed by 0.7 °C between 1910–1929 and 1989–2008, and current projections estimate ocean temperatures will be 1 °C warmer by 2030 (Lough 2009). Campbell et al. (2006) conducted temperature experiments on tropical seagrass species—including species eaten by dugongs—and demonstrated that the photosynthetic condition of all seagrass species tested was likely to suffer irreparable effects from short-term or episodic changes in sea water temperatures up to 40–45 °C. These acute stress responses of seagrasses are consistent with observed reductions in above-ground biomass during a recent El Niño event. In the Gulf of Carpentaria in 2002, seagrass loss and subsequent reports of 'water fat' (i.e. starving) dugongs are suspected to be associated with elevated sea water temperatures, although data are lacking to show a causal link between these phenomena (Kwan & Bell 2003). The likely increase in sea temperature associated with climate change is therefore considered to be *of potential concern* for dugongs in the North Marine Region.

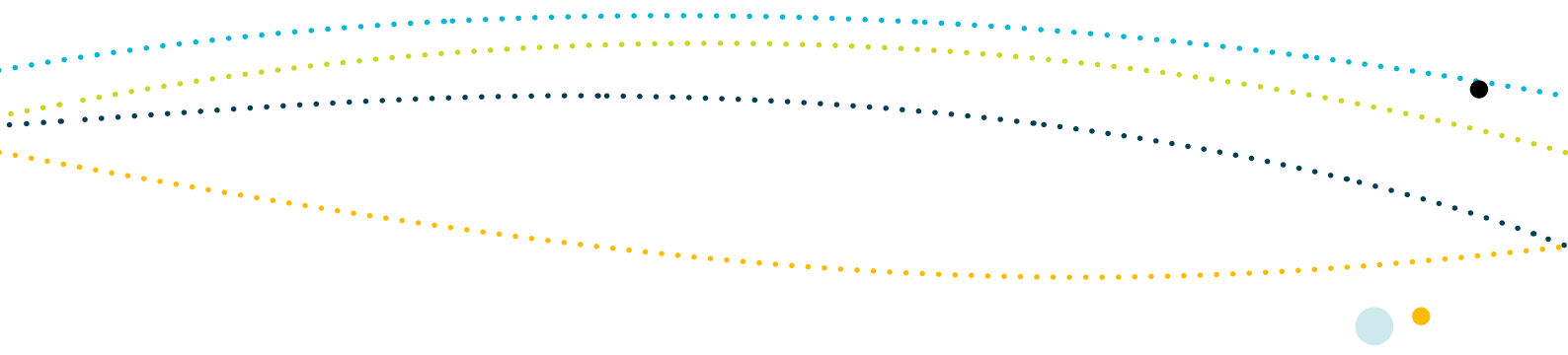
## Pressures associated with human-induced mortality of dugongs

### **Marine debris—fishing boats; land-based activities; shipping; vessels (other)**

Marine debris is assessed as *of potential concern* for dugongs in the North Marine Region. Marine debris, including derelict fishing nets, accumulates in high concentrations along the coasts adjacent to the North Marine Region, especially along the coast of north-western Cape York, Grootte Eylandt, and north-east Arnhem Land (DEWHA 2009a, 2009b; Limpus 2009; Roelofs et al. 2005). Although there are records of dugongs being stranded as a result of marine debris in Numbulwar (1996–1998) and northern Cape York (2001) (Toldi 2001 pers. comm. and Wallin 2001 pers. comm. in Kiessling 2003), the effects on the North Marine Region's dugong populations are unknown. This pressure is *of potential concern* because it is likely to cause injury or death to dugong individuals, and it is uncertain if management strategies to minimise marine debris (particularly derelict fishing nets) are adequate.

### **Physical habitat modification—storm events**

Modelling predicts that the intensity of storms and storm surges will increase (Connolly 2009; Hyder Consulting 2008). Present indications are that modest to moderate increases (up to 20 per cent) in average and maximum cyclone intensities are expected by the end of the century in some areas (Walsh & Ryan 2000). Experience from various parts of northern Australia suggests that episodic losses of hundreds of square kilometres of seagrass can be associated with extreme weather events such as cyclones and floods (Poiner & Peterkin 1996; Preen



& Marsh 1995). Light availability at seagrass surfaces is typically significantly reduced for a period of time after extreme weather events, and deposited sediments can physically smother seagrass surfaces (Cabaco et al. 2008). In addition, storm surges can directly cause dugong mortality by dumping animals above the high tide level (Marsh 1989). The likely increase in the intensity of storm events is therefore considered to be *of potential concern* for dugongs and their habitats in the North Marine Region.

### ***Extraction of living resources—Indigenous harvest***

Indigenous harvest is assessed as *of potential concern* for dugongs in the North Marine Region. Indigenous people have a native title right to harvest marine species, including dugongs, for personal, domestic or non-commercial communal needs. A number of Indigenous people living adjacent to the North Marine Region hunt dugong. However, the amount of harvest is unknown, and any impact is likely to be spatially variable.

### ***Extraction of living resources—illegal, unregulated and unreported fishing (including poaching)***

There is anecdotal evidence of dugong mortality due to local poaching and illegal foreign fishing vessels operating in the North Marine Region, including illegal harvesting of dugongs for bait in crab pots (Marsh et al. 2002). The pressure is *of potential concern*, as the level of extraction is unknown.

### ***Bycatch—commercial fishing***

Bycatch from domestic commercial fishing is assessed as *of potential concern* for dugongs in the North Marine Region. Bycatch of dugongs in gillnets has been reported (NTDR 2011) but is largely unquantified as a cause of dugong mortality throughout the species' range, including in the North Marine Region (Marsh et al. 2002). For example, Coates (2002, cited in PWS 2003) reported that over a 15-month period approximately 42 per cent of the total mortality of dugongs in the Borroloola region was from non-Indigenous human activities such as commercial fishing. A range of fisheries management measures are in place to reduce bycatch of dugongs (Saalfeld & Marsh 2004; Zeroni & Wood 2004, NTDR 2011). For example, a Dugong Protection Area has been established in the south-western Gulf of Carpentaria to minimise dugong interaction as part of the management arrangements for the Northern Territory Barramundi Fishery. However, there is still overlap between commercial fishing areas and dugong habitat and the overall effectiveness of existing measures is still to be assessed. Bycatch therefore remains *of potential concern*, especially as dugongs are highly mobile.



### 3. Relevant protection measures

The dugong is listed as a migratory and marine species under the EPBC Act. Under the Act, it is generally an offence to kill, injure, take, trade, keep or move listed marine, migratory or threatened species on Australian Government land or in Commonwealth waters without a permit. Dugongs are also a protected species under Queensland and Northern Territory legislation.

Alongside the EPBC Act, a broad range of sector-specific management measures to address environmental issues and mitigate impacts apply to activities that take place in Commonwealth marine areas. These measures give effect to regulatory and administrative requirements under Commonwealth and state legislation for activities such as commercial and recreational fishing, oil and gas exploration and production, ports activities and maritime transport. In some instances, as in the case of shipping, these measures also fulfil Australia's obligations under a number of international conventions for the protection of the marine environment from pollution and environmental harm.

Australia has implemented a number of measures to protect dugongs, including spatial and seasonal commercial fisheries closures (aimed at reducing the bycatch of dugongs in gillnets and the physical damage of trawling on seagrass beds), and Indigenous management strategies for the protection of dugong habitat and populations. Evidence of the effectiveness of these management measures, however, has not been documented. In addition, Australia is a signatory to several international agreements to protect dugongs.

#### International measures

Australia is a signatory to the following international agreements for the conservation of dugongs:

- Convention on International Trade in Endangered Species for Wild Flora and Fauna (CITES)—[www.cites.org](http://www.cites.org)
- The Bonn Convention: Conservation of Migratory Species (CMS)—[www.cms.int](http://www.cms.int)
- CMS Memorandum of Understanding on the Conservation and Management of Dugongs and their Habitats Throughout their Range—[www.cms.int/species/dugong/index.htm](http://www.cms.int/species/dugong/index.htm)

For more information on conservation listings under the EPBC Act, and related management objectives and protection measures, visit:

- [www.environment.gov.au/epbc/protect/migratory.html](http://www.environment.gov.au/epbc/protect/migratory.html)  
(listed migratory species)
- [www.environment.gov.au/coasts/species/marine-species-list.html](http://www.environment.gov.au/coasts/species/marine-species-list.html)  
(listed marine species)
- [www.environment.gov.au/cgi-bin/sprat/public/sprat.pl](http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)  
(species profile and threats database)



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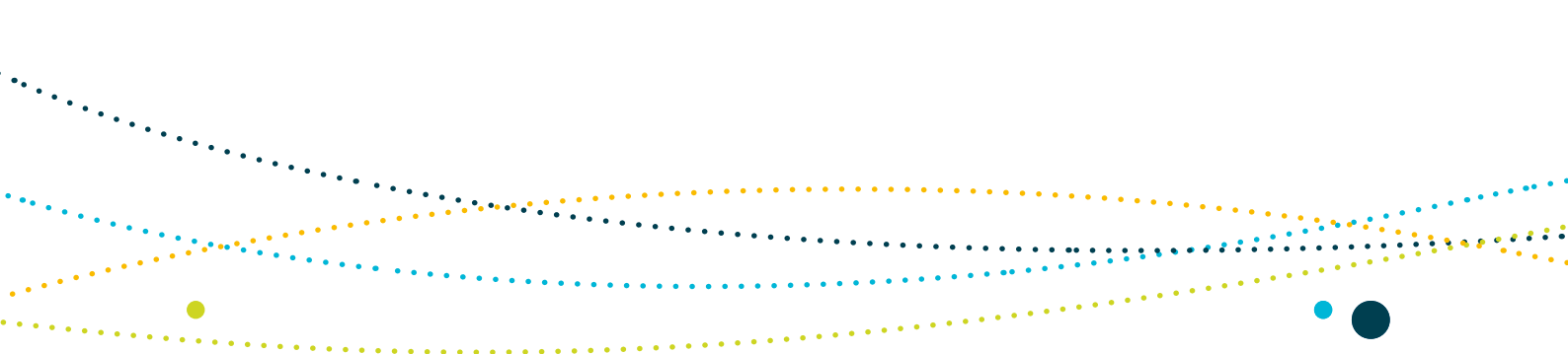
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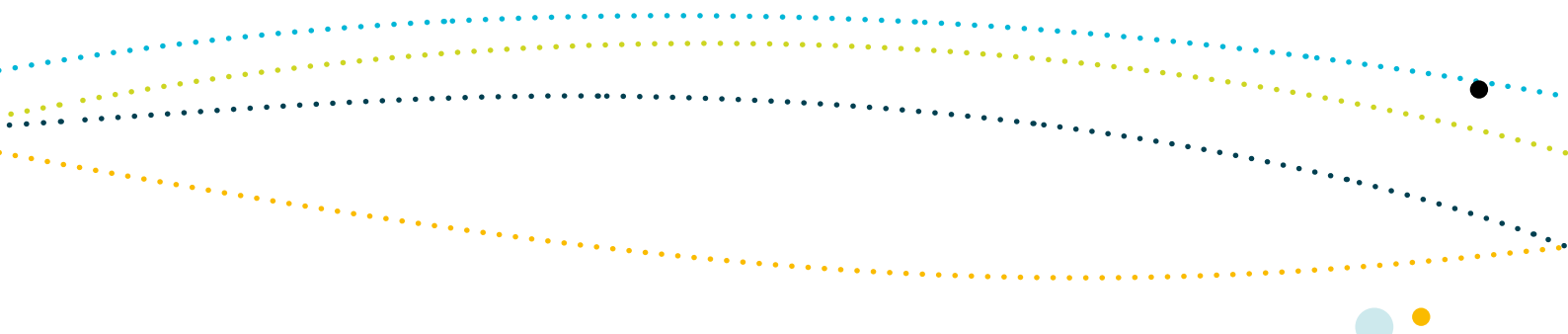
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