The status of the dugong in the Great Barrier Reef Marine Park

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Abstract

One of the World Heritage values of the Great Barrier Reef Region is that it contains major feeding grounds for large populations of the endangered species, *Dugong dugon*. Dugongs are vulnerable to anthropogenic impacts because they are long-lived slow breeding animals with a specialised diet. Their dependence on seagrass means that dugongs have an obligatory association with coastal habitats which are often under pressure from human activities. The rate of dugong population change is most sensitive to changes in survivorship and mortality from traditional hunting or incidental drowning in gill nets must be less than about 2% of females per year to be sustainable. The sustainable harvest rate will be even lower in areas where the pre-reproductive period and/or calving interval are lengthened by food shortage as a result of habitat loss or pollution. Dugong numbers appear to have been stable over the last decade in the Great Barrier Reef Region north of Cape Bedford. On the urban coast south of Cooktown, dugong numbers have declined by approximately 50% over the past eight years. Over a large section of the region, this decline is over 80%. Anecdotal evidence suggests that the decline has probably been occurring since the 1960s or even earlier. As a result of this decline, Indigenous groups have decided not to hunt along the urban coast of the Region and there is now no permitted traditional hunting of dugongs south of Cooktown. Fishers have agreed to support an Endangered Species Education Program and the Queensland Shark Control Program is being reviewed with a view of reducing by-catch. It will be necessary to introduce additional measures to decrease the incidental capture of dugongs in gill nets. Habitat deterioration remains a major unresolved threat to dugongs in the Great Barrier Reef Region.

Introduction

Australia has international responsibilities for the management of dugongs in the Great Barrier Reef Region. One of the World Heritage values of the Region is that it 'provides major feeding grounds for large populations of the endangered species *Dugong dugon*' (Great Barrier Reef Marine Park Authority 1981). In addition, the dugong has high biodiversity value as the only species in the Family Dugongidiae and one of only four species in the Order Sirenia, all of which are listed as vulnerable to extinction by the International Union of the Conservation of Nature (IUCN 1990). Prospects for the survival of the dugong are better than for any of the three species of manatee, as each manatee species has a more localised distribution than that of the dugong (in the West Indian region, the Amazon and in West Africa respectively; Reynolds and Odell 1991). In addition, the estimates of dugong abundance in Australia are much greater than has been recorded or suggested for any species of manatee (unpublished data). These factors mean that the conservation of dugongs in the Great Barrier Reef Region is significant not only for the survival of the dugong but for sirenians in general.

Taxonomic status

The dugong (*Dugong dugon*) is remarkable as the only herbivorous mammal that is strictly

Pressures which reduce survivorship

Traditional harvest

In the Great Barrier Reef Region, dugongs are hunted by members of remote communities such as Hopevale and Lockhart River on the coast of Cape York and by the Indigenous inhabitants of the urban coastal communities from Cooktown south. Dugong hunting is culturally significant and some Indigenous informants have told us that they consider it an important expression of their Indigenous identity. Dugongs are caught for their meat and for their oil which is extracted by boiling the parts of the dugong not used for food, such as the head. Dugong oil is used as a panacea for almost any ache, pain or illness. A dugong yields about 35% of its body weight in useable meat and fat (Nietschmann 1984) and on average about 18 litres of oil (Smith 1987). The meat of dugongs often ranks highest among traditional foods and no celebration is considered complete without dugong on the menu. The skilled hunter enjoys considerable prestige in the community.

There are few hunting statistics from the Region and most of them are out of date. Records between September 1989 to December 1990 indicate that 27 female dugongs were taken by the Lockhart River community (Lockhart resident, pers. comm.). Over one weekend in November 1995 at least eight and possibly 12 dugongs were taken from the area between Lockhart River and Night Island, by people from the Lockhart River and Bamaga communities (Lockhart resident, pers. comm). The adjacent area had an estimated population of 577 $\pm$ s.e. 343 dugongs at that time. The sustainable take from a population of 600 animals would be approximately six females (or 12 animals of both sexes) per year. Dugongs are also taken from the Pascoe River region by residents of Western Cape York (Smith and Marsh 1990). Between January 1984 and February 1987, 74 dugongs were taken by the Hopevale community from the Starcke River region (Smith and Marsh 1990).

Hunting in the northern region of the Great Barrier Reef is not only conducted by residents of Hopevale and Lockhart River communities. Men from both Bamaga and Weipa also use the area to hunt which places additional pressure in some localities. Dugong hunting in this region is limited by weather and the small size of boats used. Extensive travel to hunting grounds is not possible while road access remains limited. However, new roads can dramatically alter the pattern of hunting pressure. The construction of a road from Cape Flattery to Lookout Point in 1991 caused a significant increase in the number of dugongs hunted by the people of Hopevale during the winter months in 1992 (Ross Williams pers. comm.). The encouragement of the outstation movement will change the spatial pattern of dugong hunting effort. This is likely to result in hunting pressure on dugongs in areas currently unaffected by Indigenous hunting. Also, some funding for outstation development has gone into larger vessels (Lockhart resident, pers. comm.), the impact of which is impossible to judge at present. Establishing outstations in areas which are remote from current hunting effort could remove the refugial value of these areas.

The contemporary cultural significance of the dugong to urban Aboriginal and Torres Strait Islander people in Queensland has not been studied formally. However, it appears to be considerable and widespread despite many impediments to urban dwelling Indigenous people participating in dugong hunting (Ponte 1996). Hunting pressure has presumably changed spatially in the last 30 years or so (Ponte et al. 1994) as a result of the migration of Torres Strait Islanders to mainland Australia in large numbers. Some 10 500 Indigenous males now reside in the southern half of the Great Barrier Reef Region (Ponte et al. 1994) including many Islanders who are used to having dugong in their diet (Johannes and MacFarlane 1991; Harris et al. 1994). This is almost ten times the number of Indigenous males in the northern Great Barrier Reef. How many urban Indigenous males aspire to hunt dugongs is unknown. Over two and a

half years in the early 1990s, 70 permits were issued for dugong hunting between Cape Bedford (near Cooktown) and the southern boundary of the Great Barrier Reef Marine Park. Most hunters applied for a permit only once suggesting that hunting is not overtly dominated by a few individuals. (However, it may be dominated by a few defined groups. F. Ponte pers. comm. 1994). There is an established tradition of selling dugong meat in at least one city (Mackay), even though this is illegal (Mackay and Juperdilli Councils of Elders, pers. comm. 1996).

Commercial gill–netting

The by-catch of dugongs in gill nets is a significant source of anthropogenic mortality for these animals in the Great Barrier Reef Region. Although the magnitude of this impact has not been quantified, anecdotal evidence suggests that it is not sustainable. For example, of 14 dugong carcasses reported to management agencies between April and September 1996, at least eight were probable net kills (J. Slater pers. comm.). Net kills are difficult to confirm unless the animal is actually observed in the net as not all dugongs which have drowned in nets exhibit net marks).

There are 1024 fishers with net endorsements to work the east coast of Queensland; 272 fishers with endorsements for barramundi netting. Some (if not most) of the barramundi fishers are a subset of the net fishers (L. Gwynne pers. comm. 1995). According to the log–book program maintained by the Queensland Fisheries Management Authority, the commercial gill netting effort for the Great Barrier Reef Region was 7905 km net days in 1995: of which 1823 km net days were north of Cooktown, 6082 south of Cooktown. The effort in Shoalwater Bay where there has been a great deal of concern about dugongs drowning in nets was approximately 276 km net days, less than 4% of the total. These statistics assume a net length of 600 m. The actual effort will be less than this as: (1) many fishers set less than 600 m; and (2) these data refer to all 17 types of net used by commercial gill netters in Queensland, of which only two or three are recognised as particularly threatening to dugongs (G. Mandelkow pers. comm.).

The relationship between tides, bottom topography, turbidity and patterns of gill netting is likely to lead to increased mortality in relatively shallow bays such as Shoalwater Bay where seagrass is largely restricted to intertidal areas because of the large tidal range and high turbidity. Both dugongs and gill netters are forced to utilise intertidal areas on the high tide, which increases the chances that dugongs will be caught in nets there. Also, due to acoustic pollution from vessel engines (see below), dugongs are likely to be discouraged from utilising these seagrass meadows, and if they do, may be more at risk from vessel strikes.

Despite the beliefs of many members of Aboriginal communities, there is little evidence that many dugongs drown in commercial prawn trawls.

Recreational gill netting

Anecdotal evidence suggests that recreational gill netting is relatively common in northern Queensland waters despite its illegality. There are no data on these nets as a source of dugong mortality but we regard some such mortality as inevitable.

Queensland Shark Control Program

The Queensland Government spends in the order of $1 000 000 per year on shark meshing contracts (Anon. 1992). Since nets were introduced in the mid 1960s, 541 dugongs have been caught in the Great Barrier Reef Region (Baden Lane, Queensland Department of Primary Industries, Forestry and Fisheries (QDPIFF) pers. comm. 1996), most of which died (Paterson 1990). Of these, 161 dugongs were caught off Cairns, an area where there are now so few

Approximately 3000 km^2 of coastal (< 15 m) seagrass have been mapped in the Great Barrier Reef Region to date and at least 2000 km^2 of deepwater seagrass have been estimated so far. The area of seagrass on the tops of reefs has not been estimated. Virtually all of these areas are potential dugong habitat. Lee Long and Coles (this volume) rate the impacts on seagrasses in the Great Barrier Reef Region as low to moderate. The area north of Cooktown has by far the largest areas of seagrass meadows in the Region. Most are remote from known anthropogenic influences other than trawling (Morissette 1992) and almost all the shallow coastal seagrass in this Region is zoned as free from trawling. Other anthropogenic activities tend to be concentrated in three areas: near the Flinders Island Group, the Lockhart River area and in the Escape River. All existing activities apparently have a minimal influence on the surrounding seagrass beds.

In contrast, of the meadows known to support dugongs along the urban coast of the Great Barrier Reef Region south of Cooktown, only those in Bowling Green, Upstart and Shoalwater Bays are relatively free from anthropogenic disturbance (Marsh et al. 1994b). Twenty–seven percent of meadows are within 5 km of a development or a waste outlet (Morissette 1992). The most prominent industrial sources occur near Lucinda (sugar loading jetty), Townsville (Greenvale Nickel Refinery), Abbott Point (coal loading facility), Mackay (sugar mills) and Gladstone (refineries and port). Continual urban and agricultural expansions present a chronic threat in this region. There have been anecdotal reports of loss of seagrass beds along the urban coast during recent years. This is coincident with a period of rapid development and resultant expansion of boating facilities (Morissette 1992). The effects of trawling on dugong habitat in the southern Great Barrier Reef are considered minimal as it does not occur near the major seagrass beds in the region.

Chemical pollutants

Dugongs in northern Australia accumulate high levels of heavy metals (Denton et al. 1980), but have low levels of organohalogen compounds (Heinsohn and Marsh 1978) in their bodies. There is no evidence to suggest that the accumulation of heavy metals is unnatural or particularly harmful to dugongs, as it appears to be a response to the manner in which seagrasses store these minerals. However, metal levels can be so high that some dugong organs may be unsuitable for human consumption. Where ports to load metal ores are established in areas with significant populations of both dugongs and Indigenous hunters this is an issue that needs to be addressed in environmental impact studies. This issue has largely been neglected in the Great Barrier Reef Region to date even though both Townsville and Gladstone are major ports for metal transfer.

Four dugongs from Townsville were analysed for pesticides in 1978. Lindane was detected in livers of all animals. Low levels of dieldrin were detected in the liver of two animals (Heinsohn and Marsh 1978).

Acoustic pollution

There has been no attempt to study any effect of acoustic pollution from boat traffic in the Great Barrier Reef Region. However, in Moreton Bay near Brisbane, dugongs seem to avoid shallow areas where the level of vessel traffic is high, despite some areas being historically important sites for commercial exploitation of dugongs (Preen 1993). It appears that the noise of vessel traffic discourages dugongs from using these areas. Acoustic pollution could be particularly important in areas such as the Mackay/ Capricorn Section where the tidal range is high and there is little seagrass below the low tide mark as high levels of vessel traffic could prevent dugongs from being able to utilise available intertidal seagrass meadows.

Shoalwater Bay, the latter being the most important dugong habitat in the southern Great Barrier Reef Region.

Marsh et al. (in press) rate the status of the dugong in this region as 'critically endangered' because dugong numbers have declined by approximately 50% over the past eight years. Over a large section of the region, this decline is over 80%. Other evidence (catches in shark nets, reports from Aboriginal hunters, comparisons with earlier reports by scientists) suggests that the decline has been occurring since the 1960s or even earlier. If a population of animals has an 'observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is longer' (IUCN 1995, p. 15) it qualifies for this category. Three generations of dugongs equates to at least 90 years, as according IUCN Red List criteria, a generation is 'the average age of parents in the population' (IUCN 1995, p. 10).

Response

Generic conservation measures

Because of the complex jurisdictional arrangements and the dugong's use of intertidal, subtidal and estuarine habitats, the management of dugongs in the Great Barrier Reef Region relies on a close working arrangement between the Great Barrier Reef Marine Park Authority, the Queensland Department of Environment, the Queensland Department of Primary Industries, Fisheries and Forestry, the Queensland Fisheries Management Authority and stakeholder groups including local government, Indigenous peoples, commercial and recreational fishers, conservation groups and local communities. There is an urgent need to acknowledge that the dugong is an animal of special significance to Indigenous peoples and that their interest extends far beyond the management of hunting. They must be empowered to take a leading role in the development of all dugong management initiatives. This has not been done to date.

Various management agencies have prepared documents relating to dugong conservation in the Great Barrier Reef Region. The following documents are in draft format to enable discussion and comment:

- A Management Program for the Conservation and Management of the Dugong (*Dugong dugon*) in Queensland 1994–1999 has been prepared by the Queensland Department of Environment (Queensland Department of Environment 1994);

- The Turtle and Dugong Conservation Strategy for the Great Barrier Reef Region prepared by the Great Barrier Reef Marine Park Authority (Ellis 1994). This document has effectively been adopted as policy by the Authority;

- An Action Plan for Dugong Conservation in Australia has been sponsored by the Australian Nature Conservation Agency (Marsh et al. in press);

- Plan of Management for the conservation of dugong (*Dugong dugon*) in Shoalwater Bay prepared by the Great Barrier Reef Marine Park Authority (1996).

These documents acknowledge that as it is impossible to disaggregate the relative importance of the multiple impacts on dugongs in the Great Barrier Reef Marine Park, it is necessary to address all of them. This approach is also necessitated by the reluctance of the stakeholders causing the impacts to respond unilaterally. The responses to date are outlined and evaluated below. The Dugong and Turtle Review Group established by the Great Barrier Reef Marine Park Authority is scheduled to meet regularly to develop further an interagency program for dugong recovery in the Region. The role of Indigenous people in the development of this program has not been clarified.