

INTRODUCTION

The waters of northern Australia are internationally recognised as the stronghold of the dugong (*Dugong dugon*). As the only surviving member of the family Dugongidae (Marsh et al. 1999), the dugong is a species of high biodiversity value. The dugong is listed as vulnerable to extinction by the IUCN (1996), along with the other three species in the order Sirenia, the manatees (family Trichechidae). Anecdotal evidence suggests that dugong numbers have decreased dramatically throughout most of their range (Marsh et al. 1999), but significant populations persist in Australian waters, which are now believed to support most of the world's dugongs. In Australian waters dugongs occur along much of the coast from Shark Bay in Western Australia to Moreton Bay in Queensland. Consequently, Australia has an international obligation to ensure their conservation (Bertram 1981).

Aerial surveys using standard techniques developed by Marsh and Sinclair (1989a, b) have provided much of the information used to manage dugong populations in Australia. The Great Barrier Reef region south of Cape Bedford was first surveyed using these techniques in 1986–1987, with a resulting population estimate of 3479 (\pm 459 s.e.) dugongs (Marsh & Saalfeld 1990). At that time, it was recommended that the survey be repeated every five years to monitor trends in dugong distribution and abundance. The follow-up survey in 1992 recorded a reduction in dugong numbers to 1857 (\pm 292 s.e.). A repeat of the survey in 1994 confirmed this decline, and further, that it was not an artifact of the poor weather conditions encountered in the 1992 survey, which were less ideal than in 1986–1987 (Marsh et al. 1995).

Hervey Bay supports a substantial dugong population immediately south of the boundaries of the Great Barrier Reef Marine Park (GBRMP) (Preen & Marsh 1995; Marsh et al. 1995), and thus may act as a source or sink for dugongs moving into or out of the southern GBRMP. Hervey Bay was added to the survey region in 1994 to investigate whether the observed decline in the southern Great Barrier Reef region was a result of animals moving into Hervey Bay. In 1988, Hervey Bay and the adjacent Great Sandy Straits supported an estimated 2206 (\pm 420 s.e.) dugongs, but this decreased to 600 (\pm 126 s.e.) in 1993 following widespread destruction of seagrass beds after a cyclone and repeated flooding in early 1992 (Preen & Marsh 1995). The estimated dugong population for the region in 1994 was 807 (\pm 151 s.e.) (Marsh et al. 1995). However, the temporal changes in dugong numbers in the Hervey Bay region could not account for the magnitude of the population decline in the southern GBR region.

These aerial surveys suggested a decline in dugong numbers over more than a thousand kilometres of coastline in the Great Barrier Reef World Heritage Area. Anecdotal evidence indicated that such a decline had been going on for decades (Marsh et al. 1995) as did an analysis of the temporal changes in the number of dugongs caught in shark nets set for bathers protection (Marsh et al. 2001). The reasons for this decrease are complex and may include habitat loss and change, incidental drowning in both commercial and illegal gill nets and in shark nets set for bathers protection, and traditional hunting (Marsh et al. 1995). The data are not available to quantify the relative importance of these impacts, or to determine how much of the change in dugong abundance resulted from a reduction in the size of the dugong population as opposed to emigration from the survey area (absence bias *sensu* Lefebvre et al. 1995). There are no reliable data on temporal changes in Indigenous catch, or by-catch apart from the by-catch in shark nets (Marsh et al. 2001).

This decline has threatened the World Heritage values of the Great Barrier Reef region. An explicit justification for the regions' inclusion onto the World Heritage List was the fact that

it 'provides major feeding grounds for large populations of the endangered species, *Dugong dugon*' (Great Barrier Reef Marine Park Authority 1981). In 1997 the Australian and Queensland governments agreed to several measures aimed at arresting the decline, including a resolution not to issue permits for the Indigenous hunting of dugongs in the region south of Cooktown. The most controversial measure was to establish a two-tiered system of Dugong Protection Areas (DPAs). Gill and mesh netting are greatly restricted or banned in seven Zone A DPAs totalling 2407 km², and subject to lesser modifications in eight Zone B DPAs totalling 2243 km² (Fisheries Regulation [No. 11] 1997 [Queensland]). An additional Zone A DPA of 1703 km² in which gill and mesh netting practices were modified was established in Hervey Bay, immediately south of the region (Marsh 2000).

In this report we present the results of aerial surveys conducted in 1999, five years after the last survey, to again assess the status of the dugong in the southern Great Barrier Reef region. This is the first estimate of dugong abundance in the region since the establishment of the DPAs, and the resolution not to issue permits for Indigenous hunting of dugongs south of Cooktown. The results indicate that dugong numbers in both the southern GBR and Hervey Bay regions in October–December 1999 were significantly higher than the corresponding estimates in 1994, but not significantly different from that obtained for the southern GBR in 1986–1987. Most of the increase was in the northern part of the survey region (the Central Section of the GBR).