

SUMMARY

- Australia has international responsibilities for dugong conservation, particularly in the Great Barrier Reef (GBR) region, where the dugong feeding grounds are listed as one of the World Heritage values of the region. Dugongs are of significant biodiversity value as the only extant species in the Family Dugongidae and one of only four species in the Order Sirenia, all of which are listed as vulnerable to extinction by the IUCN.
- A series of standardised aerial surveys between 1986–1987 and 1994 suggested a decline in dugong numbers over more than a thousand kilometres of coastline in the Great Barrier Reef World Heritage Area. Anecdotal evidence and analysis of by-catch data from the Queensland Shark Protection Program suggested that this decline had been going on for decades.
- The reasons for this decrease are complex and could include habitat loss and change, incidental drowning in both commercial and illegal gill nets and in shark nets set for bathers protection, and Indigenous hunting. The data were 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 rather than emigration from the survey area.
- This decline threatened the World Heritage values of the Great Barrier Reef region. The Australian and Queensland governments agreed to several measures aimed at arresting the decline in 1997, 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) in which gill and mesh netting are greatly restricted or banned, or subject to lesser modifications designed to reduce dugong mortality. Another DPA in which gill and mesh netting practices were modified was established in Hervey Bay, immediately south of the region.
- Another standardised aerial survey in the time series was conducted in 1999, five years after the last survey, to again assess the status of the dugong in the southern GBR, the region south of Cooktown. This is the first estimate of dugong abundance in the region since the establishment of the DPAs and the ban on Indigenous hunting of dugongs south of Cooktown. The survey period was characterised by unseasonably poor weather, and opportunities to survey under suitable conditions were limited. For this reason, the survey coverage was incomplete, with the focus directed towards high quality habitats at the expense of regions where few or no dugongs have been recorded in previous surveys. This resulted in the omission of the region between Cape Bedford and Innisfail, part of the coastline south of Mackay, including Broad Sound, the coast between Hervey Bay and Moreton Bay, and three of six blocks in Moreton Bay.
- The results of the 1999 survey indicate that dugong numbers in both the southern GBR and Hervey Bay regions in October–December 1999 were significantly higher than the corresponding estimate in 1994, but not significantly different from that obtained in 1986–1987. Most of the increase was in the northern part of the survey region (the Central Section of the GBR).
- Moreton Bay near Brisbane was also surveyed using the same techniques but the survey was not completed because of poor weather conditions. Our estimate of 171 ± 76 s.e. dugongs is almost certainly a substantial underestimate of the dugong population of

Moreton Bay as the blocks known to support the most significant dugong densities were not surveyed.

- We consider that the observed increase in dugong numbers in the southern GBR and Hervey Bay is unlikely to be explainable solely by changes in sighting conditions. Weather conditions were very good in two significant areas (Hinchinbrook and Hervey Bay/Great Sandy Straits) and population increases were recorded in both. However, conditions were marginal throughout much of the remainder of the survey area, where increases were also observed. Inclusion of Beaufort Sea State (a surrogate for survey conditions) in statistical analyses did not reduce the significance of the overall increase.
- It is also not possible for the differences between the 1994 and 1999 population estimates to be solely the result of natural increase in the absence of immigration. The dugong is a long-lived species with an estimated maximum rate of increase of the order of 5% p.a. or 27.6% over five years. The rate of increase required to produce the effect recorded in this survey would need to be much greater than this because the controls on major sources of anthropogenic mortality, Indigenous hunting and commercial net fishing, were not introduced until 1997.
- We consider that the most plausible explanation for the increase observed is movement of substantial numbers of dugongs into the survey area, probably from the northern GBR (the region north of Cooktown). In addition, northerly movement of dugongs from Moreton Bay cannot be ruled out because the survey of Moreton Bay was incomplete. While there is no direct evidence for such movements, there is increasing evidence that seagrass abundance fluctuates over spatial scales of hundreds of kilometres in response to extreme weather events. Satellite tracking of dugongs has also proven that dugongs commonly move over large distances. One animal has been tracked moving from the northern GBR to the Central Section of the GBR.
- The dugong numbers recorded in 1986–1987 and 1999 almost certainly reflect population numbers far below those at the time of European settlement along the east Queensland coast (Bertram 1981). Thus the most salient question to be determined by management agencies and stakeholders is the target level of recovery of dugong populations in this region. The management actions to achieve this target will need to be developed in the context of: (1) the aspirations and rights of the Indigenous communities in the region, and (2) the likelihood of a change in the frequency of extreme weather events as a result of climate change.

MANAGEMENT OPTIONS

- The data from this survey support the location of the Dugong Protection Areas as areas that provide increased protection to a significant proportion of the dugongs in the region. As in previous years, in the southern GBR over 50% of all dugongs were in Zone A DPAs (10% of the 1999 survey area in this region). In addition, a further 22% were in Zone B DPAs (9.3% of the survey area in the southern GBR). In Hervey Bay/Great Sandy Straits 72.5% of dugongs were in the Zone A DPA (18.3% of the survey area in this region). Over the entire region and based on mean population estimates, 58% of the estimated dugong population was in the Zone A DPAs and 16% in Zone B DPAs. The Whitsunday Area is the only region in the southern GBR where significant numbers of dugongs were sighted in 1999 (but not in 1986–1987, 1992 or 1994), and where there is no DPA. We suggest that consideration be given to increased dugong protection in this area.
- We suggest that the likely large-scale temporal variation in the distribution and abundance of seagrass meadows in the inshore waters of the GBR region should be taken into account in developing strategies for dugong conservation. The efficacy of the DPA Bs in reducing dugong mortality in commercial gill nets is uncertain. Hence, it would be prudent for the managing agencies to have the capacity to: (1) alter the zoning status of selected DPA Bs quickly in the event of widespread destruction of the seagrass in the two key DPA As - Hinchinbrook and Shoalwater-Port Clinton, and (2) change the boundaries of the Hervey Bay DPA in the event of localised loss of seagrass in the Hervey Bay region.

OPTIONS FOR FUTURE AERIAL SURVEYS

- The results of this survey and others suggest that the capacity for aerial surveys to detect trends in dugong numbers over large spatial scales is confounded by the dugong's tendency to undertake large-scale movements. We suggest that a workshop be held to review the arrangements for aerial surveys for dugongs including their objectives, methodology, spatial scale, timing and the need for maintaining a pool of trained observers who are available for the extended periods required to complete the surveys in appropriate weather conditions. The workshop should involve representatives from the scientists who conduct the surveys, independent experts and the agencies that commission such surveys (Australian Fisheries Management Authority, Conservation and Land Management Western Australia, Parks and Wildlife Commission Northern Territory, Great Barrier Reef Marine Park Authority and Queensland Parks and Wildlife Service). It would be ideal if the review could be timed to coincide with the planned visit to James Cook University in early 2002 of Professor Ken Pollock from the University of Northern Carolina, a mathematician with expertise in wildlife surveys.