Area Size

21,135km^2

Qualifying Species and Criteria

Dugong – *Dugong dugon*

Criterion A, B1, C1, C2

Australian humpback dolphin – *Sousa sahulensis*

Criterion A, B1

Australian snubfin dolphin – *Orcaella heinsohni*

Criterion A, B1

Marine Mammal Diversity

Megaptera novaeangliae, Tursiops aduncus, Tursiops truncates

Summary

Australian snubfin dolphins, Australian humpback dolphins and dugongs are listed as Vulnerable on the IUCN Red List. Surveys in the Southern Great Barrier Reef have identified four sub-areas where these species occur regularly. These sub-areas have similar environmental features and together form a single large IMMA network of similar sites named "Hinchinbrook Channel to Round Hill IMMA". The sub-areas support small resident populations of Australian snubfin and humpback dolphins. Each sub-area includes important reproductive areas for the dugong and important feeding areas for all three species.

Hinchinbrook to Round Hill IMMA

Description:

The Hinchinbrook Channel to Round Hill IMMA network is formed by four sub-areas: 1) Keppel Bay to Round Hill, 2) Shoalwater Bay to Port Clinton, 3) Edgecumbe Bay to Repulse Bay, and 4) Hinchinbrook to Bowling Green Bay. The four sub-areas are characterised by shallow bays (<20 m), turbid estuarine waters with extensive seagrass meadows and mangrove forests. Tides in this region are semi-diurnal and tidal amplitude is generally below 4 m. Much of the land around three of the four sub-areas has been extensively modified for agriculture, grazing, ports, and industrial activities.

The Shoalwater Bay to Port Clinton sub-area is much less modified as it is a Military Training Area. Extensive flooding is common in these regions during heavy rain and cyclones and terrestrial runoff causes problems with inshore water quality (Kroon et al. 2016). High levels of anthropogenic contaminants have been found in Australian snubfin dolphins and humpback dolphins (Cagnazzi et al. 2013a; Cagnazzi et al. 2020).

Using the Hagihara method (Hagihara et al. 2018), the relative abundance of dugongs for the entire IMMA is ~2800 +/- SE 600 in 2016 (Marsh et al. 2019), so the region represents ~1% of the estimated global

Figure 1 – Australian snubfin dolphins.

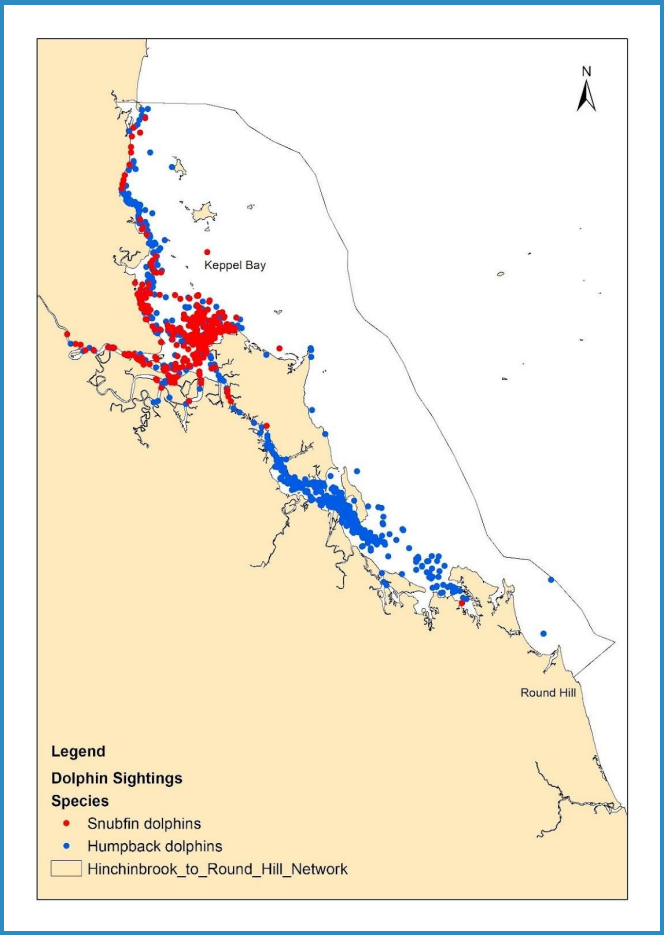

Figure 2 – Location of Australian snubfin and humpback dolphin groups sighted from a variety of surveys conducted between 1985 and 2016 between Keppel Bay and Round Hill along the east coast of Queensland, Australia.

dugong population. It is not appropriate to provide relative abundance estimates for the individual bays in the network because of the design of the survey and the movement of dugongs between bays. The dugong population in this IMMA has declined since 2005 (Marsh et al. 2019).

Criterion A: Species or Population Vulnerability

The Hinchinbrook Channel to Round Hill network includes areas containing habitat important for the survival and recovery of three species listed internationally as Vulnerable on the IUCN Red List: Australian snubfin dolphins (*Orcaella heinsohni*), Australian humpback dolphins (*Sousa sahulensis*) and dugongs *(Dugong dugon*). In Australia, all three species are considered Matters of National Environmental Significance as listed migratory species under the *Environment Protection and Biodiversity Act 1999* (EPBC Act); Near Threatened in the Action Plan for Australian Mammals 2012 (Woinarski et al. 2014); and Vulnerable in Queensland, under the *Nature Conservation Act 1992*. In the Great Barrier Reef Marine Park, all three species are considered priority species for conservation under the Reef 2050 Long-Term Sustainability Plan (Commonwealth of Australia 2018) and the importance of the Great Barrier Reef as dugong feeding habitat is a reason for the region's World Heritage Listing. Each of the sites within the Hinchinbrook Channel to Round Hill network includes Dugong Protection Areas A or B and additional extensive no-take zones (Dobbs et al. 2008). Dugongs are distributed widely along this coast. Three areas in the IMMA network, Hinchinbrook Island region, Cleveland Bay and Shoalwater Bay-Port Clinton, are consistently the most important dugong habitats in the IMMA, each supporting several hundred animals (Sobztick et al. 2017). Dugongs move between bays within this IMMA and between this IMMA and the Northern Great Barrier Reef IMMA and the Hervey Bay Great Sandy Straits IMMA (Sheppard et al. 2006; Gredzens et al. 2014). There is a significant genetic break in the Whitsunday Islands region (McGowan et al. in review). Satellite-tracked dugongs have not moved across this break, but the aerial survey data suggest that such movements occur (Sobtzick *et al.* 2017).

Criterion B: Distribution and Abundance Sub-Criterion B1: Small and Resident Populations

The Hinchinbrook Channel to Round Hill network includes habitat that supports resident populations of Australian humpback dolphins and Australian snubfin dolphins. Each resident population of snubfin and humpback dolphins consists of 50-150 individuals. Sightings of these dolphins between the residency areas are sparse, suggesting limited movement between the areas. Photo-identification studies within the areas indicate that each area is consistently occupied by individuals that are long-term residents

(Parra et al. 2006; Cagnazzi 2010; Cagnazzi 2013; Cagnazzi et al. 2013b; Cagnazzi 2017). All dolphin species have been observed feeding regularly within this IMMA. All sub-areas include river mouths, large expanses of estuarine habitat and seagrass meadows that promote the presence of fish and cephalopod prey that Australian snubfin and humpback dolphins feed on (Parra and Jedensjö 2014). Analysis of genetic population structure for Australian humpback dolphins along the east coast of Queensland (Repulse Bay, Keppel Bay, Gladstone) showed generally low levels of genetic diversity, strong genetic structure, and limited contemporary gene flow (m < 0.1) (Parra et al. 2018). Genetic analyses of snubfin dolphin biopsies collected in Cleveland Bay, Fitzroy River/Keppel Bay and Repulse Bay/Whitsundays (~ 300 km apart) showed significant levels of population structure (Cagnazzi 2010). Contemporary migration rates per generation (20 years) between sampling locations are extremely low (< 10%, m < 0.1). Overall, the available genetic data suggest that humpback and snubfin dolphins along the east coast of Queensland exist as metapopulations of small and relatively isolated populations with limited gene flow.

Criterion C: Key Life Cycle Activities

Sub-criterion C1: Reproductive Areas

The percentage of dugongs seen during the aerial surveys that have been classified as calves during the time series of aerial surveys (1974-2016) varied from zero in 2011 to 18% in 1999. Dugong fecundity is adversely impacted by food shortage and these fluctuations in percentage calves are due to the loss of seagrass caused by extreme weather events (Preen and Marsh 1995; Marsh et al. 2011; Fuentes etal. 2016). Dugongs have been observed calving in the inshore waters of this IMMA (Marsh et al. 1984).

Sub-criterion C2: Feeding Areas

The dugong is a seagrass community specialist (Marsh et al. 1982; Marsh et al. 2011; Marsh et al. 2018) and as a herbivore must spend much of its time feeding (Marsh et al. 2011). Dugong feeding plumes within the seagrass beds (*Halophila ovalis*) of the area are consistently seen in the area during aerial surveys and are a critical part of this species survival with the Hinchinbrook Channel to Round Hill area.

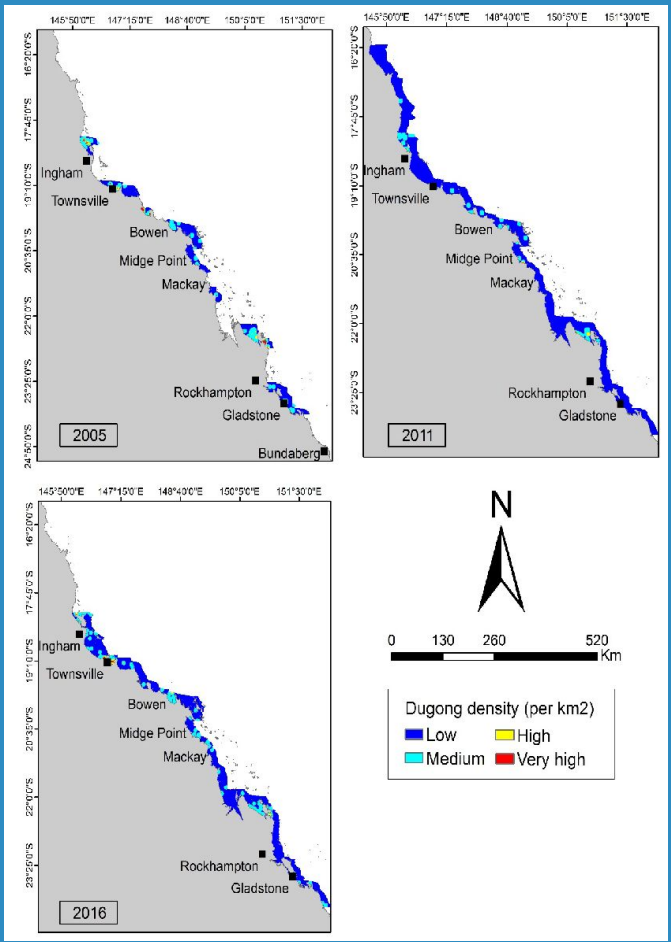

Figure 3 - Spatially-explicit models of dugong density in the IMMA region using data from aerial surveys conducted in 2005, 2011, and 2016. Dugong density estimation was based on the Hagihara method. Dugong densities were classified as Low (0 dugongs per km2); Medium (0-0.5 dugongs per km2); High (0.5-1 dugongs per km2), and Very high (>1 dugongs per km2). Low densities of dugongs were included in the model because of the difficulty of detecting dugongs in turbid water.

Supporting Information

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