

Area Size

648 km²

Qualifying Species and Criteria

Indo-Pacific bottlenose dolphin
Tursiops aduncus
Criterion C2

Indian Ocean humpback dolphin
Sousa plumbea
Criterion A; B1; C2

Marine Mammal Diversity

Megaptera novaeangliae
Stenella longirostris
Tursiops truncatus

Summary

Within and surrounding Menai Bay off the south-west coast of the Tanzanian island of Zanzibar in East Africa, the Menai Bay Conservation Area (MBCA) has been a designated protected area since August 1997. Two species of marine mammal, the Indian Ocean humpback (*Sousa plumbea*) and the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), are resident to the area with both species showing high levels of site fidelity. The MBCA provides sheltered, shallow habitat, which is important to both species for activities such as foraging, resting and nursing. It is particularly important for the humpback dolphin, a shallow water obligate species that relies on near-shore habitat for foraging. The 2015 abundance estimate produced for the Indian Ocean humpback dolphin in the MBCA was only 19 individuals, which is alarmingly small and represents a 63% reduction in abundance since 2002.

Menai Bay IMMA

Description

The Menai Bay Conservation Area (MBCA) is located off the south-west coast of Unguja Island, Zanzibar, Tanzania, East Africa. The MBCA covers an area of 470km² of mostly shallow (<50 m) habitat, characterised by fringing inshore reefs, seagrass beds, mangroves, soft sediment, and several offshore reefs. The MBCA has been a designated conservation area since August 1997 (Berggren et al., 2007) and was originally established to protect the coral reef habitats and rich biodiversity from illegal and destructive fishing practices such as dynamite fishing. In order to protect the coral habitat, the use of non-destructive gears was encouraged, and the use of drift and bottom set gillnets was increased through government subsidy. The mitigation of illegal fishing practices has been largely successful in the MBCA, although dynamite fishing is still ongoing in mainland Tanzania coastal waters (Braulik et al., 2017a).

The MBCA supports two sympatric dolphin species, the Indian Ocean humpback dolphin (IUCN Red List status Endangered (Braulik et al., 2017b) and the Indo-Pacific bottlenose dolphin, both of which have been studied since 1998 (Stensland et al., 2006; Berggren et al., 2007; Amir, 2010; Christiansen et al., 2010; Särnblad et al., 2011; Temple et al., 2016). Consistent monitoring between 1998 and 2002 identified high levels of site fidelity for both species during each field season and between years and therefore both populations were considered resident to the area (Stensland et al., 2006). The most recent abundance estimates were calculated from data



Indo-Pacific bottlenose dolphins, *Tursiops aduncus*, in the Menai Bay IMMA. Photo credit: Matt Sharpe



Indian Ocean humpback dolphins, *Sousa plumbea*, in the Menai Bay IMMA. Photo credit: Matt Sharpe

collected in 2015 and were 19 (95% CI 14-25) non-calf humpback dolphins and 114 (89-144) non-calf Indo-Pacific bottlenose dolphins (Sharpe, 2018; Sharpe and Berggren, 2019).

The bottlenose dolphin population shows a high degree of site fidelity to the MBCA where it utilizes a core area of 1.7km² within the bay (Stensland et al., 2006). Genetic analysis revealed that the population of Menai Bay is genetically distinct to a population located at the north of the island despite there being no physical barrier preventing movement between locations (Särnblad et al., 2011).

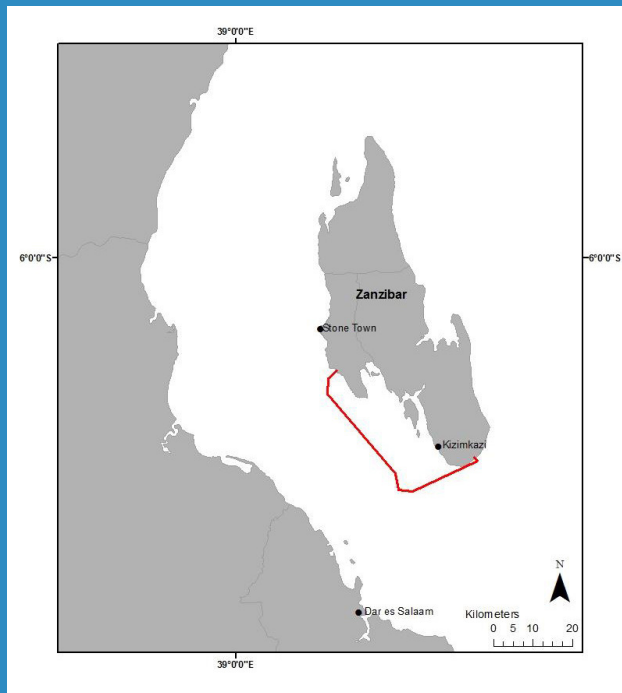
The new abundance estimate produced for the Indian Ocean humpback dolphin in the MBCA is very small and represents a 63% reduction in total abundance since 2002 (Sharpe and Berggren 2019). The MBCA fishery is now dominated by long-line, hand-line, drift gillnets, bottom-set gillnets and traps. However, the increased use of gillnets has caused increased mortality due to incidental catch (bycatch) of the two resident species of dolphin. There are a number of factors that may have driven the decline in abundance since 2002, these include high anthropogenic/fisheries mortality rates, low recruitment rates or a net emigration of individuals out of the area as a result of habitat degradation. Humpback dolphins of the MBCA are known to be taken in the bottom set gillnet fishery in the area (Amir, 2010). Bottom set gillnets are distributed in the tidal zone, close to shore and overlap considerably with the distribution of humpback dolphins (Amir, 2010). Two bycatch studies conducted in 2003/2004 and 2007/2008 estimated yearly take of humpback dolphins of around 6.4% and 4.8% of the population respectively (Amir, 2010). Since these assessments, no long-term mitigation efforts to reduce bycatch have been attempted and

these high levels of mortality have likely been consistent across years. Humpback dolphins of the MBCA show higher degrees of site fidelity to conspecifics occupying mainland Africa and are considered resident (Karczmarski et al., 1999; Stensland et al., 2006; Braulik et al., 2015; James et al., 2015). This difference in ranging patterns may be driven by the relative isolation of the island habitat of Zanzibar to the continuous habitat of the African continent (Braulik et al., 2015). Further, humpback dolphins also show fine scale habitat selection mainly driven by access to feeding grounds (Karczmarski et al., 2000; Keith et al., 2013), such as the preference for rocky reef habitats by humpback dolphins in Algoa Bay, South Africa (Karczmarski et al., 2000). The isolated and restricted island habitat of Zanzibar coupled with a possible reliance on patchy microhabitats for important activities such as foraging may leave the population particularly susceptible to habitat degradation (e.g. from anthropogenic activity and climate change). A Population Viability Analysis (PVA) baseline scenario predicted the chance of population extinction as 99.9% (SE 0.001) with the median time to extinction at 37 years. Further sensitivity analysis suggested that population recovery would only be possible with a total removal of bycatch mortality (Sharpe and Berggren, 2019). This assessment highlights the requirement of immediate management action to eliminate bycatch of humpback dolphins to prevent extirpation of the species in the MBCA.

In contrast the 2015 abundance estimate for the Indo-Pacific bottlenose dolphin in the MBCA shows no downward trend since 2002 despite high levels of apparent mortality and pressure from anthropogenic activity (Stensland and Berggren, 2007; Christiansen et al., 2010; Sharpe, 2018). Approximately 10% of the estimated bottlenose dolphin population was removed as fisheries bycatch in 2003/2004 and 2007/2008 in the drift gillnet fishery operating in the area (Amir, 2010). Further, dolphin watching tourism targeting the area is currently unregulated and unmanaged (Berggren et al., 2007). The effects of tourism activities on this population have been demonstrated to affect short term behaviour of nursing females (Stensland and Berggren, 2007) and the daily activity budget, increasing the amount of time traveling and reducing the amount of time foraging, resting and socialising (Christiansen et al., 2010). High mortality may be driving a source-sink dynamic in which the MBCA is an ecological sink (Sharpe, 2018). In this scenario abundance is kept high through immigration from outside the area, and

as a result abundance outside this area may be declining without being detected. This speculation, however, needs further investigation.

The boundary of the cIMMA has been delineated to match the boundary of the Menai Bay Conservation Area. Humpback whales are regular visitors to Menai Bay during the whale migration between June and November.



Map of Unguja Island, Zanzibar, Tanzania (6° 29' S, 39° 29' E). The Menai Bay Conservation Area (MBCA) is outlined in red.

Criterion A: Species or Population Vulnerability

The Indian Ocean humpback dolphin is currently designated under the IUCN Red List as Endangered due to its low reproductive capacity and overlap with human activities (Braulik et al., 2017b). A population specific decline in the MBCA has been observed (Sharpe and Berggren, 2019) which has likely been driven by fisheries bycatch and habitat degradation. Population viability analysis predicts a very high risk of local extinction within three generations unless anthropogenic causes of mortality are prevented. The population is particularly sensitive to the removal of mature females, with the removal of a single individual per year representing an unsustainable level of bycatch (Sharpe and Berggren, 2019).

Criterion B: Distribution and Abundance

Sub-criterion B1: Small and Resident Populations

Mark-recapture analyses based on data from 2002 estimated that there were 136 (95% CI 124–172) Indo-Pacific bottlenose dolphins and 63 (95% CI 57–95) Indian Ocean humpback dolphins (Stensland et al. 2006). A 2015 abundance estimate of Indo-Pacific bottlenose dolphins in Menai Bay was 114 (95% CI 89–144) individuals and for Indian Ocean humpback dolphins 19 (95% CI 14–25) individuals (Sharpe 2018; Sharpe and Berggren, 2019). Further investigation into the spatial patterns in sightings of both species identified a high degree of residency and a small core area that is regularly used within the MBCA (Stensland et al., 2006). A genetic study revealed the isolation of the MBCA Indo-Pacific bottlenose dolphin population to a putative population off the north coast of Zanzibar, suggesting both populations should be considered distinct communities (Särnblad et al., 2011).

Criterion C: Key Life Cycle Activities

Sub-Criterion C2: Feeding Areas

Menai Bay provides rich foraging grounds for humpback dolphins, which are reliant on nearshore reef habitats within the area for feeding activities. Indian Ocean humpback dolphins rely on patchy habitat for foraging (Karczmarski et al., 2000; Keith et al., 2013). Delineating this limited habitat within the populations range and protecting it from fisheries interaction and other anthropogenic impact is considered to be vital in avoiding local extinction of the animals using the MBCA.

Supporting Information

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**MARINE MAMMAL
PROTECTED AREAS
TASK FORCE**


  





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