

## Area Size

234,052 km<sup>2</sup>

## Qualifying Species and Criteria

Sperm whale – *Physeter macrocephalus*  
Criterion A; B2; C 1,3

Indo-Pacific bottlenose dolphin – *Tursiops aduncus*. Criterion B1

Common bottlenose dolphin – *Tursiops truncatus*. Criterion B1

Spinner dolphin – *Stenella longirostris*  
Criterion B1; C3

Humpback whale – *Megaptera novaeangliae*  
Criterion B2; C1,3

## Marine Mammal Diversity

Criterion D 2

*Balaenoptera bonaerensis*, *Balaenoptera physalus*,  
*Eubalaena australis*, *Feresa attenuata*, *Globicephala macrorhynchus*, *Grampus griseus*, *Indopacetus pacificus*, *Kogia sima*, *Lagenodelphis hosei*, *Megaptera novaeangliae*, *Mesoplodon densirostris*, *Orcinus orca*,  
*Peponocephala electra*, *Physeter macrocephalus*,  
*Pseudorca crassidens*, *Stenella attenuata*, *Stenella coeruleoalba*, *Stenella longirostris*, *Steno bredanensis*,  
*Tursiops aduncus*, *Tursiops truncatus*, *Ziphius cavirostris*

## Summary

The IMMA encompasses the waters surrounding the Mascarene Islands of Reunion and Mauritius, including underwater structures such as the seamount of La Perouse and Saint-Brandon bank, for which cetacean data are available from aerial surveys and satellite tracking of humpback whales. A total of 22 cetacean species are known to use the area. The insular shelf of Reunion and Mauritius sustain small resident populations of Indo-Pacific bottlenose dolphins and spinner dolphins. The western insular slope of Mauritius

# Mascarene Islands and Associated Oceanic Features IMMA

## Summary cont...

also represents one of the most important breeding and feeding habitat for sperm whales yet identified in the south western Indian Ocean, with spatial range extending to La Perouse seamount, Reunion and Rodrigues. The Mascarene Islands and associated oceanic features, including La Perouse Seamount and St Brandon shoal, represent suitable breeding habitats for humpback whales, which connect with other breeding sites and other IMMAs of the southwest Indian Ocean.

## Description

The IMMA is located in the Mascarene, within the EEZ of Reunion, a French overseas territory, and the Republic of Mauritius. It includes the coastal and offshore waters of Reunion, Mauritius and surrounding oceanic features: La Perouse seamount, located 90 NM north-west of Reunion, and Saint-Brandon (Carcados carajos) bank, located north of Mauritius. IMMA limits were drawn using a combination of the 2000m isobath and the undersea features (slope, seamount, escarpment, etc.). The IMMA includes coastal and oceanic habitats (insular slope, seamount and oceanic banks) valuable for multiple marine mammal species.



Figure 1 - A humpback whale mother and calf swim near the island of La Reunion. Photo credit: Globice.

Off-shore species such as melon-headed whales in Reunion and pilot whales in Mauritius are observed relatively close to shore (within 5NM from the coast). Year-round occurrence of poorly documented species such as *Kogia sima* off the northern coast of Reunion (Globice, unpublished data) and *Feresa attenuata* off the western coast Mauritius (Webster et al. 2020) are also reported.

The shallow waters (<100m) of Reunion and Mauritius sustain small resident *Tursiops aduncus* population of less than a hundred individuals. The west coast of Reunion and Mauritius also host resident spinner dolphins. Enclosed bays (in Mauritius) and extension of the shelf (in Reunion) are used as the main resting habitat in the morning (Condet and Dulau, 2016). Mark-recapture analysis also demonstrated that a population of common bottlenose dolphins (*Tursiops truncatus*) is also associated with the insular slope of Reunion year-round. The species is also regularly seen off Mauritius, often in association with spinner and/or Indo-Pacific bottlenose dolphins.

The IMMA includes aggregations of humpback whales (*Megaptera novaeangliae*). Tracking data from Reunion showed the inter-connected breeding habitats within the IMMA, which include the shelf of Reunion and oceanic features: La Perouse seamount and Saint-Brandon bank (Dulau et al., 2017).

The insular slope off the west coast of Mauritius sustains a large aggregation of sperm whales (*Physeter macrocephalus*), including both resident and transient individuals (Huijser et al., 2020). It represents a major foraging and breeding habitat for the species in the SWIO, with evidence of movement to Reunion and Rodrigues (Vely et al., 2015).

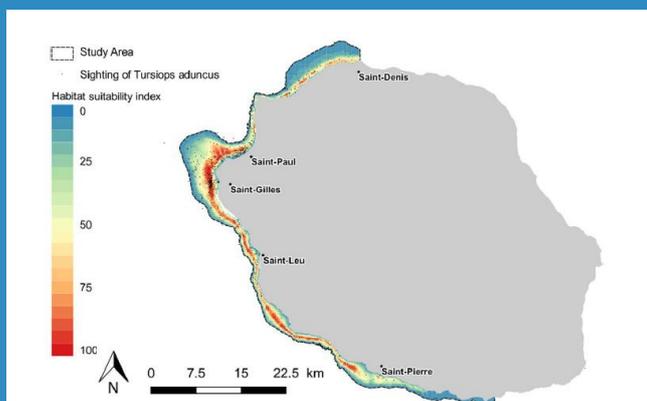


Figure 2 - Habitat suitability map of the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), showing a restricted and highly coastal habitat around Reunion Island. - (Figure 5 from Condet & Dulau 2016).

## Criterion A: Species or Population Vulnerability

The IMMA, and in particular the insular slope off the west and south-west coast of Mauritius, represents one of the main breeding and foraging habitat for sperm whales (Huijser et al., 2020; Webster et al., 2020), which is assessed as Vulnerable on the IUCN Red List of threatened species. This is supported by mark-recapture and tagging data, demonstrating high use of the area by females with calves, and acoustic monitoring, demonstrating feeding activity. The coastal waters of Reunion and Mauritius also support populations of the Indo-Pacific bottlenose dolphin, which is listed as Near Threatened on the IUCN Red List. Other threatened marine mammal species occur in the area: the Antarctic Minke whale (NT IUCN status) was sighted on several occasions off Reunion (Globice, unpublished data); and the fin whale (VU) and the false killer whale (NT) have been reported on rare occasions.

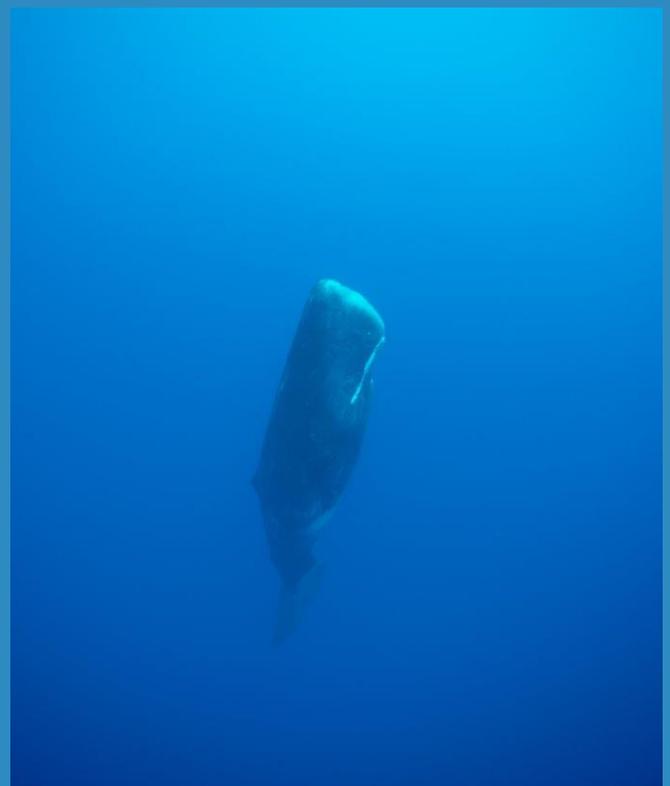


Figure 3 - A sperm whale floating in the blue off La Reunion. Photo credit: Globice

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

The inshore waters of Reunion and Mauritius sustain small resident populations of Indo-Pacific bottlenose dolphins. Mark-recapture analyses estimated the local population of 71 (95% CI = 60.2-

84.0) individuals in Reunion (Dulau et al., 2017a) and 58 individuals (95% CI 54.31–63.38) in Mauritius (Webster et al., 2014). Genetic analysis conducted using samples from Reunion, Mauritius, NW Madagascar and Mayotte demonstrated high and significant differentiation at both mitochondrial and nuclear levels, indicating restricted gene flow among islands (Dulau et al., in prep).

The shelf of Reunion and Mauritius also host populations of spinner dolphins composed of resident individuals that mix with visitors and transients. In Mauritius, the part of the population using the southwest corner of the island was estimated to be between 140–400 individuals (Webster et al. 2015). In Reunion, the population estimate is around 250 individuals, and habitat modelling showed that species use a restricted area of the shelf, off the west coast, as a main resting habitat (Condet and Dulau, 2016). Photographic recaptures between Mauritius and Reunion demonstrate inter-island movements and population connectivity (Globice, MMCS unpublished data).

A population of common bottlenose dolphins, composed of resident individuals that mix with occasional visitors and transients, is also associated to the insular slope of Reunion year-round. The population has been estimated at 254 individuals (95%CI = 191 – 337), based on mark-recapture methods over a 6 year period (2010–2015). A third of the individuals showing high residency around the island (Estrade and Dulau, 2020). While no estimates have been made yet, the common bottlenose dolphin is also regularly seen off Mauritius, often in association with the spinner and/or Indo-Pacific bottlenose dolphin. A total of 56 animals have been photo-identified, 36% of which have been seen more than once (Webster et al., 2019).



Figure 4 - Indo-pacific bottlenose dolphins, *Tursiops truncatus*, off La Reunion Island. Photo credit: Globice

## Criterion B: Distribution and Abundance

### Sub-criterion B2: Aggregations

Dedicated visual and acoustic surveys conducted in the Mascarenes demonstrated that the west and south-west coast of Mauritius supports an important concentration of sperm whales. Groups sighted off the coast of Mauritius were mostly females with calves, while few adult males were observed off Mauritius and Reunion (Huijser et al., 2020; Webster et al., 2019). A total of 101 distinct individuals have been photo-identified between 2008 and 2013 off the west coast of Mauritius. Between-year recaptures showed the presence of 19 resident individuals, forming three distinct social units, and showing site fidelity over 6 years (Huijser et al., 2020). The high numbers of photo-identified individuals sighted only once (>80 individuals) suggest that some whales have larger home range and extend movement within the Mascarene or beyond. Satellite tracking confirmed the intensive use of the west coast and also demonstrated individual movement from Mauritius to La Perouse seamount and Reunion, and Rodrigues (Vely et al., 2015).

The IMMA also supports important aggregations of humpback whales during the austral winter, from June to late September (breeding sub-stock C4) (IWC, 2006). The consistent occurrence of newborn calves and competitive groups, together with the recording of songs, confirm that Reunion is a breeding habitat for the species (Dulau et al., 2012; Ceyrac et al., 2018). The species also occurs off Mauritius and Rodrigues, although the distribution around these islands is less well documented.

## Criterion C: Key Life Cycle Activities

### Sub-criterion C1: Reproductive Areas

The IMMA includes oceanic breeding habitats (seamount and banks) for humpback whales, which were only recently discovered. Switching space-state models applied to satellite tracking data from whales tagged in Reunion highlighted areas where whales engaged in localized movements associated with breeding behavior (Dulau et al., 2017b). Satellite tracking showed high levels of connectivity between Reunion and Madagascar in the same breeding season, and demonstrated the use of oceanic features, in particular La Perouse Seamount and Saint-Brandon bank, as newly described breeding habitats for the species in the Mascarene (Figure 2; Dulau et al., 2017b).

Analysis of movement suggested that males and mother with calves visited different breeding sites within the SWIO (Cerchio et al. 2016; Dulau et al., 2017b). Within the Mascarene, a high connection was evident between Reunion and La Perouse seamount. The track of one male also indicated movement along oceanic banks north of Mauritius, with the use of Saint-Brandon shoals as breeding habitat (Dulau et al., 2017b). While the sample size of satellite tagged animals is relatively small compared to the size of the population (although comparative with other satellite telemetry studies for this species), breeding 'hotspots' indicated by only a few animals through satellite telemetry data may represent a significant breeding area as humpback whales have a strong tendency to aggregate for mating (Clapham et al. 2015). Presence of both large males (> 12m) and female groups with calves suggest that the north-west coast of Mauritius is a breeding area for the species, with 3 different social units identified (Huijser et al., 2020)

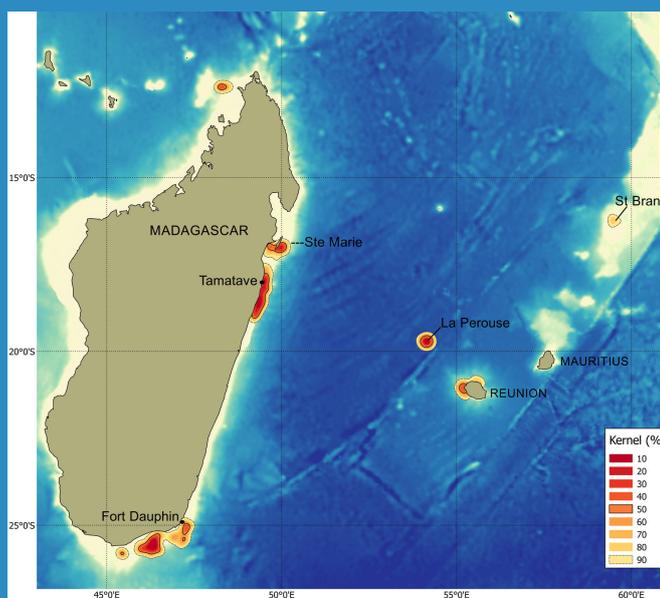


Figure 5 - Map showing the spatial distribution of the model-derived positions of 12 humpback whales tagged in Reunion in 2013, Kernel density contours indicate concentration of localised behavior and are thus indicating main breeding sites. (from Dulau et al. 2017b).

### Sub-criterion C3: Migration Routes

The area connects different humpback whale breeding sites within the Mascarene (Reunion, Mauritius, La Perouse Seamount and Saint-Brandon shoals). Males have been shown to rove between these different breeding sites, most probably to enhance reproductive success over the breeding season (Dulau et al., 2017b). More broadly, the area falls within the migratory stream of Breeding Stock C as animals commute annually between productive feeding areas in the Southern Ocean and warmer

wintering grounds off East Africa, the Comoros Archipelago, Madagascar, and the Mascarenes. The IMMA also includes part of the extended home range of female sperm whales that have been photo-identified off Mauritius. Movements of some tagged individuals show connection within the area, particularly between Mauritius, Reunion and La Perouse Seamount (Vely et al., 2015). Movements from Mauritius to Rodrigues have also been reported. Inter-island movements have been demonstrated between Reunion and Mauritius spinner dolphin populations based on mark-recapture (GLOBICE-MMCS unpublished data). Although the level of connectivity is poorly known, inter-island dispersal might be important for the long-term persistence of local populations (demographic rescue, geneflow).

## Criterion D: Special Attributes

### Sub-criterion D2: Diversity

Within the IMMA, dedicated cetacean surveys demonstrated a relatively high cetacean diversity, with 22 species sighted (Dulau et al., 2008; Globice unpublished data; Webster et al. 2020; Van Canneyt et al, 2010). Dedicated boat-based surveys reported a total of 21 species in territorial waters (12NM) of Reunion, including 17 odontocetes and 4 mysticetes (Dulau et al., 2008) and a total of 14 species, including 12 odontocetes and two mysticetes off Mauritius (Webster et al. 2020). REMMOA aerial surveys reported on cetacean diversity over the entire IMMA with higher densities observed off the west of Reunion, the south coast of Mauritius and around Saint-Brandon (Van Canneyt et al., 2010). Given the steep insular slopes around oceanic islands, off-shore species are observed relatively close to shore (within 5NM from the coast), such as melon-headed whales in Reunion and pilot whales in Mauritius. Year-round occurrence of poorly documented species such as *Kogia sima* off the northern coast of Reunion (Globice, unpublished data) and *Feresa attenuata* off the western coast Mauritius (Webster et al. 2020) are also reported.

### Supporting Information

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**MARINE MAMMAL  
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