

# **Area Size** 65.900km<sup>2</sup>

# Qualifying Species and Criteria

Humpback whale – *Megaptera novaeangliae*. Criterion A; B (ii); C (i, iii)

Blue whale – *Balaenoptera musculus.* Criterion A; B (ii); C (iii)

Sperm whale – *Physeter macrocephalus*. Criterion A; B (ii)

Melon-headed whale – *Peponocephala electra*. Criterion B (ii)

Short-finned pilot whale – *Globicephala macrorhynchus*. Criterion B (ii)

Spinner dolphin – *Stenella longirostris*. Criterion B (ii)

Indo-Pacific Bottlenose dolphin – *Tursiops aduncus*. Criterion B (i)

Indian Ocean humpback dolphin – *Sousa plumbea*. Criterion A; B (i)

Pantropical spotted dolphins – *Stenella attenuata*. Criterion B (ii)

False killer whale – *Pseudorca crassidens* Criterion B (ii)

Dugong - Dugong dugon. Criterion A; B (i)

#### **Marine Mammal Diversity**

Criterion D (ii) Physeter macrocephalus, Megaptera novaeangliae, Balaenoptera musculus, Tursiops aduncus, Tursiops truncatus, Stenella longirostris, Stenella attenuata, Sousa plumbea, Peponocephala electra, Globicephala macrorhynchus, Pseudorca crassidens, Grampus griseus, Feresa attenuata, Lagenodelphis hosei, Orcinus orca, Indopacetus pacificus, Ziphius cavirostris, Mesoplodon densirostris, Kogia breviceps, Kogia sima, Dugong dugon, Stenella coeruleoalba, Steno bredanensis

# Comoros Island Chain and Adjacent Reef Banks IMMA <sup>Summary</sup>

The area of the Comoros (Grande Comore, Mohéli, Anjouan), Mayotte and other reef banks under French jurisdiction (Zélée/Geyser complex and the Glorieuses) includes submarine canyons and a large number of seamounts located between the main islands. Small resident populations of coastal dolphins occur around Mayotte, particularly Indo-Pacific bottlenose dolphins (Tursiops aduncus) and endangered Indian Ocean humpback dolphins (Sousa plumbea). Throughout the archipelago, high densities of oceanic delphinids have been recorded, particularly spinner dolphins, pantropical spotted dolphins and melon-headed whales (Peponocephala electra). Other common species include dwarf sperm whales, Blainville's beaked whales, sperm whales, short-finned pilot whales, and false killer whales. The density of migrating humpback whales is particularly high off the south coast of Moheli, in the coastal waters of Grande Comore and on the Geyser/Zélée complex. Finally, dugongs still occur in small numbers in the lagoon of Mayotte, in the Moheli Marine Park (south coast), but this population has declined greatly over the past four decades.

#### Description

The Comoros archipelago is located in the northern Mozambique Channel, in the southwest tropical Indian Ocean. The Union of the Comoros consists of four main islands, and many surrounding small islets. The islands of Mohéli, Anjouan, and Grande Comore constitute volcanic islands. Anjouan and Grande



Figure 1- False Killer whale inside the Comoros Island Chain and adjcaent reef banks IMMA. Photo Credit: Jerermy Kiszka

proximity to the coastline. In contrast, Mohéli has a large reef complex in the south of the island, with shallow waters, including fringing reefs and pinnacles, as well as smaller islands extending to the 100m isobath (around 404 km<sup>2</sup>).

Mayotte (45010'E, 12050'S) is located in the northeastern Mozambique Channel, and is part of the Comoros archipelago. The island is surrounded by a 197 km long barrier reef, with a second double-barrier in the southwest and the immerged reef complex of Iris Bank in the northwest. The lagoon and surrounding reef complexes are  $1,500 \text{ km}^2$  with an average depth of 20 m and a maximum depth of 80 m found in the western, older, region of the lagoon. The insular slope on the exterior of the barrier reef is very steep and contains many submarine canyons and volcanoes. Iris Bank (440 59' E, 120 34' S) is adjacent to the northern extent of the 437 n.m.2 lagoon surrounding Mayotte. Iris Bank covers an area of approximately 65 n.m.2 with a mean depth of 30 m (max 80m).

Geyser Reef and Zélée Bank (460 25' E, 120 24' S), form an isolated complex 80 n.m. northeast of the island of Mayotte. This complex sits atop what is presumed to be a seamount of volcanic origin, and is composed of two distinct areas separated by a 4.5 n.m. wide channel that exceeds 600 m in depth. Geyser Reef is approximately 120 n.m.2 in area while Zélée Bank is smaller, covering approximately 70 n.m.2. Depths on this complex, range from one meter near the reef crest to 40 m in the interior regions. The edge of the complex is characterized by near vertical walls that rapidly drop to depths over 1,000 m within as little as 500 m of their shallowest points. The complex remains completely submerged at low tide, with the exception of a partially emergent western rim of the Geyser Reef.

Glorieuses is a 17 km long coral bank and covering 165 km<sup>2</sup> with two main coral islands, Grande Glorieuse (7 km<sup>2</sup>) and Lys island (600 m long). It is located east of the Comoros archipelagos about 250 km from Mayotte and 200 km from Madagascar. Mayotte and Glorieuses waters were declared as a marine protected area in 2010 and 2012 respectively.

# Criterion A – Species or Population Vulnerability

This region is a critical habitat for several threatened marine mammal species (particularly the sperm whale, the Indian Ocean humpback dolphin and the dugong), and a migratory corridor for blue whales (Kiszka et al. 2007a, 2007b, 2010a, 2010b, Pusineri et al. 2013). Information on the movements and distribution of sperm whales in this region remain scarce, but multiple sightings between Mayotte and Anjouan suggest the presence of an aggregation (Van Canneyt et al. 2010). Dugongs still occur in the Comoros, especially in the Mohéli Marine Park, but in small numbers (WWF EAME 2004; Muir & Kiszka 2012). They also occur in small numbers in the lagoon of Mayotte although this species has declined since the early 80's due to hunting and as bycatch in several fisheries. Probably less than 10 individuals are present throughout the lagoon (Kiszka et al. 2007b, Pusineri et al. 2013). Blue whales (Balaenoptera musculus) have been recorded on several occasions all year round, particularly off Mayotte (Kiszka et al. 2007a, J. Kiszka, unpublished data).

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

Small resident populations of coastal dolphins occur in the IMMA, particularly the Indo-Pacific bottlenose dolphin (Tursiops aduncus) and the Endangered Indian Ocean humpback dolphin (Sousa plumbea) around Mayotte (Kiszka et al., 2010b, 2012). Using photo-identification data, from 2004 to 2008, it was estimated that annual abundances of Indo-pacific bottlenose dolphins ranged from 47 ±18 to 98 ±50 individuals (estimated population home range is 978 km<sup>2</sup>, Pusineri et al. 2014).

Indian Ocean humpback dolphins only occur in the lagoon of Mayotte, and less than 5 individuals currently remain in the area (J. Kiszka unpublished data). Some evidence suggests that spinner dolphins occurring around some islands are resident, particularly around Mayotte (Viricel et al. 2016). However, more work is required to improve our knowledge on the residency and movements of this species. Finally the area supports a small, resident and isolated population of dugongs, dependent upon seagrass beds for foraging, particularly around Mayotte and in Mohéli (Muir and Kiszka 2012).

#### Sub-criterion Bii: Aggregations

Throughout the IMMA, high densities of oceanic delphinids have been recorded, particularly the spinner dolphin (Stenella longirostris), the pantropical spotted dolphin (Stenella attenuata) and

the melon-headed whale (Peponocephala electra) (Kiszka et al., 2010a, 2010b, Laran et al. 2017). Other common species include the sperm whale (Physeter macrocephalus), the short-finned pilot whale (Globicephala macrorhynchus) and the false killer whale (Pseudorca crassidens) (Kiszka et al. 2010a, 2010b). During aerial surveys conducted in 2009-2010 in the region, a relatively dense patch of sightings of sperm whales was recorded between the islands of Anjouan and Mayotte (off-effort sighting data, Van Canneyt et al. 2010).

# Criterion C: Key Life Cycle Activities Sub-criterion Ci: Reproductive Areas

This region is a migratory destination for humpback whales (Megaptera novaeangliae) between July and October (austral winter), where the majority of encountered groups are mother-calf pairs (Kiszka et al. 2010a, Ersts et al. 2011). The high proportion of mother-calf pairs suggests that the surrounding waters of Mayotte constitute a nursing ground for this species in the region (Ersts et al. 2011), like around the other Comorian islands (Kiszka et al. 2010a) and Glorieuses (Globice, 2005). Density of humpback whales is particularly high off the south coast of Moheli, in the coastal waters of Grande Comore and on the Geyser/Zélée complex (Kiszka et al. 2010a, Ersts et al. 2011). Reef banks off north and northeastern Mayotte (Iris, Zélée and Geyser banks) have been surveyed in 2002 and 2003, especially to evaluate the density and group composition of wintering humpback whales. The densities of humpback whales ranged from 0.027 to 0.618 whales/nm2 across three reef banks. Females with calves were the most frequently encountered group type. Encounter rates ranged from 0.98 to 2.36 groups per hour of search effort. Presumably all other species described as being present year-round also reproduce in the area.

#### Sub-criterion Ciii: Migration Routes

The region is a known breeding ground for humpback whales during the austral winter, but also a potential migratory corridor for other baleen whales and male sperm whales. Sightings of blue whales in August 2016 and April 2007 (Kiszka et al. 2007) suggest that pygmy blue whales (B. m. brevicauda) and possibly Antarctic blue whales (B. m. intermedia) migrate through the Comoros archipelago.



Figure 3 - Map showing the location of marine mammal sightings made by the REMMOA surveys around the Comoros Island China and adjacent reef banks IMMA

# Criterion D: Special Attributes Sub-criterion Dii: Diversity

The diversity of species present in the IMMA is sustained by a high variation of ocean, coastal, reef and lagoon habitats, with 22 species of cetaceans recorded and the dugong (Kiszka et al. 2010a, 2010b, Laran et al. 2017). These cetacean species include sperm whale (Physeter macrocephalus), humpback whale (Megaptera novaeangliae), blue whale (Balaenoptera musculus), indo-Pacific and common bottlenose dolphins (Tursiops aduncus, Tursiops truncates), spinner dolphin (Stenella longirostris), pantropical spotted dolphin (Stenella attenuata), Indian Ocean humpback dolphin (Sousa plumbea), melon-headed whale (Peponocephala electra). whale short-finned (Globicephala macrorhynchus), false killer whale (Pseudorca crassidens), Risso's dolphin (Grampus griseus), pygmy killer whale (Feresa attenuata), Fraser's dolphin (Lagenodelphis hosei), killer whale (Orcinus orca), Longman's beaked whale (Indopacetus pacificus), Cuvier's beaked whale (Ziphius cavirostris), Blainville's beaked whale (Mesoplodon densirostris), pygmy sperm whale (Kogia breviceps), dwarf sperm whale (Kogia sima), dugong (Dugong dugon), striped dolphin (Stenella coeruleoalba), and rough-toothed dolphin (Steno bredanensis).

#### Supporting Information

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#### Aknowledgements

The participants of the 2019 IMMA Regional Expert Workshop held in Salalah, Oman for the Identification of IMMAs in the Western Indian Ocean and Arabian Seas. Funding for the identification of this IMMA was provided to the Global Ocean Biodiversity Initiative by the International Climate Initiative (IKI). The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag. Support was also provided by Whale and Dolphin Conservation and the Tethys Research Institute.



Suggested Citation: IUCN-MMPATF (2020). Comoros Atoll IMMA Factsheet. IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force, 2020.

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