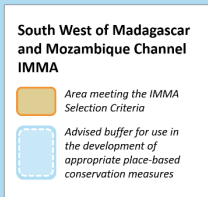


The information on this map was derived from the work of regionally assembled experts for the region. Care was taken in the creation of this map and it adheres to the Global Self-consistent Hierarchical High-resolution Geography (GSHHG) version 2.3.6 August 20, 2016, which is distributed under the Lesser GNU Public License by the National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NCEI). The authors cannot accept any responsibility for errors, omissions, or positional accuracy. Not to be used for purposes of navigation.



Area Size

139,494 km²

Qualifying Species and Criteria

Sperm whale – *Physeter macrocephalus*
Criterion A

Antarctic Blue whale – *Balaenoptera musculus intermedia*
Criteria A, C3

Pygmy Blue whale – *Balaenoptera musculus brevicauda*
Criteria A, C3

Antarctic minke whale – *Balaenoptera bonaerensis*
Criterion C3

Fin whale – *Balaenoptera physalus*
Criteria A, C3

Indian Ocean humpback dolphin – *Sousa plumbea*
Criterion A

Marine Mammal Diversity (D2)

Balaenoptera bonaerensis, *Balaenoptera musculus brevicauda*, *Balaenoptera musculus intermedia*, *Balaenoptera physalus*, *Globicephala macrorhynchus*, *Grampus griseus*, *Kogia breviceps*, *Kogia sima*, *Megaptera novaeangliae*, *Mesoplodon densirostris*, *Peponocephala electra*, *Physeter macrocephalus*, *Pseudorca crassidens*, *Sousa plumbea*, *Stenella attenuata*, *Stenella longirostris*, *Tursiops aduncus*, *Tursiops truncatus*, *Ziphius cavirostris*

South West Madagascar and Mozambique Channel IMMA

Summary

This large IMMA in the southern Mozambique Channel extends from the nearshore waters of the southwest coast of Madagascar to the Europa and Bassas da India atolls that rise from the deep mid-channel waters. The wide range of habitats within the IMMA support at least 21 cetacean species. A large-scale aerial survey in 2010 determined that bottlenose dolphins (*Tursiops sp.*) and melon-headed whales (*Peponocephala electra*) were two of the most abundant species in the IMMA. False killer whales (*Pseudorca crassidens*), short-finned pilot whales (*Globicephala macrorhynchus*), and Risso's dolphins (*Grampus griseus*) were also abundant in the area. Beaked whales, spinner and spotted dolphins (*Stenella sp.*), and pygmy and dwarf sperm whales (*Kogia sp.*) were observed in offshore deep-water habitats, while Endangered Indian Ocean humpback dolphins (*Sousa plumbea*) and Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) were more common in nearshore waters. The latter two species are impacted by coastal activities, including bycatch in artisanal fisheries. Passive acoustic monitoring indicates that the offshore pelagic waters in the Mozambique Channel represent a migratory route for Antarctic blue whales (*Balaenoptera musculus intermedia*), pygmy blue whales (*B. m. brevicauda*), fin whales (*Balaenoptera physalus*), Antarctic minke (*Balaenoptera bonaerensis*) and humpback whales (*Megaptera novaeangliae*).

Description

This IMMA is located in the southern part of the Mozambique Channel, along the southwest coast of Madagascar (21-24°S). It encompasses diverse marine habitats, including coastal, shelf, continental slope, and peri-insular slope around Europa and Bassa da India atoll. The Mozambique Channel is characterized by very dynamic mesoscale eddies generating enhanced productivity (TewKai and Marsac 2009). According to the REMMOA aerial survey (austral

summer 2009-2010), densities of beaked whales (Ziphiidae) in the southern Mozambique Channel were the highest of the entire SW Indian Ocean (Laran et al., 2017). A high diversity of marine mammals is known with more than 16 species observed in the area during aerial surveys (Van Canneyt et al., 2010), and at least an additional 2 species detected only acoustically (Cerchio et al., in press). Therefore this area appears to be a hotspot of cetacean richness (Laran, et al., 2017). In addition, high densities of sharks, rays and sea turtles were encountered in this area of the Mozambique Channel (Laran et al., 2017).

Criterion A: Species or Population Vulnerability

Antarctic blue whales (*Balaenoptera musculus intermedia*) classified as Critically Endangered, and pygmy blue whales (*B. m. brevicauda*) classified as Endangered are both known to occur in the area during the austral summer (Anderson et al., 2012, Cerchio et al. 2018; Cerchio et al., in press). The Vulnerable sperm whale (*Physeter macrocephalus*) is located in deep-water habitats, whilst the Endangered Indian Ocean humpback dolphin (*Sousa*

plumbea) is encountered in coastal areas. To mitigate further decline of this species, conservation measures were recommended against direct hunting reported in the area (Cerchio et al., 2015).

Criterion C: Key Life Cycle Activities Sub-criterion C3: Migration Routes

Antarctic blue whales (*Balaenoptera musculus intermedia*) occur in the tropical and subtropical Indian Ocean, and were estimated to number 2,300 individuals (1,150 – 4,500) in the Southern Hemisphere IWC (2007). Based upon the presence of Antarctic blue whale song off the northwest coast of Madagascar during the austral winter (Cerchio et al., 2018), it is certain that the species migrate through this area. In the SWIO, a population of pygmy blue whales (*Balaenoptera musculus brevicauda*) is defined by the “Madagascar” song-type, heard from the Madagascar Ridge to the central Indian Ocean (McDonald et al. 2006; Samaran et al., 2013). There is a likely summer feeding region on the Madagascar Ridge, for which abundance was estimated at 424-474 (Best et al., 2003). Based upon the bimodal presence of SWIO pygmy blue whale song off the northwest coast of Madagascar during

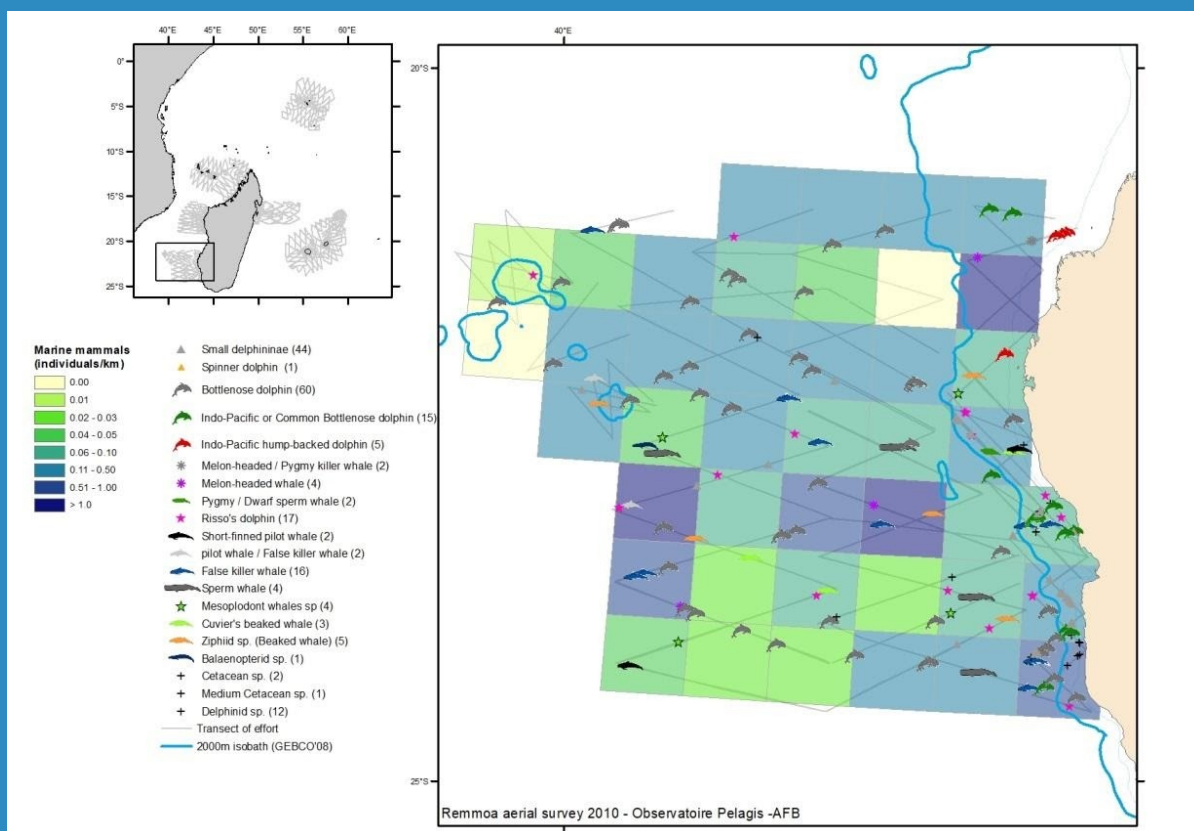


Figure 1: Sightings of cetaceans collected on effort during Remmoa aerial survey in the South of Mozambique Channel (between end of January and beginning of February 2010) detailed by species or taxon and individual encounter rate (for cell with up to 50km of effort - Unpublish map Pelagis-AFB; Van Canneyt et al., 2010)

the austral spring and autumn (Cerchio et al., 2018), it is certain that the species migrates through this area. Recent passive acoustic monitoring from the southwest coast of Madagascar (Toliara) has confirmed the presence of Antarctic blue whale song during at least the austral autumn, and SWIO pygmy blue whale song during at least the austral summer and autumn seasons (Cerchio et al., in press). Given the potential for blue whale song to propagate long distances (in excess of 100km) it is likely that these animals were moving through the offshore extent of the IMMA. In addition to the two blue whale subspecies, fin whales (*Balaenoptera physalus*), and Antarctic minke whales (*B. bonaerensis*) were also detected during the austral spring/summer ((Cerchio et al., in press) likely on migration through this area, as they have also been acoustically detected off northwest Madagascar during the austral winter (Cerchio et al. 2018).

Criterion D: Special Attributes

Sub-criterion D2: Diversity

At least 21 species have been documented in this area during the REMMOA aerial surveys (Van Canneyt et al, 2010), small boat surveys, and acoustic monitoring (Cerchio et al. 2018; Cerchio et al., in press). The most abundant species were large Delphininae, mostly common and some Indo-Pacific bottlenose dolphins (*Tursiops* spp.) with a relative density of 17×10^{-2} individuals.km² (CV = 28%) in the area and small Globicephalidae (mostly melon headed whale, *Peponocephala electra*) with 6.3×10^{-2} individuals.km² (CV: 72%). The taxonomic richness for this area predicted from occupancy analysis of marine mammals (see Laran et al., 2017) is among the maximum values obtained for the region. Large Globicephalinae, mostly false killer whale (*Pseudorca crassidens*) and some short-finned pilot whale (*Globicephala macrorhynchus*) had a relative density of 3×10^{-2} individuals.km² (CV: 41%) and Risso's dolphin with 3×10^{-2} individuals.km² (CV:41%). For deep divers, the highest densities in this area were obtained for beaked whales (Cuvier's beaked whale, *Ziphius cavirostris* and Blainville's beaked whale, *Mesoplodon densirostris*) with 0.6×10^{-2} individuals.km² (CV: 56%), while sperm whale and *Kogia* spp. were estimated each with one order of magnitude less (without correcting for the

availability bias due to dive duration of this species). Small Delphininae (*Stenella* spp.) were also significant in the area with relative density of 2.6×10^{-2} individuals.km² (CV = 41%, Laran et al, 2017). In the coastal waters the Indian Ocean humpback dolphin (*Sousa plumbea*) is encountered with direct hunting reported in the area (Cerchio et al, 2015). Other species, such as striped dolphin (*Stenella coeruleoalba*), pygmy killer whale (*Feresa attenuata*) and killer whale (*Orcinus orca*), were encountered occasionally.

Supporting Information

Anderson, C., Branch, T.A., Alagiyawadu, A., Baldwin, R. and Marsac F. 2012. Seasonal distribution, movements and taxonomic status of blue whales (*Balaenoptera musculus*) in the northern Indian Ocean. *Journal of Cetacean Resources and Management*, 12 (2): 203-218.

Best, P.B., Rademeyer, R.A., Burton, C., Ljungblad, D., Sekiguchi, K., Shimada, H., Thiele, D., Reeb, D., Butterworth, D.S. 2003. The abundance of blue whales on the Madagascar Plateau, December 1996. *Journal of Cetacean Research and Management*, 5: 253-260.

Cerchio, S., Andrianarivelo, N., Andrianantenaina, B. 2015. Ecology and conservation status of Indian Ocean humpback dolphins (*Sousa plumbea*) in Madagascar. *Advance in Marine Biology*, 72: 163-199.

Cerchio, S., Trudelle, L., Zerbini, A.N., Charrassin, J.B., Geyer, Y., Mayer, F-X., Andrianarivelo, N., Jung, J-L., Adam, O., Rosenbaum, H.C. 2016. Satellite telemetry of humpback whales off Madagascar reveals long range movements of individuals in the Southwest Indian Ocean during the breeding season. *Marine Ecology Progress Series*, 562: 193-209.

Cerchio, S., Rasoloarijao, T., Cholewiak, D. 2018. Acoustic monitoring of Blue Whales (*Balaenoptera musculus*) and other baleen whales in the Mozambique Channel off the Northwest Coast of Madagascar. Paper SC/67B/SH/14 presented to IWC Scientific Committee.

Cerchio, S., Laran, S., Andrianarivelo, N., Saloma, A., Andriananteniana, B., Van Canneyt, O., and Rasoloarjao, T. In press. Cetacean Species Diversity in Malagasy Waters. In: Goodman, S. M. (ed). The New Natural History of Madagascar. Princeton: Princeton University Press.

Fossette, S., Heide-Jørgensen, M-P., Jensen, M.V., Kiszka, J., Bérubé, M., Bertrand, N., Vely, M. 2014. Humpback whale (*Megaptera novaeangliae*) post breeding dispersal and southward migration in the western Indian Ocean. *Journal of Experimental Marine Biology and Ecology*, 450: 6-14.

IWC. 2007. Annual Report of the Report of the International Whaling Commission.

Kiszka, J., 2015. 'Marine Mammals: A review of status, distribution and interaction with fisheries in the Southwest Indian Ocean'. In: R.P. Van der Elst and B.I. Everett (eds.) Offshore fisheries of the Southwest Indian Ocean: their status and the impact on vulnerable species, pp. 305-322. Oceanographic Research Institute, Special Publication, 10.

Laran, S., Authier, M., Van Canneyt, O., Doremus, G., Watremez P. and Ridoux, V. 2017. A Comprehensive Survey of Pelagic Megafauna: Their Distribution, Densities, and Taxonomic Richness in the Tropical Southwest Indian Ocean. *Frontiers in Marine Science*, 4(139).

Mannocci, L., Laran, S., Monestiez, P., Dorémus, G., Van Canneyt, O., Watremez, P., Ridoux, V. 2013. Predicting top predator habitats in the South West Indian Ocean. *Ecography* 36: 1-18.

McDonald, M.A., Hildebrand, J.A., Mesnick, S.L. 2006. Biogeographic characterization of blue whale song worldwide: using song to identify populations. *Journal of Cetacean Research and Management*, 8: 55-65.

Samaran, F., Stafford, K. M., Branch, R. A., Gedamke, J., Royer, J.-Y., Dziak, R. P., and Guinet, D. 2013. Seasonal and geographic variation of southern blue whale subspecies in the Indian Ocean, *PLoS One* 8(8), e71561.

Trudelle, L, Cerchio, S, Zerbini, AN, Geyer, Y, Mayer, F-X, Jung, J-L, Hervé, MR, Pous, S, Sallée, J-B, Rosenbaum, HC, Adam, O, Charrassin, J-B. 2016. Influence of environmental parameters on movements and habitat utilization of humpback whales (*Megaptera novaeangliae*) in the Madagascar breeding ground. *R Soc Open Sci.*;3:160616. doi: 10.1098/rsos.160616.




Van Canneyt, O., Dorémus, G., Laran, S., Ridoux, V., Watremez, P., 2010. REMMOA Sud Ouest Océan Indien: Rapport intermédiaire pour l'Agence des Aires Marines Protégées, 70 pp.

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