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 whales (*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 summer.
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 x 10^{-2} individuals.km^{-2} (CV = 28%) in the area and small Globicephalidae (mostly melon headed whale, *Peponocephala electra*) with 6.3 x 10^{-2} individuals.km^{-2} (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 x 10^{-2} individuals.km^{-2} (CV: 43%) and Risso’s dolphin with 3 x 10^{-2} individuals.km^{-2} (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 x 10^{-2} individuals.km^{-2} (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 x 10^{-2} individuals.km^{-2} (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**


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