



**MARINE MAMMAL
PROTECTED AREAS
TASK FORCE**



**Working to Implement Conservation Actions in
the Bazaruto Archipelago to Inhambane Bay
Important Marine Mammal Area (IMMA), Mozambique
16th – 24th November 2019**

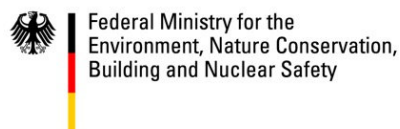




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Cover photo: Dugong (*Dugong dugon*) mother and calf, by Sam Lawrence and Ocean Collective Media. This page, Dugong by Mandy Etpison.

1. Executive summary

A team of four international experts, including the IUCN Marine Mammal Protected Areas Task Force, visited Mozambique in November 2019 to meet with stakeholders and to support the implementation of conservation and management considerations for a newly identified Important Marine Mammal Area (IMMA) for dugongs which includes habitat for the Indian Ocean humpback dolphin. The **Bazaruto Archipelago to Inhambane Bay IMMA** was proposed during the Western Indian Ocean and Arabian Seas IMMA expert workshop held in Salalah, Sultanate of Oman, 4-8 March 2019 and subsequently went through the peer review process.

The Oman Workshop was the third of five workshops organised to identify IMMAs in Pacific and Indian Ocean regions of the Southern Hemisphere, sponsored by GOBI-IKI. The project includes an implementation component, following the first three of the regional workshops. For the Western Indian Ocean – Arabian Seas Region, the Bazaruto Archipelago to Inhambane Bay IMMA was considered to be a good choice because this area represents the last stronghold of the dugong along the East African coast, and it is supported by decades of research. Still, the area is intensely fished with illegal gill nets known to cause unsustainable mortalities in the dugong population and is also proposed for extensive development, notably the proposed SASOL 2 and 3D Seismic Exploration and Exploration Well Drilling in Blocks 16 and 19 of southern Mozambique coastal waters.

This report describes the efforts conducted in Mozambique to evaluate the current situation and to propose recommendations around the new Bazaruto Archipelago to Inhambane Bay IMMA in light of a previously proposed management plan (Appendix 4). The work included a consideration of threats to dugong in the IMMA, engagement with stakeholders and suggestions for the management of the IMMA.

This report includes a narrative of the visit, with details of the people providing input and discussion during the visit, followed by a set of management recommendations that could be a starting point to inform the shaping of future marine mammal conservation policies in Mozambique waters. The report has been prepared by Task Force chairs Erich Hoyt and Giuseppe Notarbartolo di Sciara, dugong experts Vic Cockcroft and Donna Kwan, and Mozambican dugong authorities Prof. Almeida Guissamulo and Alima Gomes.

Dugongs in the coastal zone of East Africa have undergone precipitous decline during the past few decades (see Background). As the Bazaruto Archipelago to Inhambane Bay IMMA holds Africa's last viable population of these threatened sirenians, the recommendations focus on measures needed to ensure the survival of the Bazaruto dugongs which have acquired national Mozambican, regional African and global importance. Considering the demonstrated vulnerability and size of this dugong population, and in view of its outstanding universal value to African biodiversity, policymakers should be made aware that any negative impact from human activities, most notably: a) fishery bycatch, b) oil & gas exploration and exploitation, and c) unregulated tourism, is likely to have severe consequences.

2. Background

2.1. The IUCN SSC/WCPA Marine Mammal Protected Areas Task Force and Important Marine Mammal Areas (IMMAs)

The IUCN SSC/WCPA Marine Mammal Protected Areas Task Force is a working group of international marine mammal experts who have developed a classification scheme for identifying Important Marine Mammal Areas (IMMAs) in various parts of the world¹. IMMAs are discrete portions of habitat, important for one or more marine mammal species, which have the potential to be delineated and managed for conservation. Therefore, in their quality of evidence-based scientific product, IMMAs are purely biocentric. They are *not* marine protected areas (MPAs) and have no legal basis. They may, however, indicate potential sites where MPAs could be considered, and they will help support a marine spatial planning (MSP) process with a robust contribution from science.

IMMAs are an advisory, expert-based classification applied to the world's oceans, coastal waters and shorelines, and relevant inland water bodies. Areas awarded IMMA status are globally significant and may thus merit area-based protection and/or monitoring for marine mammals. The recently awarded Bazaruto Archipelago to Inhambane Bay IMMA is unique in the Western Indian Ocean because it hosts the only remaining viable dugong population along the entire East African coast.

A global IMMA network for the conservation of the world's aquatic mammals and other marine biodiversity, identified through internationally agreed criteria, functions as a repository of sites important for the maintenance of marine biodiversity. IMMAs also provide a basis for future monitoring of these highly visible species against climate change. As such, the IMMA Programme, managed by the Marine Mammal Protected Areas Task Force, offers support to the building of institutional capacity at the international and national levels to make substantial contributions to global marine conservation.

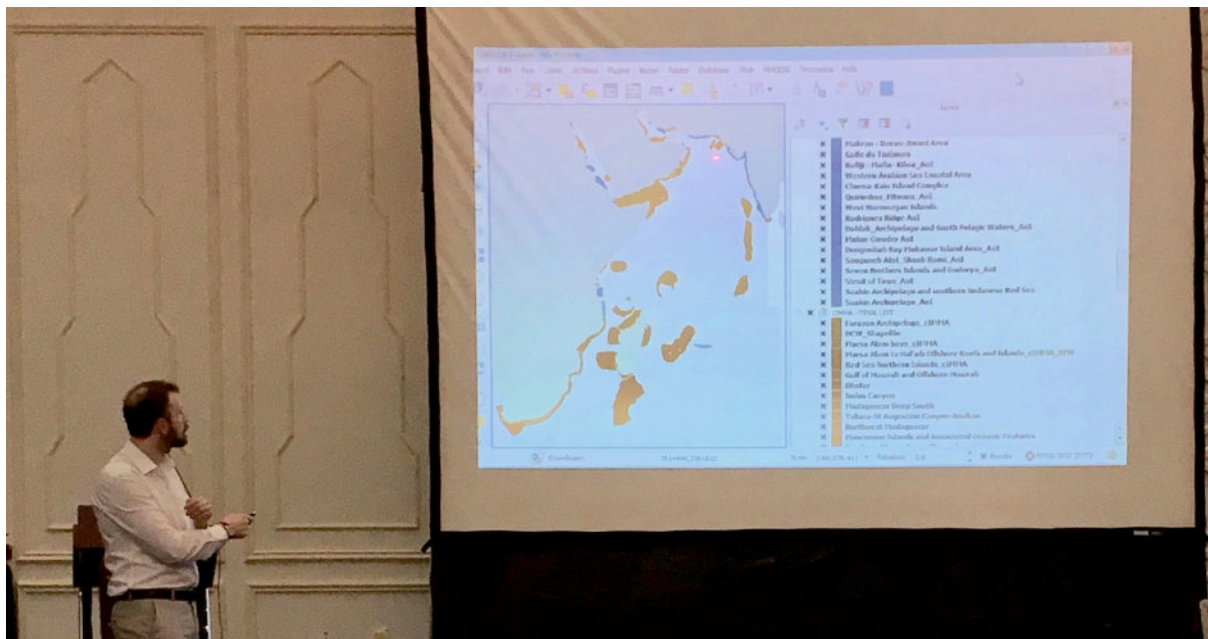


Figure 1. The candidate IMMAs and the Areas of Interest identified during the Oman workshop.

¹ <https://www.marinemammalhabitat.org>

IMMAs harness marine mammal properties as flagship and umbrella species, and as effective indicators of pelagic biodiversity and the health of ecosystems. More specifically, IMMAs support the Convention on Biological Diversity (CBD)'s portfolio of ecologically or biologically significant areas (EBSA) descriptions as a basis for promoting environmental protection and developing management plans for specific areas of the world ocean. IMMAs can also contribute to the delineation of Key Biodiversity Areas (KBAs) based on the IUCN Standard, and can support the designation of management provisions such as particularly sensitive sea areas (PSSAs) by the International Maritime Organisation (IMO).

In 2017 the Conference of Parties to the Convention on Migratory Species (CMS), by adopting Resolution 12.13, acknowledged the IMMA criteria and process, requested Parties and invited Range States to identify specific areas where the identification of IMMAs could be beneficial, and invited the CBD, the IMO and IUCN to consider IMMAs as useful contributions for the determination of EBSAs, PSSAs and KBAs. Following a protocol-based selection criterion that takes into account factors such as species diversity, distribution, population sizes, life cycle activities and certain other special attributes, IMMAs are selected with the intention to assist decision makers and managers in expert-led prioritization of conservation efforts (IUCN Marine Mammal Protected Areas Task Force 2018).

2.2. Implementing Conservation Actions in the Bazaruto Archipelago to Inhambane Bay Important Marine Mammal Area

Recently the Task Force focused on the Western Indian Ocean and Arabian Seas region for identifying potential IMMAs (Figure 1), by organising an expert workshop which took place in Salalah, Oman, in March 2019. The final report of the WIOAS Workshop is available on the Task Force website². The Western Indian Ocean and Arabian Seas IMMA Workshop was the third of five workshops organised to identify IMMAs in the Southern Hemisphere. These five workshops, being held between 2017 and 2021, are part of the framework of the GOBI/IKI Project funded by the Government of Germany. The project includes an implementation component, following each of the first three regional workshops — Pacific Islands (2017), North East Indian Ocean and South East Asian Seas (2018), and Western Indian Ocean and Arabian Seas (2019). At each workshop, stakeholders are engaged to discuss the implementation of pilot management activities based on one or more IMMAs and, in some cases, AoI identified in these regions.

Drs. Victor Cockcroft, Ken Findlay and Almeida Guissamulo identified the Bazaruto Archipelago and Inhambane Bay as a candidate IMMA for dugongs at the IMMA workshop, based on the results of ongoing marine mammal research studies (Fig. 2). The candidate IMMA was subsequently accepted as an IMMA by the independent Review Panel. The IMMA resubmission document is added here as Appendix 1.

Given that the Bazaruto Archipelago waters are a diversity hotspot for marine mammals, including ten species of cetaceans in addition to dugongs, and considering the importance of the Bazaruto Archipelago National Park for the conservation of dugongs along the East African coast, an IMMA status provides the impetus to support a long-term conservation programme for the area, along with contributing to giving the region the recognition it deserves internationally. The process can create a niche for a more aware and knowledge-based development agenda in the future.

This report describes the efforts conducted in Mozambique, leading to a set of management recommendations developed during the team's visit to the area. The work includes an analysis of threats to marine mammals in the selected pilot area (Activity VI.4 of the GOBI-IKI Project), engagement with stakeholders at local, national and international levels to discuss conservation tools and management plans (Activity VI.5), and the selection of conservation tools and support to the development of management plans for the selected area (Activity VI.6).

This report includes a narrative of the visit, with details of the places visited and the people providing input and discussion during the visit, followed by a set of management recommendations that could be a starting point to inform the shaping of future marine mammal conservation policies in Mozambique.

² <https://www.marinemammalhabitat.org/download/final-report-of-the-regional-workshop-for-the-western-indian-ocean-and-arabian-seas-important-marine-mammals-areas/>

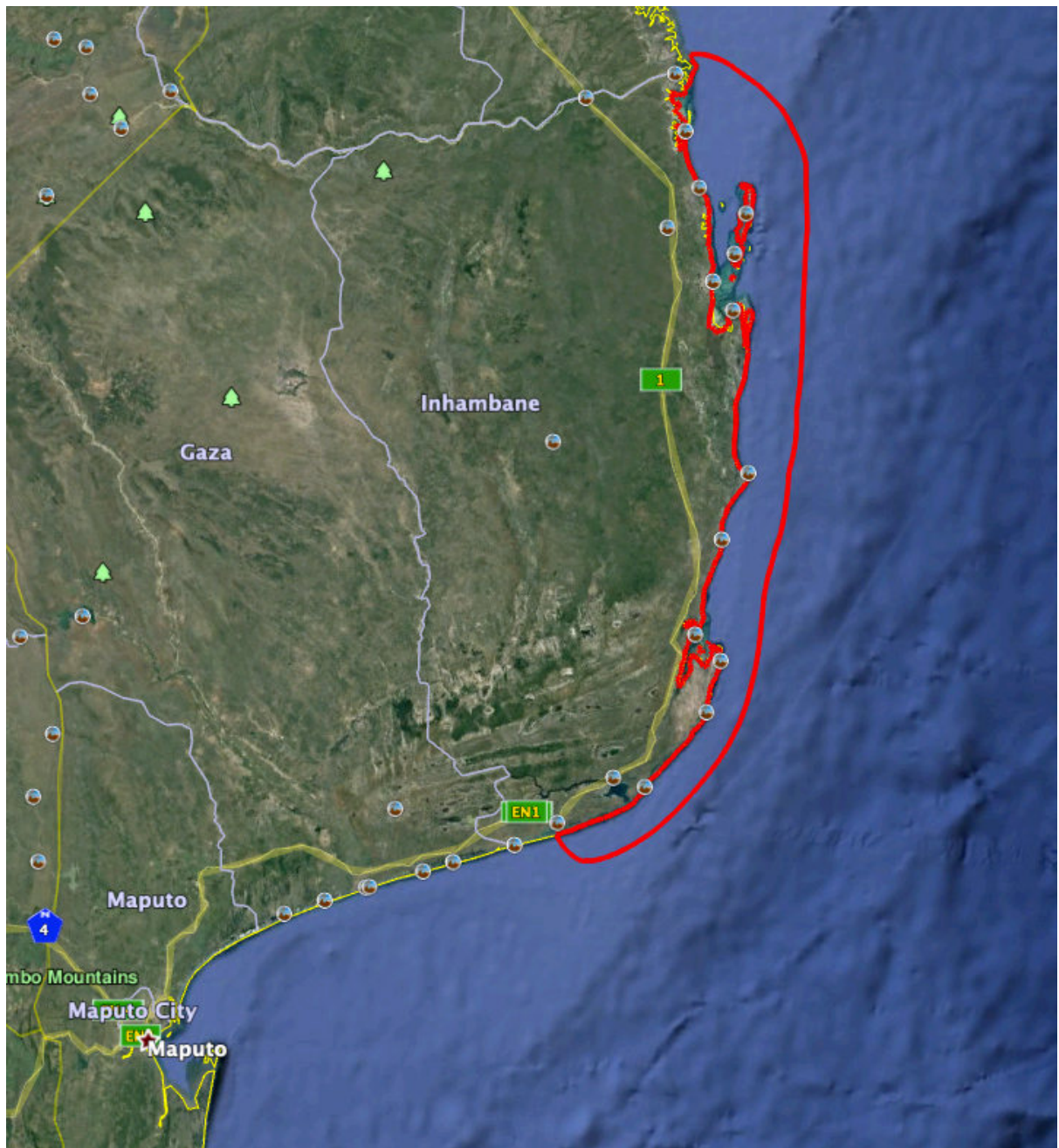


Figure 2. The Bazaruto Archipelago to Inhambane Bay Important Marine Mammal Area.



Figure 3. The Bazaruto Archipelago National Park

2.3. The coastal waters of Mozambique and the Bazaruto Archipelago

The coast of Mozambique extends from approximately 10°20' S to 26°50' S, over a distance of 2750 km. Three geographical regions can be identified within coastal Mozambique (Tinley 1971; Rodrigues *et al.* 1999; Motta 2001) including a coral coast of 850 km extending from the Rio Rovuma southwards to Pebane, at approximately 17°20'S; a swamp coast of 1050 km from Pebane southwards to Rio Save, just north of the Bazaruto Archipelago at 21°00' S; and a dune coast extending from Bazaruto southwards for 850 km to Ponto do Ouro.

The Bazaruto Archipelago is a series of four islands (Bazaruto, Benguerra, Margaruque, Bangué) lying in a general north - south linear orientation, on the central coastline of Mozambique. A fifth Island, Santa Carolina, lies to the west of the others, having formed separately. Bazaruto Bay lies between the Archipelago and the mainland and is a shallow (generally less than 30 m deep) protected bay of some 1000 km², and is largely protected from the open ocean by the four islands. Two distinct basins can be found in this bay, one to the north of Santa Carolina Island (maximum depth 33 m) and the other in the middle

section of the bay, west of the southern end of Bazaruto and northern end of Benguerra Islands (maximum depth 24 m). The northern basin is the main connection of the bay to the open sea and is the deepest area of the bay. The southern section of the bay is comprised of vast areas of tidal flat areas often drying-out during spring low tides.

The main feature of circulation within the bay is the strong tidal currents during the flood and ebb phases. The mean spring tidal range is approximately 3 m during normal spring tides, increasing to approximately 4.4 m during equinoctial spring tides. Strong tidal flows maintain the deep channels on the landward side of the islands and transport sand across the tidal flats.

The physical and chemical characteristics of water masses of Bazaruto Bay exhibit spatial and temporal variability by season as rainfall is highly variable both within and between years. December to February are the wettest months (140 mm to 170 mm), while the months from July to October are the driest (typically < 40 mm). In the dry season, the Bay has a marine character, with a uniform salinity ranging from 35 to 36 PSU. In the wet season the bay becomes more estuarine, exhibiting a lower overall average salinity (33 to 35 PSU) compared to the dry season. However a stable West-East increasing salinity gradient can be found throughout the rainy season.

The Bazaruto Archipelago area is a high-risk region for tropical cyclones.

As a shallow tropical bay, Bazaruto Bay contains extensive seagrass meadows or beds of at least nine species, which provide a feeding and nursery area for marine fauna. Likewise, the Bay also has an extensive, some 77 000 ha, of mangrove forest, as well as rocky outcrops and extensive mud flats. This wide variety of habitats and the fresh, nutrient-rich water run-off into the Bay, provide for a diversity of fauna and flora, including some 280 species of fishes and at least eight species of marine mammal.

2.4. Main marine mammal species found in the Bazaruto Archipelago to Inhambane Bay Important Marine Mammal Area and surroundings

Of the marine mammals, three species are of major concern in terms of the proposed seismic exploration and drilling. Each is dealt with separately and should be considered in relation to Figure 4, which outlines the areas proposed for exploration.

A) Dugong – *Dugong dugon*.

Dugongs of the Western Indian Ocean. Over the last five decades there has been a dramatic decline in the number of dugongs across the entire Western Indian Ocean (Cockcroft *et al.* 2018). Travis (1967) observed herds of up to 500 individual dugongs in Somalia, whilst Marsh *et al.* (2002) reported that prior to 1961, 'large' isolated populations of dugongs were sighted at both Mombasa Marine Park and Natural Reserve and Malindi Marine National Park in Kenya, and that in 1967 a herd of approximately 500 individuals was reported off Kenya's south coast (Husar 1975). Muir *et al.* (2003) reported herds of 80 animals were reported at Manda Bay, Kenya, in 1996. However, Jarman (1966) suggested lower numbers had been recorded by this time. Muir *et al.* (2003) noted that dugongs were once common along Tanzania's 900 km coastline, while Dollman (1933) described the Zanzibar Archipelago of Tanzania as the dugong's East African stronghold. However, by 1968, Ray (1968) had identified Rufiji and Kilwa as the last remaining refuges for dugongs along the Tanzania coast. The Pemba-Zanzibar channel had also been recognized as an important dugong habitat in Tanzanian waters (Bryceson 1981; Howell 1988; Korrubel & Cockcroft 1997; UNEP 2001).

Hughes (1967) noted that dugongs were relatively common on the Mozambique coast, from Maputo Bay, Chidenguele, Inhambane Bay, Bazaruto Bay, Angoche, Mozambique Island and Pemba Bay. Hughes (1967) also noted a hiatus in the distribution between Bazaruto and Angoche corresponding to low visibility waters corresponding to the "swamp coast" region of Mozambique (Tinley 1971; Rodrigues *et al.* 1999; Motta 2001). Further, anecdotal reports suggest that dugongs were once plentiful, with herd sizes of eight to ten individuals reported for Inhaca Island in the 1970s (Guissamulo & Cockcroft 1997).

Marked declines in dugong abundance were recorded across the region by a number of authors from 1990 onwards. Surveys of the entire Kenya coastline showed a sharp decline with 10 and 6 dugongs counted in 1994 and 1996 respectively (Cockcroft 1995; Komora 1996; Wamukoya *et al.* 1997; Marsh *et al.* 2002; Cockcroft *et al.* 1994). Similar declines were noted for Tanzania and the Mascarene Islands (Cockcroft & Young 1998; Muir *et al.* 2003; Kiszka *et al.* 2007).

From the 1960s, dugong populations in Mozambique, Maputo Bay, were already declining (Smithers & Lobão Telo 1976). Guissamulo & Cockcroft (1997) sighted dugongs in the eastern quarter of Maputo Bay, although there were too few sightings to estimate their abundance or density and by 1998 Maputo Bay was believed to support only two or three individuals (Cockcroft & Young 1998). Based on boat and aerial surveys conducted from 1991, Cockcroft *et al.* (1994) suggested the waters of the Bazaruto Archipelago supported the last viable dugong population along the East African coast. The most comprehensive series of surveys of dugongs in the WIO were those carried out by Findlay *et al.* (2011) in the Bazaruto Archipelago region.

The result of the past three decades of research in the WIO led to a comprehensive research project on the numbers and distribution of dugongs along the East African coast (Cockcroft *et al.* 2018). Dugong 'hotspots' in Kenya, Tanzania and Mozambique were identified through historical knowledge, fisher questionnaires and satellite telemetry. At 'hotspots' further questionnaire and focal group surveys were undertaken, as well as aerial surveys, including unpublished aerial surveys between 2007 and 2018.

Dugongs in the Bazaruto Region. The overall results for the above research indicate that dugongs are all but extirpated from the East African region, other than in the Bazaruto Archipelago. This dugong population, estimated at between 250 and 350 individuals, represents the last known viable dugong population within the Western Indian Ocean. Population viability modelling suggests this population is viable, given zero mortality through anthropogenic causes, particularly incidental catch and oil & gas exploration (Cockcroft *et al.* 2010). A management plan and conservation strategy for dugongs in the Bazaruto Archipelago has been formulated and submitted to the relevant authority (Cockcroft *et al.* 2018). In addition, Cockcroft *et al.* (2018) have proposed that Mozambique's dugongs be regarded as an IUCN special management unit and classed as highly endangered. Overall, the application of Population Viability Analysis (PVA) reinforces the perception that the dugongs inhabiting East Africa and Bazaruto Bay are in a precarious position. Modelling strongly suggests that they are particularly susceptible to long term stressors that might reduce overall reproductive success. Further, the models clearly show that regular deaths from anthropogenic sources are the major cause of their decline. Any attempt at conservation and management of these animals needs to address this issue. In this context, it is imperative that some form of incidental catch reduction be pursued. It is beyond the scope of this report to explore this further, other than to suggest suitable conservation strategies.

B) Indian Ocean humpback dolphin – *Sousa plumbea*. Indian Ocean humpback dolphins range widely along the northwest Indian Ocean and East African coast and occur throughout Mozambique. They typically inhabit shallow, coastal waters and bays less than 25 m in depth, mostly within 500 m of the shoreline on open coast, but throughout Bazaruto Bay (Guissamulo & Cockcroft 1997, 2004).

Few studies of humpback dolphin numbers have been undertaken and all have been in varying habitats. However, studies so far indicate that these dolphins occur at a density of approximately 0.45 dolphins/km², or 0.23 dolphins/linear km of coastline suggest that the Maputo Bay population was between 100 and 140 dolphins. Their distribution appears to be discontinuous along the South African coast, north of Durban, with females showing strong philopatry. The only wide-scale Indian Ocean genetic study of this species suggests that South African and Southern Mozambican are one stock, with a strong population structure. The extent of this stock and whether there is any exchange with central or northern Mozambique is unknown. Fewer than 500 to 800 humpback dolphins are estimated to inhabit South African waters.

No estimates of the number of humpback dolphins in Bazaruto Bay are available. However, Bazaruto and Maputo Bays are much the same size, consequently, it is probable they have similar numbers of humpback dolphins – 100 – 140. Although this estimate is not rigorous, it provides a 'ball park' figure from which future management and planning can be accomplished.

C) Humpback whale – *Megaptera novaeangliae*. The coastal waters (between the 20m-200m isobaths) of Mozambique are utilised as a mating, calving and nursery ground between July and November each year by the C1 South sub-stock of humpback whales (*Megaptera novaeangliae*) (as recognised by the IWC). Historical catches from Linga-linga, Mozambique, were unimodal in seasonal abundance with peak catches in July or August, suggesting the region as a breeding ground terminus of the migration. The abundance of whales on this ground was estimated (Maputo to Quelimane) at 1954 (CV 0.38) in 1991 in 2003. The 1991 survey found humpback whales distributed over the entire survey region, although densities were highest between 33°E and 35°30'E (Maputo to Ponta Zavora) over a region of shallow banks (where the southerly Mozambique Current flowed further offshore) and a high density of cow and calf pairs were recorded on the Sofala Banks during this survey. Higher than expected sighting frequencies were recorded on the 2003 survey in the regions between Cabo Inhaca and Xai-Xai, between Ponta Zavora and Bazaruto and in the region of the Pantaloon Shoals to the north east of Quelimane, while lower than expected sighting frequencies over the Sofala Banks (although these densities may be influenced by survey conditions). Cow-calf groups were distributed throughout the survey area. Competitive groups were recorded across the survey extent in 2003 (Maputo to 15 degrees S), while song was recorded across the ground (Maputo to Quelimane) in 1991, suggesting breeding behaviour across the surveyed areas. Comparison of distance-based densities suggest considerable increase in the population between the 1991 and 2003 surveys. There have not been any recent surveys, or population estimates in the local area. However, a whale photographic survey in 2007/08 in the Deep-Water Prospect showed large concentrations (sometimes more than 100 whales), between July and October. Surveys from further south in Inhambane province in 2018 show an average of 30 individuals seen per hour at peak season (July-Sept). With 20% of the individuals seen being young calves, the coastal waters of Inhambane province form a nursery in which the mothers are feeding the calves extensively during their critical early days of life.

2.5. Main threats to marine mammal conservation in the Bazaruto Archipelago to Inhambane Bay Important Marine Mammal Area.

Dugongs are vulnerable to two broad classes of impacts, (1) those that cause an increase in mortality (e.g. entanglement in fishing nets, direct catch, boat strikes, large scale habitat loss) and (2) those that decrease the reproductive rate (e.g. reduced availability of feeding grounds as a result of small scale habitat loss, reduced availability of mating individuals or increased disturbance by boat traffic). Those impacts can result from human activities (direct catch and bycatch, habitat loss as a result of human activities, oil & gas, tourism and vessel traffic) or environmental stochasticity (extreme events - e.g. tropical cyclones, heavy floods; habitat loss as a result of catastrophic environmental events).

Historically, the largest threat to dugongs has been direct catch and bycatch of dugongs in fishing nets (Heinsohn *et al.* 1976; Hines *et al.* 2005). Due to extensive human exploitation for food and other products, the dugong is rare or in danger of extinction over most of its range (Heinsohn *et al.* 1977)

It has been reported that extreme events such as the catastrophic combination of cyclones followed by heavy floods can cause extensive damage to seagrass beds, which in turn can induce animals in affected areas to increase movements in search for food (Heinsohn & Spain 1974). It has been documented that the reduction of available seagrass feeding grounds have an effect in both female and male reproduction, reducing the calving rate for several months after the cyclone. The prolonged search for food may also result in an increase in mortality by starvation, and has also been associated with an increase in bycatch – as dugongs may move to areas not previously inhabited.

Seagrass beds may also be destroyed directly by human activities such as beach seines and trawling or lost through the effects of disturbances such as dredging, inland and coastal clearing, land reclamation and boat propeller scarring. These activities cause increases in sedimentation and turbidity that, in turn, lead to degradation through smothering and lack of light. Other threats include sewage, detergents, heavy metals, hypersaline water from desalination plants and other waste products.

Other anthropogenic and natural stressors to the population include vessel activity (including strikes and noise disturbance), chemical pollutants and disease, which may be related to anthropogenic influences on water quality) (Cockcroft *et al.* 2009).

There is no documented evidence of marine seismic surveys being detrimental to populations of dugongs (Marsh *et al.* 2003), however the likelihood of marine seismic surveys, as well as, hydrocarbon explorations causing negative impacts in dugongs and other marine megafauna is extremely high (Figure 4). Marine

seismic surveys involve the use of high energy noise sources operated in the water column to probe below the seafloor (McCauley *et al.* 2000), and are among the most prevalent and powerful anthropogenic noise sources in marine habitats. Effects might include: (1) interference with the animal's natural acoustic communication signals, (2) damage to their hearing systems, and (3) behavioural changes including disturbance reactions, ranging from brief alterations in behaviour to short- or long-term effects on individuals or populations (Richardson & Malme 1993; Marsh *et al.* 2003).

The occurrence of Indian Ocean humpback dolphins along the narrow coastal belt makes them particularly susceptible to anthropogenic activities, both terrestrial and marine. In this context, 10 months of oil & gas exploration work in the shallow water area of Bazaruto is of major concern to this endangered dolphin. Of note, humpback dolphins appear more greatly disturbed by increased anthropogenic presence than bottlenose dolphins, showing more extensive avoidance behaviours (pers. comm. from Katie Reeve-Arnold based on data collected within Inhambane province and currently under analysis for publication). Dolphins use calls and whistles to transmit information across long distances, connect groups and maintain social interactions (Janik 2013), making the soundscape of the coastal water they inhabit very important to their lifecycle.

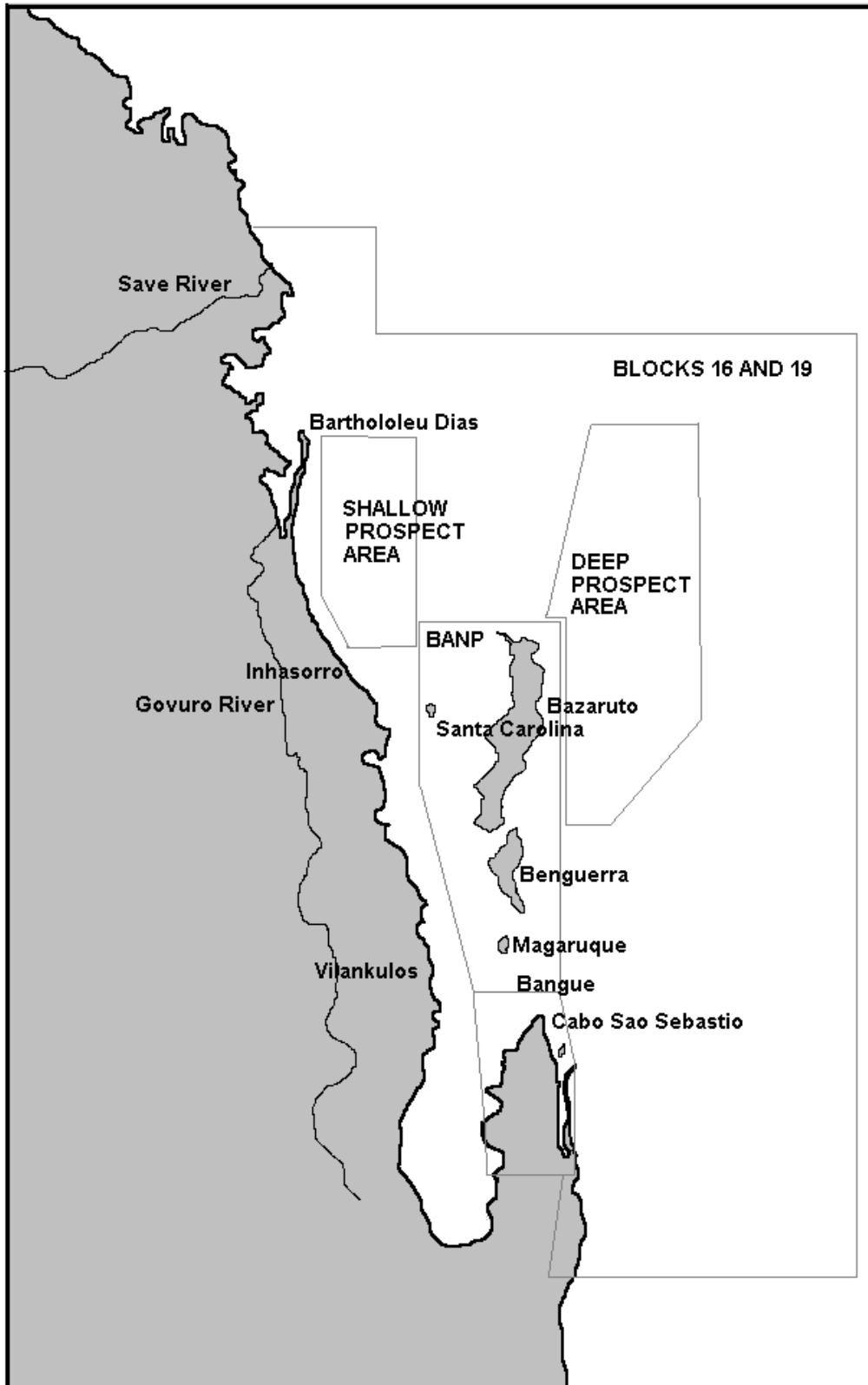


Figure 4. The Bazaruto Bay area with indication of concession blocks for future seismic exploration.

3. Team involved in the visit

IUCN Marine Mammal Protected Areas Task Force

Mr. Erich Hoyt - Co-chair; Research fellow, Whale and Dolphin Conservation

Dr. Giuseppe Notarbartolo di Sciara - Co-chair; Founder and Honorary President, Tethys Research Institute

U.N. Convention on Migratory Species Memorandum of Understanding on Dugongs

Dr. Donna Kwan – Executive Secretary

Dugongos.org

Dr. Victor Cockcroft – Nelson Mandela University, Port Elizabeth, South Africa, and Dugongos.org

Dr. Almeida Guissamulo, University of Eduardo Mondlane, Maputo, Mozambique, and Dugongos.org

Ms. Alina Gomes, PhD candidate, Nelson Mandela University, Port Elizabeth, South Africa, and Dugongos.org

This report is the result of a collective effort of all the persons listed above.



Figure 5. LEFT: Erich Hoyt, Giuseppe Notarbartolo di Sciara, Donna Kwan and Victor Cockcroft (left to right). RIGHT: Almeida Guissamulo, Giuseppe Notarbartolo di Sciara, Alima Gomes, Donna Kwan, Victor Cockcroft, Erich Hoyt.

4. Narrative of the visit and meetings

16th November 2019, Saturday

Arrival in Johannesburg, South Africa of IMMA international group, overnight at airport hotel

17th November 2019, Sunday

Flight to Vilanculos, Mozambique, travel by car to Inhassoro, lodging at Dugong Lodge

Background discussions regarding dugongs, management plans prepared by Cockcroft and others, the Dugong MoU of the Convention on Migratory Species (CMS)

- Learned about the history of dugong and cetacean studies over the previous three decades dating from early work by Cockcroft and students; Mozambique is signatory to the CMS MoU on Dugongs.
- Mozambique is a party to CMS and thus the IMMA resolution adopted by CMS which directs countries to use the IMMA tool is relevant.
- Management plan for dugong and the area was prepared in 2009 by local scientists Cockcroft and Findlay, with Prof. Almeida Guissamulo and outside experts including Drs. Marsh and Reynolds (chairs of the IUCN Sirenian Specialist Group), and Dr. Corkeron; hypothesis was that the region is last stronghold for dugong.
- Funding for work on dugong and cetaceans in Mozambique and other areas of East Africa came through a GEF grant and WIOMSA project.
- Management plan was revised in 2016 with, among other things, updated information that had verified the hypothesis through further research that confirmed that this was the last stronghold for dugong along the East coast of Africa (see Appendix 4).

18th November 2019, Monday

Location: Dugong Lodge, Inhassoro, visit to Inhassoro for sim cards & supplies, informational meeting with stakeholders

Observing beach seine being pulled up on the shore, minimal catch to be shared by about 12-15 mostly young men. Juvenile turtle was thrown back, possibly for our benefit.

Visit to Padre Pio and Caterina at the Inhassoro Catholic Church, insights into the community.

Informational meeting for discussion of the declaration of the Bazaruto to Inhambane area as an Important Marine Mammal Area (IMMA) through the International Union for the Conservation of Nature (IUCN).

- 14 local people from Inhassoro south resorts and tourism businesses, mostly Zimbabwe or South African expats attended a 5 PM meeting at Dugong Lodge.
- Cockcroft introduced the purpose of our visit and Hoyt and Notarbartolo di Sciara presented the IMMA idea and explained about what the new IUCN IMMA means. Kwan offered information about the CMS Dugong MoU and background information about dugong.
- Clarification was given that an IMMA is not a protected area but an expert identification peer-reviewed and potentially valuable as a further conservation evaluation of dugong; the Bazaruto National Park is at the core of the IMMA but 70% of the dugong are outside the park.
- An IMMA represents another brick in the wall to make a solid case for protection of dugong and a larger area of the southern Mozambique coast.
- The IMMA could be used partly to plead the strong case that this is the last viable population off eastern Africa.
- The SASOL proposal was discussed and the problems of investing and advancing tourism vs. the oil & gas and the implications for bringing substantial numbers of jobs to Mozambique. SASOL has concession in the whole area of the IMMA. Some of the main areas where they would be operating are in the heart of dugong habitat. It should be noted that SASOL was once supportive

of this population of dugongs, supporting substantial research, and they could be supportive again.

- We talked about the need to get buy-in from the director generals for the various departments, in order to sell the idea of greater protection.
- Dugong are being poached at an unknown level (one case of 10 being taken some years ago), bycaught in gill nets, and if SASOL goes ahead there would be disturbance from seismic surveys over a limited but intense period, with the future potential of oil spills and habitat disturbance. Developing an argument may be partly a matter of trying to match the numbers available from tourism and ecosystem benefits vs. fishing and oil & gas.
- IMMA recognition if followed through along with the Dugong MoU and CMS membership implications could give credibility and positive feedback for Mozambique.
- Tourism operators led by Dreamcatcher owner and others were greatly concerned about the SASOL proposals. They wanted to know more about the dugong and asked many questions of Cockcroft and Kwan. They were positive about the idea and one suggested they should erect a sign on the road “Welcome to Dugong Country”. Using the IMMA and the threatened dugong and Indian Ocean humpback dolphin, as well as the humpback whales, could increase business as it presents the unique situation here. One operator noted that they were opening a tourism office here and can promote this idea.
- One operator asked how could they help. Cockcroft suggested to use the fact that this is East Africa’s last dugong population to market to their clients. A great experience to visit the only dugongs off East Africa. He also pointed out that there is a free cellphone app called SEAFARI for reporting sightings and strandings. Operators can talk to their customers, spread the word about the situation here. Several operators downloaded the app right away.

19th November 2019, Tuesday

Location: Dugong Lodge, Inhassoro

More background discussions regarding dugong, management plans prepared by Cockcroft and others, and the Dugong MoU of the Convention on Migratory Species (CMS)

Driving visit to see the tourism lodges and properties developing south and north along the coast from Dugong Lodge.

- Johnson’s has created upmarket bar and properties including lodges on the north side of Inhassoro, catering for tourists, apparently successful and popular.
- The tourism lodges now extend further north and south along the shore than 2 years ago when Kwan and Cockcroft were last here.
- The context of Mozambique as one of the poorest countries in the world is ever visible, but artisanal fishing up and down the coast from beach seines and growing tourism industry employing many local people are important sources of income.

20th November 2019, Wednesday

Location: Dugong Lodge, Inhassoro

Attendees: IMMA International Group

Planned to go to sea to examine the dugong area up close but poor sea conditions prevented it.

- The team began work on the report and consideration of the recommendations in light of discussions in previous days.

21st November 2019, Thursday

Travel to Vilanculos by car; meeting with stakeholders based around Vilanculos at Vilanculos Beach Lodge
8.30- 12 PM, Flight to Maputo

Informational meeting for discussion of the declaration of the Bazaruto to Inhambane area as an Important Marine Mammal Area (IMMA) through the International Union for the Conservation of Nature (IUCN).

Attendees: IMMA International Group, local tourism operators, NGOs, researchers, independent consultants, tourism department, African Parks, Marine Megafauna Foundation,

- Individuals in the group introduced themselves, one by one, about 11 of them.
- Cockcroft introduced the speakers and the purpose of the meeting. Kwan gave an introduction to the CMS dugong MoU. Hoyt and Notarbartolo di Sciara presented the IMMA process and the Bazaruto to Inhambane IMMA, with Cockcroft adding necessary information on the dugong situation.
- One participant, a consultant, indicated that Mozambique has undergone a strategic shift to large scale resource extraction in recent years, and that Mozambique is being transformed into an extractive economy.
- The group asked about branding with the IUCN IMMA, that this would be valuable to have this independent verification of the importance of the area, especially in light of development proposals such as SASOL.
- Various scenarios were considered but the strong view was presented from various viewpoints that oil & gas development was not in the interest of the country and certainly not for the persistence of biodiversity and the protection of ecosystem services.
- The group asked for protocols regarding dugong and cetacean strandings in light of the possible deaths that could come from oil & gas development.
- The true value of biodiversity and ecosystem services from a healthy environment should be considered.
- Technologies for monitoring dugong and cetaceans were discussed including acoustics, satellites, drones in order to create baseline data and to measure changes in distribution or numbers if the oil & gas developments go ahead.
- Overall, the group was very engaged in wildlife protection efforts to try to keep tourism and the natural world viable in Mozambique.

22nd November 2019, Friday

Meeting at ANAC – Administração Nacional das Áreas de Conservação

Informational meeting for discussion of the declaration of the Bazaruto to Inhambane area as an Important Marine Mammal Area (IMMA) through the International Union for the Conservation of Nature (IUCN).

The meeting was chaired by Dr Mohamed A.S. Harun, Chief Advisor to the Director General of ANAC; Araman Armindo, Coordinator for Biodiversity; Raimundo Vasco Matusse, Conservation Specialist; Resia Cumbe, Human & Wildlife Conflict and Community Development; and a Communications specialist, along with our group of six: Hoyt, Notarbartolo di Sciara, Cockcroft and Kwan, joined by Prof. Almeida Guissamulo (University of Eduardo Mondlane, Maputo) and Ms. Alina Gomes (PhD student).

- Cockcroft introduced the speakers and the purpose of the meeting. Hoyt and Notarbartolo di Sciara presented the IMMA process and the Bazaruto Archipelago to Inhambane Bay IMMA, with Cockcroft adding necessary information on the dugong situation. Later, Kwan and Gomes gave valuable life history background on dugongs, explaining why their population has remained at roughly the same level. Kwan gave an introduction to the CMS dugong MoU.
- Cockcroft noted that they now had a permit for genetic exportation which is vital for analysing the Mozambique dugongs to determine if they could be declared as a distinctive population and thus be moved from Vulnerable (globally) to Endangered (for this population).
- The group discussed the Bazaruto Archipelago as a World Heritage Site, with the Bazaruto Archipelago to Inhambane Bay IMMA potentially stimulating the creation of a larger area.

- Armindo pointed to the difficulties of analysing the wide range of information from many sources, sometimes contradictory and taking decisions despite uncertainty. It was possible to point to trends, but difficult to pick up more precise information and to fit it all together and to institute the best management. Armindo wanted a population number that would trigger management action.
- Cockcroft pointed to the best surveys and other information gathered together with Guissamulo and Gomes, that now provided solid information to make the difficult management decisions. A management plan had been prepared (Appendix 4) and he said it would be circulated to ANAC as part of the present report. Substantial time and funds had been harnessed to arrive at current knowledge. Cockcroft's statement was clear: if the dugongs are not conserved in and around Bazaruto Archipelago and in the area defined by the new IMMA, then there will be none left in East Africa.
- Gomes pointed out that there are 4-5 dugong mortalities per year for various reasons. Some natural, some environmental, storms, bycatch, poaching. The population can only sustain 2 deaths of reproductively active females per year but any number in excess of two will cause extinction in fewer than 100 years. If there are no deaths, then the population could increase by 3%/year, but no one knows what the carrying capacity of the environment is. Even under the best conditions the population increase rate is less than 5%.
- Harun, the chair, noted that there were intense pressures for economic activities along the 300 km of coast where the IMMA is located. They would need to present robust arguments to government in support of marine protection but that the IMMA was a valuable asset to have in their work.
- Harun noted that they would share the information and message of the IMMAs' value with the Director General of the Ministry and thanked us for a productive interactive discussion. They would also share the message with fisheries, and requested us to do that as well.

Later in the morning and over lunch the IMMA team with Guissamulo and Gomes met to devise recommendations stemming from their discussions. Through the afternoon and evening, the IMMA team worked on the report.



Figure 6. The Task Force team meeting with ANAC officials.

23rd November 2019, Saturday

Preparation of the Report

24th November 2019, Sunday

Departure from Maputo

Having finished their task in Mozambique, the international team departed from Maputo on the 24th November.

5. Recommendations

Considering the precipitous decline of dugongs observed in the coastal zone of East Africa during the past few decades (see Background), it is apparent that the population of dugongs living in the Bazaruto Bay and surroundings, 250-300 individuals strong, is Africa's last viable population of this threatened sirenian. Dugongs still survive in fragmented units along the coast of East Africa from Egypt to Mozambique, but the numbers of these units are likely to be too small to be viable, and their future disappearance seems inevitable.

Once extirpated from Bazaruto, dugongs are also extremely likely to disappear from East Africa.

Ensuring the survival of the Bazaruto dugongs is therefore an imperative need having significance not only at the national Mozambican level, but also at the regional and even global levels. Considering the demonstrated vulnerability and size of this dugong population, and in view of its outstanding universal value to African biodiversity, policymakers should be made aware that any negative impact from human activities, most notably: a) fishery bycatch, b) oil & gas exploration and exploitation, and c) unregulated tourism, is likely to have severe consequences.

In order to support the continued presence of dugongs in Bazaruto, our main recommendations and priority actions are:

1. That the recently identified "Bazaruto Archipelago to Inhambane Bay Important Marine Mammal Area" (IMMA) be proclaimed an *Environmental Protection Area*. This would not only greatly benefit the conservation of the Mozambican "Marine Big Six" (dugongs, Indian Ocean humpback dolphins, humpback whales, sea turtles, manta rays, and whale sharks) and associated habitats, but also the local coastal communities through the increase of tourist revenues within the framework of the development of Mozambican "blue economy".
2. That in the longer term, considering that 70% of the dugong population is found outside of the Bazaruto National Park, the Park's boundaries should be extended northward (up to Save River's mouth) to fully encompass the core dugong area, as indicated by the "Bazaruto Archipelago to Inhambane Bay" IMMA. We urge ANAC to encourage African Parks (the management body of the Bazaruto National Park) to liaise and cooperate with authorities outside the Park, within the "Bazaruto Archipelago to Inhambane Bay" IMMA, including the CMS Dugong MoU, taking note of the IMMA, to effectively manage the dugong population.
3. To take into consideration that natural factors such as cyclones cannot be avoided and that they have the potential of strongly affecting dugong mortality. Thus, extreme care should be given to reducing and eliminating anthropogenic pressures, including bycatch in gillnets, oil & gas development, and disturbance from unregulated tourism.
4. Taking note of the vulnerability of the dugong population in the "Bazaruto Archipelago to Inhambane Bay" IMMA, and in particular of the modelling indicating that the population cannot sustain the removal of more than two reproductively-mature females per year, ensure that the existing gillnet ban is strictly enforced in the area.
5. To consider the *Regulation on the Environmental Impact Assessment Process*, Decree No. 54/2015, Annex V, Point 2 (c) (iii) ("the presence of migratory/congregational species, comprising habitat known to support cyclically or otherwise regularly, \geq 95% of the world or national population of a migratory or congregational species at any point in the species cycle, where this habitat could be considered a discrete management unit for these species." This fully applies to the Bazaruto dugongs and should be considered an element impeding the implementation of any activity proposed under a particular EIA. This would have consequences on oil & gas developments in the "Bazaruto Archipelago to Inhambane Bay" IMMA.
6. Should the proposed oil & gas developments by SASOL move forward, require:
 - a. That a thorough, independent environmental review be conducted before the oil and gas development begins by recognized marine mammal experts, taking note of the "CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-

- generating Activities”, to assess the ecological impacts of such development on the dugongs and associated seagrass habitats.
- b. That developers and operators to use the best available mitigation, and rigorously monitor the environmental impacts of the development on dugongs and their seagrass habitat to evaluate the effectiveness of the employed mitigation, and
 - c. That developers and operators to establish trust funds to support: (1) the training of fishers from Bazaruto Bay to obtain entry level jobs in developing industries and wildlife enforcement and monitoring patrols of the Bazaruto Archipelago National Park and adjacent waters, and (2) working with the University Eduardo Mondlane to establish the training of scientists and a comprehensive program of research and monitoring of the dugongs and their seagrass habitats in the “Bazaruto Archipelago to Inhambane Bay” IMMA.
7. To use the outstanding universal value of the dugongs and their seagrass habitat to build a strong case for nomination of the “Bazaruto Archipelago to Inhambane Bay” IMMA as a World Heritage Site.
 8. To establish or renew the commitment to fulfil the management actions listed in Appendix 4.
 9. To take cognizance of the “Bazaruto Archipelago to Inhambane Bay” IMMA when conserving marine ecosystems including sea grasses, coral reefs and mangroves in various designations.
 10. To consider that the endangered Indian Ocean humpback dolphin is widely dispersed and found consistently in the “Bazaruto Archipelago to Inhambane Bay” IMMA; this dolphin’s habitat overlaps that of the dugong and the recommendations applying to the IMMA apply also to humpback dolphins.
 11. To request ANAC’s Director General, through his advisors, to share this report and recommendations with other ministerial authorities involved in dugong conservation.
 12. To ask the focal point for the dugong MOU as well as for CMS to report progress relevant to IMMAs in Mozambique at the COP13 Dugong MOU meeting of signatory state (MOS4).

6. Acknowledgments

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7. References

- Bryceson I. 1981. A Review of some problems of Tropical marine conservation with particular reference to the Tanzanian coast. *Biological Conservation* 20(3):163-171.
- Cockcroft V.G. 1995. Aerial survey in Kenya finds few dugongs. *Sirenews* 24 [newsletter of the IUCN/SSC Sirenian Specialist Group].
- Cockcroft V.G., Guissamulo A.T., Findlay K. 2009. Dugongs of the Bazaruto Archipelago. Final report submitted to Sasol, in respect of funded project 2006-2008. 84 p.
- Cockcroft, V.G., Guissamulo, A.T., Findlay, K.P. 2010. Dugongs (*Dugong dugon*) of the Bazaruto Archipelago, Mozambique. Final Report to SASOL, January 2010. 88 p.
- Cockcroft V.G., Guissamulo A.T., Findlay K., West L., Mohamed M.O.S., Taju A., Hadi A. 2018. Dugongs (*Dugong dugon*) of the Western Indian Ocean Region: identity, distribution, status, threats and management. Final Report to WIOMSA, April 2018. 118 p.
- Cockcroft V.G., Salm R.V., Dutton T.P. 1994. The status of dugongs in the western Indian Ocean. In: First International Manatee and Dugong Research Conference, 11–13 March 1994, Gainesville, Florida.
- Cockcroft V.G., Young D.D. 1998. An investigation of the status of coastal marine resources along the west coast of Madagascar. Unpublished report, Worldwide Fund for Nature (WWF), Gland, Switzerland.
- Dollman G. 1933. Dugongs from Mafia Island and a manatee from Nigeria. *Natural History Magazine, British Museum of Natural History*.
- Findlay K.P., Cockcroft V.G., Guissamulo A.T. 2011. Dugong abundance and distribution in the Bazaruto Archipelago, Mozambique. *African Journal of Marine Science* 33(3):441–452.
- Guissamulo A.T., Cockcroft V.G. 1997. Dolphin and dugong occurrence and distribution and fisheries interactions in Maputo and Bazaruto Bays, Mozambique. Paper SC/49/SM24 presented at the 49th meeting of the International Whaling Commission, London, September 1998.
- Guissamulo A.T., Cockcroft V.G. 2004. Ecology and population estimates of Indo-Pacific humpback dolphins (*Sousa chinensis*) in Maputo Bay, Mozambique. *Aquatic Mammals* 30:94–102.
- Heinsohn G.E., Marsh H., Spain A.V. 1976. Extreme risk of mortality to dugongs (Mammalia: Sirenia) from netting operations. *Australia Wildlife Research* 3:117-121.
- Heinsohn G.E., Spain A.V. 1974. Effects of a tropical cyclone on littoral and sublittoral biotic communities and on a population of dugongs (*Dugong dugon* [Müller]). *Biological Conservation* 6:143-152.
- Heinsohn G.E., Wake J., Marsh H., Spain A.V. 1977. The dugong, *Dugong dugon* [Müller] in the seagrass system. *Aquaculture* 12:235-248.
- Hines E., Adulyanukosol K., Duffus D.A., Dearden P. 2005. Community perspectives and conservation needs for dugongs (*Dugong dugon*) along the Andaman coast of Thailand. *Environmental Management* 36(3):1-12.

- Howell K.M. 1998. The conservation of marine mammals and turtles in Tanzania. In: J.R. Mainoya (Ed.) Proceedings of the workshop on ecology and bioproductivity of the marine coastal waters of Eastern Africa. 18-20 January 1998, Dar es Salaam, Tanzania.
- Hughes G.R. 1967. Dugong status survey in Mozambique. Pp. 137–139 in: World Wildlife Yearbook, World Wildlife Fund, Switzerland.
- Husar S.L. 1975. A review of the literature of the dugong (*Dugong dugon*). Wildlife Research Report 4, U.S. Fish and Wildlife Service 30 p.
- IUCN Marine Mammal Protected Areas Task Force. 2018. Guidance on the use of selection criteria for the identification of Important Marine Mammal Areas (IMMAs). Version: March 2018. 82 p.
- Janik V.M. 2013. Cognitive skills in bottlenose dolphin communication. Trends in Cognitive Sciences 17:157–159.
- Jarman P.J. 1966. The status of the dugong (*Dugong dugon* [Müller] Kenya, 1961. East African Wildlife Journal 4:82-88.
- Kiszka J., Muir C., Jamon A. 2007. Status of a marginal dugong (*Dugong dugon*) population in the lagoon of Mayotte (Mozambique Channel), in the western Indian Ocean. Western Indian Ocean Journal of Marine Science, 6(1):111-116.
- Komora A. 1996. Life in the wild: last chance for Kenya's mermaids. Swara 19(5):13-13.
- Korrubel J., Cockcroft V.G. 1997. Dire days for dugongs: is time running out for this marine mammal, long considered to be the mythical mermaid? Africa Environment and Wildlife 5(1):28-33.
- Marsh H., Arnold P., Freeman M., Haynes D., Laist D., Read A., Reynolds J., Kasuya T. 2003. Strategies for conserving marine mammals. Pp. 1-19 in N. Gales, M. Hindell and R. Kirkwood (Eds.), Marine mammals: fisheries, tourism & management Issues. CSIRO Publishing, Victoria.
- Marsh H., Penrose H., Eros C., Hughes J. 2002. Dugong status report and action plans for countries and territories. United Nations Environment Programme (UNEP) Early Warning and Assessment Report Series 1. Cambridge: University Press.
- Marsh H., Sobotzick S. 2015. *Dugong dugon*. The IUCN Red List of Threatened Species 2015: e.T6909A43792211. <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T6909A43792211.en>.
- McCauley R.D., Fewtrell J., Duncan A.J., Jenner C., Jenner M.N, Penrose J.D., Prince R.I.T., Adihyta A., Murdoch J., McCabe K. 2000. Marine seismic surveys: analysis and propagation of air gun signals and effects of exposure on humpback whales, sea turtles, fishes and squid. Prepared for the Australian Petroleum Exploration and Production Association from the Centre for Marine Science and Technology, Curtin University. CMST R99-15, 185, unpublished.
- Motta H. 2001. Análise do FOFA (forças e fraquezas) de Implementação do Parque Nacional das Quirimbas. Draft Document. World Wildlife Fund.
- Muir C.E., Sallema A., Abdallah O., De Luca D.W., Davenport T.R.B. 2003. The dugong (*Dugong dugon*) in Tanzania: a national assessment of status, distribution and threat. Wildlife Conservation Society.

Ray C. 1968. Marine parks for Tanzania: results of a survey of the coast of Tanzania. The Conservation Foundation, New York Zoological Society.

Richardson W.J., Malme C.I. 1993. Man-made noise and behavioral responses. Pp. 631-700 in: J.J. Burns, J.J. Montague, and C.J. Cowles (Eds.), The Bowhead Whale. Spec. Publ. 2, Society for Marine Mammalogy, Lawrence, KS.

Rodrigues M.J., Motta H., Pereira M.A.M., Gonçalves M., Carvalho M., Schleyer M. 1999. Reef monitoring in Mozambique I: the monitoring programme and 1999 report. Maputo, 60 p.

Smithers R.H.N., Lobão Tello J.L.P. 1976. Checklist and atlas of the mammals of Mozambique. Museum Memoir No. 8, Trustees of the National Museums and Monuments of Rhodesia, Salisbury.

Tinley K.L. 1971. Determinants of coastal conservation: diversity and dynamics of the environment as exemplified by the Mozambique coast. Pp. 124-153 in: Nature Conservation as a Form of Land Use: Proceedings of a SARCUSS symposium. SARCUSS, Pretoria.

Travis W. 1967. The voice of the turtle. Allen and Unwin Ltd, Great Britain.

UNEP 2001. Eastern Africa Atlas of Coastal Resources: Tanzania. Nairobi, Kenya.

Wamukoya G.M., Ottichilo W.K, Salm, R.V. 1997. Aerial Survey of dugongs (*Dugong dugon*) in Ungwana Bay and the Lamu Archipelago, Kenya. Kenya Wildlife Service. 13 p.

8. Acronyms

ANAC	Administração Nacional das Áreas de Conservação
AoI	Area(s) of Interest
BAIB IMMA	Bazaruto Archipelago to Inhambane Bay IMMA
CBD	Convention on Biological Diversity
cIMMA	Candidate Important Marine Mammal Area
CMS	Convention on Migratory Species
EBSA	Ecologically or Biologically Significant Area
GBRMP	Great Barrier Reef Marine Park
GEF	Global Environmental Facility
GOBI-IKI	Global Ocean Biodiversity Initiative's project supported by the International Climate Initiative
IBA	Important Bird and Biodiversity Area
ICMMPA	International Conference on Marine Mammal Protected Areas
ICoMMPA	International Committee on Marine Mammal Protected Areas
IMMA	Important Marine Mammal Area
IMO	International Maritime Organisation
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
KBA	Key Biodiversity Area
MMPA	marine mammal protected area
MMPATF	Marine Mammal Protected Areas Task Force
MoU	Memorandum of Understanding
PSSA	Particularly Sensitive Sea Area
PVA	Population Viability Analysis
SSC	Species Survival Commission (an IUCN body)
WCPA	World Commission on Protected Areas (an IUCN body)
WIO	Western Indian Ocean
WIOMSA	Western Indian Ocean Marine Science Association

9. Appendices

Appendix 1 - IMMA Resubmission Template

IMMA Title: Bazaruto Archipelago to Inhambane Bay

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SECTION 1. Summary for IMMA e-Atlas Pop-up Box

There has been a dramatic decline in dugongs in the Western Indian Ocean since the 1960s. Ten and 6 dugongs were counted off Kenya in the mid 1990s (Cockcroft, 1995; Komora, 1996; Wamukoya *et al.*, 1995; Marsh, *et al.*, 2002; Cockcroft *et al.*, 1994). Similar declines were noted for Tanzania, the Masceline Islands (Cockcroft & Young, 1998; Muir *et al.*, 2003;) and Mozambique (Cockcroft & Young 1998). Based on boat, aerial and questionnaire surveys conducted from 1991/97 Cockcroft *et al.*, (1994) suggested that the Bazaruto Archipelago supported the last viable WIO population. Comprehensive aerial surveys of the Archipelago in 2007/2008 (Findlay *et al.*, 2011) estimated a population of between 250 and 350 individuals. Recent aerial, acoustic and questionnaire surveys off East African ‘hot spots’ suggest that dugongs are all but extirpated from the East African region, other than in the Bazaruto Archipelago (Cockcroft *et al.*, 2018).

SECTION 2. Information for IMMA Summary Box

Common Name	Scientific Name	IMMA Selection Criteria Met (x)							
		A	Bi	Bii	Ci	Cii	Ciii	Di	Dii*
Dugong	<i>Dugong dugon</i>	x	x						

SECTION 3. Description of IMMA

Bazaruto Archipelago and Inhambane Bay are on the East coast of Central Mozambique from the Save River in the north (20° 54' 15.01" S, 35° 03' 45.91" E) to Tofino (23.8569° S, 35.5480° E) in the south. Both bays have extensive shallow waters, with large tidal ranges and extensive seagrass beds. Inhambane Bay was known in the past to host substantial numbers of dugongs, though few, if any, remain. Some 250 to 300 dugongs remain in the Bazaruto Archipelago and population viability modelling suggests this population is viable, given zero mortality through anthropogenic causes. Numerous cetacean species are resident, or visit the area.

SECTION 4. CRITERION A: Species or Population Vulnerability

The results of the past three decades of research in the WIO led to a comprehensive research project on the numbers and distribution of dugongs along the East African coast (Cockcroft *et al.*, 2018). Dugong ‘hotspots’ in Kenya, Tanzania and Mozambique were identified through historical knowledge, fisher questionnaires and satellite telemetry. At ‘hotspots’ further questionnaire and focal group surveys were undertaken, as well as aerial surveys, including unpublished aerial surveys between 2007 and 2018 (see

Table 1). Overall the results for this research indicate that dugongs are all but extirpated from the East African region, other than in the Bazaruto Archipelago area (Findlay et al., 2011).

SECTION 5. CRITERION Bi: Small and Resident Populations

Both bays have extensive seagrass beds, and Inhambane Bay was known in the past to host substantial numbers of dugongs, though few, if any, remain. The Bazaruto dugong population, estimated at between 250 and 350 individuals, is the only known fairly large dugong population within the Western Indian Ocean. Population viability modelling suggests this population is viable, given zero mortality through anthropogenic causes, particularly incidental catch and disturbance through oil & gas exploration (Cockcroft et al., 2010). A management plan and conservation strategy for dugongs in the Bazaruto Archipelago has been formulated and submitted to the relevant authority Cockcroft et al., 2018). In addition, Cockcroft et al. (2018) have proposed that Mozambique's dugongs be regarded as an IUCN special management unit and classed as highly endangered. Consequently, this is believed to be the last and only viable dugong population left off East Africa (Cockcroft, et al., 2018).

SECTION 12. Supporting Information

For information on East African dugong research, please view:

<https://www.dugongs.org/>

Dugongs (*Dugong dugon*) of the Western Indian Ocean Region: – Identity, Distribution, Status, Threats and Management.

<https://www.wiomsa.org/ongoing-project/dugongs-dugong-dugon-of-the-western-indian-ocean-region-identity-distribution-status-threats-and-management/>

Developing an education and awareness campaign to conserve dugongs in the Bazaruto Archipelago and Mozambique (MZ3).

<http://www.dugongconservation.org/project/developing-education-awareness-campaign-protect-dugongs-bazaruto-archipelago-mozambique-mz3/>

The distribution of dugongs in the coastal waters of Mozambique (MZ2).

<http://www.dugongconservation.org/project/distribution-dugongs-coastal-waters-mozambique-mz2/>

Cockcroft, V.G. 1995. Aerial survey in Kenya finds few dugongs. *Sirennews* 24 [newsletter of the IUCN/SSC Sirenian Specialist Group].

Cockcroft, V.G., Salm, R.V., Dutton, T.P. 1994. The status of dugongs in the western Indian Ocean. In: First International Manatee and Dugong Research Conference, 11–13 March 1994, Gainesville, Florida.

Cockcroft, V.G., Young, D.D. 1998. An investigation of the status of coastal marine resources along the west coast of Madagascar. Unpublished report, World Wide Fund for Nature (WWF), Gland, Switzerland.

Cockcroft, V.G., Findlay, K.P., Guissamulo, A.T., Lindsay West, Mohamed, M. 2018. Dugongs (*Dugong dugon*) of the Western Indian Ocean Region: Identity, Distribution, Status, Threats and Management. Western Indian Ocean Science Association Final Technical Report. 143pp.

Findlay, K.P., Cockcroft, V.G., and AT Guissamulo. 2011. Dugong abundance and distribution in the Bazaruto Archipelago, Mozambique. *African Journal of Marine Science* 2011, 33(3): 441-452

Kizka, J and C. Muir. 2008. Status of the marginal dugong (*f*) population in the lagoon of Mayotte (Mozambique Channel) in the Western Indian Ocean. *Western Indian Ocean Journal of Marine Science*, 6(1), 111-116.

Komora, A. 1996. Life in the Wild: Last chance for Kenya's mermaids. Swara 19 (5): 13-13.

Marsh, H., Penrose, H., Eros, C., Hugues, J. 2002. Dugong status reports and actions plans for countries and territories. Nairobi: UNEP.

Muir, C.E, Sallema, A., Abdallah, O., De Luca DW, Davenport TRB. 2003. The dugong (*Dugong dugon*) in Tanzania: a national assessment of status, distribution and threat. Wildlife Conservation Society.

Wamukoya, G.M., Mirangi, J.M. and W.K. Ottichilo. 1995. Marine Aerial Survey (Sea Turtles and Marine Mammals). KWS Technical Series Report No. 1.

SECTION 13. Additional Figures and Maps for Inclusion in the PDF Factsheet

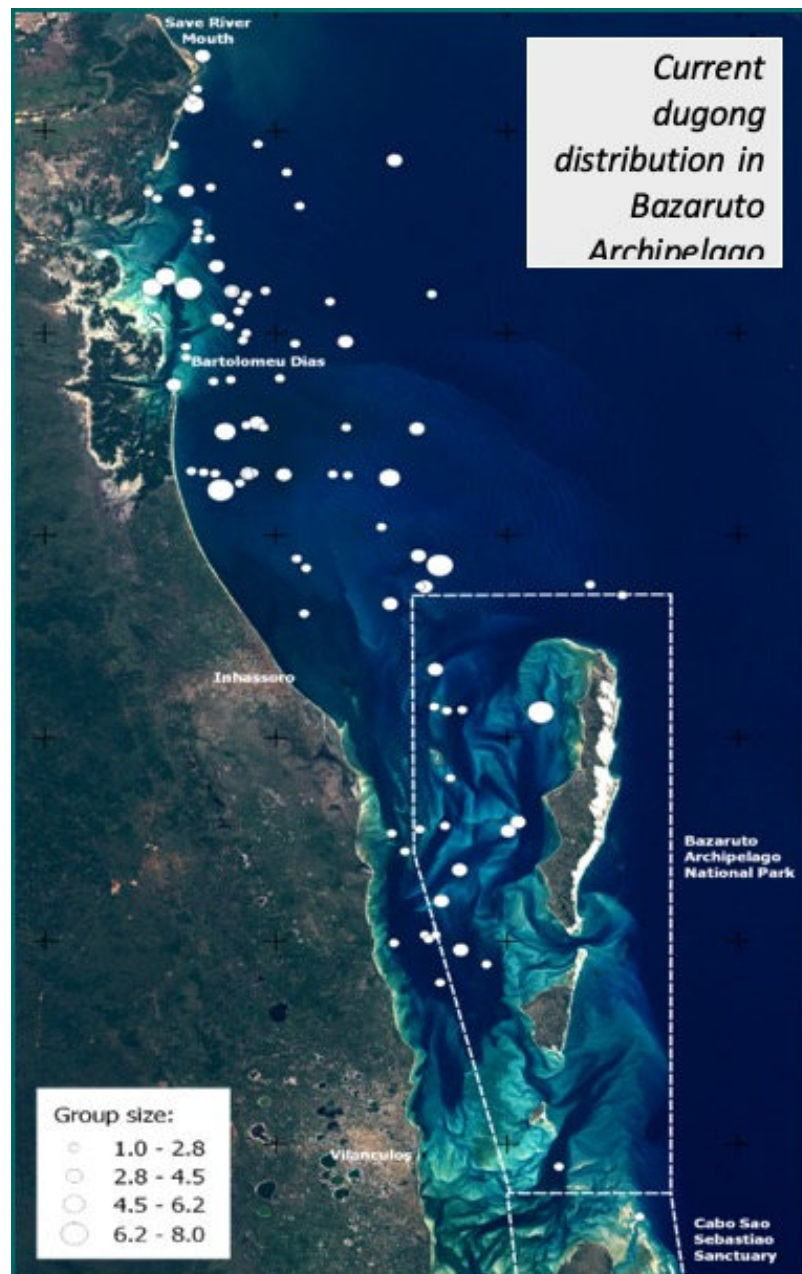


Table 1: Details of the aerial surveys undertaken in Kenya, Tanzania and Mozambique between 2007 and 2018 (Cockcroft et al., 2018). Excluding 28 aerial survey of the Bazaruto Archipelago undertaken between 2007 and 2009, where a population of between 250 and 350 dugongs was estimated (Findlay et al., 2011).

Country	Area	Year	No. of surveys	Total Effort (nm)	No. of sightings	No. of individuals
Mozambique	Vilanculos to Inhambane	2007	1	317	0	0
	Quirimbas Archipelago	2007	2	599	0	0
	Maputo Bay to Ponta do Ouro	2009	2	381	1	1
		2018	1	362	1	2
	Bazaruto archipelago region	2017 - 2018	7	2.234	95	212
Tanzania	Mafia, Kilwa, Rufiji	2016 – 2017	3	1.296	0	0
Kenya	Kenyan coast	2016 – 2017	3	1.746	2	2
TOTAL			19	4.703	99	217

SECTION 14. List of All Primary Species Meeting IMMA Selection Criteria, Including the IUCN Subpopulation Name If Available and IUCN Red List Status

Scientific Name	Common Name of Species	IUCN Population or Subpopulation Name	IUCN Red List Status
<i>Dugong dugon</i>	Dugong		Vu

SECTION 15. List of All Species Present in the IMMA but Not Meeting the IMMA Selection Criteria, Including the IUCN Subpopulation Name If Available and IUCN Red List Status

Scientific Name	Common Name of Species	IUCN Population or Subpopulation Name	IUCN Red List Status
<i>Sousa plumbea</i>	Indian Ocean humpback dolphin		En
<i>Orcinus orca</i>	Killer whale		LC
<i>Stenella longirostris</i>	Spinner dolphin		LC
<i>Stenella attenuata</i>	Pantropical spotted dolphin		LC

<i>Delphinus delphis</i>	Common dolphin		LC
<i>Feresa attenuata</i>	Pygmy killer whale		LC
<i>Lagenodelphis hosei</i>	Fraser's dolphin		LC
<i>Megaptera novaeangliae</i>	Humpback whale		LC
<i>Balaenoptera acutorostrata</i>	Common minke whale		LC
<i>Pseudorca crassidens</i>	False killer whale		LC
<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin		Vu

[end of resubmission template]

Appendix 2 – Important facts about dugongs

Life-history traits

- maximum longevity (~70 years or longer)
- low reproductive potential
 - delayed sexual maturity
 - age before breeding (females 6-17 years; males 4-16 years)
 - maximum possible rate of increase (e.g., low natural mortality and no human-induced mortality) is 5% per year
 - only a single calf per birth
 - time between breeding — 3-7 years; not in continuous breeding condition all year-round
- calves rely heavily on mother, both for sustenance and for protection
- migratory (may stay in localised areas or range widely) but mainly use inshore habitats
- primarily graze on seagrass but can also eat marine algae

Worldwide, the dugong is listed in the IUCN Red List as being *Vulnerable* to extinction (Marsh et al., 2015). Mozambique dugongs are presumed to be a geographically and isolated dugong population. A species-wide genetic research is ongoing to reveal dugongs' population structure and the degree of isolation of the East Africa population(s).

Appendix 3 — Hazard risk assessment process

Mortality threats to dugongs and marine mammals

To be assessed and completed by community representatives

Major pressure types	Pressures	Likelihood # (considering both current and likely future situation)	Consequence #	Overall Risk (considering both likelihood and consequence)	Possible management response(s)
Land-sourced impacts	Clearing or modifying coastal habitats increasing sediment runoff				
	Habitat loss (e.g., coastal reclamation)				
	Nutrient and pesticides from run-off				
	Industrial/urban pollution				
Marine – sourced impacts	Boat strike (especially near ports, vessel access channels)				
	Noise concerns (e.g., vessels, pile-driving)				
	Changed dugong behaviour because of vessels (e.g., high speed vessels, jet-skis)				
	Poaching/illegal hunting				
	Disease				
	Dredging and/or dumping of dredge material				
	Incidental capture in fishing gear (nets)				
	Marine debris (e.g., ghost nets)				
Climate change	Marine habitat degradation from typhoons				
	Bleaching impacting seagrass				

Use guidance below in Tables 1-4 to assess Consequence, Likelihood and Risk Level.

Assessing consequence. Note that separate tables should be used to define the consequences applicable to environment (ecosystem) and environmental perception, as described in Tables 2 and 3 below:

DESCRIPTION	DEFINITION
CATASTROPHIC	Impact is clearly affecting the nature of the ecosystem over a wide area OR impact is catastrophic and possibly irreversible over a small area or to a sensitive population or community Recovery periods of greater than 20 years likely OR condition of an affected part of the ecosystem irretrievably compromised.
MAJOR	Impact is significant at either a local or wider level or to a sensitive population or community. Recovery periods of 10 - 20 years are likely.
MODERATE	Impact is present at either a local or wider level. Recovery periods of 5 - 10 years anticipated.
MINOR	Impact is present but not to the extent that it would impair the overall condition of the ecosystem, sensitive population or community in the long term.
INSIGNIFICANT	No impact or, if impact is present, then not to an extent that would draw concern from a reasonable person. No impact on the overall condition of the ecosystem.

Table 1: Consequence (Environment –Ecosystem level)

DESCRIPTION	DEFINITION
CATASTROPHIC	Negative and extensive national media attention and national campaigns
MAJOR	Negative national media attention and national campaign
MODERATE	Negative regional media attention and regional group campaign
MINOR	Individual complaints
INSIGNIFICANT	No media attention

Table 2: Consequence (Environmental Perception)

Assessing likelihood. The second step in the hazard risk assessment process is to individually assess the likelihood of the consequences of an event occurring. There are five levels used in this step, as described in Table 3.

DESCRIPTION	FREQUENCY	PROBABILITY
Almost certain	Expected to occur more or less continuously throughout a year (e.g. more than 250 days per year)	95-100% chance of occurring
Likely	Expected to occur once or many times in a year (e.g. 1 to 250 days per year)	71-95% chance of occurring
Possible	Expected to occur once or more in the period of 1 to 10 years	31-70% chance of occurring
Unlikely	Expected to occur once or more in the period of 10 to 100 years	5-30% chance of occurring
Rare	Expected to occur once or more over a timeframe greater than 100 years	0-5% chance of occurring

Table 3: Likelihood

Assessing risk level. Risk = likelihood x consequence. Having determined the likelihood and consequence, Table 4 is used to determine the hazard risk grade (ie., Low, Moderate, High or Extreme).

This provides a uniform, single method of grading hazards against each other in order to determine a priority order for dealing with the risks identified and deciding what resources will be allocated to each hazard. It is important to note that these risk grades have no absolute value and so care may need to be applied for ranking purposes across different States.

	CONSEQUENCE RATING				
LIKELIHOOD	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
ALMOST CERTAIN	M	M	H	E	E
LIKELY	M	M	H	H	E
POSSIBLE	L	M	H	H	E
UNLIKELY	L	L	M	M	H
RARE	L	L	M	M	M

Table 4: Hazard Risk Grade

Appendix 4 - Dugong Management Plan (2018)

produced by DUGONGOS.ORG and accepted by the National Facilitating Committee

Subsequent to a SASOL sponsored population assessment of dugongs in the Bazaruto Archipelago, it became clear that the dugong population in the region was unlikely to survive unless local authorities and communities adopted immediate and effective conservation. Consequently, a specialist dugong workshop was convened by the National Directorate of Conservation Areas (DNAC), and held in Maputo in May 2009. The Workshop addressed four main topics: Research and Monitoring; Law Enforcement for dugong conservation; Education; and Preparation of a national Dugong Management Plan (DMP).

This is a re-worked summary and main recommendations from this workshop and is informed by a National Fish and Wildlife Foundation funded programme undertaken between 2009 and 2013 and produced under a WIOMSA funded programme, which commenced in 2014 and is ongoing.

Population estimates for the species in Mozambique are of the order of only several hundred, and concentrated in the region of the Bazaruto Archipelago National Park (BANP). Such critical numbers, together with low potential rates of population increase mean that the only option is to manage the metapopulation for zero removal. Various threats to dugongs were identified. Coastal development results both in habitat loss as well as increased pressures from artisanal fisheries; contamination by marine pollutants (including those arising from hydrocarbon extraction processes) will impact on both dugongs and their habitat. However, most dugong mortality results from commercial gill netting for shark fins, especially in remote areas, where monitoring is difficult. Capture of dugongs in gill nets occurs either intentionally or as bycatch, when drowning takes place in nets unattended overnight. Despite this, fishing authorities continue to promote gill netting over seine netting owing to the greater selectivity of the former.

The Workshop identified those factors responsible for the failure of law enforcement related to dugong protection and concluded that enforcement should be targeted at high-risk areas. After considering a range of mitigation procedures to counter dugong mortality, the Workshop laid the basis for a Dugong Management Plan (DMP). The short-term objectives of the DMP are to prevent further reduction in dugong populations and their habitat in Mozambique, whilst in the long-term they are to promote recovery of the Mozambique dugong populations and the habitat on which they depend, using a multi-stakeholder approach. The DMP proposes additional Areas of Special Protection to cater both for movement of dugongs across BANP boundaries, as well as for those populations residing permanently outside those boundaries.

A set of Priority Actions are defined, including: implementation of protections measures within the BANP; recommendations on staffing within DNAC; revisions and/or amendments to the legal system; implementation of protection measures outside of the BANP; education and awareness campaigns; community-level involvement; consideration of artificial reefs and the promotion of alternative livelihoods; and development of a specialist Dugong Protection Unit.

DRAFT MANAGEMENT PLAN

BACKGROUND

The **Dugong Management Plan** (DMP) draws on the presentations, discussions and outcomes of the Dugong Workshop. Despite its protected status in all waters of Mozambique (through Decree 12/2002), dugongs remain highly endangered along the East African coast. Indeed, Mozambique harbours what is believed to be the last viable population in the Western Indian Ocean, the DMP is arguably the final attempt at conservation of this relict population.

OBJECTIVES OF THE DMP

Short-term: To prevent further reduction in dugong populations and their habitat in Mozambique.

Long-term: To promote the recovery of the Mozambique dugong populations and the habitat on which they depend, using a multi-stakeholder approach.

GEOGRAPHIC SCOPE OF THE DMP

The original population is now highly fragmented with few animals in Maputo Bay, the Quirimbas and in the Inhambane region and these are becoming increasingly isolated. Where necessary, other provinces could draw on the DMP to develop their own plans for local implementation.

Core areas of the dugong population were identified as outside the BANP boundaries. These dugongs will require special protection by defining additional **Areas of Special Protection (ASPs)**. Based on dugong surveys and reports, as well as on the extent and location of sea grass beds, the areas outside of the BANP which are considered as foci for ASPs are from the BANP's borders, as far north as Chiloane, from the coast out to a depth of approximately 50 metres.

The complex question of ASPs is addressed later, as the status and boundaries of Marine Protected Areas in Mozambique is in a state of flux and it is perhaps premature to propose a legal status for ASPs at this stage.

IMPEDIMENTS TO DUGONG CONSERVATION

The following are considered to be the major threats to effective dugong conservation:

- the increasing poverty of local communities and associated increasing pressures on marine resources as more nets, boats and lines are deployed either for subsistence, or to supplement family incomes;
- the potential impacts of the DMP itself on local people (e.g., restrictions on fishing gear and practices that the Plan might impose) which may make the DMP hard to implement;
- declining fish stocks;
- dependence (and hence vulnerability) of coastal communities on natural resources, such that crop failure may exacerbate pressures on marine resources;
- incidental (and sometimes intentional) capture of dugongs in fishing nets, particularly in gill nets set in remote areas;
- the shark fin trade which makes extensive use of gill nets;
- the lack of law enforcement;
- fishing practices that impact on dugong habitat (mainly beach seining);
- uncontrolled coastal and inland development leading to coastal degradation, sedimentation of estuaries, and sea grass destruction;
- growth in tourism, particularly in the form of lodges on the Bazaruto Archipelago, leading to increased human populations on the islands;
- potential stress to dugongs from oil & gas exploration (chiefly seismic activity), and eventual hydrocarbon exploitation;
- climate change and its consequences for marine life in the region.

PROPOSED PRIORITY ACTIONS

The Priority Actions of the DMP are aimed to a large extent at addressing the above impediments and categorised as **Category 1, URGENT**, to be implemented as soon as possible, **Category 2**, to be implemented subsequently.

IMPLEMENT PROTECTION MEASURES WITHIN THE BA (Category 1)

The Dugong Workshop highlighted the critical need to protect adult survivorship of dugongs, and the key to this is the location, reporting and immediate removal of any form of illegal gill netting. This Action is a composite of two major thrusts:

Communications and Law Enforcement

An effective VHF Highband radio network is imperative to link the BANP and the core dugong area outside the BANP. Staff must be trained both to operate the network (with links to the navy, tourist operators etc.) in order to extend the “eyes and ears” of DNAC, as well as to undertake routine maintenance of radio equipment. Such a network will create an effective communication system between dhows, sentinel posts, DNAC (on both the islands and the mainland), Honorary Rangers, and other agencies.

Sentinel Tower Network

Sentinel towers should be erected to monitor illegal activities. Recommended locations include:

- The NE point of Santa Carolina
- Ponto Dond
- Bartolomeu Dias
- A point some 20 km north of Bartolomeu Dias

Dhow Patrols

It is proposed to allocate one dhow to each of 5 Community Associations distributed in the core dugong area. These will be operated by Community *Fiscais*. Each dhow will have a radio, as well as a 25 hp outboard engine as back-up to sail power. In addition, the dhow *Fiscais* could provide transport to DNAC *Fiscais* to undertake and assist with patrols in the BA. *Fiscais*, Game Guards, should provide information on dugong sightings, captures and mortalities.

In addition, a ‘DUGONG HOTLINE’ should enable any member of the public to report the same, especially sightings. The accruing conservation benefits will extend to include turtles, sharks and dolphins. Some form of incentive can be instituted to promote this.

Law Enforcement

Legal authorities, the private sector and fishermen have different interpretations of the regulations relevant to dugongs. The regulations need clarification and dissemination to all stakeholders, to inform them of:

- of the nature of offences and related penalties, including what actions to take should a dugong be accidentally caught in a net, or found dead;
- that the enforcement of penalties will take place in a progressive manner;

- of the zones of operation of enforcement agencies within the BA.

Inter-agency collaboration

Government agencies charged with law enforcement related to the protection of marine resources should be encouraged to collaborate. DNAC and the Minister of Tourism should be encouraged to create a collaborative forum and invite relevant agencies (Police, Navy, Fisheries, Ministry of Agriculture, and NGOs) to define problems and appropriate solutions. This should be done immediately.

Field Implementation

Enforcement measures should be appropriate to the magnitude of threat to the resource. The greater the impact of an illegal activity, the more intense the protection measures need to be and the more severe the penalties. It is recommended that after a warning period, a system of escalating penalties be applied for contraventions of the legislation. For example in the case of illegal netting, the first infringement might carry a warning plus a fine; net confiscation would take place on the second offence; and both net and vessel confiscation on the third. A similar set of graded penalties could be instituted for seine netting and other fishing practices.

LEGAL REVISIONS (Category 1)

A specialist **legal consultant** needs to be employed to:

- explore legal options for the ASPs outside of the BANP;
- initiate legal machinery to secure and proclaim this new status;
- review, interpret and summarise all legislation (including proclamations contained in the BANP Management Plan) related to the use of gill nets and other fishing practices prejudicial to dugongs, including permit systems, mesh sizes, net sales, and record keeping;
- following on the above, make recommendations where the legislation is needed but lacking, or where it is ambiguous (especially legislation related to mesh sizes);
- advise on what action to take in cases of illegal mesh size;
- make the above summary accessible in a form that can be readily utilised by legal practitioners, law enforcement officers, DNAC staff, tourists and tourist operators, Community Associations, and fishermen;
- investigate potential options with regard to the legal status of the DMP, and make recommendations in this regard, to ensure that there is some obligation for defined authorities to properly implement the Plan;
- recommend working links with any proposed parastatal body emanating from the new National Conservation Policy;
- explore law enforcement options related to dugongs with various authorities (DNAC, Navy, Maritimo, Police, Honorary Wardens), and so produce a document that streamlines law enforcement procedures for dugongs, and that can be made widely available to all enforcement officers, with ease of interpretation (see also of the DMP);
- review and make recommendations to amend legislation related to penalties for illegal fishing, including those pertaining to the permanent detention of dhows, and the time interval during which confiscated dhows may be bought back by offenders;
- review and make recommendations to amend legislation related to what constitutes illegal fishing practices, with special attention given to the compulsory attendance at set nets at all times;
- rationalize the issue of netting permits in the BANP and other areas critical to the survival of the dugong population (e.g. Bartolomeu Dias and north); recommend a system whereby only one government agency is mandated to issue netting permits anywhere in Mozambique;
- assist DNAC in integrating the with the new National Conservation Policy (see above).

EDUCATION AND AWARENESS PROGRAMMES

Education in Schools, Communities and the Media (Category 1)

Educational and awareness programmes are important conservation tools and should be initiated as soon as possible (Dugongos.org and WWF have done some groundwork in this regard).

Educational avenues to consider include:

- through schools, promote dugong clubs for children, where the objective would be to establish the dugong as a cultural icon, with a sense of ownership for potential involvement of children in dugong related activities;
- specific courses (given by a travelling unit) to explain the rationale for dugong law enforcement to fishing communities;
- specific courses for journalists and TV/radio presenters on the biology, status and conservation significance of dugongs, to assist them in promoting the species as a national icon.

Dugong Release Procedures (Category 1)

Training to be given to Fishing Associations, BANP staff and other interested parties on methods of releasing dugongs that have been caught in nets.

Procedures to be followed in case of dugong mortality (Category 1)

Recent events surrounding dugong deaths have highlighted the lack of defined procedures to follow. Clearly defined procedures need to be formulated and made available in various forms and fora, including public places (signposts, community/fishing centres, schools etc), these should specify:

- brief legal framework surrounding dugongs;
- action to be followed by fishermen directly involved;
- action to be followed by other members of the public;
- the role of police and other paramilitary or military bodies;
- fate of the meat;
- responsibilities of defined persons to collect specified biological material, and where to lodge it.

Dugong Website (Category 1)

A website already exists to report dugong sightings and strandings (www.dugongs.org), as does a smartphone app (SEAFARI). A related web site serves as a platform for individuals and organisations to report Illegal, Unreported and Unregulated (IUU) fishing and other marine infringements along the Mozambican coastline. 'Eyes on the Horizon' (EOTH www.eoth.org) is an initiative of the EU-SADC Monitoring, Control and Surveillance (MCS) project and the Ministry of Fisheries, which was set up in 2003 in collaboration with the tourism industry to help combat IUU fishing. Reports of fishing vessels working close inshore, shark finning and poaching are relayed to the relevant Mozambican authorities for action. The dugongs.org website and the SEAFARI app provide:

- tourists and others with basic information on the biology of the animal in Mozambique, and its critical status;
- a resource for educators and media workers seeking information on dugongs, including material for school curricula;
- a site (for registered operators only) for the reporting and recording of all dugong sightings and other dugong-related data concerned with management and law enforcement;
- DNAC with a site for reporting dugong infringements, and for other registered users to monitor the outcomes of the reporting of illegal activities related to dugongs;
- a site where all regulations of the BANP can be maintained, and which can be readily accessed by Police, legal bodies, lodges and DNAC;
- access to the BANP Management Plan, summary versions of that Plan, and updates to it;
- a source for posters and other promotional material.

The establishment of a website should coincide with the provision of Internet facilities to relevant authorities (e.g. Police and Maritimo).

ALTERNATIVE LIVELIHOODS PROGRAMME (Category 1)

This set of Actions is aimed at reducing pressure on the fish resource in Bazaruto Bay, and to offer alternative livelihoods to fishers, who will have restricted access to defined protected areas under the DMP and who might also experience gear restrictions resulting from its implementation. A three year study, between 2009 and 2012, assessing alternative livelihoods was pioneered by Dugongos.org. However, the Plan recognises that employment will never be created for all those displaced from fishing, as well as the inherent difficulties in transforming fishermen into farmers or tourist operators.

Successful promotion of alternative livelihoods is difficult, though not impossible. Ideally, alternatives should:

- be as lucrative as the existing activity;
- be undertaken with the same or less effort as in current activities, unless there are perceived additional benefits;
- be undertaken with the same or less family dispersion if women are to be involved;
- not encourage the action one is trying to prevent (e.g. it would be counterproductive if profits from improved fishing were used to invest in inappropriate equipment, such as mosquito nets).

The promotion of alternative livelihoods, or increased returns to existing livelihoods, may not reduce pressures on the resource base, they may even increase them. Improved and alternative livelihoods can however provide the conditions that make it possible for local communities to adopt sustainable management practices. The two processes, of livelihood improvement and sustainable natural resource management, need to reinforce each other.

Eco-tourism has the potential to change livelihoods. However, it is currently monopolised by commercial operators despite undeniable potential for community-based tourism. The dugongos.org study emphasised the need for feasibility studies in producing business plans and the necessity for the establishment of a Private Public Partnerships (PPPs) in terms of eco-tourism. For example: to establish and manage set of ecotrails with overnight facilities, involving the community, tourist operators and DNAC. Marine eco-tours, using dhows to find dugongs is another option.

HONORARY RANGER (OFFICIAL) SCHEME (Category 1)

This Action is intended to give selected individuals, from prominent citizens, tourist operators to Island lodge operators some authority to allow them to play a more meaningful role in dugong conservation. A consultant (possibly the same legal consultant as above) will be tasked to review how honorary ranger schemes (Parks, Fisheries and perhaps others) operate successfully in other SADC countries, and then to make recommendations. This will most likely entail new legislation.

MANAGEMENT COUNCIL SUPPORT (Category 2)

A Management Council (MC) has been formed in the Quirimbas National Park to serve as a representation of a range of stakeholders. The MC has Ministerial approval, and one is planned for the BANP. This will provide a mechanism for the private sector and the Community Associations to voice concerns and to contribute to conservation in the BANP. A draft template exists for the Management Council of the BANP. The proposal in this Action Plan is for the BCSP to support the formation and operations of the MC in the BANP, by assisting in initial meetings and by operating as a secretariat. Ultimately, the Council should have access to the level of Director and even Minister. In this way, valuable feedback from the operation of the DMP can be received at high level.

BANP STAFF COMPLEMENT (Category 2)

For an area the size of the BANP and core dugong habitat, there are too few protection staff and several key posts are missing. There should be a significant increase in the number of protection staff, for both the BANP and for core dugong areas, to man sentinel towers and accompany dhow patrols. The BANP Management Plan makes provision for 78 staff allocated across sectors that include Extension and Communities, Assets, Tourism & Marketing, Research & Monitoring, Fund Raising, a Management Council, and an advisory body ('Counselling Nucleus') for the Director. While not denying the need for staff in these areas, it is recommended that Phase II of the BCSP re-define these needs in light of the DMP's major emphasis on law enforcement.

This increase in staff will require additional vehicles and boats. In the short-term these will comprise:

- one boat (28' hull with two 150 hp engines) for use in patrolling and reacting to information;
- two dhows to help monitor seagrass beds and collect information on netting and other activities;
- two quadbikes to facilitate patrols (patrol staff would be able to cover more ground and arrive at Observation Posts earlier - and stay later - than without transport);
- two 4x4 pickups for deploying *Fiscais* on the islands (one vehicle each on Bazaruto and Benguera).

To achieve a cost-effective increase in protection staff, the BCSP should initiate a Community *Fiscais* recruitment programme, to reinforce DNAC staff numbers and facilitate monitoring outside the BANP.

Implementation after ASP designation (Category 2)

Once ASPs have been defined and their legal status secured, the following Actions are recommended:

- DNAC will inform all stakeholders of the location and new legal status of the ASPs;

- those agencies responsible for the enforcement of laws related to illegal netting will conduct regular patrols in the ASPs, whereby increasingly severe measures will be taken against offenders. This enforcement will be assisted by the Dugong Protection Unit.

In the ASPs, *shore-based marking* will be investigated as a possible means for dhows to determine whether they are within an ASP.

Seagrass Watch (Category 2)

An excellent programme that can be started in the BA is Seagrass-Watch (www.seagrasswatch.org). This is a global programme that conducts long-term monitoring of sea grass to provide an early warning system for changes to the coastal environment. Operating in 17 countries, the objectives of the program are to:

- educate involved communities on the importance of the sea grass resource;
- raise awareness of coastal management issues;
- train local stakeholders in the use of standardised scientific methodologies;
- support conservation measures that ensure the long-term resilience of sea grass ecosystems.

Sea grass-Watch identifies areas important for seagrass species diversity and conservation and the information collected is used in management of coastal environments. The program involves collaborative partnerships between local communities and their schools, qualified scientists and end-users (environmental management agencies). Participants collect quantitative data on sea grasses and their associated fauna by means of simple yet scientifically rigorous monitoring techniques. It is an excellent way of combining scientific education with conservation awareness. Elsewhere, communities involved in the program have been shown to develop a sense of custodianship and understanding of the local marine environment.

COMMUNITY GAME GUARDS (FISCAIS) (Category 1 & 2)

Much of the success of the DMP will depend on self-policing within communities, due to the almost complete lack of government enforcement at a local level. For example, appropriate fisheries policies (based on IIP fisheries data) will theoretically provide long-term benefits for the artisanal sub-sector - but this will only happen if the resource management findings are translated into action, through community participation.

Consequently, it is recommended that Phase 2 of the BCSP provides for the planning, recruitment, training and deploying of village “*Fiscais*”. Without some form of legal status to effect arrests, it is expected that these Community *Fiscais* would act mainly as informers for DNAC staff, but they will have both the training and the technology to report illegal activities affecting dugong populations. Areas of operation will cover all core dugong areas. This is not a novel concept, and WWF has experience of this in the BANP. However, the DMP makes a new proposal – the use of community *Fiscais* on dhows and outside the BANP, in addition to those based on land.

Broadly, the scheme proposes recruiting from a number of communities spread throughout the core dugong area. The Community Game Guards will man these and will be permitted to use them for line fishing during routine observational and reporting activities. The dhows themselves should be adequate rewards for *Fiscais* services, but this facility should be augmented by a reward system linked to the successful outcomes of reporting.

A Feasibility Study for *Fiscals* will draw heavily on the work of WWF, but incorporate these new proposals. WWF has established a Joint Law Enforcement programme in the Quirimbas National Park, involving local communities. This can be adapted to suit the BA. IDPPE has recently started a similar programme of Joint Law Enforcement in Vilankulo, to which this could link.

RESOURCE ENHANCEMENT PROGRAMME (Category 2)

This Action is aimed at using artificial reefs to entice (rather than force) fishing pressure away from areas of dugong habitat and where gill netting is problematic for dugong populations. A preliminary desk study should review global experience with artificial reefs and make local proposals regarding:

- Technology viability;
- costs of technically feasible options for specific areas;
- management opportunities and challenges; and
- institutional/legal responsibilities.

This would be followed by field consultations to explore design details, location, access and management. If this appears feasible, then the Action could proceed to an installation phase.

RESEARCH AND MONITORING

The overall objective of Research and Monitoring is to gather specific ecological and socioeconomic information that will contribute to management of the species and its habitat, taking into account current and planned developments in the region. It should also provide feedback to allow for the necessary adjustments in mitigation and management.

Monitoring (Category 2)

There is a host of environmental parameters that can be usefully monitored, from population to hydrocarbon pollutants, to law enforcement. However, given the danger of devoting resources to monitoring, where they could better be used for active protection **for a declining population**, only the following should be considered a priority.

- **Reporting and Monitoring of Infringements**

DNAC and the Fisheries Dept will undertake monitoring operations in joint operations, with logistical support from BCSP boats. Data collected to include: GPS localities; dhow registration and owner details; catch composition; gill net details.

Research

A similar rationale exists for research, and only three research proposals are regarded as priorities at this stage:

- **Review of shark finning trade in Mozambique & Gill Net Study (Category 1)**

Local traders sell dried shark fins to agents who send them via Tanzania to Asia, mainly China. The rationale for this Action is that gill netting in Mozambique is driven largely by this trade, and that any understanding of it will contribute to dugong conservation through control of gill netting. A consultant will work actively with fishing authorities to collect data on fishing practices and the socio-economics of the trade. Legal

recommendations emanating from the study will form the basis for management and restriction of netting.

There is already a comprehensive study on beach seining in Mozambique. Data on gill netting are available, but further information is needed:

- patterns of attendance by fishermen at nets;
- duration of netting and factors that determine this;
- timing of netting, especially diurnal/nocturnal patterns;
- methods of monitoring and controlling the above; and
- incentive options to discourage netting.

At the same time a desktop study could extract all fisheries data relevant to dugongs (especially where bycatch is an issue) and integrate this with any primary data collected.

- **Socio-Economic Study of Archipelago Fisheries (Category 1)**

Knowing the value of the local fishery to fishers is crucial in any proposal for Alternate Livelihoods; fishery limitation measures, or incentive schemes.

- **Fish Traps (Category 1)**

In the Arabian Gulf, fish traps are used extensively in dugong habitat. Made of wire mesh, these baited traps are not only safe for dugongs but the mesh size also allows juvenile fish to escape. Trials of locally constructed traps could be undertaken in dugong habitat. The intention would be ultimately to enforce the replacement of gill nets with fish traps in dugong-sensitive areas.

DEVELOP A ToR AND PROCEDURES FOR A DUGONG PROTECTION UNIT (Category 1)

There is need for a **Dugong Protection Unit (DPU)**, which will serve as a co-ordination and advocacy agency to implement all aspects of the DMP. There are various organisations that could host the DPU, any of the following: **IDPPE, IIP, MICOA, DNAC** and **DNTF**. It is proposed that the DPU be initially located within MICOA (where it would operate under a Steering Committee with representation of all other bodies described above) and that it would later be transferred to the new autonomous Conservation Agency, within the Ministry of Tourism. It would be subject to review by an independent body.

The proposed Action is for the BCSP to assist with:

- Setting up the ToR for the DPU, including its functions as an advocacy group to facilitate implementation of the DMP; maintenance of a monitoring database; cross-ministerial coordination; maintenance of links with international bodies (e.g. Save the Manatee Club of Florida); and a “watchdog” role to ensure that the GoM fulfils its obligations as signatory to various international marine conventions;
- making recommendations on composition and structure of the DPU (at the least, there should be a natural scientist, a social scientist and an educator in the Unit);
- outlining its *modus operandi*, including the roles of its members;
- setting procedures for the independent review and up-date of the DMP by the DPU; and
- defining transparent procedures for the efficient handling of funds for dugong conservation. There is international, bilateral and multilateral funding available for dugong conservation; correct procedures need to be followed to apply for funds, and once secured these will need proper administration by an appropriate body.