Title/Name of the area: MAPUTO BAY (SOUTHERN MOZAMBIQUE)

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Abstract
Maputo bay is rather large shallow bay which has 5 rivers inletting. The bay is diverse, harboring major critical habitats (extensive mangroves, extensive seagrasses beds and the southern most large coral reefs in Africa southern hemisphere) and other alike (sandy and rocky beaches, rough and gentle coastline, etc); massive biodiversity in various taxa for a rather small area. Maputo bay is also an important single fishing ground, the second in Mozambique especially for shrimp. The bay is also home for several species of special concern such as dugongs, dolphins, 5 species of turtles, sharks, whales, seahorses, endangered bivalves, vulnerable seagrass Zostera capensis, Inhaca Island holds 33% of all bird species occuring in Southern Africa, etc. The bay has the marine and terrestrial reserves of Inhaca island and Machangulo peninsula but faces challenges such as having the Maputo port and industries in the western bay (Maputo city), mangrove deforestation, overfishing mainly in the near shore as well as impacts from extreme events such as floods, sedimentation.

Introduction
Maputo bay has an area of 1280 km^2 (Guissamulo 1993) and a depth variation of 8-20 m (Ministério da Defesa Nacional 1986; Nhapulo 2000), most of it being less than 10 m deep (Nhapulo 2000). The bay has a muddy substrate, especially in its western and southern areas; other areas tend to be sandy. Rocky substrates in the intertidal area are prominent on the eastern side of the Inhaca Island, especially in the northern end of island. Water temperature around Inhaca Island varies within the extremes of 20-39°C and the salinity within 30-39 ppt with a mean of 35 ppt.Tides vary from 0.3-3.8 m and are semi-diurnal with two low and two high tides per day. Other meteorological data for Inhaca Island (western Maputo bay) were (in the period 1989-1998, data provided by National Institute for Meteorology, Mozambique): extreme total monthly precipitation 5.4-259.3 mm in rainy seasons (October-March) and 0.0-121.2 mm in dry seasons (April-September); mean extreme monthly air temperature 18.0-31.6ºC in rainy and 14.8-30.8ºC in dry seasons; nebulosity (cloud coverage) had an overall median of 5 in rainy and 3 in dry seasons (scale varying from 0=minimum to 10=maximum nebulosity). Predominant winds were from SW at Inhaca and from NE at parts of Maputo Bay and wind speed in the Maputo Bay/Maputo area was 1.0-3.7 m s^{-1} in rainy and 1.0-3.4 m s^{-1} in dry seasons. Data on nutrients in the water column are scarce, but Paula et al. (1998) found neglible amounts of nitrate in shallow water at the west coast of Inhaca between May and December, while there was up to around 2.5 µmol N l^{-1} between January and April.

Location
Fig 1 The maps below depicts the main habitats within Maputo bay.

Feature description of the proposed area
Mangroves border the banks of the three main estuaries/estuarine systems that open to Maputo Bay, and form a continuous belt along its southeastern banks, from the mouth of the Maputo River to Inhaca island (Figure 1). Mangroves cover an area of about 176 km^2 around the Maputo Bay (Table 1). In most of the estuaries surrounding the bay, mangrove habitats extend c. 15-20 km upstream. The only exception is the Tembe river, where mangroves extend c. 50 km upstream.

Seagrass beds occur in over 38 km^2 of the bay, mainly in the shallow inlets bordering Inhaca Island (Banco do Sangala at Inhaca northern bay, between Inhaca and Portuguese Island and *Saco da Inhaca*)

and the shallows located just southwest of Inhaca. A smaller area is located in the northwest margin of the bay between the mouths of the Incomati and the Espírito-Santo estuaries (northeast Maputo city). The western and southern Maputo bay is less suitable for seagrasses given the existence of fine sediment plume produced by discharge of several rivers (mostly Maputo, Matola, Tembe , Umbeluzi) also associated with extensive mangrove swamps in the shallow southern shores.

Rocky habitats are scarce throughout the bay, covering an area of about 40 ha, and are mainly made up of sandstone outcrops that occur mostly around Inhaca island (see Figure 2 for detail). The areas of consolidated and older sandstones are located at Ponta Mazónduè (Inhaca northeast end), cabo Santa Maria (northern tip of the Machangulo peninsula) and Ponta Torres, whereas rather softer sandstones are common is several spots around Inhaca island.

Coral reefs are even more limited in range occurring in only 3 known locations (Barreira Vermelha, Ponta torres and Baixo Danae), one south of Portinho da Inhaca, at Barreira Vermelha, and the other in the vicinity of Ponta Torres, and totaling an area of 12 ha. A third place in at the bay entrance at Baixo Danae. The once exuberant coral reefs of Portuguese Island vanished during the end of last decade of the 20th century due to dramatic sand accretion. The three sites contain 71 species of corals, most of which, specially at Inhaca, are scleractinian (reef-building) (Shleyer and Pereira, in press). The fauna of Maputo bay specially the rather well known Inhaca Island is rich and diverse, highlighting its importance both for biodiversity conservation and provision of natural resouces for locals communities. Around 26 classes of marine invertebrates have been identified for Inhaca, including 232 families and 965 species. Around 490 fish species are present (Macnae and Kalk, 1969). Eighteen species of echinoderms associated with Indo-pacific coral reefs were recorded. Twenty-five reef fish families were recorded for Inhaca Island. Most of the fish species around Inhaca have part of their life cycle associated with coral communities and the islanders depend heavily on this resource. Therefore the coral communities are important for the local community.

At least five marine mammal species occur at Inhaca, including the endagered dugong, two species of dolphins and two species of whales. Five marine turtlespecies (Turnland 1999) occurs at Inhaca two of which (the loggerheard *Caretta caretta* and leatherback *Dermochelys coriacea*).breed on the eastern shore - The The protection turtle breeding grounds on Inhaca is of particular importance.
In the intertidal zone, 6 species of seagrass and 8 species of seaweed have been recorded. They shelter numerous animals such as worms, sea cucumbers, molluscs, crustaceans, shrimps and fish.

Inhaca provides permanent or transitory habitat for 299 bird species, representing 33% of all birds occuring at Southern Africa, and including shorebirds, birds of marshy areas and forest birds. Some birds are Palearctic migrants, a few are intra African migrants and some are residents (De Boer and Bento, 1999). The Inhaca intertidal zone supports thousands of shorebirds. Direct counts from 1995, 1996 and 1997 recorded 6,566, 5,100 and 8,514 shorebirds respectively. This shows the importance of the island as the most southern flyway for migratory birds on the east coast of Africa. The avifauna of Inhaca does not form a representative sample of the average Mozambican avian community where 78% of species are resident, as only 40% of bird species are resident. This emphasises the role of Inhaca for Palearctic migratory birds and vagrants. Palearctic migrants are most numerous in the littoral zone around the island, while the rarer irregular visitors are more commonly recorded from the littoral zone, swamps and forest (De Boer and Bento, 1999). The forest supports the richest community of birds. Eight bird species recorded on Inhaca are listed as Red Data Book threatened species (De Boer and Bento, 1999).

A small population of dugong are found in sheltered areas on the Inhaca coast in shallow waters close to the coastaline, where they feed on several species of seagrass in the bays and lagoons (Stuart and Stuart, 1995, Fernando et al in press).

The island has wide intertidal areas and nearby sandbanks with a large diversity of fish and marine invertebrate fauna. At least one reef is in good condition, despite sedimentation processes arising from

erosion. For its size the island holds several diverse marine habitats which are mostly represented along large and separated stretches of coastline. Its location in a subtropical region makes it of significant scientific interest. Corals and Mangroves occur in between transitional of tropics and temperate zones. That fact is determinative for the differences among coral and mangrove communities occurring in north and centre of the country. The coral reefs at Inhaca Island are not the most southerly on the east coast of southern Africa as mentioned by Macnae and Kalk, 1969), but they are the most accessible from the shore. Three small fringing reefs occur along the coasts of Inhaca Island in shallow water.

Sandy beaches border the coastlines northwards and southwards of the entrance of the bay, as well as the southwest margin of the bay between the mouths of the Espírito-Santo and Maputo estuaries. Sandy beaches are also common around the western and eastern side of Inhaca and Portuguese islands, as well as between this island and northeast side point on Inhaca (Ponta Mazónduè), where increasing accretion led to the formation of a small Sangala island (known as part of Banco Sangala, Inhaca northern bay) . The sand accretion on the eastern side of Inhaca island, associated with the prevailing inland winds, gave rise to sand dunes reaching an altitude of around 80 metres, tallest at Inhaca's Indian Ocean side. The sandy beaches on the eastern side of the island are nesting grounds for leatherback and loggerhead turtles. These habitats are considered to be of global conservation significance.

Maputo bay produces some 400 tones of shrimp (4% of the total catches of Mozambique) and 2000 tones of fish (Prof. Macia, Pers. com.).

Feature condition and future outlook of the proposed area

Maputo bay is rather well kept on the western side of it - Inhaca and Portuguese island and around Machangulo peninsula and in some estuarires namely Maputo river and at Incomati and around islands of the Incomati estuary (NW end). The western end of the Maputo bay is more transformed due to the development of the Maputo city and its main activities such as Port of Maputo, industries. Main threats to Maputo bay include:

- Deforestation of Mangrove in the western side of Maputo Bay
- -Pollution in western Maputo bay. The pollutants or main drivers of pollution to the Maputo bay or to immediate bay surrounding regions, waters or estuaries are: sewage, microbial pollution and their association with stormwater; waste and litter; port activities including dredging and accidental oil spills while transferring from tankers to the port, agricultural activities and pesticides (impact on water unknown or not measured); industrial activity their untreated of unfiltered waste (Scarlett and Bandeira, in Press)
- Sedimentation from floods,
- Increased activity (from tourism, fisherman) in coral reefs
- Seagrass revolving for collection of clams (Bandeira and Gel 2003)
- Habitat transformation / land reclamation / Mangrove clearing for urban development

Strengths and opportunities for Maputo Bay:

- Inhaca and Portuguese islands are already considered as Zones of Special Vigilance
- Endangered species are present, especially dugongs
- High quality tourism is in place
- There are management plans for Inhaca Island
- There is a good state of knowledge about Maputo Bay (this is the most documented studies area in Mozambique)
- Management authorities in place in the conservation areas.

- The area has high species richness and diverse ecosystems
- The proposed area is part of Maputaland Centre of Endemism
- The proposed area has exceptional aesthetic values
- There are research facilities in place
- There are tourism development plans at some places of the proposed area

Opportunities:
- To involve communities in conservation and co-management
- Tourism and infrastructure development
- Improvement of the livelihood of local communities
- Improvement of the protection of endangered and endemic species
- Better management of the fisheries

Assessment of the area against CBD EBSA Criteria

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.				**X**
Explanation for ranking: -Maputo Bay however rather small encompasses a treatise of interconnected habitats that harbor vast diversity and resources. -The bay is very shallow (10m in average) but also collects fresh waters from 5 rivers. Providing a diversity of both mangrove forests, seagrasses habiats and coral reefs (71 species). -Home to around only 10 dugongs (located at Inhaca Island). Connection with extensive meadows of dugong food seagrass (Holodule uninervis and Halophila ovalis – See Bandeira 2002, Fernando et al. *in press*). -Largest Zostera capensis meadows in the world,recently rated as vulnerable (IUCN Red list) - Other impornt species of special concern (see above) -2nd largest shrimp fishing ground in Mozambique -33% of bird flora of southern Africa (299 species) (De Boer and Bento 2002)					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.				**X**
Explanation for ranking: -Home to Dugongs as associated with important seagrass meadows edible by dugong (Holodule uninervis and Halophila ovalis – Fernando et al in press) -Largest meadow of Zostera capensis in the world (Vulnerable according to IUCN Red List) -Largest coral reefs far south of equator in eastern Africa - Turtles nesting sites, 5 species occur in Maputo bay (Inhaca, Macaneta, Machangulo) -Dolphins -33% of birdlife of southern Africa (299 species), some species of special concern					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.				**X**
Explanation for ranking: -Largest meadow Zostera capensis IUCN Vulnerable seagrass (see Bandeira in press) -Turtles nesting areas -Dolphins					

-High diversity of various groups some vulnerable (southern coral reefs, birds, seagrasses, fish and invertebrates). -299 bird species, representing 33% of all birds occurring at Southern Africa, some of them species of special concern (De Boer and Bento, 1999)					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				**X**
Explanation for ranking: -Increased economic development in the western Maputo bay, focus to Maputo port and industries, relation with pollution -sedimentation from currents and floods -increased activity in coral reefs (fishing and tourism) -Possible over fishing -Mangrove deforestation Seagrass revolving (destruction) for collection of edible clams)					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.				**X**
Explanation for ranking: -Maputo bay is the second largest fishing ground from shrimp in Mozambique. -Highly productive seagrass meadows (Bandeira 2002b) - More than 20 artisanal fish landing areas that provides high numbers of catches -Hihg clams production form rivers banks/estuaries (Incomati river, Espiruto Santo Estuary)					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				**X**
Explanation for ranking: -Inhaca Island: 6 mangrove species, 8 seagrass species, 71coral reefs, 299 bird species, 244 seaweeds species, 5 turtles, dugong, -Estuaries of Incomati river, Maputo river, Estuary of Espirito Santo with high biodiversity. See the Book by Macnae 1995 for more information as well as new book "The Maputo bay Ecosystem – by Bandeira & Paula (going to press) for additional details on biodiversity.					
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.				*X*
Explanation for ranking: Inhaca and Portuguese islands with focus to marine reserves of Inhaca and adjacent Portuguese island Maputo river estuary and Machangulo peninsula					

Sharing experiences and information applying other criteria (Optional)

Other Criteria	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**

Add relevant criteria	**Habitat connectivity**				**X**
Explanation for ranking: -High connectivity of resources with habitats: e.g. shrimp with mangroves, mud and high bay waters (De Abreu thesis) -Fisheries with both seagrasses or mangroves and deep waters of the bay. -life cycle of some crustacean (e.g. Scylla serrata crab) with estuaries and inner bay waters					

Main References

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Maps and Figures

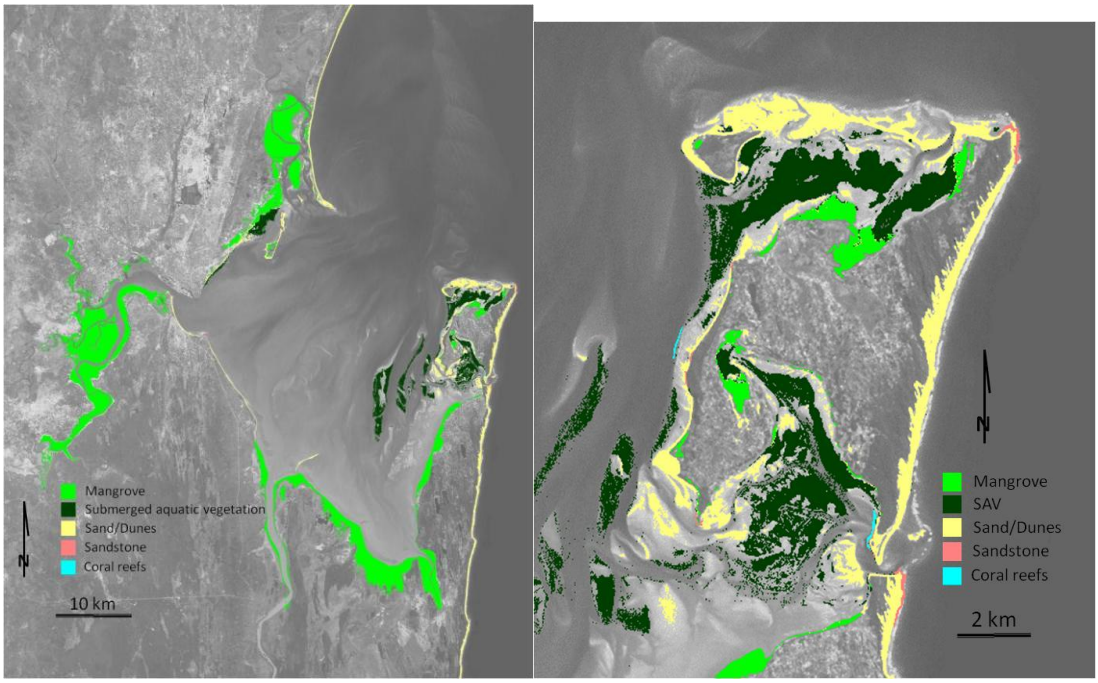

Fig 1. (a) Maputo bay; (b) Inhaca and Portuguese Island (From: The Maputo Ecosystem book)

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