

**Title/Name of the Area: QUIRIMBAS COMPLEX TO PEMBA BAY,
(NORTHERN MOZAMBIQUE)**

Presented by: *Salomao Bandeira** & *Davide Samussone*

*Department of Biological Sciences, Universidade Eduardo Mondlane, Maputo, Mozambique.
sband@uem.mz

Abstract

This assessment covers the extensive coastline of the northern end of Mozambique, from the border with Tanzania at Rovuma river to Pemba Bay (known as the third deepest bay in the world), all home to extensive biodiversity of both habitats and species dispersed in 28 major islands. Main habitats in this region are extensive coral reefs, mangrove forests, seagrass and seaweeds assemblages, rocky and sandy beaches. Invertebrate and fish fauna is very diverse and yet more studies are needed. Main species diversity in this area are: Numerous species of fish, mollusks crustaceans, coral reefs, three species of sea turtles, *Chelonia mydas*, *Eretmochelys imbricata* and *Lepidochelys olivacea* 3 species of Dolphins *Tursiops truncatus*, *Stenella longirostris*, *Sousa pumilea* and *Grampus griseus*, and 3 species of whales *Peponocephala electra*, *Globicephala nacrorrhynchuse* and *Physeter macrocephalus*. Recent oil and gas prospection are new activities that may challenge issues of resource sustainability in this area.

Introduction

Mozambique has one of the long coastline in eastern Africa, with about 2700 km divided biogeographically in three regions, the North dominated by coral reefs and limestone, the center estuarine region and South soft with parabolic dunes (Massinga & Hatton 1996). The Quirimbas Archipelago make a part of the North biogeographic region comprising a chain of 28 islands, housing complex habitats capable of supporting among others some species of special concern such as corals, sea turtles, dugongs, dolphins and some species of whales, sharks and mollusks (Ferreira et al., 2009).

The southern Quirimbas archipelago is home of the Quirimbas National Park, proclaimed in 2003 and comprising 11 islands and mainland territories which five islands (Ibo, Fion, Matemo, Quisiwe and Quirimba) have a long tradition of permanent human occupation. Quirimbas National Park is located within the latitude 12° 00' 00'' E and 12° 55' 04'' S and longitudes 39° 10' 00'' E and 40° 39' 44'' E.

The coastal region of Quirimbas Archipelago does not present significant variations in depth. However entire coastal zone presents an irregular bathymetry with values ranging from 90m to 400 m depth. This variation of the sea depth is responsible for the effect of wave's diffraction along the entire coast reducing the impact and the speed of the propagation and oscillation of the waves. The tidal range here has a highest peak at 3-4 metres.

One of the most important features of the region is the Banco de São Lázaro, which constitute a mountain island at the bottom of the sea. This Archipelago is located in the boundary between Mozambique and

Tanzania where the South Equatorial current meets the Eastern Africa coast with some of the most impressive coral reefs of the Western Indian Ocean, dispersed through a complex of coastal habitats, from Pemba bay in Mozambique to Rovuma Estuary in the border between Mozambique and Tanzania (www.Transmap.com).

Several coastal and marine habitats are found on the Archipelago such as Mangrove forest, Seagrasses, coral reefs, sea turtles, whales, sharks, fishes and Invertebrates.

People's densities in this site is small, less than half of a million people in the entire section of this EBSA site, however the area gets challenged from migrant fishers from neighboring Mtwara (Tanzania) and Nacala in Nampula Province. This paper was aimed to provide Scientific Information to describe this EBSA - Wuirimbas complex –Pemba bay.

Location

The Quirimbas Archipelago is located in Cabo Delgado province north of Mozambique. Located on the boundary between Tanzania and Mozambique being known as a transboundary area with common features and thus calling these two countries to establish marine and terrestrial limits for land use and conservation purpose. As was stated above 28 islands cover the archipelago and additional extensive coastline including the perimeter of Pemba bay. Figures below depicts this long area.

Feature description of the proposed area

The diversity of the Quirimbas complex-Pemba bay EBSA presents extensive marine habitats making this an important area for conservation in the north of Mozambique. This has prompted the proclamation of the Quirimbas national park and latter studies proposed a proclamation of the Rovuma National Reserve (yet to be proclaimed). The mangroves and seagrasses presented in the archipelago and surrounding mainland regions functioning as nurseries for fish and a myriad of invertebrates. The most extensive coral reefs also support approximately 42 genus of fish and 133 species in southern island (Mefunvo, Quisiwe and Quipaco) becoming the fisheries activity in these islands more intensive and the tourism activity. In the Central islands (Ibo, Quirimba, Sencar and Quilalea) 115 genus and 326 species of fishes are found and lately the Northern islands have 41 genus and 134 species of fishes on their entire coral reefs. Coral reefs around Quirimbas islands tend to cover half or more of the perimeter of these islands

The main type of reefs found includes steep walls often found in the Southeast of the islands and shallow coral gardens with gentle slope. The bottom mountain called Banco São Lazaro also support great stocks of fishes which the most abundant specie in this mountain is *Lutjanus bohar*.

Feature condition and future outlook of the proposed area

Studies conducted by Frontier Mozambique from 1996 to 1998 indicated a good condition of reefs, well developed and supporting diverse biota, but at this time some islands such as Rolas, Quirimbas, Quilaluia,

Mefunvo, Quisiwe, and Quipaco showed some evidence of disturbance by anchors, while the reef Quipaco suffered both sedimentation and input of fresh water.

The mangrove forest also experienced changes in area occupied with about 21 km² were lost during the decade 1995-2005 but reversely it gained near 32 km² and 336 km² remained unchanged (Ferreira et al 2009).

The coast of Quiterajo shows an effective increase of the mangrove area as a result perhaps of natural sedimentation accretion on the seaward side and subsequent colonization by mangroves vegetation.

The Pemba bay on the Southern end of this EBSA area shows a different pattern of changes on mangroves forest area (Bandeira et al. 2009, Ferreira et al. 2009). In this region mangrove cover suffered a net decrease especially in the south with a loss of 2 km² compared with a gain of 1 km², for a total of 27 km² (Ferreira et al 2009). This may be due to the proximity of the influence of Pemba town, the largest city in the province and the development of shrimp aquaculture ponds.

The recent discovering of natural gas reserves near the marine protected areas could be the greatest vulnerability and the area acclamation could be the reason for threatening taking in account the construction of infrastructure and people occupation. Sustainable management and balanced development and conservation is needed to preserve the important marine resources most of their considered by IUCN on the Red List. Within the Red List of IUCN there are sea turtles (*Chelonia mydas*, *Eretmochelys imbricate* and *Lepidichelys olivacea*) and the Dugong (*Dugong dugon*), among others

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
<p><i>Explanation for ranking</i></p> <ul style="list-style-type: none"> -Almost the most pristine and diverse coral reefs -Most extensive area of coral reefs in the Eastern Africa -Qurimbas-Pemba is probably a unique highly diverse in Eastern Africa both in marine and coastal habitats 					

- mangrove e.g. Quissanga-Ibo is teh largest (Ferreira et al. 2009)
- High habitat connnectivity as fauna migrate between seagrasses beds, mangroves and coral reefs. More studies are needed still.
- Endless seagrass meadows intermingled with diverse seaweeds (101 species identified, Cravalho & Bandeira 2003).
- Species of special concern include: sea-turtles, potato bass, few dugongs, myriad of invertebrate, dolphins, whales
- Shallow and sudden dept that also enables canyons some with cold water upwelling(eg. Vamizi Island, etc), also potential for coelacanth (*Latimeria chslumnae*)
- Diverse fisheries, less exploited still.
- Important bird areas. Focus to e.g. sooty tern (*Onychoprion fuscatus*)
-

Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.				X
--------------------------------------------------------------	-----------------------------------------------------------------	--	--	--	----------

Explanation for ranking

- Mangroves, seagrasses and coral reefs known worldwide as nurseries, foraging and protection areas for small fishes, shrimps among other organisms.
- Canyons would be important for coelacanth
- Canyons also important for prevention/alleviation of coral bleaching
- Coral reefs harbours rare species such as potato bass
- Seagrass useful to dugongs, That's the dugong edible *Halodule uninervis* and *Halophila ovalis*. Also extensive shallow intertidal areas with both seagrasses and seaweeds.

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

- Shallow areas such as those of Quissanga-Ibo, bay of Palma , Ulombi, etc are important nurseries
- Canyons may probably host deep sea rare species
- Canyons with upwelling that prevent or contain large scale bleaching e.g Vamizi Island
- Mangrove and deep waters also in Pemba bay
- Low people densities would allow more conservation of species of special concern or less common species such as mollusks, megafauna, etc

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

- Migrant fisherman brings artisanal extensive fisheries from neighboring highly populated regions of Mtwara (Tanzania) and Nacala in Nampula province in Mozambique
- Possible intensive tourism in Pemba

<p>-Shrimp aquaculture at expenses of mangrove forests -Prospection for oil and gas -harmful fishing techniques such as using of night fishing using small-sized mesh purse sieve net with a support on a torch (recently learned from neighboring Tanzania)</p>					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.				X
<p><i>Explanation for ranking</i> -Mangroves, seagrasses and coral reefs area presents signs of high productivity of flora, fish and marine invertebrates providing the source of subsistence for local people. Examples include high growth dynamics of seagrasses and extensive edible invertebrates such as mollusks. Edible urchins. More studies area needed still -Numbers and quantities of species of fish supporting the artisanal and commercial fisheries are high. -Size of caught species varies including large fish being caught even in population centre as Pemba bay</p>					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				X
<p><i>Explanation for ranking</i> -High numbers of species per group as documented in several Frontier- Mozambique reports -flora and fish biodiversity is high as document in reports such as Bandeira et al 2009, Bandeira & Gel 2003, Carvalho & Bandeira 2003)</p>					
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
<p><i>Explanation for ranking</i> -Most of the Quirimbas archipelago and indeed important sections of Pemba bay is rather pristine with several quite intact sections. A number of these islands have no water which have prevented people's settlements. -Quirimbas is indeed an archipelago of biodiversity. See also www.transmap.com -The Swavo island south of the Rovuma river estuary also harbor terrestrial wildlife. -Pristine coastal areas, many of this without whatsoever road infraestructure further highlight how remote/pristine most of the Quirimbas is till today</p>					

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
<p><i>Explanation for ranking</i> The abundance of critical habitats (mangroves forests, seagrass habitats and coral reefs) in close proximity enables movements and high production and biodiversity of fauna. However more science on site is needed to further document and compare this.</p>					

References:

Bandeira, S.O.,C.C. F. Macamo, J.G. Kairo, F. Amade, N. Jiddawi and J. Paula (2009). Evaluation of mangrove structure and condition in two transboundary areas in the Western Indian Ocean. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 19: 46-55.

Bandeira SO & Gell F (2003) The Seagrasses of Mozambique and Southeastern Africa. In F. Short and E. Green. *Seagrass Atlas of the World*. World Conservation Monitoring Centre. University of California press. 93-100 pp. ISBN 0-520-24047-2

Carvalho AM & Bandeira SO (2003) Seaweed flora of Quirimbas Archipelago, northern Mozambique. In: Chapman ARO, Anderson RJ, Vreeland VJ and Davison IR (eds). *Proceedings of the XVIIth International Seaweed Symposium*, Cape Town, South Africa. 28 Jan.- 2 Feb. 2001. Oxford University Press. ISBN 019 850742 9.

Ferreira, M. A., F. Andrade, R.N. Mendes, J. Paula (2009). Use of satellite remote sensing for coastal conservation in the Eastern Africa Coast: Advantages and shortcomings (2009). *European Journal of Remote Sensing* - 2012, 45: 293-304.

Massinga A. and J. Hatton (1996). *Status of coastal zone of Mozambique*. In: Lundin, C.G. and O. Lindén (Eds) *Integrated Coastal Zone Management in Mozambique*. Inhaca Island and Maputo, Mozambique, May 5-10, 1996. World Bank and Sida.

Sitoe, A., V. Macandza, A. Gabriel, M. Carvalho and F. Amade (2009). *Biodiversity Baseline of the Quirimbas National Park*. Final report, consultancy. Gestão de Recursos Naturais e Biodiversidade. Faculdade de Agronomia Universidade Eduardo Mondlane.

www.Transmap.ul.fl.pt (2012)

Maps and Figures

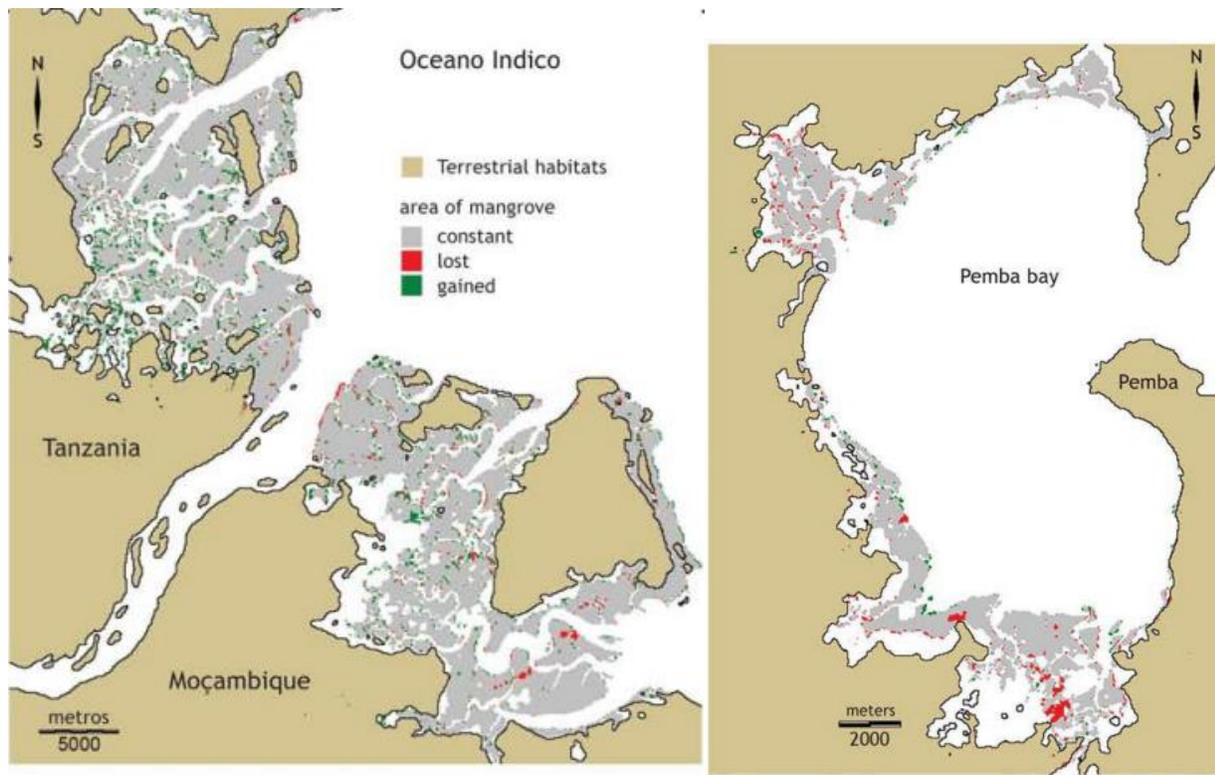


Figure1. Showing the losses of mangroves area around the mouth of Estuary of Rovuma (Left) and the losses of mangroves area in Pemba bay, Mozambique (Right). (Ferreira 2009)

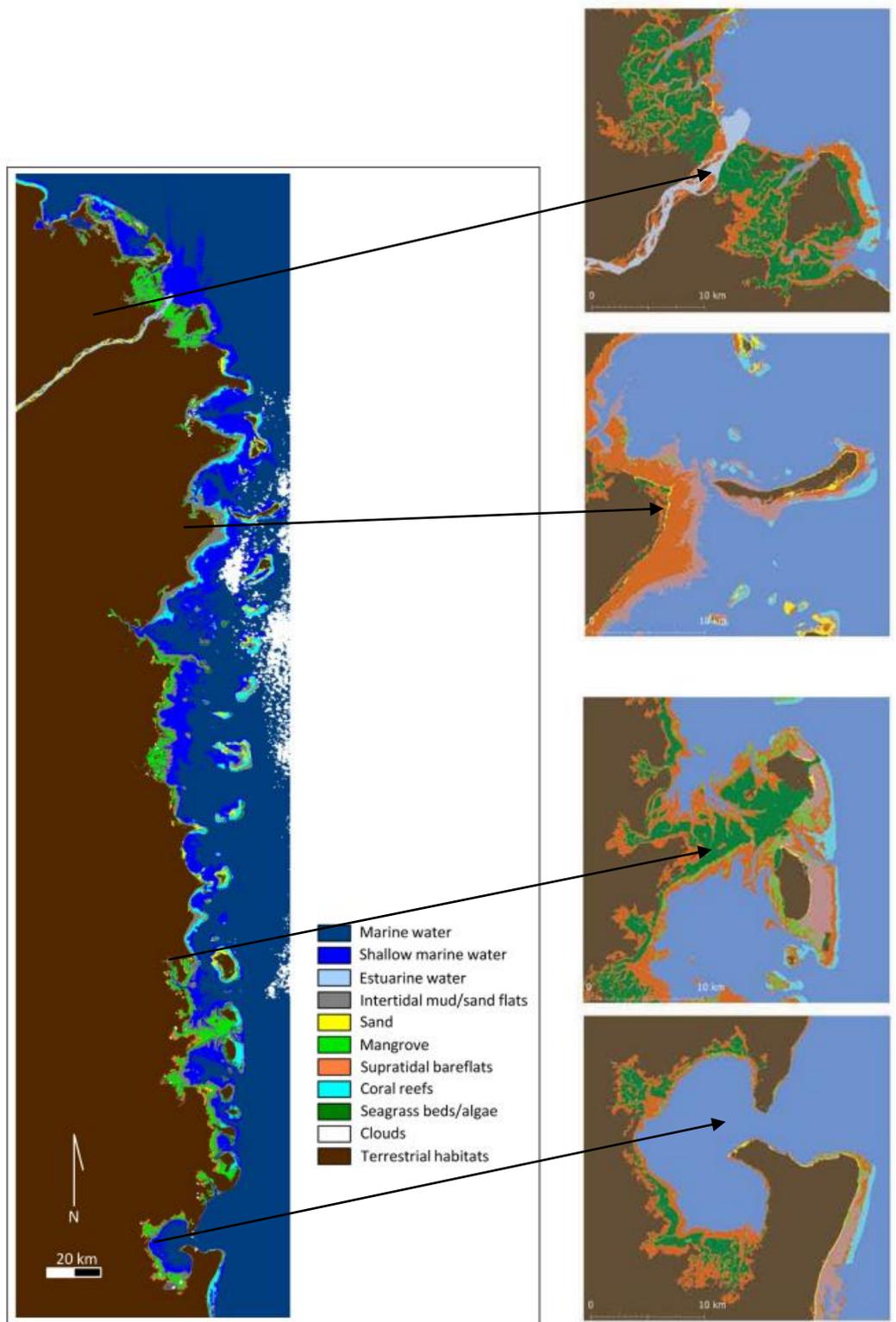


Fig 2. Quirimbas complex to Pemba Bay EBSA

Rights and permissions: photos credits to Ferreira et al 2009 / TRASMAP (Fig 1) and TRANSMAP (Fig 2)