



REGIONAL SEAS

Mario B. Fay:

Maziwi Island off Pangani (Tanzania):

History of its destruction and possible causes

UNEP Regional Seas Reports and Studies No. 139

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Preface

In spite of the uncertainties surrounding the predicted climate changes, greenhouse gases seem to have accumulated in the atmosphere to such a level that the changes may have started and their continuation may now be inevitable.

The environmental problems associated with the potential impact of expected climate changes may prove to be among the major environmental problems facing the marine environment and adjacent coastal areas in the near future. Therefore, in line with the Decision of the Fourteenth Session of the UNEP Governing Council on "Global Climate Change"¹, the Oceans and Coastal Areas Programme Activity Centre (OCA/PAC) of UNEP launched and supported a number of activities designed to assess the potential impact of climate changes and to assist the Governments in identification and implementation of suitable response measures which may mitigate the negative consequences of the impact.

Task Teams on Implications of Climate Change have so far been established for nine regions covered by the UNEP Regional Seas Programme (Mediterranean, Wider Caribbean, South Pacific, East Asian Seas, South Asian Seas, South-East Pacific, Eastern African, West and Central African and the Kuwait Action Plan region).

The initial objectives of the Task Teams are to prepare regional overviews and site-specific case studies on the possible impact of expected climate changes on the ecological systems, as well as on the socio-economic structures and activities of their respective regions.

The regional overviews, are intended to cover the marine environment and adjacent coastal areas influenced by or influencing the marine environment.

The regional overviews, prepared by the Task Teams are planned to be presented to the Intergovernmental Meetings convened in the framework of the relevant Regional Seas Action Plans in order to draw the countries' attention to the problems associated with expected climate change and to prompt their involvement in development of policy options and response measures suitable for their region.

Once the site-specific case studies developed by the Task Teams (impact studies) is achieved, emphasis will be placed on providing assistance to national authorities in defining specific policy options and suitable response measures.

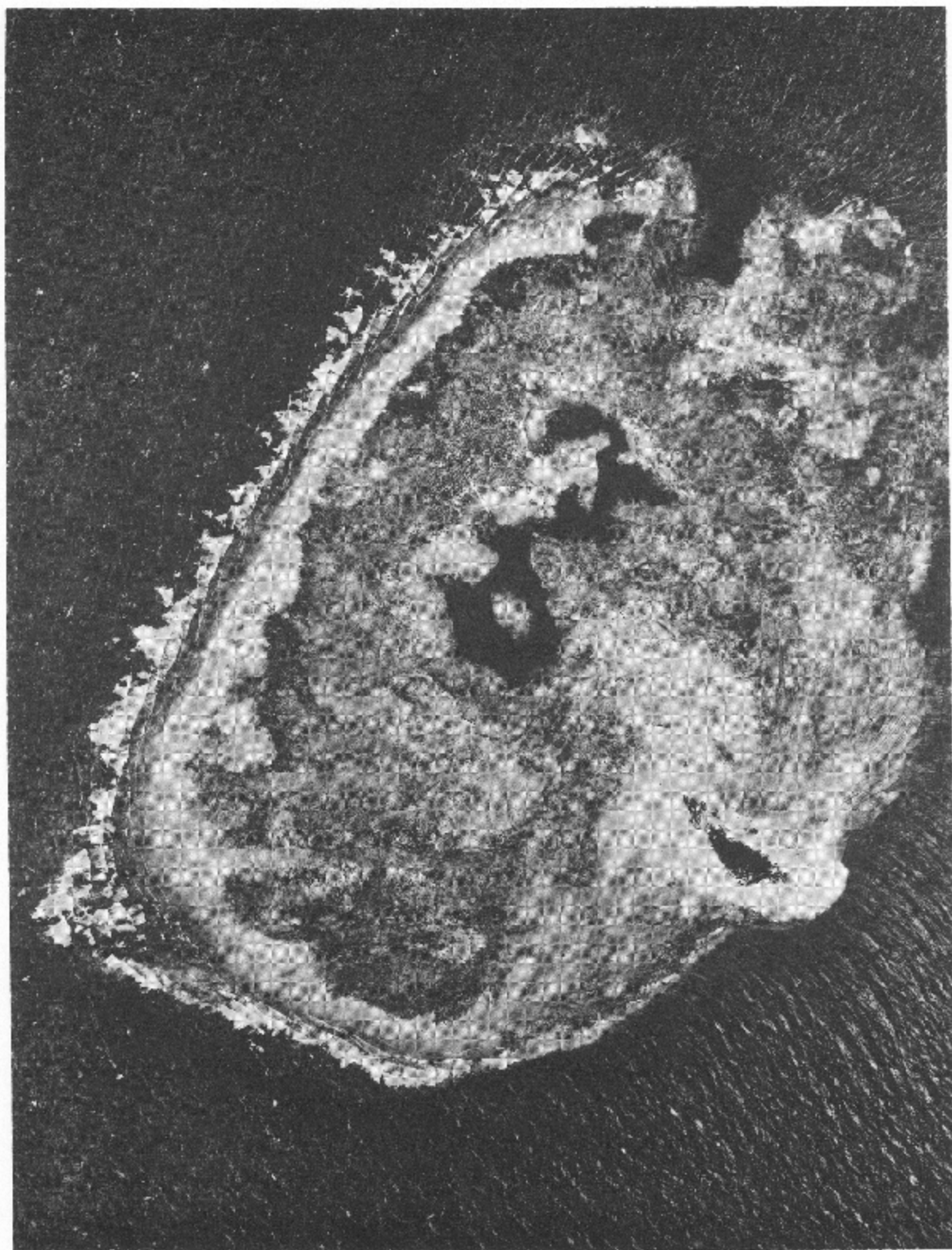
To complement the activities being undertaken by the Eastern African Task Team, a consultant was commissioned to carry out a preliminary study on the disappearance of Maziwi Island off the Tanzanian coast in the early 1980's. The study was undertaken in October 1989.

The tasks of the consultant were to:

- (i) compare aerial photographs from different years of the island;
 - (ii) compile seismic and meteorological data for the critical period;
 - (iii) carry out field work around the Maziwi coral reef in order to ascertain the former position of Maziwi Island; study the present topography of the reef; study the distribution of sand on the reef flat and around the reef; collect samples of sand for laboratory analysis; and estimate current velocities, wave direction and amplitudes around Maziwi Island; and
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- (iv) carry out laboratory analysis; mineralogical and granulometric properties of the sand collected from Maziwi coral reef.

This document is a comprehensive report on the findings of the study as outlined in (i) to (v) above, including conclusions and concrete proposals on further studies on Maziwi and other islands of the Eastern African region which might be subject to similar circumstances.



The Island that disappeared (Maziwi Island)

Aerial photograph of Maziwi Island taken in 1975.
Photo courtesy of Dr. Lutz Werding,

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Introduction

Since at least two decades most of those sections of the shoreline of Tanzania which are built up by unconsolidated sediments have been showing a tremendously increased rate of erosion. Many good examples of this rapid coastline retreat can be studied in the area north of Dar es Salaam (Beach Erosion Monitoring Committee 1982) and between Pangani and Tanga (northern Tanzania). The average rate of coastline displacement for the Dar es Salaam area is estimated to be about 3 metres/yr, in certain places this rate exceeds 5 metres/yr (Fay, in prep.). Along the most developed parts of the coast (i.e. tourist hotel complexes north of Dar es Salaam) this development means a catastrophe to the national economy jeopardizing the Tanzanian efforts of promoting the tourism industry.

Large parts of the backshore area in this region are composed of Holocene terrigenous sands (ancient beach ridges, Alexander 1969). North of Dar es Salaam this belt is up to 0.5 km wide. Pangani town is situated on a more than 1 km wide strip of ancient beach ridges running approximately parallel to the present shoreline. Since these sands are only very little exposed above the present high tide level (centimetres to decimetres), it can be assumed that they formed after the last post-glacial rise of sea level, i.e. after 7000-5000 years B.P. (Seibold & Berger 1982, p.117). These, in geological terms, very young sand accumulations are presently being eroded and redistributed along the beaches and in the shallow parts of the continental shelf. Although a few sections of the coast still show a seaward shifting of the beachline (i.e. portions directly down-drift of interruptions of the beach, which means usually areas north of river mouths and tidal channels), the general trend has reversed from progradation to retrogradation.

Similar observations can be made in the extensive mangrove swamp areas in the estuaries and deltas of the Tanzanian coast. In the Ruvu delta, mangroves are rapidly eroded (pers. comm., A.K. Semesi, University of Dar es Salaam). According to the Fishery Officers in Pangani, all mangrove swamps along the river Pangani estuary presently undergo erosion.

Due to the predominant southeasterly winds, longshore transport along the coast north of Dar es Salaam is commonly directed northwards. Exceptions from this trend can only be observed at strongly embayed sections where the general wave pattern is disturbed by intensive refraction around headlands. According to the observations made by the author and by other researchers (Bryceson & Stoermer 1980), waves generated during the season of the NE-monsoon are not able to reverse this trend significantly.

There has been a controversial discussion among scientists working in Tanzania about the possible causes for the increased rate of coastal erosion. Various factors have been made responsible: Extraction of sand from rivers for construction purposes, destruction of the fringing and barrier coral reefs by dynamite fishing, removal of vegetation from the mangrove swamps, rise of the relative sea level (Beach Erosion Monitoring Committee 1988; Fay & Griffith 1987).

Due to lack of basic data, no satisfactory answer can be given up to now. What is mainly missing is the following information:

- Data on historical shoreline changes.
- A series of topographic maps and air photographs of sufficiently large scale and accuracy to allow analyses of shoreline retreat during the last decades. Air photos are available since 1953, but they do not cover the entire Tanzanian coast.
- Records on the former and present sediment discharge of the rivers (most of them flowing seasonally only).
- Continuous and reliable tidal gauge data of the Tanzanian harbours for the last decades.
- A coastal inventory and a littoral data base, as suggested by Qu  lennec & Ibe (1989), forming a basis for identifying areas which are presently or might be in the near future subject to erosion and for initiating research into such areas.

This study on a small island off the Tanzanian coast ought to be regarded as a first step towards a better understanding of the processes which are presently causing coastal erosion along this part of the East African coast.

Why Maziwi Island?

Maziwi Island (also Maziwe Island) is (or better: was) located at the northern end of the Zanzibar Channel approximately 50 km south of the town of Tanga (northern Tanzania), 8 km southeast of the mouth of the Pangani river (fig.1). Latitude and longitude values are 05 degrees 30'S and 39 degrees 04' E, respectively. The closest settlement is Pangani town, from which the island can be visited by using a boat. Pangani is accessible from Tanga on an all-weather dust road.

Maziwi Island was famous for being the most important single nesting ground in East Africa for three species of endangered marine turtles: *Lepidochelys olivacea* (olive ridley turtle), *Chelonia mydas* (green turtle), and *Eretmochelys imbricata* (hawksbill turtle) (Frazier 1974, Shedd 1974). During the period July to October 1974 more than 25 females nested on Maziwi Island, which was the highest concentration of nesting turtles in Tanzania (Shedd 1974, p.2). Lack of vertebrate predators and only occasional visits by humans (fishermen, who used the island for stop-overs) made Maziwi Island an almost ideal sanctuary for turtles. Hence, the Tanzanian Government intended to protect the island by Game Laws ("Maziwi Island Reserve"). In 1982 it was reported that Maziwi Island was submerged and therefore unsuitable for nesting of turtles (IUCN/UNEP 1982, p.36, Mainoya & Pratap 1988).

Choosing Maziwi Island for a case study on beach erosion processes has a number of merits compared to mainland beaches:

- Since the island was not inhabited by humans, certain causal factors of beach erosion, such as sand extraction, considerable devegetation, and marine construction works, can be excluded.
- The terrestrial part of the island has always been sufficiently small to let people who regularly visited it (fishermen) notify any changes of the beachline configuration. A loss of 50 metres of land on an island with a diameter of only a few hundred metres might be much more conspicuous than the same loss of land along a mainland coast with scattered settlements.
- At least a few scientists (zoologists) visited Maziwi Island for studies, and reliable information can be obtained from their scientific reports.

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