FRONTIER TANZANIA

COASTAL FOREST RESEARCH PROGRAMME

SITE DESCRIPTION AND EVALUATION:

Mkwaja Coastal Mosaic, Pangani District, Tanzania

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THE SOCIETY FOR ENVIRONMENTAL EXPLORATION

AND

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PREFACE

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Visitors and hunters alike regularly make use of the beach immediately south of the Madete estuary as base camp.

2.4.2.5 Water Supply and Management

The bulk of the water used by the residents within the site, ie the cattle herders, is provided by a few of the 19 catchment dams.
The amount of precipitation received by the ranch ensures that most of the dams retain available water all year round.

2.4.2.6 Scientific Research

Numerous botanical collections were made in the area by Peter (in Buyuni, Mkwaja and Sadani), Procter (in Kwamsisi and Sadani), Tanner (in Mkalamu, Serawani, Serewa, Sima), van Rensburg (in Mkalamu), Semsei (Mlisazi), Frazier (Mto Kama), Hannington (in Sadani) and Fisher (in Uvinje).
The Ranch itself has been repeatedly the object of agronomical studies on management (B.Fox,XXX), grazing quality (Kloetzli, XX) and especially on Trypanosomiasis prevention through Tsetse flies control (sterile males release experiment in 1988, Deltamethrin experiment since 1990).
Biological surveys were undertaken by two Frontier expeditions. The first occurred in August and September 1991 and centered mainly on the Sima and Madete riverine forests and on the Mbuyuni dry hilltop forest (Cockle & Dickinson, 1992). The second occurred during November 1991 and explored the Kama mangroves and surveyed the nesting activities of Green turtles on the strip of beach south of the Madete estuary (Clarke & Matthews, 1992). A short third visit in November 1991 (Clarke & Matthews, 1992) concentrated on two small forests of the northern sector of the Ranch (not included in the area here considered).

2.4.2.7 Settlements

No villages are located within the site. The cattle herders live in small settlements near the cattle pens, generally near a dam. There are about half a dozen such settlements distributed to the north and west of the area.
The game rangers live in small isolated huts in the Madete and Mligazi sectors.

2.4.2.8 Hunting

Hunting was widespread and important before 1988. Local residents used to practice subsistance poaching with muzzle loaded "gaboris", and mobile night poaching was carried out on a commercial basis using Land Rovers and spotlights by residents from Pangani. This was particularly developped after the Independance, since a game control unit was based on the Madete under the British Administration. Occasional hunters from Tanga also came to shoot on the Ranch.
The hunting was generally practised by night and the animals (Buffalo, Bushbuck, Waterbuck, Reedbuck, Hatrebeeste, Sable) were shot indescriminately.
In 1988 however, the Ranch demanded that the issuing of licences by the District authorities for hunting on the Ranch be ceased. This demand was based on the grounds that wounded buffalos constituted a serious hazard for the workers on the Ranch. Several incidents had effectively occurred in these circumstances. This request on the

whole has been granted, but some poaching nonetheless continued, sometimes implicating governement officials.
The game being public property, it is perfectly legal to hunt on private land as long as the hunter is in possession of a valid permit from the authorities and that the owner of the land is previously informed about the hunt.
Hunting on the public land is similarly subject to permits for major game. Villagers probably hunt for themselves on a small scale, but no direct evidence of this was found. On the public land, situated near villages and disturbed by wood exploitation, game in much scarser than elsewhere, especially in the more open areas.
Very recently, the Wildlife Division of the Ministry of Land, Natural Resources and Tourism (???) has banned all forms of hunting on the entire territory of Pangani District. This provides legal support for the anti-poaching campaign undertaken by the Ranch Management since 1988.
Elephant poaching and ivory trading was very active even until 1988. Ivory from inland was loaded unto ships from the beaches between Mkwaja and Sadani, then transported to Zanzibar (until 1964) or Mombasa.

2.4.2.9 Bushfires

Although not exactly a land use, bushfires need mentioning. They are almost always of human origins, set by firewood cutters, poachers, or by the occasional foot traveller. The reasons for the setting on fire are not always clear.
Fires annually sweep through one third to one half of the Ranch and the Mkwaja village lands.

2.4.3 SURROUNDING LAND USE

Sadani Game Reserve lies immediately south of the site and the Mkwaja Ranch extends further to the north (cf Map 3). Public land lying to the west holds scattered settlements and shambas along the road to Mkata, but remains otherwise unpopulated and lightly used as a grazing area by the smallholders. Land lying along the coast harbours fishing villages with few surrounding shambas.

2.4.4 CURRENT HUMAN POPULATION IN AND AROUND THE STUDIED AREA

No village lies inside the area, but a few small localized settlements to house the Ranch's personnel occur at cattle stations and at Rangers' posts.
The two neighbouring villages of Mkwaja and Mkalamu (cf Map 2) house respectively about 2000 and 3000 inhabitants.
To the south west the land is largely unpopulated.

The inland population, essentially Mkalamu, is of the Zigua tribe. The coastal settlements however fall under the broad Swahili appellation, with much Arab influence.
On the Ranch and at Mkalamu, there are many Wagogo people who were attracted to the area by the prospects of cattle herding jobs. Moreover, there are a few Wamakonde, Wabondei and Washambaa people.

3.0 EVALUATION

3.1 EVALUATION OF FEATURES

3.1.1 BIOLOGICAL AND PHYSICAL FEATURES

3.1.1.1 Size

The site covers a large area which lies in continuation of the Sadani Game Reserve, itself bordered to the west by the Zaraninge-Kiono Forest Reserve (Ansell & Dickinson, 1992) and to the north by the Wami Delta (150Km^2 of mangroves). This secures a total of 800Km^2 under various protective statuses, an area sufficient to encompass large populations of game and other wildlife, an important issue in the case of rare and wide ranging species such as the Wildebeeste and the Oryx.

3.1.1.2 Diversity

The site includes 16 different habitats pertaining to 5 broad vegetation types (9 vegetation types following White's(1983) classification). Each can potentially harbour different faunistic communities. Mosaic formations are reknowned for their important biodiversity per unit area. Moreover, coastal forests are more and more considered as centers of biodiversity on a regional, national or even international scale, and the two main forest types found on the site are distinctive at a regional level at least, being different from the three neighbouring forest blocks (Zaraninge-Kiono, Genda Genda and Msubugwe).

3.1.1.3 Naturalness

The site has an ancient man-generated mosaic landscape resulting from the influence of fire and, more recently, of the construction of dams.
Within this context, the vast majority of the vegetation included in the area, and particularly the dry hilltop forests, can be considered natural.
The influence of cattle, however, is not negligible. As far as the game population is concerned, it is likely that the cattle present in the west and north is a limiting factor to their numbers, without altogether causing their disparition. Similarly, the species composition and ecology of the pastures are slightly different to what they would be if no grazing occurred. This is not relevant to the southeastern areas, which have been left ungrazed.
The multiple man-made dams scattered within the site, although not of natural origin, are left to be colonized by communities from the natural wetlands which lie in the south east.
The land lying to the north east and not included in the Ranch's territory is also subject to grazing by cattle and, in addition, is heavily exploited for fuelwood (mainly in the Sima and Mafui basin). Stands of intact riverine forest still subsist however along the middle course of the Sima river (Cockle & Dickinson, 1992).

3.1.1.4 Rarity

The East African coast is globally densily populated and all natural and semi-natural habitats are ultimately threatened by the population growth and the demand for land. Much has been irreversibly altered in the last decades. The coast lying north of the Wami to Mkwaja is still practically devoid of population (see also Hawthorne, 1983) and faunistically rich. Of this portion of

land, the area between the Mligazi and Mkwaja, here discussed, is apparently the most diverse. The same concentration of large and medium sized game is not found further north before the Umba Game Controlled Area, just south of the Kenyan border and considerably more inland. Moreover, some of the vegetation types encountered on the site (all pertaining to the Zanzibar-Inhambane zone of endemism), such as the dry and riverine forests, are directly destroyed everywhere and are now rarely found intact.
The area is the only known Tanzanian site for the Giant Brown Bat, a globally rare species, and for a possible new species of Thread snake. It also harbours several other threatened and/or localized species.

3.1.1.5 Fragility

The closed vegetation types, and more precisely the forested areas, are liable to be "eroded" by the frequent bushfires, especially when the grassland has been undergrazed (whether by cattle or game). Such a situation is a typical cause for the disparition of dry tropical forests (Janzen, XXX).
The disparition of this habitat type would lead to that of the forest-dependant species, which include species using forests as refuge.
The grasslands and woodlands are potentially threatened by overgrazing by cattle and subsequent incroachment by bushland.
The vegetation/fauna equilibrium could be easily altered by an excessive proportion of cattle compared to natural game. Areas where game was drastically reduced in favour of cattle showed rapid vegetation changes, the cattle favouring some species and disdaining others, while a species-rich game community has a comparatively even effect (Lind & Morrison, 1974).

3.1.1.6 Typicalness

The area here considered constitutes a classic example of what a large portion of the northern Tanzanian coast was like when population pressures were lower and sisal estates inexistant.

3.1.1.7 Position in an Ecological Unit

The area constitutes a transition between the flat lowlands of the Sadani-Mkwaja strip and the foothills of the coastal escarpment which runs from the Zaraninge-Kiono plateau (Ansell & Dickinson, 1992) to the East Usambara mountains through Genda Genda (Clarke, Matthews & Dickinson, 1992) and Mount Tongwe (Matthews & Dickinson, in prep.).
The area's watershed (Magurui/Mligazi rivers) is independant from that of Zaraninge-Kiono (Wami watershed) and that of Genda Genda and Msubugwe (Pangani watershed). In this respect, the area lies within the buffer between the two main oceanic watersheds of the northern part of the country, thus participating in their ecological distinction. In this way it also constitutes an individual entity distinct from both neighbouring blocks, the Mligazi originating almost exclusively from the North Nguru mountains, as opposed to the Wami and Pangani rivers which also drain the South Nguru and Rubeho mountains, and the East and West Usambara, Pare, Kilimanjaro and Meru massifs, respectively.

3.1.2 ECONOMIC VALUE

3.1.2.1 Forestry

Due to the scattered distribution and small overall number of the timber species, forestry cannot be economically envisaged.

3.1.2.2 Agriculture

The rised lands have proven relatively fertile, but the bulk of the lowlands are not particularly suited to agriculture, although data is lacking on the subject.

3.1.2.3 Cattle Ranching

The woodlands and grasslands have long proven their quality as grazing land as long as cattle breed and numbers are carefully monitored.
Moreover, the area is on the border of a localized pocket free from the East Coast Fever cattle disease (Map of Tanganyika Territory: Cattle densities.Survey Division, Dept. of Land and Mines, Dar-es-Salaam 1942 revised 1947) which elsewhere causes much economical difficulties.
The Tse-tse fly, direct cause of the Trypanosomiasis disease and indirect cause of the Anaplasmosis disease, has been the object of intensive local studies and is currently under specific and "environment-friendly" eradication (Fox, pers.comm.).
Predations by Lions and Spotted hyenas have caused concern in the past with cattle weakened by Trypanosomiasis/Anaplasmosis, and locally "cattle-eating families" of Lions developped, which had to be eliminated or driven out. However, an annual Lion kills toll of 30 heads out of 13,500 is considered as economically acceptable and a total elimination of predators is superfluous.
Encroachment by non-palatable "bush" vegetation after overgrazing and total elimination of fires has been a serious problem in the past in the northern areas of the Ranch (outside the site).

3.1.2.4 Water Supply

With a good rainfall yearly average of 1000mm, its natural wetlands and its 19 catchment dams (with five more planned by the Ranch Management), the area generally contains a year-round plentiful supply of easily accessible open water, used by people, cattle and wildlife alike, and only by wildlife in the southern region.

3.1.2.5 Intrinsic Appeal for Nature Tourism

While the rolling landscape of shallow hills is pleasing to the eye from anyone of the hilltops, the naturalist will found many objects of interest in the variety of habitats encountered.
Individual habitats such as dams and beaches offer the possibilities of a pleasurable sojourn, and forests, woodlands and grasslands constitute ideal settings for guided tours.
The relative abundance of attractive wildlife such as Antilopes, Giraffes and Monkeys could be the key to a successful Nature tourism entreprise.

3.1.3 CULTURAL VALUE

Locally, plants are used for medicinal purposes and wood for fuel and construction.
The southern region, just north of the Mligazi, is considered in

Pangani as a quality hunting ground for meat, especially by the Arab population. Since 1988, these practices are actively fought to ensure the recovery of the game populations and preserve the rarest species.
In a wider sense the area should be considered of cultural importance to the modern population of the entire country, through its typicalness of a disappearing form of landscape and its biological values, as well as through its original attempt to ally nature conservation and partial economical sustainance.

3.1.4 ACTIVITIES LIKELY TO DAMAGE THE SITE AND ITS FEATURES

Exploitation of the thicket clump woodland and riverine forests for fuelwood, if allowed to continue, will seriously and maybe irreversably alter the entire ecosystem of the concerned habitats. Not only will the vegetation and plant species composition be adversely affected, but also the presence of available cover is of prime importance to most local animal species.
Logging in the Mangroves for construction poles has been nationally recognized as a serious cause of coastline erosion and a threat to prawns populations. Mangroves also harbour an original community of plants and animals.

Excessive bushfires ultimately lead to the elimination of stable forest vegetation by successive erosion of the borders, especially when, as is the case here, the mosaic disposition of the different vegetation types lead to a very high border-length/surface-area ratio (Janzen,).
Total elimination of fire would interrupt the maintenance of the woodland and fire-generated grasslands. Ultimately, after an unknown number of years it is believed that most of the area would be covered with woody vegetation and maybe later with true forest, a scenario not compatible with the maintenance of a healthy game population or cattle, but which could be of interest to Forestry oriented bodies.

Unchecked cattle numbers would lead first to the weakening of the wild grazing community, then to their possible eradication through intense competition. The grazing by cattle only, with plants preferred and others disdained, alters the herbs species composition towards a loss in species diversity (dominance of "unpalatable weeds"). Tree species regeneration and dispersal could also be affected by the rarefaction or disappearance of seed-dispersing animal species. Heavy overgrazing leaves the ground poorly covered by grasses or even bare through direct consuming and intense trampling, and this in turn prevents fire from controlling the spread of "bush" vegetation over grassland.

Uncontrolled hunting has a number of negative effects. It weakens the aimed game population in general, with as a possible result population explosions of unhunted competitor species (unlikely in the present case). It could cause fatal weakening (beyond the viable level) of rare species populations such as the Oryx, the Sable or the Elephant. The elimination of large predators would cause total disregulation of the population stability of most animal species.
Another direct result of bad poaching is the accidental wounding of game which, among other effects, then become particularly dangerous, especially in the cases of Buffalos and large cats.

Further settlements around dams would limit the access of wildlife to watering points and thus hinder the maintenance of healthy animal populations.

Other potential damaging factors are excessive off-road driving and too conspicuous human manifestations.

3.2 POTENTIAL VALUE OF THE STUDIED AREA

3.2.1 POTENTIAL CONSERVATION VALUE

The site has a high conservation value. Typical coastal mosaic, and especially its forest component, are internationally threatened. The conjunction of an unpopulated area of coastline and corresponding hinterland with the presence of such vegetation assemblages and that of a rich fauna including rare species constitute an exceptional occurrence.

3.2.2 POTENTIAL ECONOMIC VALUE

3.2.2.1 Development of Nature Tourism

The site holds a good potential for nature tourism.
This could be developped in conjunction with Sadani Game Reserve and the Zaraninge-Kiono Forest Reserve. The Sadani Game Lodge and air srip could be used, as well as the existing private airstrip on the ranch. The possibility of liaisons by air with other Game Reserves and National Parks could be examined.
Day trips from the Sadani Game Lodge could be organised or a lodge constructed on the site in an appropriate setting. Lodging in the local villages, thus involving the local population, could be considered. Transport and guiding services would have to be provided, the guides preferably pertaining directly to the reserve's administration.

3.2.2.2 Potential Agricultural and Commercial Forestry Value

The agricultural potential of the area is not particularly high, except on the more fertile hills, although data is lacking on this subject.
Although a few timber species are present, their low number and scattered distribution make their exploitation uneconomical.

3.2.2.3 Potential Pharmaceutical Value

The pharmaceutical value of the site remains largely unknown, although plants are regularly used by the local Zigua population.

3.2.2.4 Potential cattle ranching value

Economically, this is probably the most viable activity in the area. However, repeated Tsetse fly controls are necessary to the maintenance of high yields.
The question of the possibility of Nature preservation under a cattle grazing regime is debatable, and many hold that the two activities are mutually exclusive. However, the Ranch's past experience has shown that game can coexist to an extent with cattle grazing if vigorous anti-hunting action is taken.

3.2.3 POTENTIAL RESEARCH, RECREATIONAL AND EDUCATIONAL VALUE

Valuable research could be conducted on the site, especially concentrating on the influences of cattle on the vegetation and the wild animal community, habitats mosaic ecology, edge effects, general ecology. The functional ecology of low altitude mosaic habitat has not been much studied in the past, and similarly coastal monsoonal forests remain poorly known.
Recreational and educational values are both high through the quality and originality of the site. Lodging and guiding facilities could be organised locally.

3.2.4 POTENTIAL LAND ACQUISITIONS

An extended management inland to the west, where human density is particularly low, could secure further extents of similar vegetation types and ultimately form a protected "stepping stone" between Zaraninge-Kiono and Genda Genda, along the coastal escarpment.
Similarly, an extension to the north could comprise the whole area of the Ranch up to Genda Genda and Msubugwe and thus secure a protected, although used by cattle, coastal corridor between the Sadani Game Reserve and these forest blocks.

3.2.5 POTENTIAL ROLES OF GOVERNMENT BODIES IN THE DEVELOPMENT OF THE STUDIED AREA

In order to secure the long term future of the reserve on a national level, it would be necessary to involve the Ministry of Land, Natural Resources an Tourism, and the relevant Divisions of the same Ministry, namely, the Game Division, the Forestry and Beekeeping Division, the Agriculture (????) Division. The Ministry of Science & Education (???) could also play an important role in the promotion of research on the site, and the use of the site for educative purposes.

3.2.6 POTENTIAL ROLES OF N.G.O.S AND BUSINESS IN THE DEVELOPMENT OF THE STUDIED AREA

There are ample possibilities for the involvement of various businesses in the development of the area. It would be preferable to encourage the local population to participate as actively as possible in caretaking or related activities.
Similarly, the outside expertise, advice and financial assistance provided by NGOs could be of great benefit to the development and management of the whole structure.

3.2.7 RATIONALE FOR THE ESTABLISHMENT OF MKWAJA COASTAL MOSAIC MANAGED RESERVE

Mkwaja coastal mosaic is an excellent representative of the original north Tanzanian coastline, offering both its typical aspects and more distinctive features such as the particular hilltop dry forests. It similarly harbours a diverse and representative wildlife comprising several rare species in need of protection. These characteristics contribute to give the area both cultural and biological importance at the national and international scale.

The presence of a cattle ranch on the area has brought into question the compatibility of economically viable grazing with the

maintenance of a rich and healthy fauna. The management of the site in the optic of landscape and wildlife preservation allied with economic viability would reflect national concern over environmental issues such as wildlife depredation and land degradation. It could also serve as a original experiment which conclusions could be used constructively for similar projects worldwide, especially if scientifically monitored by concomittent and independant ecological studies.

The development of research facilities on the site would make possible the independant monitoring of the management and contribute to the knowledge and understanding of this type of complex habitat mosaic.

4.0 RECOMMENDED MANAGEMENT OBJECTIVES

1. To preserve the site as a rich habitat complex and a typical coastal landscape (maintain the sample ecosystems in a natural state and protect scenic beauty).

2. To promote and maintain healthy wildlife populations (conserve genetic resources).

3. To preserve the original ecology of the site, both as a separate entity and as part of the global regional and national unit (maintain ecological diversity and environmental regulation).

4. To authorize controlled and light use as cattle grazing land and non destructive tourism (promote a sustainable economical utilisation respectful of the environmment).

5. To carry out non destructive research (promote education, research and environmental monitoring).

6. To repair and prevent human depredation on the site.

7. To initiate awareness, stimulate local participation and offer alternative and viable development perspectives to gain local rural support.

5.0 MAIN FACTORS INFLUENCING MANAGEMENT AND DEVELOPMENT

a) Status: none at present.

b) Control: Ranch Manager (Amboni Ltd), District Natural Resources Officer and Village Councils (allocated by the Government).

c) Resources available: The feasability of implementing any management prescriptions would, at least initially, depend on resources available from Amboni Ltd, the Mkwaja Ranch, the relevant Governments bodies, and other external parties.

d) Local rural development: compensation to the local rural population for immobilised public land is essential for their approval and support of the project, and the long-term survival of the project. This should include the participation of the local Village Governments in the management of the area, the involvement of the local population in caretaking and other tourism-related activities if any, the equitable distribution of benefits if any, and, more important, the introduction of viable alternatives to

economic activities interrupted by the project (ie salt boilers, hunting). This could be implemented by:
- the planting/reafforestation of mangrove species on the coast near the villages, thus providing household fuelwood and quality building poles, as well as preventing coastal erosion and providing habitat to some fished species (such as shrimps).
- the promotion of the use of salt pans rather than the fuel demanding traditionnal boilers, the salt workers maybe grouping in a small cooperative to organize the establishment and maintenance of the pans. Salt pans are already successfully in use south of Sadani, on the Wami delta.
- the easy access at reasonable price to a part of the Ranch's yield of beef meat, to quality young stock and/or to veterinary assistance to compensate for the loss of hunting grounds.

e) Ranch development: compensation to the Ranch for grazing restrictions is essential for the long-term survival of the project. This should include participation in the management of the area, benefits from the game viewing fees and other marginal income, and the assurance of high quality pastures.

f) Tourism development: if visitors are to be attracted to the site, access must be improved and links strengthened with neighbouring centers of tourism (ie the Sadani Game Lodge, Tanga).

6.0 MANAGEMENT OPTIONS AND RECOMMENDATIONS

6.1 RECOMMENDED MANAGEMENT ZONING SYSTEM

In order to take into account all aspects of the management objectives, the following zoning recommendations are forwarded (see Map 5).

A controlled grazing zone: where cattle strictly monitored within the ranch's structure is allowed to graze without undue disturbance of the natural fauna. This grazing zone is limited to a specific area (north west mainly) and to specific vegetation types (woodland and grassland). This zone is also available for nature viewing and research and includes the controlled settlements zones. Along its northern border, it is adjacent to the outlying areas of the Ranch's grazing land.

A nature viewing zone: where visitors can be taken on guided tours. This zone overlaps with the grazing zone, but does not include the sanctuary zones. It is limited to a specific area (east and central part mainly) where it includes all vegetation types (except forests, mangroves, beaches and wetlands which will only be available in part). Local facilities could be organized such as hide-outs on a dam, picnic sites, etc...

Controlled settlement zones: where the cattle herdsmen and current game rangers employed by the ranch are lodged. These are stricly limited in space and locations, only occurring at the present cattle and game rangers' stations, which are to be kept to the minimum. Settlement zones are to be fenced off. No other than the necessary personnel will be entitled to reside in these settlements.

Sanctuary zones: where no visitors or cattle are allowed. These zones are in part defined geographically (along the Mligazi's

northern bank, along the beach between the Mafui and the Madete) and in part following vegetation types (most of the forests, most of the mangroves, most of the wetlands). These zones are to provide total and effective protection of fragile habitats and serve as control areas for the monitoring of wildlife. They are open to non destructive research.

A recovery zone: where a damaged area needs special management, such as the stimulation of riverine forest regeneration on the Sima and the Mafui. This zone is open to research but excludes cattle grazing and nature viewing. Its position adjacent to outlying public land near the Mkwaja village calls for the erection of a strong physical buffer such as a fence.

A turtle management zone: where turtle nesting areas are fenced off against disturbance and predators (1Km strip of beach immediately north of the Kama mangroves).

6.2 PROTECTION AND MANAGEMENT OF BIOLOGICAL AND PHYSICAL RESOURCES

6.2.1 RESERVE STATUS AND ADMINISTRATION

The actual status and administration of the site would have to be modified in order to permit the fulfilment of the management objectives.

The Management Committee would have to include representants of the owner of the greater part of the land, Amboni Ltd, and of a government authority. The latter could be part of the Central, Regional, District or Local Governments, involving these different levels respectively.

For the project to be insured long term viability, the ultimate control of the area would have to be given to the relevant Central Government authority, which would then allocate the management to the Management Committee. No comparable administration structure exists at present on the site.

A National Biosphere Reserve type status would be recommended, managed and administrated by a joint Management Committee composed of the Ranch Manager and the concerned Local Governments, under the responsibility of the Ministry of Land, Natural Resources and Tourism, to which the above Committee's Chairman would be answerable.

The 99 years lease by Amboni Ltd need not be altered if the Company accepts and undertakes to manage in accordance with the management objectives.

6.2.2 MANAGED RESERVE BOUNDARY LOCATION AND MARKING

6.2.2.1 Possible Options

i) Boundary Location:
Enforce the present Ranch's boundary up to the Mkwaja-Kwamsisi road.
Survey an original boundary to include other sensitive habitats.

ii) Boundary Marking
Leave the boundaries unmarked. This requires no maintenance but is

not practical in the field, where guards and the local population have to deal with them every day.
Demarcate the boundaries all around the reserve, using a standard technique.
Demarcate the boundaries where they do not already follow a clear landmark (ie a railway track, a river, a beach), using various methods taylored to the particular configuration and situation of the boundary: fences along borders adjacent to settlements or to outlying pasture/hunting zones around villages, ditches across grasslands/wetlands (taking care not to adversely affect the natural drainage), exotic and non-spreading trees planting along roads, in bushland, etc... All these techniques necessitate some initial financial outlay, but only the fences will need regular maintenance thereafter, and these can be kept to a minimum.

6.2.3.2 Recommended Options

Survey a new boundary to include sensitive areas not already included in the Ranch's territory.
Locate the new boundary as much as possible along natural features to minimise boundary marking.
Mark the remaining boundaries using techniques adapted to the local situation and necessitating only limited maintenance.
Publicize locally the location of the new boundaries through maps and explanations in English and Kiswahili apposed in relevant sites and at the Local Government offices.

6.2.4 MANAGEMENT ZONES

The following possibilities can be considered:
1.Management of the reserve as a single unit, all activities occurring together on the same territory. Considering the number of very distinct and practically exclusive management objectives and practices intended on the Reserve, this could lead to major organization difficulties.
2.Designation of standard practice management zones, ie core area surrounded by buffer zone. This is of limited relevance to the management objectives and is difficult to adjust to the ecological and regional contexts.
3.Designation of management zones taylored to the management objectives and to the regional and ecological contexts. This should greatly facilitate the sound management of the Reserve. The recommended zoning system is as outlined in section 6.1.

The recommended option is the implementation of a zoning system appropriate to the specific resources available and to the management objectives for the Reserve.

6.2.5 REPAIR TO DISTURBED AREAS

The disturbed areas of thicket clump woodland of the Sima and Mafui basin should be left to regenerate naturally, paying particular attention to fire control.
The heavily disturbed areas of riverine forest along the Sima should be replanted with saplings raised from locally collected seeds or directly with local seeds, thus keeping genetic pollution and costs to a minimum. Judicious assistance of the natural regeneration of the forest may take longer than standard reafforestation practices but will be much more relevant to the management objectives and will cost much less.

6.2.6 GREEN TURTLE NESTING SITE PROTECTION

The Green turtles and their nests/hatchlings need active and urgent protection against predation by humans and animals, and against human disturbance in general.
The independant project proposed by Matthews (1992) could easily be adopted and implemented by the Reserve's Management Committee. This project recommends the fencing off of a portion of beach where important nesting concentration occurs. Non-destructive scientific activities and discreet patrolling would be the only activities allowed in the sector.
To optimize costs and effectiveness, the fencing off of most southernly portion of the beach (see map) is recommended.

6.3 HUMAN USE

6.3.1 NATURE TOURISM

6.3.2 CATTLE RANCHING

In order to preserve the natural environment, cattle numbers will have to be strictly monitored and possibly kept below 3000 heads, although this will be best decided by the independant monitoring of the reserve.
Grazing will have to be planned according to the ecological specificities of the pastures.

6.3.3 COLLECTING OF TRADITIONAL MEDICINAL PLANTS

The local traditional healers will retain full rights to collect the plant parts necessary to the local villages' use. However, monitoring of these collecting activities should be ensured, maybe through licences issued to a limited number of local traditional healers, with licences and licencees' activities liable to be checked by the rangers.

6.4 ADMINISTRATION AND PARK MANAGEMENT

6.4.1 ADMINISTRATION

The reserve will have to be administrated by Amboni Ltd, through the Ranch Manager, and the Ministry of Land, Natural Resources and Tourism, through the

6.4.2 ON-SITE GUARDS

A game rangers' force is already in place on the Ranch since 1988. Their numbers may have to be raised slightly to permit the patrolling of the additionnal sensitive areas such as the Sima/Mafui basin, the beaches and the mangroves.

6.4.2 LIAISON

6.4.3 LINKS WITH N.G.O.S AND BUSINESS

6.4.4 LIAISON WITH OTHER GOVERNMENT BODIES

6.4.5 ROAD/TRACK DEVELOPMENT AND MAINTENANCE

Access would have to be ameliorated in order to accept visitors to the site. The coastal road from Sadani needs some repair work done if it is to be used regularly at all, as it would be the case if relations with the Sadani Game Lodge were to be developped.
Rainy season transport is liable to be difficult and could interrupt visits for three months each year.

6.5 RESEARCH, MONITORING AND EDUCATION

6.5.1 RESEARCH FACILITIES DEVELOPMENT

Research being an essential aspect of the management objectives, it is important that researchers visiting the site should be provided basic accomodation.
Initially, camping facilities with access to clean water and regular food supplies from Mkwaja or Mkalamu could suffice.
The use of an all weather and secure building would be essential for the storage of scientific equipment and the undertaking of basic laboratory activities.

6.5.2 EDUCATION FACILITIES DEVELOPMENT

6.5.3 LOCAL CONSERVATION EDUCATION PROGRAMME

6.5.4 SUGGESTED AREAS FOR FURTHER RESEARCH

EXECUTIVE SUMMARY

SITE:	Mkwaja Coastal Mosaic
MAP SHEETS:	Ordnance Survey 1:50 000 Series Y742(D.O.S.422) Edition 3-TSD/OSD 1987 Sheets 149/3 Kwamsisi 149/4 Mkwaja Mkwaja Ranch Boundary Map 1:62,500, Amboni Ltd 1961
GRID REFERENCES:	38°34'40"-38°49'48"E 5°46'40"-5°58'S
LOCALITY:	Pangani District, Tanga Region, Tanzania
STATUS:	Long leased (by private Company) land for most of the site, except the north east zone which has no status.
MANAGED BY:	Amboni Ltd Ranch Manager, District Natural Resources Officer and Village Council.
AREA:	Approximately 246km², distributed in XXXha privately owned by Amboni Ltd, and XXXha of public land.
TENURE:	Private 99 years long lease by Amboni Ltd. Government land allocated to local villages.

SITE DESCRIPTION

An extent of coastal lowlands presenting an exceptional variety of habitats, including five woodland types, two forest types, coastal thicket, semi-arid scrub, grassland, wetlands, saltmarshes, mangroves and beaches. This coastal mosaic complex supports a number of nationally and internationally important species.

RECOMMENDED MANAGEMENT OBJECTIVES

- To preserve the site as one of the best remaining areas of extensive typical coastal mosaic in Tanzania.
- To maintain viable populations of the wildlife present on the site.
- To repair and prevent any human depredation of the site.
- To protect the archeological remains present on the site.
- To facilitate and encourage research on the site.
- To integrate the protection of the site with its economic utilization as cattle grazing land and tourist game viewing park.

MAIN MANAGEMENT RECOMMENDATIONS

- To modify the area's status to enable a joint management of the private and public land zones.
- To organize a sound and clear administrative framework from local to national level.
- Within the area:
    - . To define, mark and maintain clear boundaries,
    - . To define relevant management zones,
    - . To stop and prevent all forms of logging,
    - . To prevent any further human settlements,
    - . To control the lighting and spreading of bushfires,

. To regulate the land uses such as cattle grazing in order to maintain a healthy and stable fauna,
. To stimulate natural regeneration on the logged sites,
. To extend the current ranch game ranger force's role to that of park ranger force.

- To promote the plantation of timber, fuelwood and construction wood species, especially that of mangrove species, around the villages.
- To promote the organization of the saltworks into a medium scale salt pan industry and gradually eliminate the small scale and fuelwood demanding salt boilers.
- To encourage the participation of the local population in the running of the area via education programmes and direct and equitable benefits.

MAPS

1 Location and access on the north Tanzanian coast.

2 Main settlements and tracks.

3 Land tenure and status.

4 Topography and hydrography.

5 Managed reserve boundaries and management zones.

FIGURES

1

2

3

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This document aims to provide a comprehensive description and evaluation of the Mkwaja coastal mosaic and its features, with particular emphasis on the forested areas. Given this information a number of management options and recommendations have been suggested, having in view the protection of the relevant biological characteristics. It is hoped that these will be taken into account and contribute to the formulation of future management policies for the site.

1.2 NATIONAL AND REGIONAL BACKGROUND

Tanzania has 13 National parks (totalling 45,230 sq Km), all situated inland, and more than 87,400 sq Km of Game Reserves, of which the Sadani Game Reserve is the only one situated on the coast. The Umba Game Controlled Area and the Selous Game Reserve are the next nearest to the coast, lying about 50Km away.
Under TFAP, the entire extent of mangroves are moreover protected.
Nature Reserves only number Mazumbai in the West Usambara mountains and Amani in the East Usambara mountains, the latter under proposed status. Very recently, a private
Tanga Region holds

2.0 SITE FEATURES

2.1 GENERAL INFORMATION

2.1.1 LOCATION AND ACCESS

Site Name:	Mkwaja
Region:	Tanga
District:	Pangani
Nearest Town:	Pangani
Forestry office:	Pangani (Forestry Officer in Mkwaja)
Access:	Accessible by vehicle from the north, south and west, and a few kilometres east from Mkalamu Railway Station. Private airstrip on the Ranch.
Grid References:	38°4'40"-38°49'48"E / 5°46'40"-5°58'S
Area:	Approximately 246km^2
Boundary length:	Approximately 70km, including 7km of beach.
Maps:	Ordnance Survey 1:50 000 Series Y742(D.O.S.422) Edition 3-TSD/OSD 1987 Sheets 149/3 and 149/4 Mkwaja Ranch Boundary Map 1:62,500 Amboni Ltd, 1961
Aerial Photographic Coverage:	

2.1.2 MAIN FEATURES

An area of coastal lowlands, including: several riverine/riparian and dry forests; coastal thicket; Acacia, Doum palm, Borassus palm, thicket clump and dense woodlands; grasslands; semi-arid scrub; wetlands and, along the sea, sand beaches and mangroves.

2.2 ESTABLISHMENT, STATUS, ADMINISTRATION AND MANAGEMENT

2.2.1 HISTORY OF ESTABLISHMENT

The sisal company existed before the First World War and was German and Swiss jointly owned until the war, when it was entirely taken over by the Swiss.
Amboni Ltd acquired a 99 years lease of the Ranch's land in 1952 and cattle was therein introduced in 1954.
The remaining part of the site, in the north east, has always been general public land.

2.2.2 OFFICIAL STATUS

Mostly 99 years privately leased land with some areas of general public land without status in the northeast.

2.2.3 LAND TENURE AND RIGHTS OF WAY

Mostly owned (under long lease) by Amboni Ltd, with some areas in the east and northeast owned by the Government.
The Sadani-Tanga road runs across the eastern part of the area and the Mkata-Mkwaja road along the northern border. Both are public rights of way and regularly used.
Public tracks opened and used by loggers are found on the public land.
Many private dirt tracks are located inside the Ranch's boundary and are used daily by the Ranch's personnel (see maps 2 and 3).

2.2.4 MANAGEMENT AUTHORITY AND CURRENT MANAGEMENT

The greatest part of the site is currently managed as cattle grazing land by the Ranch Manager, under the direction of Amboni Ltd. The southeastern part however, is not used for grazing but left untouched.
The number of cattle in the area, the southern part of the Ranch, has fluctuated between 1500 and 2500, but the current Management is set on about 3500 heads in the future, although these will not be permitted to graze in the southeastern part.
A new form of near specific Tsetse fly control using Deltamethrin was implemented in the area in 1991.
The forested public land (Sima and Mafui riverine forests) is managed by the District Forestry Commission. The rest of the public land is under the responsibility of the Village Council but no management is actually practiced.

2.2.5 SITE DEFINITION AND BOUNDARIES

2.3 ENVIRONMENTAL FEATURES

2.3.1 PHYSICAL ASPECTS

2.3.1.1 Climate

The climate is of typical coastal affinities over most of the area, receiving around 1000mm/year of rainfall, in two definite rainy seasons: the "long rains" in April-May and the "short rains" in November-December. Dry months (February, June, July and August) receive less than 50mm, but are rarely totally without precipitations (cf Figure 1).
Some areas in the south receive much less and are affiliated to the

Somali Arid Zone which occurs locally between Sadani and Mkwaja.
On the Ranch's headquarters, 5km north of the northern boundary, the annual rainfall varied between 500mm (in 1970) and 1700mm (in 1961) from 1955 to 1979, with an average of 1000mm.
Temperatures are highest in March and lowest in July and August. Maxima vary from 28C to 32.2C and minima from 20.5C to 23.7C (cf Figure 2).

2.3.1.2 Hydrology

The site lies between the rivers Mafui to the north and Mligazi to the south. The shallow hills included in the area are catchment reliefs for the Mafui, the Sima, the Madete and the Kama, all seasonal. The Magurui crosses the area from west to east, disappearing in the central lowlands before draining into the Ocean.
The area forms part of the Mligazi watershed, which originates in the north Nguru mountains.
The mangroves are concentrated around the mouths of the Magurui and the Kama, with further secondary patches at the mouths of the Madete, Sima and Mafui.
19 rain catchment dams have been built within the area during the last 35 years, and five more are planned. Most of them have available open water all year round. They are not emptied or cleaned, but occasionally burst under heavy rainfall and need constant maintenance.

2.3.1.3 Geology

The site lies on marine jurassic coralliferous limestones (Kent et Al, 1971).

2.3.1.4 Soils
The lowlands are characterized by a thick layer of "black cotton soil" rich in clay and silt, over sandy alluvium.
The shallow hills have a light fine-grained sandy soil.

2.3.1.5 Altitudinal Range

Altitude rises from sea level to 100m on Bohomera Hill in the north and on the northwest range near Mkalamu (cf Figure 4).

2.3.2 BIOLOGICAL ASPECTS

2.3.2.1 Habitats

Acacia woodland	5000ha?	
Doum Palm woodland	4000ha?	
Borassus Palm woodland	200ha	
Thicket clump woodland	3000ha?	
Dry woodland scrub	5500ha?	
	Total wooded grassland	17,700ha
Dense woodland	200ha?	
Intermediate woodland	50ha	
Coastal thicket	2000ha?	
Dry coastal forest	250ha	
Riverine forest	100ha	
Riparian gallery forest	100ha	
Mangroves	1000ha	
	Total closed vegetation	3,700ha

Grassland	3000ha?
Semi-arid scrub	50ha?
Wetland	100ha?
Beaches	50ha (variable)
Mudflats	1-20ha (variable)
	Total open vegetation 3,200ha

Note: all surface areas are approximate.

2.3.2.2 Flora

i) Vascular Plants

No extensive collection was undertaken, but some scattered data is available from the forests (Frontier-Tanzania Expedition August-September 91, and pasture research by Pr Kloetzli involved the identification of most pasture herbs, shrubs and trees (see Appendix XX).

Numerous botanical collections were made in the area by Peter (in Buyuni, Mkwaja and Sadani), Procter (in Kwamsisi and Sadani), Tanner (in Mkalamu, Serawani, Serewa, Sima), van Rensburg (in Mkalamu), Semsei (Mligazi), Frazier (Mto Kama), Hannington (in Sadani) and Fisher (in Uvinje).

Four species of epiphytic Orchids were recorded (*Microcoelia spp*, XXX, XXX) and the typical coastal scrub species *Vanilla roscheri*.

ii) Non-vascular Plants

No data available.

iii) Vegetation Communities

Apart from the natural pasture communities undertaken by Kloetzli between 1974 and 1980, basic vegetation survey was carried out by Frontier-Tanzania in 1991.

Lowlands around the estuaries are covered by mangroves with the species *Ceriops tagal*, *Bruguiera gymnorrhiza*, *Rhizophora mucronata*, *Avicennia marina* and *Xylocarpus granatum* (Clarke & Matthews, 1992).

Several woodland types cover most of the grounds, dominated by *Acacia zanzibaricus* and *Hyphaene thebaica* with *Euphorbia candelabrum*. Some restricted areas of lowlands near water courses support important populations of *Borassus aethiopium*. These are referred to by White (1983) as Zanzibar-Inhambane wooded grassland.

Riparian vegetation comprises typical riparian species such as XXX.

A band of intermediate woodland (apparently White's transition woodland) borders the Sima riverine forest to the north, with scattered woodland tree species over dense populations of forest species on poor sandy soils (see figure 6).

Dry forests on the hilltops are dominated by XXX, with abundant *Encephalartos hildebrandti*, and several Euphorbs *Euphorbia tirucalli*, *Euphorbia sp*???. Two epiphytic Orchids (*Microcoelia sp* and XXX) are also found in these forests, along with the climber fern *Microsorium sp* (see the figures 7 and 8).

Riverine forest along the Sima has a vegetation comprising both riparian and forest species. Both of these forest types correspond to White's Zanzibar-Inhambane undifferenciated forest.

Extensive coastal thicket (White's Zanzibar-Inhambane evergreen thicket) occur both on the lowlands and on the hillsides in some places, with scattered *Adansonia digitata* and *Encephalartos hildebrandti*, *Euphorbia candelabrum*, *Euphorbia tirucalli* and the localized occurrence of *Vanilla roscheri* and XXX (other large epiphytic orchid).

Edaphic grassland studded with thicket (White, 1983) covers extensive areas of lowland to the east.

The shallow hills to the west are covered with dry woodland scrub of thorny species (White's Zanzibar-Inhambane scrub woodland).
In the southern lowlands the Acacia woodland thins out into open grasslands.
Patches of semi-arid scrub occur in the extreme south, in some areas contiguous with the Sadani Game Reserve.
Wetlands are regularly scattered throughout the area, many having permanent open water all year round. Brackish wetlands occur to the south east, with lush *Phoenix reclinata* formations bordering deep ditches.

iv) Vegetation Structure

The structures of the three main closed vegetation types are summarized in the table below (see aso the figures 3, 4 and 5):

	Forest		Coastal thicket
	dry	riverine	
Canopy type	s.evergr.	evergr.	evergreen
Canopy height	12-20m	20-25m	5-8m
Canopy cover	80-90%	50-90%	50-90%
Canopy density	medium to low	high	medium to high
Lower stratum height	6m	10m	-
Lower stratum cover	20-50%	40-70%	-
Shrub layer height	2-3m	2-3m	-
Shrub layer cover	30%	10-20%	-
Herb cover	20%	0-10%	0-10%

The structure of the other habitats can be succintly described as below:
Acacia zanzibaricus woodland: The woody vegetation is deciduous, with a sparse to very sparse canopy 5-10m high over dense grass and small shrub cover.
Doum Palm woodland: The woody vegetation is semi-evergreen, with scattered shrubs and Acacias and prominent 5-15m *Hyphaene thebaica*. The grass layer is continuous and dense.
Borassus Palm woodland: A high and dense grass layer, with a few clumped evergreen bushes and scattered *Borassus aethiopium* up to 25m high.
Thicket clump woodland: A very heterogeneous formation comprising grassland and small scattered thickets every 20-100m. These thicket clumps are organised around 1-10 major 10-20m woodland trees under and around which are grouped 2-8m shrubs and a few lianas. Canopy density is high and ground cover practically absent inside the clumps.
Dense woodland: A dense formation of evergreen sclerophyllous trees forming a broken 10-15m canopy over a very dense evergreen shrub layer.
Intermediate woodland: A scattered layer of 10-12m deciduous trees providing very thin and broken canopy over a layer of dense semi-evergreen shrubs.
Dry woodland scrub: A formation of densely scattered and mainly thorny small trees and shrubs over grassland.
Semi-arid scrub: A formation of thinly dispersed small mainly

thorny shrubs over poor grassland or almost bare ground.
Wetlands: An open formation of rushes and sedges and aquatic vegetation in the water.
Mangroves: A mainly closed monostratified and evergreen formation of small bushy trees up to 5m high.
Beaches and mudflats: A practically bare habitat, with some scattered halophytic herbs and shrubs where silt accumulates.

v) Vegetation Components of Importance to Other Biotic Groups

All vegetation types harbour distinctive animal communities, however, some components deserve particular attention:
. closed vegetation, from thicket clumps to forests, acts as a refuge for nocturnal animals during the day, and against predators and bush fires. They are the exclusive home of the Red duiker, the Elephant shrews, the Large slit faced bat, the Sykes' monkey and the Black and white colobus.
. fruit trees are vital food sources for many mammals, including Vervets, Sykes' monkeys, Epauleted bats, Rousettes, Bushbabies, Squirrels and many bird species.
. grasslands are notorious for the abundance of mammals they can harbour, especially of the species considered as "game".
. wetlands, including mangroves and beaches, are the key to the presence of many water birds (the African fish eagle, the Woolly necked stork, the Malachite kingfisher, the Yellow beaked stork, the Little grebe, etc...) and of several mammals (the Hippopotamus, the Marsh mongoose, the Waterbuck, etc...), and are widely used by other species as drinking points. Wetlands are also the centers of most of the Amphibian community.

vi) Natural Disturbance to Vegetation

Natural causes account for few disturbances. However, the following can be noted:
Some small scale tree damage is regularly caused by Elephants in all habitats, especially noticeable in dense woodland and dry forests.
The riparian zones along the seasonal riverbeds are subject to the current flow during the April-May long rains, and numerous tree falls can be noted on the banks, especially on the outside of meanders.
A concentration of tree falls was noted on the eastern edge of the Mbuyuni dry forest, presumably caused by the prevailing eastern winds on a regressing area of forest.
Fire disturbance is practically never of natural origin.

2.3.2.3 Fauna

i) Mammals

XXX were noted in the area, by the Frontier-Tanzania expedition (Cockle & Dickinson, 1992) and by the Ranch's personnel. The area harbours many game species as well as less conspicuous small mammals, some of which are considered rare in their range.
Some species of interest are listed below.

Internationally scarse:
- Elephant (*Loxodonta africana*)
- Oryx (*Oryx gazella callotis*)
- Sable (*Hippotragus niger roosevelti*)
- Greater Kudu (*Tragelaphus strepticeros bea*)
- Eland (*Taurotragus oryx pattersonianus*)
- Lichtenstein's hartebeeste (*Alcelaphus lichtensteini*)

Bohor reedbuck (*Raphicerus melanotis*)
Burchell's zebra (*Equus burchelli boehmi*)
Oribi (*Ourebia ourebi*)
Hunting dog (*Lycaon pictus*)
Sykes's monkey (*Cercopithecus albogularis*)
Tanzanian black and white colobus(*Colobus angolensis palliatus*)
Zanzibar galago (*Galago zanzibaricus*)
Black and rufous elephant shrew (*Rhynchocyon petersi*)
Large slit-faced bat (*Nycteris grandis*)
Silver bat (*Glauconycteris argentata*)
Persian leaf-nosed bat (*Triaenops persicus afer*)

Only known locality in Tanzania:
Giant brown bat (*Scotophilus gigas*)

Red Data Book species are the Elephant (vulnerable), the Hunting dog (endangered), the Zanzibar galago (vulnerable) and the Black and rufous elephant shrew (rare).

The Hunting dog and Oryx were sighted in 1988 but not since. Wildebeeste, Eland, Greater Kudu and Zebra are known to move across the Mligazi between the Ranch and the Sadani Game Reserve. Elephants only occasionally visited the Ranch until 1990, but now they seem to stay for much longer periods at a time.

ii) Birds
XXX species were recorded from the site but many more are probably present, which need to be surveyed. None are Red Data Book species, but a few deserve mention.

Grey heron (*Ardea cinerea*)
Yellow billed egret (*Egretta intermedia*)
Night heron (*Nycticorax nycticorax*)
Avocet (*Recurvirostra avocetta*)
Spotted thicknee (*Burhinus capensis*)
Ground hornbill (*Bucorvus leadbeteri*)
Red capped robin chat (*Cossypha natalensis*)

iii) Reptiles
XXX species have been recorded from the site. Those of interest are noted below.

Possible new species:
Thread snake (*Leptotyphlops sp*)

Internationally scarse:
Green turtle (*Chelonia mydas*)
Nile crocodile (*Crocodylus niloticus*)
Sand lizard (*Heliobolus spekii spekii*)

Two species are mentioned in the Red Data Book: the Green turtle (endangered) and the Nile crocodile (vulnerable).

iv) Amphibians

v) Fish
No data available.

vi) Invertebrates

Invertebrate collections were undertaken in the dry, riverine and riparian forests (Cockle & Dickinson, 1992). The resulting identifications are pending.

2.4 CULTURAL, LAND USE AND SOCIO-ECONOMIC FEATURES

2.4.1 CULTURAL FEATURES: ARCHEOLOGICAL REMAINS

Pangani District holds a number of Swahili archeological remains, some of which are of importance. The coast south of Mkwaja shows an outstanding concentration of 17th-19th century ruins and tombs. In Mafui, at the mouth of the Mafui river, there are the ruins of a remarquable small mosque of the 15th-17th century. At Uzimia, near the mouth of the Madete river, there are several 17th-19th century graves scattered in the bush and ruins of a 15th-16th century mosque and 16th-19th century houses. Finally, at Buyuni Kuu, there are the remains of another mosque and several 18th century graves. All these archeological sites have been looted to various degrees, used for stone quarries or depleted of many of their decorative chinese bowls (see "Report on the historical monuments of Pangani District" and A.A.Mturi's "A guide to Tongoni ruins", 1975).

2.4.2 PAST AND PRESENT LAND USES

2.4.2.1 Forestry

The dry hilltop forests, all situated within the ranch's territory, have not been exploited so far and are in good to excellent condition.
Forested areas situated near the ranch's cattle herders' settlements have been lightly exploited for firewood.
The riparian and riverine forests and the thickets situated on the public land have been exploited for firewood, destined to the local villages and salt boilers. Timber extraction, if present, is limited by the small quantity and scattered distribution of timber species.

2.4.2.2 Agriculture

No agriculture has been known to occur recently on the site, except the personal gardens of the cattle herders, which are of limited extent.

2.4.2.3 Pharmaceutical

Pharmaceutical use of the site is still widely unknown but plants are regularly used for medicinal purposes by traditional Zigua healers in Mkalamu. The cattle herders' community, not being of a local tribe, probably has a less extensive knowledge and use of the plants.

2.4.2.4 Tourism and Recreation

Tourism and recreation is practically inexistant and limited to the personal visitors to the Ranch's headquarters and the occasional Amboni Ltd staff members. Recently, people from Pangani and Sadani have enquired about game viewing tours on the Ranch.
Hunting permits are sometimes issued in Pangani for game hunting on the site, despite the Ranch Management's request to cease issuing such licences.