

THE ECOLOGY AND CONSERVATION OF THE ARABUKO-SOKOKE
FOREST; SOME INTERIM HIGHLIGHTS.

BY

JANET A. AWIMBO

AND

SIMON N. WAIRUNGU

FOREST ECOLOGY DIVISION, KEFRI.

A paper presented during the First Annual Conference of the Kenya Forestry
Research Institute; 17th - 18th October, 1990.

1.0 INTRODUCTION

The Arabuko-Sokoke Forest in Kilifi district is one of the last remnants of lowland forest on the East African coast (Kelsey and Langton, 1984). It covers an area of approximately 42,000 hectares; 4,330 of which comprises a gazetted Nature Reserve. It is the largest of Kenya's coastal natural forests within the Ecozone III with an average rainfall of 800 mm which tends to increase in North-west and South-east direction. Mean temperatures are high, ranging from 24°C to 30°C. The diverse soils vary between white to pale-brown sandy soils and the red, lateritic soils characteristic of the Magharini Ridge (Kelsey and Langton, 1984).

For hundreds of years, the forest was the source of timber for furniture, boat building and other construction material to the Arabs and local Giriama people, but this was on a smaller scale. However, from early to mid 20th century, there was increased exploitation of the forest for timber by European merchants to supply their market locally and abroad. There was also increased utilization of the various forest products due to the increasing population of Giriama and Arabs, hence increased local demand for construction poles, wood for boat-building, firewood, gum copal, vines and medicinal extracts (Kelsey and Langton, 1984).

Clearing of the forest for cultivation and establishment of exotic plantation (compensatory forestry) has also contributed to an overall reduction in the forest size under natural vegetation. This reduction has called for strict rules governing the legalised activities in the forest by the Forest Department. Harvesting of timber has been declared illegal and foresters supervise dead-wood collection outside the nature reserve and guard against theft.

2.0 THE COMMUNITY STRUCTURE OF THE FOREST

The structure of the forest community is diverse and its physiognomy ranging from lowland rainforest through woodland to areas of thicket vegetation. Previous workers have classified the vegetation into various types based on the dominant tree species. Moomow (1959) published the first major description of the vegetation types in the forest. He described the distribution of the dominant trees and shrubs and the level of exploitation of the popular tree species. An inventory survey aided by the Canadian Government in

conjunction with the Forest Department (1967) came up with estimated volumes of the various timber trees.

Later studies emphasized on the presence of various vegetation zones or sub-communities within the forest. Britten and Zimmerman (1979) identified four whereas Kelsey and Langton (1984) identified six such sub-communities (Appendix 1). This aspect of zonation is an important ecological phenomenon which governs distribution of the various fauna species such as birds.

The following are the estimated areas covered by the six sub-communities according to Kelsey and Langton (1984:

Habitat type (sub-community)	Percentage of total forest area.
Cynometra-Brachylaena-Manilkara zone	30%
Cynometra thicket	35%
Brachystegia woodland	18%
Afzelia zone	10%
Hymenaea-Manilkara zone	3%
Lowland rainforest zone	5%

The basic criteria for this classification are the dominant tree species. Distribution of the specific tree species appears to depend mainly on the soil type and amount of rainfall eg. the cynometra thicket and the cynometra-Brachylaena-Manilkara zones occur on the red (jilore) soil.

3.0 THE ARABUKO-SOKOKE NATURE RESERVE

The nature reserve was gazetted in the late 1960s by the Forest Department, covering an area of 27 km² (about 2,700 ha) but expanded by 16 km² more (about 1635 ha) in 1979 to its current size of about 43 km² (4330 ha). Despite the exploitation done before it was gazetted, this nature reserve gives the best representation in structure and composition of the forest formation because it has remained undisturbed over years. Five sub-communities of the six described by Kelsey and Langton are represented with the exception of the lowland rainforest zone.

In 1988, a pilot study was launched by KEFRI in collaboration with the

National Museums of Kenya (NMK) and funded by World Wide Fund for Nature (WWF) with the following four objectives:-

- (i) To document the trees and shrubs species found in the Nature Reserve;
- (ii) To investigate the population structure and dynamics of the trees and shrubby species in the Nature Reserve;
- (iii) To sample the forest zone surrounding the Nature Reserve and assess its effectiveness as a buffer zone; and
- (iv) To conduct a socio-cultural survey in the neighbourhood of the forest.

The first two objectives have been addressed and work on the next two is under progress.

4.0 RESULTS OF THE VEGETATION SAMPLING

Table 1 gives the species composition, their population status and range of the dominant size class of a species in the five main vegetation sub-communities of the Arabuko-Sokoke Nature Reserve.

Table 1 - Tree Species Composition and Population Status

Afzelia Zone

Botanical Names	Local Names (Swahili or Giriama)	No recorded	DBH Range (in cm)
<u>Dryptetes reticulatus</u>	Magatho	59	5 - 25
<u>Maytenus undata</u>	Muriakitu	20	5 - 25
<u>Markhamia zanzibarica</u>	?	16	5 - 25
<u>Grewia plagiophylla</u>	Mkone	16	5 - 35
<u>Cassipourea euryoides</u>	Mgome	14	5 - 25
<u>Strychnos decussata</u>	Mkwakwa	13	5 - 15
<u>Haplocoelum trigonocarpum</u>	Mfungatanzu	13	5 - 25
<u>Manilkara sansibarensis</u>	Mngambo	10	5 - 35
<u>Ludia mauritiana</u>	?	9	5 - 15

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Heinsia crinita</u>	Mchocho	8	5 - 15
<u>Polyalthia stuhlmanii</u>	Mwanganjini	5	5 - 15
<u>Hymenaea verrucosum</u>	Mtandarusi	5	5 - 15
<u>Suregada sansibarensis</u>	Mdimu mwitu	4	5 - 15
<u>Pleurostyliia africana</u>	Mtangae	4	5 - 35
<u>Nesogordonia parvifolia</u>	Mrunza	3	5 - 15
<u>Afzelia quanzensis</u>	Mbambakofi	3	35 - 65
<u>Ozoroa obovata</u>	Mkayukayu	2	5 - 15

(b) Cynometra Thicket

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Cynometra webberi</u>	Mfunda	229	5 - 35
<u>Strychnos decussata</u>	Mkwakwa	51	5 - 15
<u>Manilkara sulcata</u>	Mzedzi	18	5 - 15
<u>Brachylaena huillensis</u>	Mhuhu	11	5 - 25
<u>Haplocoelum trigonocarpum</u>	Mfungatanzu	8	5 - 15
<u>Combretum schumanii</u>	Mperu mwitu	7	5 - 15
<u>Ozoroa obovata</u>	Mkayukayu	6	5 - 15
<u>Lanea schweinfurthii</u>	Mnyumbu mwitu	3	5 - 15
<u>Oldfieldia somaliensis</u>	Mbirandu	3	5 - 25
<u>Canthium mombanzensis</u>	Bilcha	1	5 - 15
<u>Encephalatos hilderbrandtii</u>	Mkisapo	1	25 - 35

(c) Cynometra-Manilkara-Brachylaena Zone

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Cynometra webberi</u>	Mfunda	214	5 - 45
<u>Manilkara sulcata</u>	Mzedzi	30	5 - 25
<u>Brachylaena huillensis</u>	Mhuhu	25	5 - 35
<u>Combretum schumanii</u>	Mpera mwitu	13	5 - 15
<u>Ochna sp.</u>	Mdhahabu	6	5 - 15
<u>Croton pseudopulchellus</u>	Myama	3	5 - 15
<u>Salacia sp.</u>	Chako	3	5 - 15
<u>Mundulea sericea</u>	Mthupa	3	5 - 15
<u>Haplocoelum trigonocarpum</u>	Mfungatanzu	2	5 - 15
<u>Strychnos decussata</u>	Mkwakwa	1	5 - 15
<u>Euphorbia sp.</u>	?	1	5 - 15
<u>Encephalatos hilderbrandtii</u>	Mkisapo	1	25 - 35

(d) Hymenaea-Manilkara Zone

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Manilkara sansibarensis</u>	Mngambo	80	5 - 45
<u>Drypetes reticulatus</u>	Magatho	77	5 - 15
<u>Hymenaea verrucosum</u>	Mtandarusi	27	5 - 35
<u>Croton pseudopulchellus</u>	Myama	24	5 - 15
<u>Polyathia stuhlmanii</u>	Mwangajini	20	5 - 15
<u>Maytenus undata</u>	Muriakitu	15	5 - 15

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Carpodiptera africana</u>	Mjilore	15	5 - 25
<u>Cassipourea euryoides</u>	Mgome	7	5 - 25
<u>Brachylaena huillensis</u>	Mhuhu	6	5 - 35
<u>Haplocoelum trigonocarpum</u>	Mfunga tanzu	6	5 - 25
<u>Suregada sansibarensis</u>	Mdimu mwitu	5	5 - 15
<u>Combretum schumanii</u>	Mpera mwitu	3	5 - 15
<u>Asteranthe asterias</u>	Mcherere	2	5 - 15
<u>Grewia plagiophylla</u>	Mkone	2	5 - 35
<u>Pleurostyliia africana</u>	Mtangae	1	35 - 45
<u>Nesogordonia parvifolia</u>	Mrunza	1	5 - 25
<u>Mimusops fruticosa</u>	Mngambo kapehe	1	5 - 15

(e) Brachystegia Woodland

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Brachystegia specifformis</u>	Mrihi	35	5 - 65
<u>Haplocoelum trigonocarpum</u>	Mfunga tanzu	34	5 - 15
<u>Polyalthia stuhlmanii</u>	Mwangajini	11	5 - 15
<u>Cassipourea euryoides</u>	Mgome	9	5 - 15
<u>Margarititaria discoidea</u>	Mukisolala	8	5 - 15
<u>Xylopia arenaria</u>	Mbarawa mwitu	8	5 - 15
<u>Strychnos decussata</u>	Mkwakwa	7	5 - 15
<u>Hymenaea verrucosum</u>	Mtandarusi	6	5 - 25

Botanical Names	Local Names (Swahili or Giriama)	No. recorded	DBH Range (in cm)
<u>Carissa tetramera</u>	Gurura	5	5 - 15
<u>Maytenus undata</u>	Muriakitu	5	5 - 15
<u>Lanea schweinfurthii</u>	Mnyumba mwitu	4	5 - 15
<u>Psydrax robinsianum</u>	Mukisola	4	5 - 15
<u>Suregada sansibarensis</u>	Mdimu mwitu	3	5 - 15
<u>Asteranthe asterias</u>	Mcherere	2	5 - 15
<u>Grewia plagiophylla</u>	Mkone	1	5 - 15
<u>Vitex ferruginea</u>	Mfudu	1	5 - 15
<u>Manilkara sansibarensis</u>	Mngambo	1	5 - 15

5.0 DISCUSSION

Arabuko-Sokoke forest is an important community for the conservation of valuable genetic resources. At present, harvesting of timber is illegal but scars of past over-exploitation are visible especially in the area outside the nature reserve which may take long to recover. However, it is expected that appropriate management and conservation strategies especially after recommendations from the current studies, one completed will encourage quick recovery.

Results of the initial ecological survey in the nature reserve (Table 1) have shown that the major tree species such as Manilkara sansibarensis, Hymenaea verrucosum, Brachystegia specifformis, Cynometra webberi, Afzelia quanzensis and Brachylaena huillensis have restricted distribution. Other lesser trees such as Maytenus undata, Drypetes reticulatus, Croton pseudopulchellus, Polyalthia stuhlmanii and Haplocoelum trigonocarpum have wider distribution.

Afzelia quanzensis and Brachystegia specifformis had the largest diameter but the number recorded was low. Manilkara sansibarensis, Brachylaena huillensis and Hymenaea verrucosum also grow to bigger size and the number recorded was

higher compared to A. quanzensis and B. speciformis. Cynometra webberi is a medium size tree and the number recorded was high but a notable change is the larger diameters recorded for C. webberi in the Cynometra-Manilkara-Brachylaena zone as compared to those in the cynometra thicket. Other species such as Drypetes reticulatus, Haplocoelum trigonocarpum, Strychnos decussata and Manilkara sulcata are small size trees but the numbers recorded were relatively higher.

Besides tourism, the forest has a lot of potential for herbal medicine and wild fruits. These can be exploited economically to generate income especially to the local people who are rich in ethnobotanical knowledge. This calls for proper management plans aimed at sustainability of the resources by the Forest Department.

Despite the strict measures by the Forest Department, some illegal activities continue in the forest though on a smaller scale. Tree poaching on Brachylaena huillensis which is highly liked for curving and construction posts is evidenced by the recently cut stumps especially outside the nature reserve. Pleurostyliia africana has become popular and is poached for its high quality timber. Hunting is another activity evidenced by the presence of traps even in the nature reserve.

In some parts of the forest community, elephants damage trees by debarking or uprooting especially along walking paths, but destruction is on a smaller scale. Elsewhere, elephants have been known to be a limiting factor to natural regeneration eg. in Budongo rainforest in Uganda (Eggeling, 1947).

6.0 CONCLUSION

The current status of the Arabuko-Sokoke forest influenced by both historical and environmental factors, presents a challenge in the conservation of the coastal flora. That the forest should remain sustainably productive, whether commercial harvesting continues or not is the ultimate goal of its managers and environmentalists alike. It is hoped that further and diverse investigations on this forest community will continue.

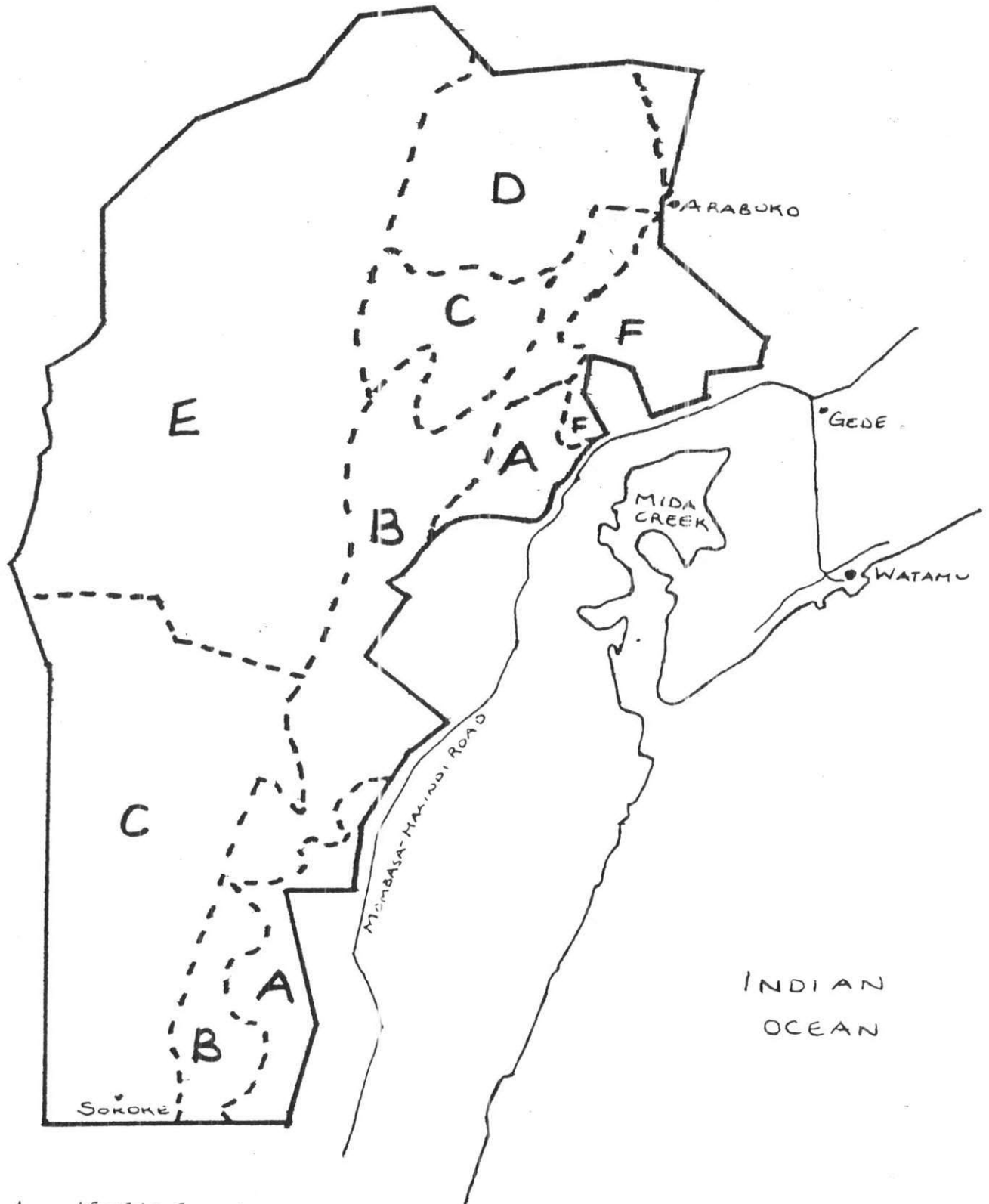
Each study may not provide final solutions to the problems faced, but they will indicate the direction to follow in conserving and rejuvenating the Arabuko-Sokoke forest. Proper management plans are required to ensure sustainable utilization of the forest resources in view of the ever increasing demand amongst the local people for fuelwood, construction poles, etc.

7.0 REFEREES

- Britten and Zimmerman, (1979). The Avifauna of Sokoke Forests. Journal of the EANHNS and National Museums of Kenya.
- Dale, I.R. and Greenway, P.J., (1961). Kenya Trees and Shrubs. Buchanan Estates. Pp. 654.
- Eggeling, W.J. (1947). Observations on the Ecology of the Budongo rain-forest; Uganda. J. Ecol. 34:20-87.
- Kelsey, M.G. and Langton, T.E.S. (1984). The conservation of the Arabuko-Sokoke Forest, Kenya. International council for Bird preservation.
- Kenya Soil Survey (1982). Exploratory soil survey Report No.EI.
- Moomaw, J.C., (1959). A study of the Plant Ecology of the Coast region of Kenya colony. Department of Agriculture, EAAFRO.
- National Environmental and Human Settlement Secretariat, (1984). Kilifi: District Environmental Assessment Report.

APPENDIX I

THE HABITAT TYPES OF THE ARABUKO-SOKOKE



- A Afzelia forest
- B Brachystegia woodland
- C Hymenea - Malnikara forest
- D Cynometra - Malnikara - Brachylaena forest
- E Cynometra thicket
- F Lowland rain forest