

TINLEY

A PRELIMINARY REPORT ON THE ECOLOGY OF THE
PONGOLO AND MKUZE FLOOD PLAINS

With particular reference to the Hippopotamus

23.7.58. to 31.8.58.

by

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PONGOLO FLOOD PLAIN.

10.8.58. to 31.8.58.

Part 1.

Hippopotamus amphibius.

Part 2.

General account of the Environment.

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Part 1.

HIPPOPOTAMUS AMPHIBIUS.

PREVIOUS STATUS OF HIPPO ON THE FLOOD PLAIN

In past times the shooting and killing of hippos in this area was a common occurrence. Though animals are still being periodically killed to-day it is only done by local natives. The increase of hippos on the flood plain has also been helped by the continued shooting of the animals in Portuguese territory, which has caused them to move south onto the Pongolo Flood Plain. After having spent some time talking to old inhabitants of North-eastern Zululand, both European and Native, it is evident that though hippos were commonly seen in parts, they occurred only in very small herds, doubtless because for so long they were shot by anyone at will.

Till 1955 hippo numbers had not obviously increased in the Ndumu Game Reserve. Since then, however, their numbers have increased greatly. It appears that the increase is not in the number of herds, but in the size of the fewer herds. Being hunted in Portuguese territory as much as in Zululand the animals commonly moved between the two areas; resorting to Lake Mpandhleni and other Maputa river pans during the Portuguese close-shooting season (between October and May). The animals also moved up the Usutu into Swaziland, and into some of the larger flood pools in the river's gorge which intersects the Lebombo Mountains.

DISTRIBUTION AND NUMBERS OF HIPPOPOTAMI

From periodic observations made during the last three years, it is evident that hippos are increasing in number fairly rapidly. Although snaring of the animals still continues in many parts, they are no longer harried by European hunting parties. The largest herd on the flood plain is in Polwe Pan (Ndumu Game Reserve) of 32 animals, though this breaks up periodically into two herds of 23 and 9. Mahlanguze Pan has 30 animals in one herd.

Factors governing the distribution of hippo herds in individual pans are:-

- 1) Suitable shallows between 3 and 6 ft. depth; for lying-up during daylight hours.
- 2) Reed beds and marsh areas; or sections of deep water in the pan, where the animals can move to if disturbed by human beings.

During/.....

During the period of low water in the pans this year, a total of 300 hippos were counted on the Pongolo Flood Plain. Below are the numbers of hippo in each individual herd occurring on the flood plain (see sketch Map 1.).

Pans lying along the west bank of the Pongolo river
(reading from north to south)

Banzi Pans	(a) Herd of 26 (including 4 calves) in the Mvutsheni Pan. (b) Herd of 8 in Bantana Pan. (c) Herd of 4 on the north-west edge of Banzi (1 calf). (d) Single animal in northern section of pan.
Nyamiti Pan	(a) 16 (including 2 calves). (b) 5 (1 calf). (c) 10 (2 calves). (d) 6 (1 calf). (e) 28 (3 calves).
Namanini Pan	6 (2 calves).
Ubumbe	3 (1 calf).
Sivunguvungu	11.
Kangazini	17 (2 calves).
Ntonti	15 ? (2 calves).
Mzinyeni	4.
Mayazela	11 (1 calf).

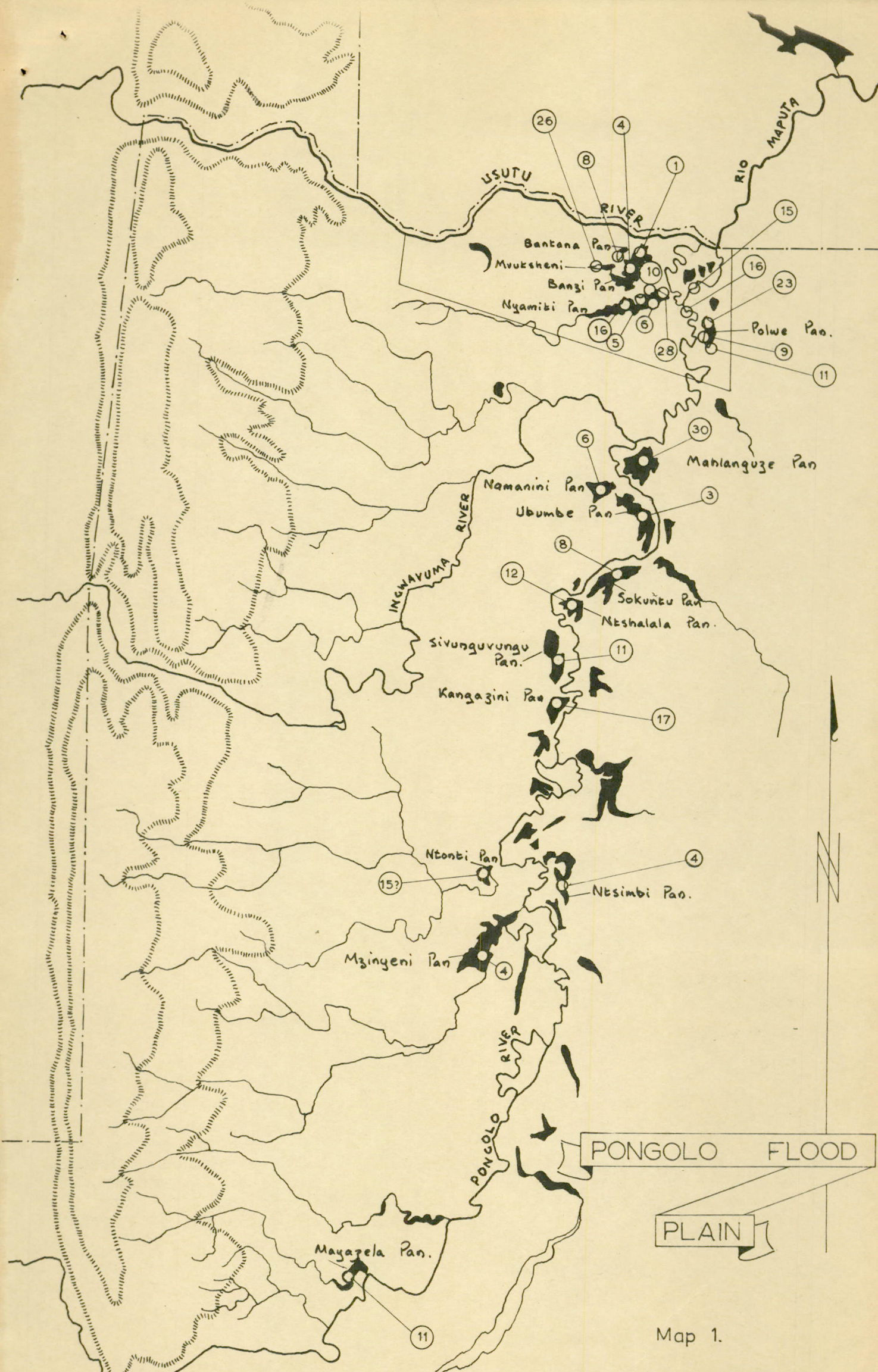
Pans situated along the east bank of the Pongolo river
(reading from north to south).

Section of Pongolo River in the Ndumu Game Reserve	(a) 15. (b) 16 (2 calves).
Polwe Pan	(a) 23 (5 calves). (b) 9 (1 calf). (c) 11 (1 calf).
Mahlanguze	30 (3 calves).
Sokunte	8 (1 calf).
Ntshalala	12 (3 calves).
Nsimbi	4.

Total number of hippo calves noted during the period of low-water this year was 38.

An accurate count of hippos in Ntonti Pan was not possible due to their inhabiting densely overgrown areas of marsh made up of imbuku Echinochloa pyramidalis and reeds Phragmites. The number of hippos shown for Ntonti Pan is approximate, and has been underestimated rather than over-estimated.

The counting of hippos on the flood plain was done with the aid of a land-rover, a boat and on foot.



DISTRIBUTION OF HIPPO

Map 1.

HIPPO MOVEMENTS TO AND FROM THE FLOOD PLAIN

It appears that very little movement occurs between the flood plain pans and the pans in Portuguese territory, as has been the practice in previous years. As mentioned at the beginning of Part 1, this is probably due to the continual shooting of hippos on the Portuguese side.

With the coming of summer rains and high waters over the flood plain, some animals move back and forth between Portuguese East Africa and Zululand, especially when maize crops appear. Some movement still occurs into the Usutu river gorge in the Lebombo Mountains. A small herd is sedentary for some time in suitable flood pools in the gorge. A few animals proceed further upriver into Swaziland. Individuals also wander up the Pongolo through the river gorge and stay for some time in pools before moving back towards Otobotini. Seasonal movement of a herd of 5 hippos is known. They inhabit a large pan to the north (P.E.A. side) of the "Red Cliffs Area" on the Usutu river. These animals occur in the Portuguese Pan during the winter months, moving into Ushoku Pan (western Ndumu Game Reserve) during the summer high waters.

LOCAL MOVEMENTS OF HIPPOS ON THE FLOOD PLAIN

As mentioned in my Sibayi Report, hippos move periodically from one shallows area to another, probably due to fouling up of the water. Some movement also occurs with the changing of grazing areas, though this is uncommon as few pans are of a large size and grazing grounds are within easy reach.

There are two periods when there is a large amount of herd movement on the flood plain.

- (a) During the winter dry season when many of the smaller pans dry up completely, whilst a great number of the larger pans become extremely shallow. When this happens hippo herds are to be observed occurring in close proximity to one another; several herds sharing a small stretch of water some 400 yds. in length by 150 yds. wide. Very little fighting between herd bulls occurs at this period, considering the closeness of one herd to another. But most of the single bulls are easily sought out by herd bulls at this time of the season, and are usually killed.
- (b) During the summer rainy season when most of the pans and the river are filled to capacity, and during times of high flood waters when the entire plain is covered in water, the herds move out to new lying-up places, which occur in parts where they are usually absent during winter. At this time herds break up into small groups and become widely scattered over the entire flood plain. The floods cover up the greater portion of the nearby grazing so that much nocturnal movement is evident at this period, when animals walk out several miles into grassy woodland (Vegetation Type 4 - see below) in search of grazing.

LYING-UP HAUNTS

These lying-up haunts are used mainly at night or in the early hours of the morning, before the animals go back into the water. During the winter months the lying-up haunts are also used during the day, since at this time of the year there are small numbers of biting flies. During summer the animals seldom come out, except to graze along the edges or suckle their young, as the biting flies, Tabanus and Glossina spp. appear in large numbers with the change to higher temperatures and humidity. These flies can be seen continually trying to settle on the animals as they surface and submerge whilst lying-up in the water.

Throughout the winter months hippo usually lie out in the sun near the water's edge; either on a mud bank or sandbank. In reed-bed areas the animals use exposed patches of dried mud for lying-up purposes. As most of the flood plain is dry (except for the pans) during winter, many lying-up haunts are to be found in the riparian fig forest (Vegetation Type 1.) of the Pongolo river.

In summer most of the understory of riparian forest is covered with water, so that lying-up haunts in thorn-bush and closed woodland patches on either side of the flood plain are more frequently in use. Lying-up haunts occurring in either thorn-bush and/or closed woodland, used continually throughout the year, are to be found near four pans on the flood plain, - they are Banzi, Nyamiti, Ntonti and Mayazela.

To summarize the main points of the use of lying-up haunts :

- (a) In winter, animals lie-up either along the edges of pans or in dried reed-beds, and in riparian fig forest, as well as in thorn-bush and/or closed woodland adjacent to the pans.
- (b) During summer, they seldom lie-up on the edges of pans; lying-up haunts in adjacent thorn-bush and/or closed woodland, commonly used at night only. In some areas such as at Tete Pan, summer lying-up haunts are found in patches of sand forest some two miles from the edge of the flood plain.

A description of the common trees and plants making up the vegetation of the thorn-bush forest and woodland adjacent to the flood plain is described in Part 2. under Vegetation.

Leeches are common throughout the waters of the flood plain and are to be found on the animals in quantities. Water Turtles frequently use hippo as places to sun themselves.

GRAZING GROUNDS

Most of the grazing is done at night on the flood plain itself during winter months, with short excursions into the adjacent woodland area. Some animals graze during the day in the reed-beds and areas of marsh (on imbuku grass), occasionally along the edges of the riparian fig forest (on "hippo grass", Setaria chevalieri), and in the pan shallows (on lily bulbs, Nymphaea sp.). During the summer months with the coming of the flood waters, the greater part of the grazing on the flood plain is covered, so that animals are obliged to wander farther afield into woodland grass areas adjacent to the plain. In many places they wander as much as six miles in search of suitable grazing. When possible the animals graze away from native habitation, though they do not appear to be concerned by human presence, as they are at Lake Sibayi. When "imbuku" grass is covered by summer floods, many hippos frequent natives' mealie fields when the plants are between 6" and 3' in height.

At Ntonto Pan a herd of 15 hippos live in both the open pan waters as well as in amongst the marsh area of the pan. This marsh area is covered over with a "floating" blanket of iMbuku grass, interspersed here and there with bullrushes, Typha capensis and other water grasses, Cyperus spp. Many of the animals cannot be seen, their presence being revealed by the occasional heaving of iMbuku grass into the air and continued loud munching noises. Flocks of Cattle Egrets, Bubulcus ibis wait tensely for such movements, which send insects scattering everywhere. Sometimes a hippo stands up out of the marsh with matted bunches of iMbuku grass hanging from it.

In the woodland areas it was noticed that hippos prefer short grass, found in one of several localities. Where the grass has been burnt, or along tracks and paths, or grass growing under heavy foliaged trees, and also, during the summer months, in and along the edges of the numerous small seasonal pans and pools which are to be found in the thorn-bush and woodland areas.

One does not have to work in the field long before asking oneself, how does a hippo manage, with such large incisors, to crop very short grass? Watching a hippo grazing one notices that all the grass is cropped with the lips, which cover the incisors completely. The upper lip does the cutting, as the head is nodded downwards with each gathering. On close inspection of the lips, it is found that the entire fore-edge of the upper lip has a sharpish, hard ridge, serrated in parts. When cut, it has the appearance of the hard callouses which form on the hands or feet of humans.

SOLITARY HIPPOS

Very few solitary hippos occur on the flood plain as they are usually killed off by the herd bulls, usually during May or the earlier winter months, when the flood plain waters have largely receded and the herds occur in close proximity to one another. Two occur in the Ndumu Game Reserve, one of which moves frequently south into the Ingwavuma river; one at Ubumbe Pan, and the other in the Omengu Pan. These animals are never sedentary, but frequently move long distances throughout the length of the flood plain, staying in stretches of water unoccupied by herds.

During summer there is a possibility that when some of the large herds break up, these single animals take over one or two of the cows temporarily.

There are perhaps other single animals on the flood plain, but they have not been noted. Some of the very young bulls are hidden away very carefully by their mothers, and unless one spends much time in one place they are easily overlooked.

NATIVE METHODS FOR PREVENTING HIPPOS GAINING ACCESS TO CROPS

The greater part of the Pongolo riparian fig forest has either been chopped down, or where this has failed Natives have burnt the larger trees over a long period. Where they have felled trees to open up new ground for cultivation, they have used the trunks for building log fences around their fields to keep hippos out.

The two principal methods used are :

1. Log fences.
2. Noise-making contraptions.

In many places both methods are used together.

All hippo-runs are usually blocked, but this is only effective for a short period, for as soon as the Pongolo river rises hippos are able to clamber in and out anywhere along its banks. Many of the Natives' fields are situated between pans and rivers, or between the pans and higher ground on either side of the plain. Hippos do as much damage to crops by walking through them, as by eating them.

METHODS USED BY NATIVES TO KILL HIPPOS

Firearms are still to be heard on occasions on the flood plain, though nowadays they are used more commonly for shooting birds and monkeys.

The three main methods used by the Natives are:-

1. Firearms.
2. Steel cable nooses. Set in the bush along the edges of the pans, or more commonly in the riparian forest of the Pongolo, where they are set at the upper entrance to hippo runs.
3. Sharpened poles. These poles are between 5' and 8' in length by 2" to 3" in diameter, sharpened at one end and burnt to harden the point. These are set singly or in pairs at the bottom of the steep runs which lead into the Pongolo river.

All snares and sharpened stakes are removed from the flood plain during winter as the Natives allow their cattle to graze around the pans and along the river. When the first meales appear, domestic stock is kept away from the flood plain and the Natives replace their snares.

SUMMARY PART 1.

1. Hippo numbers appear to have increased greatly in the last few years; by natural increase and by animals moving in from Portuguese East Africa.
2. Two main factors for hippo distribution on the flood plain are:
 - (a) Suitable shallows between 3' and 6' in depth.
 - (b) Areas of deep water and/or reed beds and marsh.
3. Largest herd on the flood plain is 32 animals (it is of interest to note that the largest herd in Lake St. Lucia is exactly the same size). Hippos counted on the flood plain during winter this year number 300.
4. Very little movement away from the flood plain now occurs; what movement there is, is mainly during summer. Local movements occur chiefly during times of low water and during times of floods - the latter period when herds break up into small groups.

5. Use of lying-up haunts controlled largely by the height of waters on the plain. During winter, lying-up is either along edges of the pans or in the Pongolo riparian forest. During summer, most of the flood plain is covered in water, the animals using patches of thorn-bush and closed woodland for lying-up, adjacent to the flood plain.
6. Grazing is done principally on the flood plain itself. During summer when much of the grazing is covered by water, hippos wander farther afield at night, into adjacent wooded areas in search of grazing.
7. Four single hippos are known to inhabit parts of the flood plain. These animals wander freely over the whole area.
8. Two methods are used by Natives to keep hippos out of the crops:
 - (a) Log fences.
 - (b) Noise-making contraptions.
9. Firearms can still be heard in the flood plain area, and are used on occasions to shoot hippo. Two other methods used to kill hippos are steel noose cables and sharpened poles, which are set respectively at the top and bottom of hippo runs.

Part 2.

GENERAL ACCOUNT OF THE ENVIRONMENT.

INTRODUCTION

The area under survey, namely the Pongolo Flood Plain, is the country between Otobotini Drift in the south, where the Pongolo river comes through the Lebombo Mountains northwards for some 50 miles, to its confluence with the Usutu river. The flood plain is, on the average, between half-a-mile and 3 miles wide.

The flood plain is situated in the north-western section of North-eastern Zululand (Tongaland), lying almost parallel to the Lebombo Mountains. Time permits only a general outline of the hippos' environment.

The basic outline (with alterations) for maps 1, 3 and 4 were taken from the 1 : 250,000 Northern Zululand Topo. The outline of map 2 (with additions) from Acock's Veld Types of South Africa 1 : 1,500,000.

I would like it to be kept in mind that these maps are not minutely accurate, but are merely sketch maps included to clarify and illustrate certain parts of the text.

ACKNOWLEDGMENTS

For help, encouragement and information, and for identifying botanical specimens collected from the flood plain area, I would like to thank Mr. C.J. Ward (Ecologist to the Natal Parks, Game & Fish Preservation Board). To Rangers J.M. Feely and T.B. Oatley I am much indebted for reading through the manuscript. I must also express my sincere thanks to Mrs. A. Dutton for her typing of the final draft.

CLIMATE

Two main seasons are experienced in the flood plain area. From May to the middle of September, the dry winter season, when temperatures vary between 40°F nocturnally, to 82°F diurnally. Heavy dews fall throughout the winter months, coupled with the presence of dense valley mist, which rises as late as 8.45 a.m. at times. Little or no rain falls during the winter period. During this season strong winds are experienced, especially in August, south and south-westerly winds alternating with north and north-easterly winds. Easterly winds are common at mid-day. Winds often blow continuously for several days and nights at a stretch.

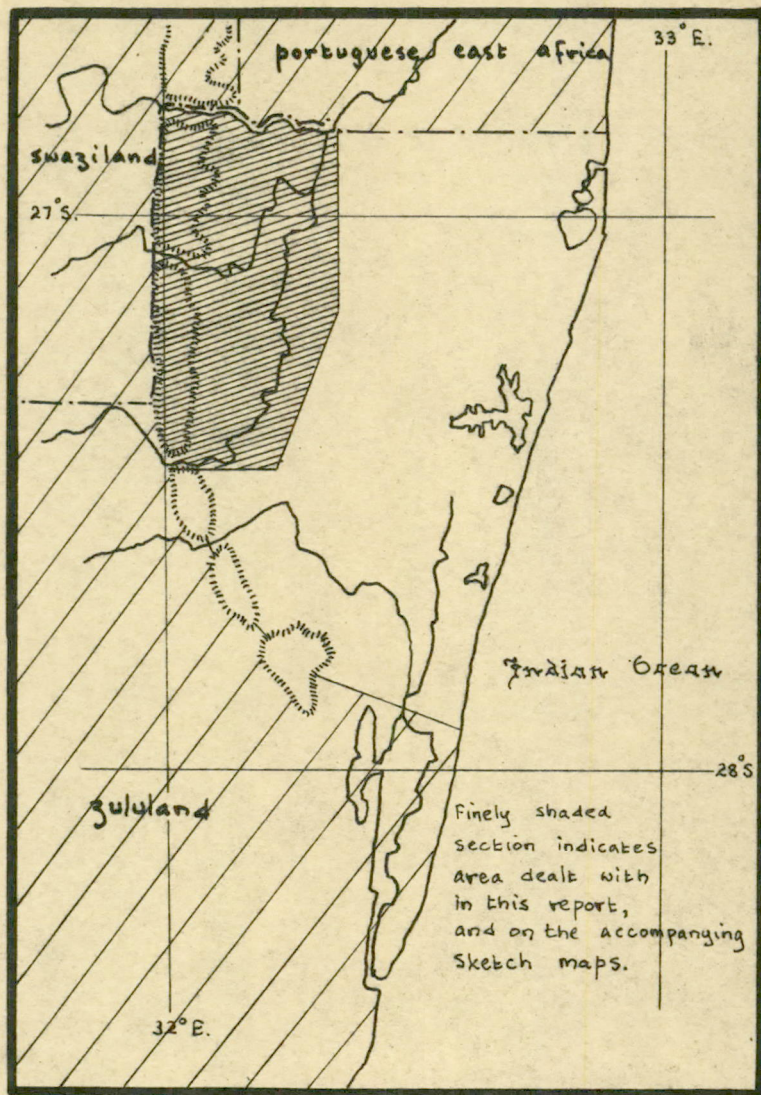
From the middle or latter part of September till April, is the summer rainy season, with temperatures rising to 115°F (day temperature) or more. Days and nights are very humid. Very little dew falls during the summer months and mist is rare. Heavy rains fall during September and part of October, after which they fall at intervals till February, when there is a recurrence of heavy rains. With the coming of summer, north-easterly and south-westerly winds become dominant. Most of the rain is brought by thunderstorms from the south or south-west, occasionally from the north-west, but usually swinging around to the south-west. It is usual to have no wind at all at night. Rare falls of hail are experienced, usually with lightning storms.

Winds have some effect on local small movements of hippos in some pans.

TOPOGRAPHY

The Lebombo Mountains which rise abruptly from the flat, low country on the west in both Swaziland and Zululand, reach 2,000 ft. and more in places. On the east, they descend more gradually down over rounded foothills to the Pongolo river. This chain of mountains is from 8 to 10 miles wide and is almost parallel to the coastline. In the south, the range is low and runs in a north-westerly direction as far as Gollel, where it turns north. These mountains are interrupted in five places where rivers cut through into Tongaland (North-east Zululand). The largest and northernmost is the Usutu river, which flows from west to east till its confluence with the Pongolo is reached, where it turns north-east towards Delagoa Bay, and is known as the Maputu. The second largest is the Pongolo river, which breaks through the mountains in the central part of the Zululand section of the range. The Ingwavuma river is situated midway between the Usutu and Pongolo, flowing from west to east through a gorge of its own, several miles north of Ingwavuma Village (situated on top of the mountain). After leaving the mountain, it flows eastwards then north-eastwards for some way, before turning south-eastwards to meet the Pongolo river several miles south of the Ndumu Game Reserve.

South of the Pongolo River Gorge is the Mkuze river, which flows from west to east into the Tongoland low-country for some 30 miles, before turning southwards to enter the northern end of Lake St. Lucia. The Mkuze river is usually perennial, though very often it dries up completely for several months. The fifth river, the Umsunduzi, which is the main tributary of the Mkuze, is seasonal, and when flowing joins the Mkuze river at the eastern end of the Mkuze Game Reserve. The Usutu, Ingwavuma and Pongolo rivers are perennial.



Position of the Pongolo Flood Plain

Map 2.

After emerging from the Lebombo Mountains, the Pongolo river flows for some three miles in an easterly direction, before swinging to the north-east, in which direction it flows for some eleven miles before turning again, this time to the north, running almost parallel to the Lebombo Mountains, till it reaches its confluence with the Usutu river in the north-eastern corner of the Ndumu Game Reserve. The river meanders back and forth in tight turns over the flood plain; and through the years has formed new channels and ox-bow "lakes".

The country along the western side of the flood plain is made up of fairly high, rounded hills, with lesser undulating hills to the base of the Lebombo Mountains. The highest of these long hill areas is the Shemula Hill - 625 ft., and others 579 ft. (Ndumu Hill), 399 ft. (Bundweni - north of Kwambose Store), and 483 ft. (near Otobotini Drift). These rounded hills are composed of loose, sandy red soil, changing to brown, stony clay soils along the edge of the flood plain, with patches of brown and heavy black soil occurring here and there. Throughout the length of the country adjacent to the flood plain, red sandy soil alternates with red-hard soils and brown clay soil which is found mainly in conjunction with the stony soils, i.e. between the Ingwavuma river and Namanini Pan, and between Kwambose river and Otobotini Drift. Moving westwards towards the Lebombo, red sandy soils alternate with light-brown and white soils (where sand forest occurs), red hard soil, thence onto the brown stony terrain of the Lebombo foothills.

This western rolling hill country is intersected with numerous seasonal streams and watercourses which rise on the Lebombo Mountains. The chief of these are, reading from north to south, Umsinduze, Enlube, Gwambane and Nonjinjigaze, which are tributaries of the Ingwavuma river. The Nyati (also known as Kwamboses or Mlambongwenya), Kohlokohlwane, Mfongoze, and Mlambo flow onto the Pongolo Flood Plain on the west or left bank.

The country along the length of the eastern side of the flood plain is low, flat and/or undulating, with numerous low ridges lying north-south in direction. Many of these ridges rise to between 300 ft. and 420 ft. in height, and are composed of white sandy soil. These ridges are interspersed with areas of flat country, and many north-south lying depressions which are summer filled to form pans. Nearer the flood plain these ridges are less noticeable, being wider and intersected by numerous valleys, some long and others short; seldom, if ever, holding water. About ten of these depressions occur on the eastern side adjoining the flood plain. The largest of these depressions are those (reading from north to south) running into the Nhlanjwana, Enhlolweni and Nhlanjane Pans. These three depressions are several miles long, and for the most part are north-south in direction, but turn westwards to join the flood plain.

The low undulating country along the edge of the eastern section of the flood plain is mainly composed of loose, white sandy soil, alternating with brown soil in the north, and brown and black clay soils farther south. From Mbuyayeni Pan, southwards to the Makatini Flats there is hard, red terrain, interspersed with patches of stony ground. The entire flood plain lies below the 250 ft. contour.

Some 30 pans are situated on either side of the Pongolo river on the plain. Some dry up completely during times of drought, but otherwise pan waters rise and fall with the seasons. The two largest pans are Mahlanguze and Banzi (the latter an Usutu Pan, but is part of the same flood plain).

Three pans, the Mayazela, Mfongoze and Ntonte on the western edge of the flood plain are cliff-sided, between 50 ft. and 80 ft. in height. Some cliff faces are sheer, others wooded. The occurrence of fossil-beds on the western edge of the flood plain is noticeable in cliffs or pan edges, also in the clay-like patches of soil in the adjacent dry ground.

The flood plain widens out in the vicinity of Nhlanjane Pan in the south, and varies throughout its length from half-a-mile to 4 miles in width. The two widest sections of the flood plain are in the Ndumu Game Reserve and in the Tete - Mzinyene Pan area. At four points along the course, the river has broken into two channels, but these join again after a mile or two. The Pongolo river joins the Usutu at three different localities, which are referred to as the 1st, 2nd and 3rd confluences.

In the latter months of winter, water on the flood plain is at its lowest. The first 10 days in September are usually the time of lowest water. From then on, with the commencement of first summer rains locally and up-country, the rivers and pans fill rapidly. Some of the pans are not affected immediately when the Pongolo is in flood, for they have no direct linking channel with the river. These are usually filled indirectly through marshes from other pans. With high floods the entire plain is covered in water. There are usually floods again during February, when the waters are often higher and of longer duration than those in September.

VEGETATION

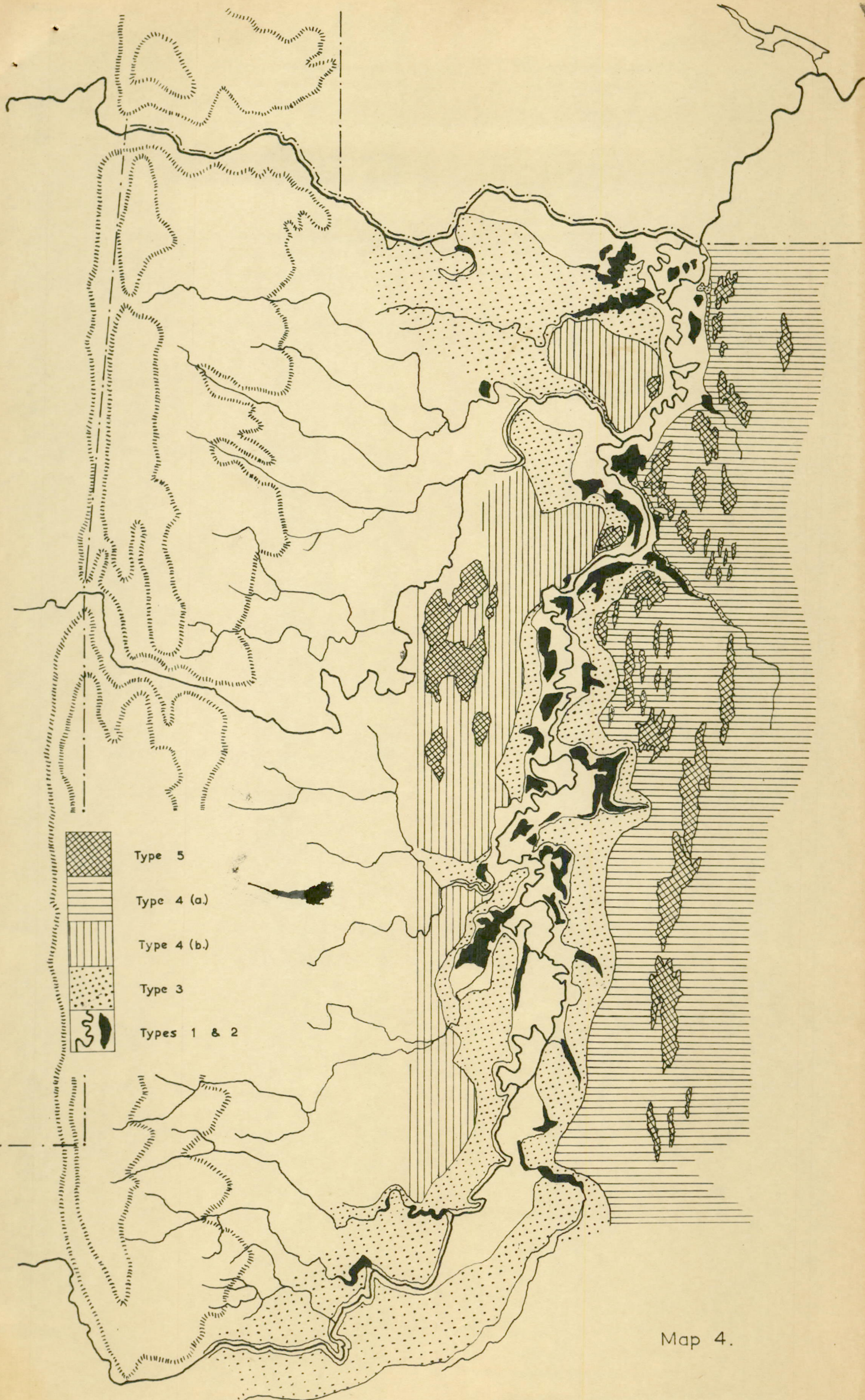
The vegetation on and adjacent to the flood plain, is readily divided into five principal Types. They are :

- Type 1. Riparian forest.
2. Aquatic and marginal pan vegetation.
3. Acacia tree and bush vegetation.
4. Open and closed woodland.
5. Sand forest.

These divisions are indicated roughly on the accompanying sketch map and in Fig. 1. There is an intergradation of the vegetation types throughout the area dealt with, one Type giving way to the next, often imperceptibly; though in certain areas there is a sharp definition to be found between certain vegetation types, i.e. between woodland and sand forest.

The following notes deal with a general description of vegetation from east to west across the flood plain; this covering the five vegetation types. Following this, slightly more detailed notes are given on each division made.

The country adjacent to the flood plain along the eastern section, is composed mainly of low undulating hills and longitudinal ridges and depressions composed of loose white sand. These ridges and depressions are covered in many parts with long, narrow patches of sand forest. This dry type of forest has a canopy of between 15 ft. and 20 ft., with emergents of 25 ft. and 30 ft. These sand forest patches are predominantly longitudinal in form. Some of the



- Type 5
- Type 4 (a)
- Type 4 (b)
- Type 3
- Types 1 & 2

Map 4.

DISTRIBUTION OF VEGETATION TYPES

Very approximate. Simplified greatly.

common trees of sand forest are Mfomoti Newtonia hildebrandtii, Mkwangu Erythrophloeum guineense, Tsatsalatana Hymenocardia ulmoides, and Mziti. Between these patches of sand forest is short grassland covered with open woodland. The height of the woodland trees vary between ten and twenty feet. The dominant tree is Nkonono Terminalia sericea. Other common trees found in this woodland are, - Mhlala Strychnos spinosa and Mkwakwa Strychnos innocua, Mpiso Albizzia versicolor, Mnulu Balanites maughamii.

Moving slightly west down towards the flood plain woodland becomes noticeably thicker and dense patches of closed woodland now appear (this is still on white sandy soil). In closed woodland Skakane-enkulu Acacia mossambicensis becomes very common, and some large specimens are to be seen. Other common trees in this section are Mpafa Ziziphus mucronata and Mtomboti Spirostachys africanus. Closer to the flood plain the soil changes to loose brown sand, or to hard baked red soil alternating with brown clay-like or loamy soil, the former supporting groves of Mkaya Acacia nigrescens. Thick matted growth of acacia thorn-bush with uGaku Acacia grandicornuta, Mtezane or Mziyazembe Dichrostachys sp., iSpapa Euphorbia grandicornis, Mtwetwe Acacia heteracantha, and Mnala Albizzia anthelmintica on clay soils.

At the edge of the flood plain fever trees Acacia xanthophloea are dominant, interspersed with Mkuhlu Trichilia emetica and occasional large fig trees Ficus sycamorus. In places reeds Phragmites mauritianus and iMbuku grass Echinochloa pyramidalis grow to the edge of stands of fever trees. Between the fever trees and reeds, there are clumps of iFubu Ficus capreaefolia and iPata Grewia caffra growing over small shrub-like growths of fever and fig trees. In other areas there are fairly wide mud flats (during winter) between fever trees and the pans. Many of these mud-flat areas are covered with water-grasses and sedges Cyperus sp.

In some areas thorn-bush grows close to the water's edge, and in other pans are surrounded by iMbuku watergrass and reeds. The majority of pans have lilies Nymphaea sp. and other aquatic plants growing in and along the edges. Where pans do not occur wide sections of the flood plain are covered with iMbuku, interspersed with reed-beds. From the pans the Pongolo river forest is reached. This forest is of some 30 to 55' in height, composed dominantly of fig trees. The forest follows the course of the Pongolo faithfully throughout its length. The greater part of this riparian forest has been chopped down or burnt so that for long stretches only a line of trees remain. Dense tangles grow between the forest and river, in many places hanging down over the water. In the quieter stretches of the river submerged aquatic plants are able to flourish.

From the river westwards to the western edge of the flood plain the vegetation is the same as described for the eastern section. On the western edge some of the pans are cliff-sided. In parts the cliffs are bare rock, other sections being covered in dense bush interspersed with large trees and tall aloes Aloe marlothii leaning out. From the plain edge moving west brown-clay and stony brown soils are reached, these bearing dense patches of acacia bush, and in parts short acacia woodland. In the southern area of the western side thorn-bush gives place to open rolling grass-covered hills, dotted with Mganu Sclerocarya caffra and iSfisi Heeria sp.

Watercourses and depressions are covered in dense tangles and thorn bush with a sprinkling of large trees. In the central and northern part on the west, brown soil, covered with acacia trees, gives way to red sandy soils, supporting open and closed woodland with a ground cover of short grass. The dominant trees of woodland are Combretum, Terminalia, Sclerocarya and Strychnos spp. Certain areas are composed of hard red soil where Mkaya Acacia nigrescens is very common as well as Mtomboti, Skakane-enkulu and iSpuza Acacia gerrardii. The red sandy soils give way to light brown or whitish loose sandy soil where large patches of sand-forest occur.. The largest sand-forest patch on the western side of the Pongolo is known as the Inswenyama. From these sand forest areas the country becomes gradually more stony as the Lebombo Mountain foothills are approached.

The riparian forest along the stream and watercourses coming into the Pongolo Flood Plain from the Lebombo Mountains is of a different type. One of the dominant large trees is the Mhlume Adina microcephala var: galpinii. Fig trees are also to be found along these streams, but become uncommon as the mountains are reached.

General detailed notes on the five principal Vegetation Types.

TYPE 1. RIPARIAN FOREST

Riparian forest occurs along the banks of the Pongolo river. In places this forest has been reduced to several scattered specimens of Ficus by the continual chopping and burning by Natives for new fields. In other sections, i.e. Confluence area of Usutu - Pongolo rivers; and the west or left bank of the Pongolo river between Makanes Drift and Namanini Pan, there remain large unharmed patches of riparian forest. This forest is predominately composed of fig trees Ficus sycamorus.

Along the south bank of the Usutu river the vegetation is reeds Phragmites with large trees growing close or scattered along the water's edge. The three dominant big trees are Mkuwane, Umkuhlu and Mhlosinga Acacia xanthophlea; interspersed with clumps of iFubu and iPata.

(a) Forest Canopy (between 35 - 55' height).

- | | |
|----------------------------|-----------------------------|
| <u>Ficus sycamorus</u> . | <u>Rauvolfia caffra</u> . |
| <u>Trichilia emetica</u> . | <u>Syzygium guineense</u> . |

(b) Mid-stratum vegetation (between 12 - 20' height).

- | | |
|--------------------------------|------------------------------|
| <u>Rauvolfia caffra</u> . | <u>Ficus capreaefolia</u> . |
| <u>Oncoba spinosa</u> . | <u>Trema guineense</u> . |
| <u>Conopharyngia elegans</u> . | <u>Gardenia thunbergii</u> . |
| <u>Pisonia aculeata</u> . | <u>Pavetta</u> sp. |

(c) Forest Understory.

- | | |
|-----------------------------|--------------------------------|
| <u>Acacia pennata</u> . | <u>Ficus capreaefolia</u> . |
| <u>Grewia caffra</u> . | <u>Allophyllus decipiens</u> . |
| <u>Popowia caffra</u> . | <u>Plumbago</u> sp. |
| <u>Setaria chevalieri</u> . | |

The dominant riparian understory cover is a plant of 1 - 5' height, - Achyranthes aspera.

WESTERN RED SAND TERRAIN			FLOOD PLAIN			EASTERN WHITE SAND TERRAIN		
		Mixed woodland grading into the open Combretum woodland of the Lebombo foothills.						
	TYPE 5.	Sand Forest occurring in small and large patches. The largest forest area known as the Inswenyama. Height of forest between 15' and 25'. Has heavy growths of "old man's beard" (<i>Usnea barbata</i>). Dense undergrowth along the edges.						
	VEG. TYPE 4 (b)	Mixed and/or Closed Woodland. Dominantly <i>Combretum</i> , <i>Strychnos</i> , <i>Sclerocarya</i> , <i>Terminalia</i> spp. Scattered bushes and thickets occur throughout. Tree canopy between 12 and 20' height, with larger trees up to 25'. This with a ground cover of grasses and herbs between 6" and 3' height.						
	3.	Short dense thorn bush and thickets (12'); with open ground where aloes and scrub is dominant (15-20') Tall trees are scattered throughout i.e. <i>Salvadori australis</i> , <i>Spirostachys africanum</i> , <i>Papea capensis</i> .						
	TYPE 2.	Flood plain margins lined with narrow or wide belt of Fever trees, with scattered stands of <i>Ficus sycamorus</i> , <i>Trichilia emetica</i> , <i>Acacia alba</i> , (35'-50') Very little ground cover under trees. Reeds and "imbuku" wabergass on the pan edges. Many pans have areas of dry mud-flats in winter. Aquatic plants grow in and along edges of pans.						
	VEG. TYPE 1.	Forest, dominantly <i>Ficus sycamorus</i> , lining banks of Pongolo river. Where undisturbed by cultivation forest varies in width between 20' and 100 yds. Large riparian forest occurs at the confluence of Pongolo - Usubu rivers. Forest margins grade down to water-grasses through tangles, shrubs, small trees. Canopy of forest between 35' and 55', emergents probably to 60'.						
	VEG. TYPE 2.	In places closed woodland and bush grow down close to the pan edges. In these instances the waters edge is only lined with reeds. Common aquatic plants occurring in the numerous pans are <i>Nymphaea</i> sp., <i>Potamogeton</i> sp., <i>Ceratophyllum</i> sp.						
	TYPE 3.	In the southern portion low dense acacia bush and thickets with uncommon scattered tall trees, open patches occur covered in succulants. (12'). Open taller thorn woodland occurs further eastwards. Ground cover of shrubs, grasses & herbs 10"-6'.						
	VEG. TYPE 4 (c)	Open <i>Terminalia</i> Woodland, height of trees between 12-15'. Nearing the flood plain this woodland becomes more closed in appearance, where <i>Acacia mossambicensis</i> is a common tall tree. Ground cover is made up of grasses, herbs (6"-3') interspersed with low bushes and shrubs, and small tree growths - mainly of <i>Strychnos</i> spp. The grasses in this area are not dense, but form a rather open cover.						
	5	Sand Forest patches in the East are characterised by their longitudinal form. From 15'-600' wide and 100 yds. to 5 miles in length. These are not all continuous strips, but disjointed						
	4							
	5	Forest strips occur on both the depressions and undulating ridges. These ridges and depressions are also north-south in form.						
	4							
	5	Sand Forest varies in canopy height between 15'-20', sometimes 25', - with giant emergents i.e. <i>Newtonia</i> sp. (30'). No forest marginal growth.						
	4							

This main soil type interspersed with (a) small patches of white sand, also (b) red hard-bake soil and (c) stony clayey soils. (a) Covered by Sand Forest. (b) *Acacia nigrescens* dominant. (c) Dominantly covered by Veg. Type 3. In the southern part brown clayey soil alternates with very stony ground i.e. between Mfongosi & Otubabini.

Black muddy soils, interspersed with brown clayey types. Covered in many parts by layers of silt. Stones are rare. Several pans on the western edge are cliff sided, - some bare others covered in bush and aloes. Fossil beds are visible in many sections on the western margins

For the most part white sand is dominant. Changing to pale brown sand or clayey brown soil adjacent to the Flood Plain. In the south the country adjacent to the plain grades from white sand to red hard-bake soil alternating with brown clayey soils. Till the Makatini Flats (the area between the Pongolo & Mkuje rivers) where red hard-bake soil alternates with stony brown clay soils.

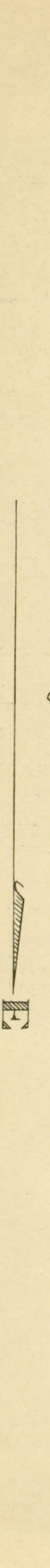


Fig 1. Sketch to illustrate an east to west section across the Pongolo Flood Plain and adjacent country. Showing main soil divisions and their respective vegetation types.

(d) Forest Creepers.

- | | |
|------------------------|-------------------------|
| Acacia pennata. | Grewia caffra. |
| Capparis tomentosa. | Popowia caffra. |
| Dalbergia armata. | Ipomoea sp. |
| Cissampelos mucronata. | Combretum microphyllum. |

(e) Marginal river-bank growth.

Dominantly Ficus capreaefolia and Grewia caffra which grow in dense tangles overhanging the water from the sides of the banks. Also amongst this dense entanglement grow Larantus kraussiana, Ipomoea sp., Acacia pennata and Phoenix reclinata.

(f) Vegetation of the Forest margins.

- | | |
|--------------------------|--------------------------|
| Trichilia emetica. | Trema guineense. |
| Phyllanthus reticulatus. | Lippia javanica. |
| Acacia albida. | Kigelia pinnata. |
| Kraussia floribunda. | Sesbania aegyptiaca. |
| Antidesma venosum. | Combretum microphyllum. |
| Cymbopogon excavatus. | Setaria chevalieri. |
| "iSwani" grass. | Echinochloa pyramidalis. |
| Phragmites mauritianus. | |

TYPE 2. AQUATIC & MARGINAL PAN VEGETATION.

(a) Submerged aquatics.

- | | |
|-------------------------|------------------|
| Ceratophyllum demersum. | Naias interupta. |
| Utricularia sp. | |

(b) Semi-emergent plants.

- | | |
|--|------------------------|
| Nymphaea capensis. | Nymphaea lotus. |
| Potamogeton crispus. | Trapa bispinosa. |
| Jussiaea diffusa. | Jussiaea suffruticosa. |
| Potamogeton schweinfurtii - only noted from the Mfongozi stream. | |

(c) Floating aquatics.

- Pistia stratiotes.

(d) Marginal Pan vegetation.

Dominantly Echinochloa pyramidalis and Phragmites mauritianus. On the dried mud along the edges of the pans, where short sparse growths of Echinochloa occur the vegetation is mainly:-

- | | |
|----------------------|-----------------------|
| Cyperus fastigiatus. | "iMizi" (Cyperus sp.) |
| Sesbania aegyptiaca. | Asclepias physocarpa. |

Behind this water edge vegetation are stands of scattered or closely growing large trees, commonly:-

- | | |
|--------------------|----------------------|
| Ficus sycamorus. | Acacia xanthophloea. |
| Trichilia emetica. | Acacia albida. |
| Kigelia pinnata. | |

(b) Short trees, shrubs and bushes of 6 - 12' height.

Acacia senegal.	Dichrostachys sp.
Gardenia cornuta.	Acacia grandicornuta.
Acacia arabica. var: kraussiana.	
Euclea divinorum.	Euclea daphnoides.
Gymnosporia senegalensis.	Canthium ventosum.
Ptaeroxylon obliquum.	Phyllanthus reticulatus.
Gardenia neubaria.	Rhus sp.
Strychnos spinosa.	Strychnos innocua.
Garcinia livingstonei.	Commiphora neglecta.
Acacia karroo.	Ficus smutsii.
Gardenia spatulifolia.	Combretum zuluenses.

(c) Succulents, low bushes and plants occurring from almost ground level to 6' height.

One species of aloe (Aloe marlothii) grows commonly in places to some 9' height.

Euphorbia grandicornis.	Aloe marlothii.
Aloe parvibracteata.	Senecio fulgens.
Stapelia gigantea.	Cussonia kraussii.
Canthium ventosum.	Dichrostachys sp.
Sansieveria thyrsoflora.	Croton menyartii.
Gardenia neuberia.	Adinum multiflorum.
Carissa sp.	Azima tetraacantha.

(d) Creepers occurring in thorn bush vegetation.

Euphorbia tirucalli.	Cissus quadrangularis.
Landolphia kirkii var: delagoensis.	
Grewia caffra.	Asparagus falcatus.
Asparagus spp.	Cissus viminalis.
Capparis tomentosa.	

Type 3 occurs throughout most of the clay or hard red soils adjacent to the flood plain. Where this type is absent, e.g. Ntonti Pan and the eastern sections of the flood plain in the Ndumu Game Reserve, woodland (of Type 4) occurs down to the Marginal flood plain trees. A large, short, closed thorn forest occurs on the Ndumu Game Reserve on the west of the flood plain, this known as the Mahemane Bush. Similar, but very much smaller patches occur throughout the western plain area.

In parts, such as between the Kohlokohlwane stream to opposite Mzinyeni Pan on the main road between Ndumu and Otobotini Drift, a large area of hard, red soil occurs which supports acacia tree vegetation, dominantly Acacia nigrescens which, in many places, occurs in pure stands of some 30' - 35' height. Tall grass is the prevalent ground cover. This form of vegetation is common on parts of the Makatini Flats. Other trees occurring in this acacia tree-veld are:-

Heeria sp.	Spirostachys africanus.
Ziziphus mucronata.	Acacia mossambicensis.
Sclerocarya caffra.	Acacia gerrardii.
Acacia heteracantha.	

With Gossypium herbaceum, Gymnosporia senegalensis, Euclea divinorum the common shrubs.

TYPE 4. OPEN & CLOSED WOODLAND.

The wooded areas of the western flood plain follow closely the distribution of red and/or white sandy soils, and occur mostly on the former type of sand. The primary closed woodland areas are (1) between the Nyati stream north to the Magwagwa watercourse, which flows (in summer) into the south-west end of Namanini Pan, and (2) the Ndumu Hill area. Open woodland is common, alternating with patches of Type 3 between the Nyati stream and Otobotini Drift.

The eastern country adjacent to the flood plain has mixed open and closed woodland in the southern and central sections occurring on either red or brown loamy soils. In the vicinity of Tete Pan the woodland country changes with the transition to white sandy soil, where it is dominantly Terminalia woodland. Close to the flood plain are sections of Type 3 vegetation, which are different in appearance to the other areas, due to the greater number of tall trees.

(a) Terminalia Woodland of the Eastern Flood Plain area.

Occurring dominantly between the strips and patches of Sand Forest (Vegetation Type 5). Nearer the flood plain Acacia mossambicensis becomes very common, where the vegetation is denser. Average height of this woodland is between 15' - 25'. Terminalia Woodland is composed mainly of:-

<i>Terminalia sericea.</i>	<i>Albizia versicolor.</i>
<i>Albizia adiantifolia.</i>	<i>Strychnos spinosa.</i>
<i>Garcinia livingstonei.</i>	<i>Conopharyngia elegans.</i>
<i>Acacia mossambicensis.</i>	<i>Combretum zeyheri.</i>
<i>Sclerocarya caffra.</i>	<i>Vangueria infausta.</i>
<i>Sapium reticulatum.</i>	<i>Strychnos innocua.</i>
<i>Mundulea sericea.</i>	<i>Brachylaena discolor.</i>
<i>Antidesma venosum.</i>	

Growing throughout the open wooded areas are a sprinkling of lone forest trees, mainly:-

<i>Balanites maughamii.</i>	<i>Dialium schlechtei.</i>
<i>Hymenocardia ulmoides.</i>	<i>Pteleopsis myrtifolia.</i>

(b) Mixed Woodland of the Western Flood Plain area.

Also parts of the southern and central sections on the east. Average height of the woodland trees vary between 15' - 25'. Mixed Woodland is composed primarily of:-

<i>Combretum zeyheri.</i>	<i>Sclerocarya caffra.</i>
<i>Strychnos spinosa.</i>	<i>Combretum zuluense.</i>
<i>Terminalia sericea.</i>	<i>Acacia mossambicensis.</i>
<i>Ziziphus mucronata.</i>	<i>Strychnos innocua.</i>
<i>Peltophorum africanum.</i>	<i>Heeria sp.</i>
<i>Sterculia rogersii.</i>	<i>Schotia brachypetala.</i>
<i>Albizia anthelmintica.</i>	<i>Albizia evansii.</i>
<i>Boscia albitrunca.</i>	<i>Lannea kirkii.</i>
<i>Dichrostachys sp.</i>	<i>Euclea daphnoides.</i>
<i>Euclea divinorum.</i>	<i>Combretum guenzii.</i>
<i>Combretum transvaalense.</i>	<i>Canthium ventosum.</i>
<i>Gossypium herbaceum.</i>	<i>Vangueria infausta.</i>
<i>Albizia versicolor.</i>	<i>Carissa sp.</i>
<i>Commiphora neglecta.</i>	<i>Rhus sp.</i>
<i>Mundulea sericea.</i>	<i>Euphorbia ingens.</i>
<i>Kigelia pinnata.</i>	

Towards the flood plain and near depressions the following species become dominant.

<i>Euclea divinorum.</i>	<i>Spirostachys africanus.</i>
<i>Acacia heteracantha.</i>	<i>Acacia robusta.</i>
<i>Acacia robusta.</i>	<i>Acacia senegal.</i>
<i>Schotia brachypetala.</i>	

Further west the woodland occurring on red sandy soils is found to the very edge of Sand Forest (Vegetation Type 5). Two Sand Forest patches occur close to the flood plain edge. Here both woodland and thorn bush grow to their edges.

TYPE 5. SAND FOREST.

Sand Forest is a dry form of Coastal Forest, with its own characteristic dominants. Moving from the edge of the flood plain this is the third main division of vegetation to be encountered. First into thorn country, and then through wooded ground. Sand Forests occurring along the eastern side of the plain are formed in long discontinuous strips, which lie north - south and are some fifty feet wide by several hundred yards in length. In certain areas near the plain this Sand Forest is to be found in large patches, almost as wide as they are long - interspersed with small, narrow grass-covered openings. All the Sand Forest in this area occurs on white sandy soil. Important forest patches and strips adjacent to the flood plain on the east (reading from north to south) include - Nkonhlolo, Skilane, Mpumelo, Tongwaan and Magengeni.

Few, but large areas of Sand Forest occur to the west of the plain. These are quite different in shape from those described on the east. Here the forest areas are as wide as they are long. The longitudinal formation is not evident here. Two small patches of forest are in close proximity to the plain; in the north the Lukondo Forest (on the southern boundary of the Ndumu Game Reserve), and opposite Makane's Drift, south of Ubumbe Pan - the Mahlamvu Forest. The largest Sand Forest on the west is the Inswenyama. The majority of these western forest patches occur on white sand, but some are on light brown sandy soil.

For the most part Sand Forest canopy is found between 15' - 20' in height with 25' emergents. In places they are taller, about 30' with 35' emergents. Many have an open understory, or have a dense understory along their margins with an open ground cover in the centre. Others are thickly overgrown throughout their understory sections. Almost all Sand Forests have no marginal vegetation but end abruptly where open woodland and grass begin. This is probably due to the numerous fires which rage through the territory, especially during the later winter months.

(a) Forest Canopy.

<i>Newtonia hildebrandtii.</i>	<i>Hymenocardia ulmoides.</i>
<i>Erythrophloeum guineense.</i>	<i>Croton sp.</i>
"Mziti" tree.	<i>Pteleopsis myrtifolia.</i>
<i>Balanites maughamii.</i>	<i>Drypetes arguta.</i>
<i>Ptaeroxylon obliquum.</i>	<i>Dialium schlechtei.</i>
Many of the canopy trees are covered in "old man's beard" -	
<u><i>Usnea barbata.</i></u>	

(b)/.....

(b) Mid-stratum vegetation.

- | | |
|--------------------------|-----------------------|
| Teclea gerrardii? | Drypetes arguta. |
| Hymenocardia ulmoides. | Ptaeroxylon obliquum. |
| Canthium obovatum. | Fluggea sp? |
| Chrysophyllum natalense. | Cussonia sp. |
| Carissa bispinosa. | Croton gratissimus. |
| Euphorbia grandidens. | |

(c) Forest Understory.

- | | |
|--------------------------|------------------------|
| Sansieveria thyrsoflora. | Zamioculcas zamifolia. |
| Uvaria caffra. | Popowia caffra. |
| Croton gratissimus. | |

(d) Forest Creepers.

- | | |
|-------------------------------------|-------------------|
| Landolphia kirkii var: delagoensis. | |
| Euphorbia tirucalli. | Dalbergia armata. |
| Popowia caffra. | Uvaria caffra. |
| Smilax kraussiana. | Rhoicissus sp. |

Three species of vegetation are often noted along the edges of Sand Forest but do not constitute a marked sub-division. They are:-

- | | |
|--|-------------|
| Croton menyhartii. | Carissa sp. |
| Combretum zeyheri (very white barked specimens, with winged seeds of about $1\frac{3}{4}$ inches in length). | |

NATIVES

The country adjacent to the Pongolo Flood Plain is probably the most heavily populated native area in Tongoland. They depend upon the plain for the cultivation of their crops and for a perennial supply of water both for themselves and their stock.

Domestic stock (cattle and goats) are in great numbers throughout the area. During the summer months domestic stock are grazed in the wooded grass country on either side of the flood plain, away from any crops. In winter natives allow both goats and cattle to graze on the plain itself, amongst their old fields, and along the edges of the riparian forest. During this latter season all hippo snares are removed from the flood plain for the safety of their cattle. Their stock drink either from the Pongolo river or the pans. As soon as the summer crops appear, hippo snares are re-set. During summer, domestic stock drink from the "land" side of the pans.

Cultivation begins with the first summer rains - usually during the middle of September. Every available bit of ground is used. Where fields are found to be too small or the soil not rich enough, large sections of riparian forest are chopped out and burnt, often down to the water's edge. Where large forest canopy trees are encountered, the natives build up large stocks of wood and trash at the base of the tree to which they set fire. Only after several weeks - sometimes months - are they successful in felling these giants, a charred stump perhaps remaining as evidence of the previous extent of the forest. Large fields are put under sugar cane, which is their principal "drinking crop". Maize is the chief food, and other crops cultivated in the flood plain area are:-

Casava/.....

Casava
Sweet potato
Kaffir-corn (uncommon)
Banana

Pumpkin
Ground-nuts (uncommon)
Calabash plants
Mango

Seasonal activities of the Tonga natives living along the flood plain.

September

First summer rains begin usually about the eleventh of the month, though often later. With the commencement of the rains maize, sweet potatoes and pumpkins are planted. At this time small huts or shelters are built in or on the edge of the fields. With the rising of the water in the flood plain "mona" fish-traps are set. These long, basket-like traps are placed in channels between the river and pans, and between each pan where there is a suitable depth of water. In many parts, a line of these traps is set in the marsh areas. Line-fishing is also done. Both fishing practices continue till the end of May.

October

With the appearance of the maize plants, hippo snares are set both along the river-facing edges of the pans, and in the riparian forest of the Pongolo. These snares remain till the latter end of May, when they are removed with the incoming of domestic stock into the plain.

December

Natives collect fruits of many trees for consumption. Mainly from Mnwebe Labourdonnasia discolor, Mnxambo Manilkara concolor?, Mkuwane Ficus sycamorus, Mneyi Rhamnus zeyheri, uMkuhlu Trichilia emetica.

January

Mango fruits are taken for consumption.

February

During this month marula or "Mganu" Sclerocarya caffra fruits ripen and fall to the ground; these fallen fruits are collected and boiled into a "wine". The seeds are cracked open and the hard fleshy kernel used for cooking with other foods, either crushed or cooked whole. The "Mganu wine" season lasts from three to four weeks. Other edible fruits which ripen at this time are: Mvilo Vangueria infausta, Mpimbi Garcinia livingstonii and Mbungwa Landolphia kirkii var: delagoensis.

June

As pan waters recede, the natives are able to get further into the pans as the area of shallows become fairly extensive. During this month they begin to collect lily bulbs, both Amazibo Nymphaea capensis and Amahlolhlwane Nymphaea lotus.

July - August

Collecting of lily-bulbs becomes very important, including the bulbs of the semi-emergent aquatic plant iNyiva Jussiaea diffusa.

"Fonya" fish trapping is also important at this time. This is done manually by both native men and women who wade in the pan shallows with small conical-shaped baskets, open at both ends. The larger opening below is used for "clamping" on to the bottom when fish are caught, the fish then being easily taken out from the smaller, upper opening.

During this period "monkey apple" Strychnos innocua/spinosa fruits are collected for consumption.

May

At the latter end of this month almost all hippo snares are removed, as maize crops are finished, and domestic stock are now permitted to graze on the plain.

Sugar-cane drink is made throughout the year, but especially during the winter months.

Many of the natives have small wooden punts on the river and on some of the larger pans. Supply stores are far apart, and the presence of punts helps to shorten distances. There are three stores on the west of the flood plain - Ndumu, Kwanbose and Otobotini. In the east are Sihangwana and Tshempene's stores, the latter in the south.

During summer, natives snare and/or shoot hippo when the opportunity arises. During the winter they set snares for crocodile and Spurwing Geese. Others build hides on mud-flats unfrequented by Europeans, where they shoot White-faced Duck and other aquatic birds.

A tremendous amount of snaring goes on throughout the flood plain area in bush and forested areas.

NOTES ON MAMMALS

A complete list of mammals occurring either on the flood plain or adjacent country was not made, as time did not permit. The commoner mammals are listed, and are shown as either occurring on the plain or in the open, wooded, or forest areas situated on either side of the plain.

1. Mammals noted on the Flood Plain. In or on the edges of riparian forest.

- | | |
|----------------|-----------------|
| Chacma Baboon | Nsamango monkey |
| Vervet Monkey | Leopard |
| Water Mongoose | Hippopotamus |
| Bushbuck | |

2. Mammals occurring in the country adjacent to the Flood Plain.

- | | |
|------------------------|-----------------------|
| Elephant | Fruit Bat (sp. ?) |
| Bushbuck | Nyala |
| Grey Duiker | Red-bush Duiker |
| Impala (re-introduced) | Suni Antelope |
| Slender Mongoose | Water Mongoose |
| White-tailed Mongoose | Banded Mongoose |
| Antbear (uncommon) | Selous' Mongoose |
| Elephant Shrew | Yellow Squirrel |
| Long-eared Bat | Cane Rat |
| Rusty-spotted Genet | Lesser Leaf-nosed Bat |
| Vervet Monkey | Bushbaby |

This list of mammals is from sight records of the individual species, except in the case of the leopard, whose pug marks were noted in the Pongolo confluence forests. The two bats were caught when they flew into my room one night and identified in the hand. No small mammals were noted from the riparian forest areas. Probably due to seasonal flooding these forests give the impression that they are completely devoid of any small mammals. There are probably some species present which only some form of trapping will make their presence known.

NOTES ON BIRDS

Birds characteristic of or common in the botanical divisions made, are listed under their respective vegetation type habitats.

Vegetation Type 1.

- | | |
|-------------------------|---------------------------|
| Pel's Fishing Owl | White-eared Barbet |
| Heuglin's Robin | Golden-tailed Woodpecker |
| Green Pigeon | Black-bellied Starling |
| Narina Trogon | Scaly-throated Honeyguide |
| Banded Harrier-Hawk | Long-crested Eagle |
| Wahlberg's Eagle | Green Coucal |
| Trumpeter Hornbill | Paradise Flycatcher |
| Blue-mantled Flycatcher | Ashy Flycatcher |
| Collared Flycatcher | Square-tailed Drongo |
| Tambourine Dove | Terrestrial Bulbul |
| Black Cuckoo-Shrike | Natal Robin |
| Forest Weaver | Hadedah Ibis |

Sub-division (e).

- | | |
|-----------------------------|-----------------------|
| Wattle-eye Flycatcher | Night Heron |
| Golden-rumped Tinker Barbet | Heuglin's Robin |
| Peter's Finfoot | Cisticola erythroptus |

Sub-division (f).

- | | |
|-----------------------|----------------------|
| Spectacled Weaver | Common Waxbill |
| Cisticola erythroptus | Tawny-flanked Prinia |
| Black-eyed Bulbul | Klaas's Cuckoo |
| Hooded Mannikin | |

Birds noted along the river courses, occurring where river banks are forested, and at open banks when nesting:

- | | |
|-----------------------|-------------------------|
| Black Sawwing Swallow | White-fronted Bee-eater |
| Little Bee-eater | Pied Kingfisher |
| Pigmy Kingfisher | Giant Kingfisher |
| Sand Martin | |

Pied Wagtails occur along the river, nesting on convenient stationary collections of logs, roots and other materials, brought down by floods. Little Egrets are often noted at time of low water, feeding in the mud shallows on the river's edge.

Other birds noted along river courses are Reed Cormorant and Darter.

Vegetation Type 2.

Birds of open pan waters.

Darter	Reed Cormorant
Dabchick	

Fish Eagle and Osprey use open waters as hunting grounds.

Birds occurring along the edges of pans, especially where water-grasses and reeds meet the water.

Thick-billed Weaver	Yellow Weaver
Cabanis Weaver	Spotted-backed Weaver
African Jacana	Half-collared Kingfisher
Black Crake	Squacco Heron
White-backed Duck	Malachite Kingfisher
Moorhen	

Birds occurring in shallows (or damp soils), preferably on mud-flats.

Black-winged Stilt	Avocet
Greenshank	Openbill
Sacred Ibis	Glossy Ibis
Treble-banded Sandplover	Kittlitz Sandplover
Marsh Sandpiper	Curlew Sandpiper
Little Stint	Wood Sandpiper
Grey-headed Gull	White-faced Duck
Red-billed Teal	Yellow-bill Egret
Spurwing Goose	

Birds occurring in reed beds and other watergrasses.

Cisticola erythroptus	Cisticola galactotes
Stonechat	Rufous-bellied Heron
Reed Warbler	Swamp Warbler
Great Reed Warbler	Purple Gallinule
Ethiopian Snipe	

Birds noted on dry mud-flat areas.

Richard's Pipit	Cape Wagtail
Water Dikkop	Blacksmith Plover
Wattled Plover	

Vegetation Type 3.

Yellow-bill Hornbill	Glossy Starling
White-throated Robin	Crested Francolin
Crested Guinea-fowl	Fiscal Flycatcher
Red-faced Mousebird	Pied Barbet
Red-backed Shrike	Four-coloured Bush Shrike
Sabota Lark	Laughing Dove
Cisticola chiniana	Green-spotted Dove
White-helmet Shrike	Cardinal Woodpecker
White-breasted Sunbird	Sombre Bulbul
Jacobin Crested Cuckoo	

Vegetation Type 4.

Brown-headed Parrot	Pale Flycatcher
Scimitar-bill Hoopoe	African Hoopoe
Fork-tailed Drongo	Orange-breasted Bunting
Black-crowned Tchagra	Bully Canary
Black Cuckoo	Plum-coloured Starling
Yellow-throated Sparrow	Black-headed Oriole
Brubru Shrike	Clapper Lark
Burnt-neck Eremomela	Black Flycatcher
* Kurrichane Thrush	Greater Honeyguide
Black-collared Barbet	Striped Kingfisher
Brown-hooded Kingfisher	Red-eyed Turtle Dove
Green-spotted Dove	Lizard Buzzard
Black-bellied Korhaan	Jardine's Babbler
Spotted Eagle Owl	Brown-Harrier-Eagle

* This species defines Vegetation Type 4 in Tongaland.

Vegetation Type 5.

African Broadbill	Neergard's Sunbird
Bearded Robin	Peter's Twinspot
Pearl-spotted Owlet	Little Sparrow-Hawk
Square-tailed Drongo	Collared Sunbird
Purple-crested Turaco	Olive Bush-Shrike
Grey-headed Bush-Shrike	Red-bill Hoopoe
Natal Robin	Forest Weaver
Nicator	Wattle-eye Flycatcher
Yellow White-eye	Bleating Bush-Warbler
Rudd's Apalis	

For the most part this forest type has much the same avifauna as Vegetation Type 1.

MISCELLANEOUS

Throughout the flood plain area both Crocodiles and Monitor Lizards Varanus niloticus are extremely common, especially in the Ndumu Game Reserve.

Freshwater Turtles are also to be found in large numbers throughout the area.

SUMMARY PART 2.

1. Dry winter period extends from May till September, and the wet summer from the latter half of September to April. Main rain-bearing wind is from the south-west. Annually north and north-west winds alternate with east and south to south-west winds.
2. Three perennial rivers of the flood plain are the Pongolo, Ingwavuma and Usutu. Numerous seasonal streams rise in the Lebonbo Mountains flowing into the western edge of the plain. On the west of the plain red sandy soils alternate with hard red, loamy and clay types. Cliffs occur on several pans on the western side. Highest hill on the west is 625 ft. Low-lying white sand country is present on the east, intersected with numerous undulating longitudinal ridges and depressions. Pale loam and clayey soils occur close to the plain edge on the eastern side. Thirty principal pans occur on the plain, together with numerous smaller seasonal pans.

3. Vegetation of the flood plain and contiguous areas are divided into five types:

- Type 1. Riparian Forest.
2. Aquatic and Marginal Pan vegetation.
3. Acacia Tree and Bush vegetation.
4. Open and Closed Woodland.
5. Sand Forest.

White sand country supporting mainly Terminalia woodland with Sand Forest patches. Western section mainly Types 3 and 4, the latter a mixed woodland. Several large Sand Forest patches occur on the west.

4. Flood plain probably the heaviest native populated area in Tongaland. Natives own large herds of cattle and goats. Cultivation of crops is principally on the plain itself. Main crops are maize, sugar-cane, sweet potatoes. Harvest fish during both summer and winter seasons.
5. Mammals noted from sight records on and adjacent to the flood plain are listed. Birds common to the vegetation divisions made are listed. Large populations of crocodiles inhabit the plain, the heaviest concentration in Ndumu Game Reserve.

MKUZU FLOOD PLAIN.

23.7.58 to 1.8.58

Part 1.

Hippopotamus amphibius.

Part 2.

General account of the Environment.

Part 1.

HIPPOPOTAMUS AMPHIBIUS

DISTRIBUTION AND NUMBERS

Distribution appears to be governed principally by the seasonal rise and fall of water in the upper and central sections of the flood plain (between the Mkuzi Game Reserve and Oyengu Pan). The other important factor limiting their distribution, whether in the central flood plain area or the lower permanent swamps, is the presence or the lack of suitable shallows to lie up in during the daylight.

The pans, from Oyengu westwards, are subject to seasonal flooding as is the lower swamp country, except that the central pans dry fairly rapidly. The smaller dry up almost completely, and the larger show up large areas of mud-flats. The lower section of the plain, which is pure papyrus and reed swamps, has a more stable water level. The rise and fall of waters in the swamps is less noticeable as flood waters are dispersed over a greater area.

The size of the pan in the swamps does not appear to be of any importance if it is safety the animals seek, as all pans in this lower section have a dense impenetrable belt of papyrus and reeds growing along their edges. On several occasions hippos were heard grunting far out in the swamps. Thus it was absolutely impossible to obtain any count or details of hippos inhabiting the swamps. From previous experience, it is extremely hard to count hippos in the swamps from an aircraft, as the open stretches of water are so small. Yet this is the only satisfactory method of getting a general count. The central section is of course far easier as the pans are similar to those on the Pongolo Flood Plain. The same type of marsh persists here as on the Pongolo Plain.

Hippo were heard grunting from three large pans, where it was impossible to make a count either on foot or by boat. These I have included on the distribution map with question marks as to the individual herd numbers.

The total of hippos actually counted on the flood plains numbers 73. The largest herd occurs in the central portion of Mosi Pan, numbering 16, and appear to be fairly sedentary. Other herds in the same pan move frequently to Oyengu Pan.

Hippo herds occurring in certain pans on the north of the Mkuze river.

Mosi Pan	(a) 16
	(b) 12
	(c) 15
Mpanzi Pan	15

Herds occurring in pans south of the Mkuze river.

Tshanetshe Pan	?
Manhlangweni	?
Mpempe	13
Denezana	?
Matanjani	2

No single animals were observed during the course of the survey, nor did the local natives know of any.

LOCAL MOVEMENT OF HIPPOS ON THE FLOOD PLAIN

I was able to gather very little information on this subject, and only with further frequent observations will any idea of hippo movements and/or changes in their numbers, be noted.

When/.....

When high water is experienced on the flood plain during summer, hippos are known to inhabit the Ntambalala and Nsumu Pans for as long as the height of pan waters permit them to stay there. These pans recede fairly rapidly, although the latter have a wide expanse of water which remains through part or the whole of winter, but is extremely shallow throughout. Two hippos have been observed to frequent Nsumu Pan almost every year.

LYING-UP HAUNTS

Lying-up haunts of the individual herds occur in a variety of situations and vegetation types. Those herds occurring in the central (Mosi, Oyengu, Tshanetshe and Neshe Pans) flood plain have lying-up spots close to the water's edge, in either riparian forest (of the Mkuze river) or patches of coastal forest, as well as in dense woodland which has a closed understory. During summer months when riparian and swamp forest areas have water over their understory, the lying-up haunts in the wooded and coastal type forests become more popular.

In the central flood plain hippo lie-up during the day in suitable shallows in clumps, as in the Pongolo Pans. In the swamp areas the animals tramp down large stands of papyrus on to patches of thick mud, so that the water is a suitable depth.

Lying-up spots were noted mainly along the eastern shore of Mosi Pan, the western wooded areas of both Tshanetshe and Mpempe Pans (on the south of the river), and in a patch of coastal forest on the west bank of Enhlankha Pan.

GRAZING GROUNDS

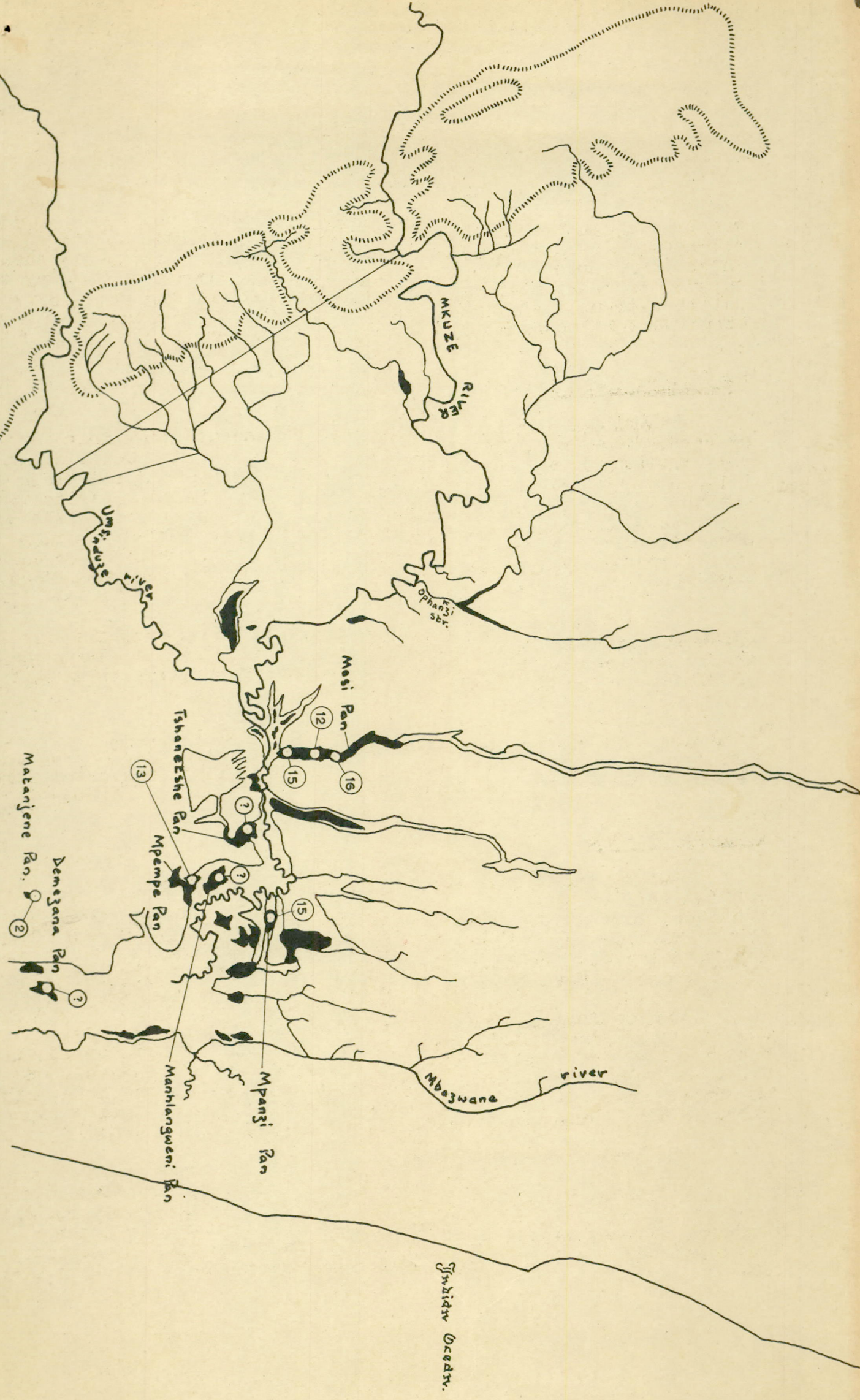
During the winter period the flood plain itself in the central section appears to be the main source of grazing. Large sections, such as the Neshe Pans, are completely covered over by iMbuku watergrass. Hippo in Mosi and Oyengu Pans graze out some way into the country on either side of the pans, which supports a dense ground cover of grass in woodland.

Hippos frequenting the swamp country appear to walk out considerable distances over the open lala palm and grassveld, in search of suitable grass patches. Favourable grazing is found along the edges of the many marshes which occur in the lala palm and grass areas. This grazing is done in terrain similar to most parts of the country surrounding Lake Sibayi.

The grass country on either side of the swamp area is not dense, but forms an open cover, growing thicker near patches of bush and shrubs. Large fires are numerous in the entire flood plain area, but have their greatest effect in the open grass country. I can only presume at this stage that a fair amount of nocturnal and local movement takes place when the country is burnt out.

Map 1.

DISTRIBUTION OF HIPPO



NATIVE METHODS FOR PREVENTING HIPPOS GAINING ACCESS TO CROPS

For the most part the riparian forest on the northern or left bank of the Mkuze River has been cleared, if not completely then in sections, for cultivation. There are no hippo-inhabited pans between the Lebombo Mountains and the confluence of the Mkuze - Umsinduzi rivers, except in summer, when several hippos move into Nsumu and Ntambalala Pans, occasionally visiting the Mtundana Pan. On this account there is no need for any form of fence to keep hippos out, till the Mosi area is reached.

Along the Mosi and Oyengu Pans log fences are constructed when maize is first planted. This type of fence is also to be found in the Mdhlazi Pan area.

METHODS USED BY NATIVES TO KILL HIPPO

The methods used are the same as those listed in the paper on the Pongolo. The snaring of hippos is confined to certain sections as the animals are not as widespread as they are on the Pongolo plain. The heaviest concentration of hippo snares are to be found along the Mosi and Oyengu Pans, especially the former where the use of sharpened poles is a common practice.

I was not aware of any shooting of hippos by Natives, but this, no doubt, is done as much as on the Pongolo Flood Plain, and perhaps commonly in the Mosi Pan area. Hippos frequenting the swamp areas are, in the main, more safe from human interference than anywhere else in Tongaland.

SUMMARY PART 1.

1. Total of 73 hippos noted on the flood plain. Largest herd totalling 16 animals. Many herds were impossible to count due to the large swamps, which are impenetrable.
2. Lying-up haunts occur in forest patches and woodland close to the pan edges.
3. Grazing is done chiefly in the woodland areas where grass is the main ground-cover. Some grazing is done on the plain itself in the central part.
4. Natives used the log-fence method chiefly for keeping hippos out of their fields.

Part 2.

GENERAL ACCOUNT OF THE ENVIRONMENT

INTRODUCTION

The Mkuze Flood Plain includes the area from the exit of the Lebombo Gorge in the west, to the swamp country which eventually connects with the north of Lake St. Lucia.

The Mkuze river is, for the most part, an east flowing river, and has the greatest variation in weather, soil and vegetation types of any waterway in Tongaland. All the others are principally north - south-lying rivers and lakes. The Flood Plain is about forty-five miles in length, varying from a hundred yards to several miles in width - the latter width in the swamp areas.

Many of the native names mentioned in the text and shown on the accompanying sketch maps, were collected from Natives during the survey.

ACKNOWLEDGMENTS

I wish to thank Ranger L.C. Denyer for help in many fields, especially regarding numerous native place names of the Flood Plain area, and also for the mutiplicity of kindnesses he and his wife showed me during the course of the survey and on innumerable other occasions.

CLIMATE

The climate of the flood plain area is much the same as that described for the Pongolo, but with these main differences. Due to the easterly course, the swamp areas and Mbazwane river have a considerably higher rainfall than that experienced in the Mosi and Mkuzi Game Reserve areas. The former part of the flood plain occurs within the littoral of the Tongaland region, and is thus subject to the alternating land and sea breezes; as well as the characteristic wind storms which rage over the open grass country on the east.

As on the Pongolo Flood Plain, heavy valley mist and dew are experienced during the winter period. Rain comes from the southwest, usually in the form of thunderstorms.

TOPOGRAPHY

Along the eastern margins of the swamp area (where the Mkuze and Mbazwane rivers merge) and the Mbazwane river, the country is predominantly loose, white sandy soil, making up the low undulating plains between the swamp area and the coastal dune range. The greater part of the eastern section is permanent or semi-permanent marsh. Small patches of coastal forest are scattered on the dry ridges intersecting the areas of marsh.

Proceeding westwards over the Mbazwane river, the country is largely covered by loose, white sandy soil which forms the very gently undulating terrain as far west as the Oyengu Pan. Numerous small, permanent marshes are scattered throughout, the majority of which are the source of the streams Masenga, Manaba, Kobeyana and Bigibigi, which flow into the swamps on the north of the Mkuze river in the vicinity of Mdhlazi Pan. The streams listed above, and the marshes of the Oyengu and Mosi Pans, are all longitudinal in form. This is well demonstrated by the Mosi Marsh, which begins some way south of Manaba Store, and flows (in summer) imperceptibly southwards into the Mosi Pan.

The use of the word "swamp" on maps and in common usage by people where the Mosi is concerned, is entirely a misnomer. This is a typical marsh, with reeds and a dense covering of short grass known to the Natives as "Mtente". The entire Mosi depression (both the north-flowing section as well as the south-flowing) is true marsh, where water is shallow and seasonal, with muddy soils along the edges. Swamps are permanent with deep water, covered mostly by papyrus - as well as reed-beds.

Few hills rise about 160' a.s.l. in the undulating terrain between the Mbazwane river and Oyengu Pan. The larger pans on the north of the Mkuze river are, from east to west, - Nhlutu, Tshangu, Bowane, Mdhlazi, Oyengu and Mosi. White sandy soil persists between the Oyengu and Mosi Pans, though in parts along the eastern edge of the latter, hard clay-like soil of a pale brown colour is common. From the western edge of Mosi Pan, for about half-a-mile, there occurs brown sandy soil, in parts loamy. Westwards to the Ophanzi stream, the terrain is dominantly loose red sand, interspersed here and there with patches of whitish or pale brown sand, which supports Sand Forest. Numerous undulating north-south lying ridges are a feature of the red-sand area. The highest of these is known as the Donsa Ridge, being 435'.

Once across the Ophanzi stream, the terrain changes immediately to red, hard soil, interspersed with large areas of clayey red, brown and black soils. Patches of brown, stony clay soil occur in scattered localities, but are mainly confined to the areas contiguous to streams and watercourses. Further west towards the Lebombo Mountains, red, hard soil becomes dominant, before the stony areas of the Lebombo foothills are reached.

The southern area of the Mkuze river has much the same range and variation in soils as described above, except that, as on the eastern margins of the swamp, the western edge has open, white sandy undulating hills, interspersed with a profusion of marshes and small pans. The larger pans occurring on the southern section, include Demezane, Enhlankha, Mpempe, Manhlangweni, Tshanetshe and Nsumu.

Fossil beds are present in many parts of the upper and central sections of the flood plain.

In addition to the Mkuze, two other large rivers flow into the flood plain. These are the Umsinduze and Mbazwane. The former is entirely a seasonal river; while the latter is perennial, as it drains a large tract of marsh country on either side of its course.

The entire flood plain is below the 250' contour.

VEGETATION

As the Mkuze river meanders eastwards across part of Tongaland, it embraces a large variation of vegetation forms on and contiguous to its flood plain, showing an excellent cross-section of the effect of aspect, climate and soils on the distribution of the vegetation types.

The vegetation of the area can be divided into eight main types, with appropriate sub-divisions under each. The eight divisions recognized are:-

- Type 1. Riparian Forest.
2. Aquatic Vegetation.
3. Swamp Forest.
4. Open Grassland and Lala Palm Vegetation.
5. Acacia Tree and Bush Vegetation.
6. Open and Closed Woodland.
7. Coastal Forest.
8. Sand Forest.

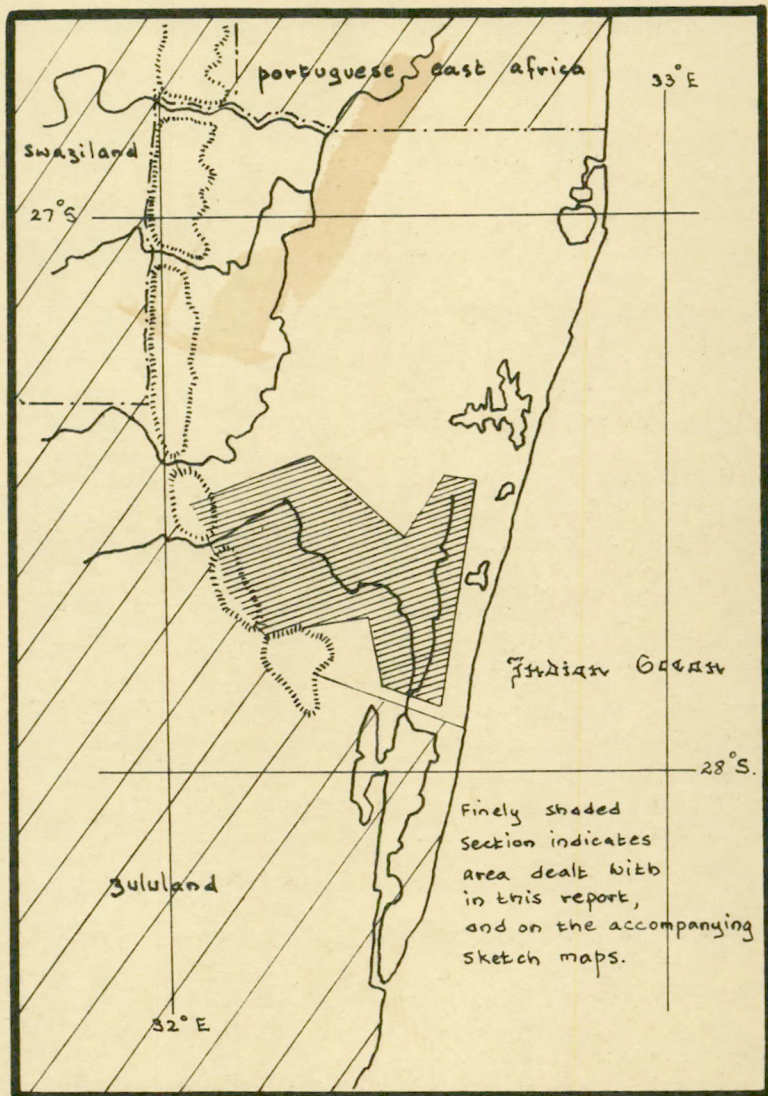
For ease of description, the vegetation along a south-east to north-west cross-section line is given, covering all eight Types (see Fig 1). This is followed by more detailed notes on the individual Types where necessary.

The low, undulating country on the eastern edge of the Mbazwane river is covered, for the most part, in grass, sedges becoming common as marshes are neared. These marshes have very little, if any, open water. The sedges and other water herbage, are rooted in black mud in stagnant water, one to three feet in depth. In the larger marshes the water depth is very much greater. The insectivorous plant, Drosera sp. is common along the edges of the marshes in the sandy, soggy ground. The grassland forms a dense cover, in places growing to a height of four feet. Grass is ranker on the edges of patches of shrubs and stunted trees. The greater part of this eastern, white sandy terrain supports a rather open growth of grassveld, which is usually between one and three feet in height.

These grasslands along the Mbazwane river have small, round patches of short coastal forest, scattered throughout on dry ground. The forest patches are some 12' - 15' in height, with taller trees of 20'. Here and there, pure stands of Strelitzia nicolai can be seen, with stunted growths of Strychnos innocua near the edges. Most of this marsh grass country is drained by the Mbazwane river. This vegetation is typical of Vegetation Type 4; here, lala palms Hyphaene crinita are uncommon, and where they do occur, reach a little way above the surrounding grass. The grass and lala palm belts on either side of the Mbazwane river, are subject to large grass fires, which at times burn for days on end, scorching everything; leaving a white desert, with minute stubs of grass and herbs showing through.

The Mbazwane river begins just south of the Mbazwane Store in the north, and flows almost due south for some fifteen miles, before merging into the huge swamp area of the south-eastern section of the Flood Plain. Numerous tributaries flow into the western side or right bank of the river, one of which is some five miles long. The entire Mbazwane river system supports a luxuriant growth of Swamp Forest (Vegetation Type 3), southwards to where the river opens out into the papyrus and reed-beds. In places, the Swamp Forest is over a quarter of a mile in width. Ferns Stenochlaena tenuifolia festoon the trees from near the water and boggy ground into the canopy. Red-coloured roots of Ficus hippopotami hang down in long streamers over the water. The canopy may be from 35' - 55'

high/.....



Position of the Mkuze Flood Plain

Map 2.

high, though it is hard to judge as the viewer stands on higher, dry ground at the sides. A multiplicity of smaller ferns, creepers, orchids and tall stands of Stenochlaena cover the under-story and most of the mid-stratum in a rich, green mass. Walking about in the forest, where the squelching ground is not covered by some plant, one notices the extensive network of roots and fine hair-roots everywhere in the mud. The silent running water is crystal-clear, and reddish in colour. Such a fantastic profusion of luxuriant plant life cannot be equalled in any other type of vegetation occurring in this region.

Along the Swamp Forest edges, on dry ground, dense, short coastal forest or woodland thickets occur. Lala Palms in between the growths of Umdoni trees, with Antidesma venosum, Strychnos innocua and spinosa (stunted specimens), Albizia adiantifolia, Vangueria infausta become more evident, increasing in quantity westwards to the Oyengu Pan. From these stunted thickets, open, undulating white sand terrain is reached, where stunted lala palms are the dominant species, on a ground cover of grass; and innumerable herbs and stunted tree growth, between 6" and 1' of Parinari mobola and Syzygium caudatum. Lala palm and grass is interrupted by patches of coastal forest and closed woodland growing on ridges. Here, Dialium schlechteri, Albizia adiantifolia, Phoenix reclinata, Acacia arabica var: kraussiana grow in profusion.

Throughout the grass and palm belt, are small patches of rank grass, surrounding stunted stands of Phoenix reclinata, Vangueria infausta, Dichrostachys sp., Lippia javanica and Dalbergia obovata.

The grass-palm belt between the Mbazwane river and Oyengu Pan, is traversed for some way by more or less permanent marshy streams, in places giving way to swamp and patches of Swamp Forest. They are, in succession westwards, - Masenga, Manaba, Ntanganene, Kobeyane and Bigibigi. Between the Masenga and Manaba streams are large stands of Umdoni park-land, especially evident along the edges of the large, marshy grass-covered depressions. These depressions contain seasonal water, though some are more permanent in nature.

The above-mentioned streams are north-south in course, merging into the swamp country, adjacent to Mdhlazi Pan. The upper reaches of the streams are thickly overgrown with tall stands (about 4' - 5') of Cyperus sp. (probably immensus) sedge, with a dense ground cover of Mtente Imperata cylindrica. Reeds Phragmites occur in small scattered patches. Other sedges Cyperus sp. are dominant throughout the streams' courses. In the lower section, swamp occurs; and isolated patches of papyrus Cyperus papyrus are present, interspersed with short growths of reeds. Of the patches of Swamp Forest occurring on these streams, the largest and most spectacular is the Manaba Forest at the junction of the Manaba and Ntanganene streams, and the Gwamba Forest at the confluence of the Masenga and Mpopomeni streams. These forests have a canopy of between 45' - 55' height. Some of the large trees are Ficus hippopotami, Rauvolfia caffra, Macaranga capensis. On the eastern edge of the Manaba Forest, several extremely large specimens of "Kaffirboom" Erythrina (probably caffra) grow to some 50' height in the swamp.

Two cattle dip tanks are situated on the western side of the Mbazwane river. Here, the stands of Lala palms have been permitted to grow to their full height. During July most of these had large clusters of brown seeds. These specimens were 12' - 15' in height. Natives have been stopped from cutting these palms to tap their juice, as they form a wind barrier against wind erosion. No ground cover can be found around cattle dips.

Lala palm is the dominant vegetation until the edge of the Oyengu Pan is reached, where Nkonono Terminalia sericea becomes common, occurring as large trees, forming a very open woodland. Umdoni and Strychnos spinosa, Strychnos innocua and Antidesma venosum are common in this open woodland and palm vegetation.

Further north, where the Oyengu Pan is left behind, the palms become denser in growth as the eastern Mosi wooded country is reached. Scattered amongst the palms are numerous trees and shrubs, between 15' and 20' in height.

In the extreme south, between Oyengu Pan and Bigibigi stream, there is closed woodland with Terminalia sericea, Syzygium caudatum and Albizia adiantifolia predominating, until a huge coastal forest area is reached, known as the Emdhlovu.

Crossing the sedge-covered, marshy stream which runs into the top end of Oyengu Pan, dense woodland is the vegetation immediately on the west of the pan, behind the fringing Umdoni trees. Closed Woodland persists throughout the area between the Oyengu and Mosi Pans. The entire area is interspersed with patches of Coastal Forest (Vegetation Type 7), and tall, lone Balanites maughamii next to patches of bush and thickets. The mixed woodland canopy is some 20' in height, with a generous growth of big trees to 30' height. Referable to Type 6.

Reeds interspersed with iMbuku watergrass line the banks of the Mosi Pan. The upper or northern part of the pan disappears into large reed-beds, which become scattered patches farther north along the Mosi Marsh. Mtente becomes one of the dominant marsh plants - mainly where the ground is soggy, but not necessarily inundated. Fever trees are scattered singly throughout the length of the Mosi, but become more common as the Mkuze river is reached in the south.

From the west bank of the Mosi, open mixed woodland occurs in a belt, about half-a-mile to a mile wide from the water's edge; after which it becomes closed Terminalia Woodland, but not dense, growing between 15' - 20' height with 25' emergents. This Terminalia Woodland, appearing on loose, red and brown sandy soil, has a noticeable lack of understory shrubs, the dominant ground cover being grass of some two feet in height. Four principal trees make up this Closed Woodland, namely Terminalia sericea, Acacia mossambicensis, Combretum zuluense, Strychnos innocua.

Gently undulating, red sand country occurs to the west, down to the Mkuze river (opposite the Mkuzi Game Reserve). One high, wooded ridge traverses the area between the Mosi and Mkuze river. This is the Donsa Ridge (shown on published maps as Udangasele) running north-south. Dense Terminalia - Acacia Woodland occurs from the ridge westwards, to about three miles from the Mkuze river and the Ophanzi stream. Throughout the Terminalia Woodland described above, are sections of pale or white sands which support Sand Forest patches. The largest of these is the Emakosini in the south, between Mosi and the Neshe Pans.

Out of the woodland into open country there is a ground cover of grass and scattered marula trees and acacias. In the depressions running towards the Mkuze river, there is fairly dense bush cover, interspersed with big trees. As one approaches the Mkuze riparian forest, the first knob-thorn and flat crown acacias are noted. This is about their easternmost extension in this part of the flood plain. South of Mtundana Pan, towards Neshe Pans, the country is open, acacia tree vegetation, with scattered thickets and bush of thorn and taller non-thorny trees, i.e. Sideroxylon inerme, Spirostachys africanus, Peltophorum africanum. This vegetation is due to the presence of brown clayey soil, interspersed with hard, red, stony soils.

The edge of the fringe of riparian forest that remains on the left bank of the river is now reached. This is but a remnant of the forest which once was fifty to a hundred yards wide along the left bank. On the Mkuze Game Reserve side, or the right bank of the river, tall, riparian forest is present, the canopy varying between 45' - 60' height. For the most part, this forest has extremely dense undergrowth, which in parts is almost impenetrable. The dominant understory of riparian forest is the Ulimilwengwe or isBambangubo Achyranthes aspera, which grows to five feet in parts, but is more common in dense stands up to three foot height. Coupled with this are tangled masses of thorny creepers, which either form large thickets, or grow twisting their way into the canopy, with innumerable branches hanging down to shoulder height. The dominant tree is Ficus sycamorus, of which there are some giant specimens. Riparian Forest is here termed Vegetation Type 1.

Following my cross-section line again, from the Ophanzi stream in a north-west direction, brown clayey soils are encountered for the first time. This soil supports dense thorn bush, dominated by acacia, and acacia vegetation. The thorn bush areas are interspersed with taller, non-thorny trees, such as Pseudocassine transvaalensis, Pappea capensis and Schotia brachypetala.

Further westwards, the thorn country becomes more open, red soil prevalent, and the brown or stony clay and loam soils confined to the depressions and watercourses. The red, hard soil occurring here supports a typical growth of open Acacia nigrescens tall tree vegetation, with a ground cover of tall grass. Other trees of a shorter habit are Bolusanthus speciosus, Heeria sp., Sclerocarya caffra, Acacia heteracantha. Towards the Lebombo foothills, the ground becomes more stony and although thorn bush and thickets persist into the foothills following streams and watercourses, Combretum vegetation becomes important.

A description of the individual Vegetation Types and the variation of each form in different localities, is given. Although remaining basically the same, the overall appearance of the same type of vegetation varies distinctively enough from place to place along the flood plain, to warrant mention of the different variations.

TYPE 1. RIPARIAN FOREST.

Riparian Forest can be divided into the following sub-divisions.

- (a) Canopy.
- (b) Mid-stratum.
- (c) Understory.
- (d) Creepers.
- (e) Marginal river-bank growth.
- (f) Forest margins.

This type of vegetation occurs throughout the length of the Mkuze river's course, from the Lebombo Mountains in the west to where the river merges into swamp country, where the forest comes to an abrupt end. Average width of riparian forest varies from a narrow fringe of large trees to about sixty yards and more. Lesser growths occur on the Ophanzi stream and Umsinduzi river, and latter having a prevalence of fever trees. The forest canopy rises to 60' and more in parts, the dominant tree being Ficus sycamorus. Both mid-stratum and understory are a tangled mass of vegetation, usually of a thorny nature. In parts the mid-stratum is clear, where trees of 15' and 20' are to be found. The greater part of the riparian forest understory is inundated by seasonal flood waters from time to time.

TYPE 2. AQUATIC VEGETATION.

Aquatic vegetation can be divided into the following sub-divisions.

- (a) Submerged aquatics.
- (b) Semi-emergent plants.
- (c) Floating aquatics.
- (d) Marginal vegetation.
- (e) Flood Plain vegetation of
 - i. Swamp.
 - ii. Marsh.

i. Vegetation covering the swamp country of the south-east portion of the flood plain is dominantly Cyperus papyrus and Phragmites mauritianus. This swamp vegetation persists for some way up the streams which flow in from the north, between the Oyengu Pan and Mbazwane river. There is a noticeable lack of Echinochloa pyramidalis throughout this area. The above described vegetation changes gradually to marsh where iKwane Cyperus sp. prob. immensus is dominant with Imperata cylindrica grass on the soggy ground along the edges. Stands of Juncus kraussii occur in dense and open growths amongst the latter grass. In the permanent stretches of water along the streams, clumps of tall papyrus are common. Nymphaea capensis and Nymphaea lotus are present on the open stretches of water.

ii. Marsh vegetation of the flood plain consists dominantly of Echinochloa pyramidalis, fringed with Phragmites along the edges. Scattered patches of Typha capensis occur throughout. Cyperus fastigiatus is the commonest vegetation on dry mud-flats or on dry seasonally flooded margins of pans. Echinochloa pyramidalis grows in thick belts along the edges of the deeper pans.

TYPE 3. SWAMP FOREST.

Swamp Forest is divided into the following sub-divisions.

- (a) Canopy.
- (b) Mid-stratum.
- (c) Understory.
- (d) Marsh vegetation of swamp forest margins.
- (e) Marginal swamp forest vegetation on dry ground.

The largest area of swamp forest occurs on the Mbazwane river and its tributaries. The height of the canopy varies but little, and is usually some 35' - 50'.

Vegetation noted in the small Swamp Forest patches.

- | | |
|-----------------------|-----------------------------|
| Ficus hippopotani. | Macaranga capensis. |
| Voacanga dregii. | Syzygium guineense. |
| Rauvolfia caffra. | Myrica conifera. |
| Cussonia umbellifera. | Stenochlaena tenuifolia. |
| Cyperus sp. | Erythrina sp. (prob caffra) |

Marginal Swamp Forest vegetation on dry and/or soggy ground.

- | | |
|-----------------------|----------------------|
| Cussonia chartacea. | Kraussia floribunda. |
| Albizia adiantifolia. | Dialium schlechteri. |
| Syzygium caudatum. | Phoenix reclinata. |
| Setaria chevalieri. | |

The most westerly swamp forest occurring on the flood plain is on the western edge of Mdhrazi Pan.

TYPE 4. OPEN GRASSLAND & LALA PALM VEGETATION.

Type 4. can be divided into the following sub-divisions.

- (a) Dominantly grassland with -
- i. Patches of Coastal Forest.
 - ii. Scrub/Dwarf tree growth.
 - iii. Marsh.
- (b) Dominantly Palms with -
- i. Patches of Coastal Forest.
 - ii. Woodland (Umdoni/Other).
 - iii. Scrub/Dwarf tree growth.
 - iv. Marsh.

Hyphaene crinita is the dominant vegetation between the Mbazwane river and Oyengu Pan on the north of the plain. The white sandy soil also supports a ground cover of grass and herbs with scattered dwarf growths of Parinari mabola and Syzygium caudatum. The latter occurs in pure growths as much as a foot in height, though it is more usual to see stands 6" high. Grass has disappeared in many sections as the plant Helichrysum kraussii has taken over.

As the Mbazwane river is approached short trees of 12' - 15' height become common amongst the palms. Common species are:-

- | | |
|-----------------------|------------------------|
| Antidesma venosum. | Syzygium caudatum. |
| Albizia adiantifolia. | Strychnos innocua. |
| Mundulea sericea. | Garcinia livingstonii. |
| Brachylaena discolor. | Vangueria infausta. |
| Albizia versicolor. | Strychnos spinosa. |
| Dichrostachys sp. | Acacia senegal. |
| Sclerocarya caffra. | Trichilia emetica. |

The more open lala palm country has stunted patches of scrub and bush, made up mainly of:-

- | | |
|--|-----------------------|
| Phoenix reclinata. | Strychnos innocua. |
| Strychnos spinosa. | Dichrostachys sp. |
| Albizia adiantifolia. | Brachylaena discolor. |
| With rank grass and thick growths of <u>Helichrysum kraussii</u> along the edge. | |

In the west, where palm vegetation extends towards the Mosi Marsh area, tree vegetation becomes taller and forms true woodland in parts, though very open. Thickets occur everywhere, being made up of close-growing Phoenix reclinata and tall trees interlaced with creepers, commonly Smilax kraussiana. The larger trees of this part are some 20' high. Large Terminalia sericea trees are important features of this palm area.

Common vegetation occurring in palm veld nearing the Mosi Marsh include:-

Acacia arabica var: kraussiana.	Acacia robusta.
Trichilia emetica.	Kigelia pinnata.
Terminalia sericea.	Strychnos innocua.
Strychnos spinosa.	Garcinia livingstonii.
Syzygium caudatum.	Vangueria infausta.
Mundulea sericea.	Antidesma venosum.

On the eastern side of the Mosi Pan, between the Coastal Forest patches, similar species as listed above make up a closed woodland with taller trees and many patches of bush composed of dense-growing woodland trees, interlaced with creepers and shrubs. Common trees, including the above, are:-

Acacia mossambicensis.	Ziziphus mucronata.
Combretum zeyheri.	Balanites maughamii.
Dialium schlechteri.	Sclerocarya caffra.

Here palms are still evident, but are not dominant.

TYPE 5. ACACIA TREE & BUSH VEGETATION.

Type 5. is divided into two main sub-divisions, namely:-

- (a) Treeveld with tall grass (hard, red soils).
- (b) Thorn Bush interspersed with taller non-thorny trees (clay and loamy soils).

From the brief glimpses of this type of vegetation, it appeared to me to be much the same as the Pongolo Flood Plains Vegetation Type 3. Some examples are listed hereunder.

Sub-division (b) occurs in the western Neshe Pans area. Between the pans and the Mkuze river: short dense thorn bush with taller trees scattered throughout, growing on brown clayey soil and loamy sand. (See Pongolo Flood Plain under Vegetation Type 3. (a) and (b)). The same type of vegetation is dominant on the clay and loam soils from the Phanzi stream westwards towards the Lebombo foothills.

In the central area between the Ophanzi stream and the Lebombo, occur large areas of hard, red soil which bear tall, open acacia treeveld, with Acacia nigrescens prevalent. These occur up to 30' and 35' in height. The ground cover is tall grass. Smaller trees forming this open treeveld are:-

Bolusanthus speciosus.	Heeria sp.
Peltophorum africanum.	Acacia heteracantha.
Sclerocarya caffra.	Ziziphus mucronata.

LEBOMBO MT. RANGE HARD RED SOIL &/or CLAY TYPES RED SAND TERRAIN MOSI PAN WHITE

Though vegetation Type 5 extends some way into the valleys and on the bases of the foothills, the vegetation becomes dominantly open Combretum woodland, supported by very stony and rocky soils. Height of the tree tops of this open woodland is about 15'. Though it varies greatly between 12 and 20'.

<p>Hard red soil is dominant in parts, alternating with pale brown clay types which are common in the vicinity of watercourses and the flood plain. Some of the clayey soils are stony, this becoming more pronounced as the Lebombo foothills are approached.</p>	<p>Ophanzi str. During winter, hard black mud soil with patches of clay.</p>	<p>Loose red sand persists over the greater part of the area. This interspersed with pale brown and white sand. The latter supporting a characteristic type of vegetation. Though red sand is prevalent reached the soil becomes more solid in formation, with large or small patches of clayey soil. Stones are rare in the areas of the Mosi Marsh. Red sand does not occur to the east of the Mosi Marsh.</p>	<p>TYPE 1.</p>	<p>TYPE 6(c).</p>	<p>8.</p>	<p>VEG. TYPE 6(b).</p>	<p>8. TYPE 6(b).</p>	<p>TYPE 2.</p>	<p>6(c).</p>
<p>Hard red soils have a covering of dense growing tall grass, with tall trees scattered throughout. Dominantly <i>Acacia nigrescens</i>. Very little shrub or bush growth is present, though prevalent when water-courses and depressions are reached. Other tree growth occurring amongst or between the "groves" of knobthorn are:- <i>Acacia heteracantha</i>, <i>Bolusanthus speciosus</i>, <i>Heeria</i> sp., <i>Sclerocarya caffra</i>.</p>	<p>Dense thorn-bush and scrub between 6-12' height, - dominantly <i>acacia</i> spp. Open patches of Aloe covered ground, with numerous thickets are common. Throughout this short dense bush are taller acacias and non-thorny trees. Common vegetation forming the short bush growths are:- <i>Acacia senegal</i>, <i>Acacia grandicornuta</i>, <i>Euphorbia grandicornis</i>, <i>Gardinia cornuta</i>, <i>Acacia arabica</i> var. <i>kraussiana</i>, <i>Euclea divinorum</i>, <i>Euclea daphnoides</i>. With taller trees of 15'-25' height, - mainly <i>Schotia brachypetala</i>, <i>Pappia capensis</i>, <i>Sideroxylon inerme</i>, <i>Spirostachys africanus</i>, <i>Pseudocassia transvaalensis</i></p>	<p>Height of riparian forest varies between 30-55'. Width on either side of the bank, from a fringe to some 40'. Riparian forest is very much wider and more luxuriant in growth on the Mkoze river. Dominant large tree is <i>Ficus sycamorus</i>. Others are <i>Rauvolfia caffra</i>, <i>Syzygium guineensis</i>, <i>Trichilia emetica</i>. In places the Ophanzi str. has only a thin fringe of trees, with otherwise reed covered banks.</p>	<p>Approaching the flood plain near the Ophanzi stream the woodland thins out, - <i>Acacia karroo</i> scrub is found under a scattering of large <i>Sclerocarya caffra</i> & <i>Spirostachys africanus</i>. Moving from east to west this is the first time <i>Acacia nigrescens</i> & <i>Acacia heteracantha</i> are met with. This is a mixed wooded area with patches of dense scrub & bush before opening out eastwards into <i>Terminalia</i> Woodland.</p>	<p>On the pale &/or white sand patches are patches of Sand Forest. These strips are between 20-25' height. No marginal forest vegetation is usual.</p>	<p>From near Ophanzi str. to Donsa ridge the Closed Woodland is dominantly <i>Terminalia sericea</i> & <i>Acacia mossambicensis</i>. Interspersed with patches of Sand Forest. After the Donsa ridge to near the Mosi Pan closed <i>Terminalia sericea</i> woodland persists (that is with the tree tops touching). Closed Woodland of 15'-20' height with larger trees of 25' height. Other than <i>Terminalia</i> common trees noted in this closed woodland are:- <i>Acacia mossambicensis</i>, <i>Strychnos innocua</i>, <i>Combretum zuluense</i>, <i>Spirostachys africanus</i>, <i>Strychnos spinosa</i>, <i>S. innocua</i>, <i>Dichrostachys</i> sp., <i>Hyphaene crinita</i> is still evident throughout this section, in small numbers. The ground cover is dominantly grass. Very little shrub growth. On the edge of the Mosi open woodland with an undercovering of shrub growth is common, dominantly <i>Sclerocarya caffra</i>, <i>Ziziphus mucronata</i>, <i>Acacia mossambicensis</i>.</p>	<p>Tall rank grass is present along the edge of the Mosi amongst the marulla trees.</p>	<p>Along the marsh edges, & covering large sections of the soggy ground is <i>Imperata cylindrica</i> (grass). Where water is prevalent in the marsh it supports large & small beds of <i>Phragmites mauritianus</i> reeds. Fewer trees grow here & there along the edges. The pan is edged by reeds & <i>Echinochloa pyramidalis</i>. <i>Nymphaea</i> sp. waterlilies are common.</p>	<p>Mixed dense woodland of 20'-25' height. Mainly <i>Terminalia sericea</i>, <i>Sclerocarya caffra</i>, <i>Acacia mossambicensis</i>, <i>Schotia brachypetala</i>, <i>Ziziphus mucronata</i>.</p>	

Fig. 1. Diagrammatic cross-section from south-east to north-west illustrating the distribution of the cross-sectional line is made along the north of the flood plain.

SAND

Oyengu Pan

WHITE SAND TERRAIN

ose white sand
gins from the
si Marsh.

tending east -
rds covering
ne entire littoral

ea, including
Coastal zone
range.

7.

6(c)

TYPE 2.

VEG. TYPE 4 (b)

2

4(b)

2

4(b)

7

TYPES 4(b) & 6(c)

3

7

4(b)

3

TYPE 4 (b)

TYPE 3

4(d)

Coastal Forest canopy between 20-25' height. Dominant trees *Dialium schlechteri*, *Hymenocardia ulmoides*, *Labourdonnaisia discolor*. Understory - *Zamioculcas* sp. *Sansiveria thyrsiflora*

Other common trees of this mixed woodland are: - *Strychnos spinosa*, *S. innocua*, *Balanites maughamii*, *Conopharyngia elegans*, *Acacia robusta*.

On the western edge of Oyengu Pan is a small belt of umdoni (*Syzygium caudatum*) trees. Dense growths of *Paragmites mauritianus* & *Echinochloa pyramidalis* occur on the pan edges. In the marshy str. on the N. of the pan there is a covering of *Cyperus* sp. (prob. *immensus*) & *Imperata cylindrica*.

The eastern margins of Oyengu Pan are heavily wooded. A dense mixed type of woodland heavily overgrown with shrub understory. This woodland soon opens out into open-treeland of the lala Palm area. Common trees of this dense wooded area are: - *Ziziphus mucronata*, *Gardenia cornuta*, *Schotia brachypetala*, *Kigelia pinnata*, *Brachylaena discolor*, *Antidesma venosum*, *Spirostachys africana*.

Open Lala Palm country. Ground covering of grass, herbs & dwarf tree growth (*Parinari mabola* & *Syzygium caudatum*). Palm belt is interspersed with numerous small marshes. Patches of scrub & bush are common - these made up of *Hyphaene crinita*, *Phoenix reclinata*, *Albizia adiantifolia*, *Brachylaena discolor*, *Lippia javanica*, *Strychnos spinosa*, *S. innocua*, & *Kraussia floribunda*. This type of vegetation is the beginning of what probably will eventually be a small patch of Coastal bush or forest.

Bigibigi sbr. Covered dominantly by *Cyperus* sp. (prob. *immensus*). Also *Imperata cylindrica* on soggy ground. Small patches of reeds.

Kobeyana stream.

Lala palm vegetation dominant, but with large areas of grass covered seasonal marshes. Along the marsh edges there are large stands of *Syzygium caudatum*. The majority of these trees are between 25'-30' height. Only a grass groundcover exists under the umdoni wooded areas. In places small patches of bush occur on large ant-hills.

Swamp forest on the Manaba stream. Canopy between 40-55'. In parts with a dense undergrowth, dominantly *Stenochlaena tenuifolia* (fern).

Short coastal forest patches grow close along the dry soil margins of swamp forest. These have a very dense undergrowth.

Masenga stream.

Palm vegetation becomes more open, with larger areas of grassland, herbs, & dwarf tree growth.

Nearing the Mbagwane river scrub & dense bush is very common. Small dense patches of coastal forest are scattered along the swamp margins.

Mbagwane river. The largest single stretch of Swamp Forest in southern Tongaland covers the greater part of the river and its tributaries. Canopy trees up to 55' height. (approx.).

Dominantly open grassland interspersed with large areas of marsh. *Hyphaene crinita* almost rare. Small rounded patches of coastal forest occur here & there.

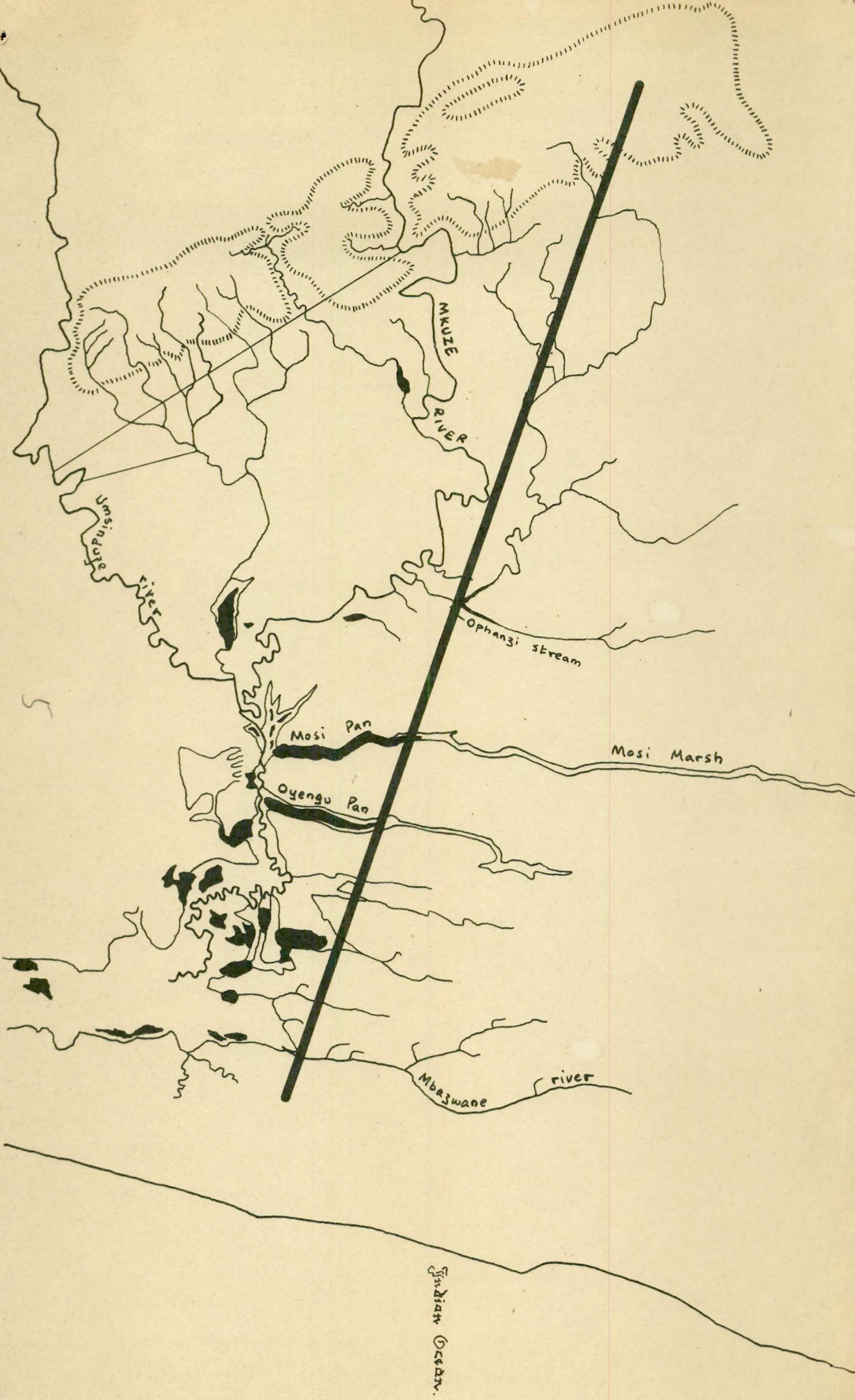
Vegetation Types on and adjacent to the Mkuze Flood Plain.

N.W.

S.E.

Map 4.

Position of the cross-section line used in Fig 1.



TYPE 6. OPEN & CLOSED WOODLAND.

Woodland is divided into the following sub-divisions.

- (a) Umdoni Woodland - scattered patches from the Mosi Pan eastwards.
- (b) Terminalia Woodland - prevalent on red sandy soil. Occurs predominantly from the Mosi Marsh westwards.
- (c) Mixed Woodland.

Umdoni woodland patches occur in the palm belt west of the Mbazwane river. It is usual for these patches to be pure stands of Syzygium caudatum, forming an open park-like vegetation. The only vegetation noted under the trees is grass, with some small herbs and perhaps several small Phoenix reclinata palms. The largest stands of Syzygium caudatum occur between the Bigibigi and Masenga streams where they grow along the edges of the seasonal, grass-covered marshes common between these streams. Trees are between 15' and 25' height. Some of the larger trees probably reach 30'. See Fig 1. for occurrence.

Terminalia woodland, though dominant between the Mosi Pan and Ophanzi stream farther west, also occurs between the Mosi and Oyengu Pans, though for the most part the latter area is covered mainly by Mixed Woodland. From the Mosi eastwards Terminalia sericea becomes one of several dominant trees, so it is actually referable to sub-division (c) Mixed Woodland.

The dominant trees of Terminalia Woodland between Mosi Pan and the Ophanzi stream are:-

- | | |
|-------------------------------------|--------------------------------|
| <u>Terminalia sericea</u> (mainly). | <u>Acacia mossambicensis</u> . |
| <u>Combretum zuluense</u> . | <u>Strychnos innocua</u> . |
| <u>Strychnos spinosa</u> . | |

Also occurring in this belt of Closed Woodland are the following:-

- | | |
|---------------------------------|-------------------------------|
| <u>Dichrostachys</u> sp. | <u>Hyphaene crinita</u> . |
| <u>Spirostachys africanus</u> . | <u>Brachylaena discolor</u> . |

The Mixed Woodland area between Mosi Pan and Oyengu Pan is of a closed type (at least for the most part, the tree tops touching). This Mixed Woodland area has dense undergrowth in most parts, constituted mainly by rank grass. Patches of Coastal Forest occur throughout this section, and are common.

Vegetation making up this closed Mixed Woodland area are:-

- | | |
|--|--------------------------------|
| <u>Sclerocarya caffra</u> . | <u>Terminalia sericea</u> . |
| <u>Acacia robusta</u> . | <u>Strychnos innocua</u> . |
| <u>Strychnos spinosa</u> . | <u>Conopharyngia elegans</u> . |
| <u>Vangueria infausta</u> . | <u>Acacia mossambicensis</u> . |
| <u>Trichilia emetica</u> . | <u>Ziziphus mucronata</u> . |
| <u>Acacia arabica</u> var: <u>kraussiana</u> . | |
| <u>Dialium schlechteri</u> . | <u>Balanites maughamii</u> . |
| <u>Garcinia livingstonei</u> . | <u>Kigelia pinnata</u> . |
| <u>Brachylaena discolor</u> . | <u>Antidesma venosum</u> . |

The entire eastern margin of Oyengu Pan has an extremely dense Mixed Woodland of between 20' - 30' height. For the most part this Mixed Woodland has very dense undergrowth, with tall grass along the edges. This "belt" does not occur very far eastwards before opening out into Lala Palm vegetation.

Mixed Woodland on the eastern side of Oyengu Pan is composed mainly of:-

Schotia brachypetala.	Euclea divinorum.
Kigelia pinnata.	Ziziphus mucronata.
Gardenia cornuta.	Spirostachys africanus.
Sclerocarya caffra.	Acacia pennata.
Euclea daphnoides.	Trichilia emetica.
Phoenix reclinata.	Hyphaene crinita.
Rhus sp.	Kraussia floribunda.
Canthium sp.	Dichrostachys sp.
Phyllanthus reticulatus.	Acacia karroo.
Acacia senegal.	Acacia mossambicensis.
Euphorbia ingens.	Conopharyngia elegans.
Combretum zuluense.	Strychnos innocua.
Strychnos spinosa.	Ficus sycamorus.
Acacia robusta.	Antidesma venosum.
Vangueria infausta.	Terminalia sericea.
Albizia adiantifolia.	Syzygium caudatum.
Asclepias physocarpa.	

TYPE 7. COASTAL FOREST.

Coastal Forest can be separated into the following sub-divisions:-

- (a) Canopy.
- (b) Mid-stratum.
- (c) Creepers.
- (d) Understory.
- (e) Marginal forest growth.

Coastal Forest patches are irregular in shape, and commonly occur as small patches, especially in the palm and grassveld. Otherwise, large patches are to be found here and there throughout. The forest canopy is between 15' - 25' in height, with emergents to about 30'. Coastal Forest occurs from the Mosi Marsh eastwards.

Dominant canopy trees are Dialium schlechteri, Hymenocardia ulmoides and Labourdonnaisia discolor.

TYPE 8. SAND FOREST.

Sand Forest can be separated into the following sub-divisions:-

- (a) Canopy.
- (b) Mid-stratum.
- (c) Forest Creepers.
- (d) Understory.

When necessary, another sub-division, namely "Emergents", can be inserted at the beginning.

This dry form of coastal forest occurs from the Mosi Marsh westwards. It has a canopy of between 15' - 25' with emergents of 30' or more. Dominant canopy trees are Newtonia hildebrandtii, "Mziti", Pteleopsis myrtifolia, Dialium schlechteri, Hymenocardia ulmoides. Though most of the southern Tongaland patches of Sand Forest are irregular in shape, their tendency is towards the longitudinal form, - as is so obvious a little farther north.

NATIVES.

The heaviest concentration of Natives are in two areas:-

1. The entire northern section of the Flood Plain, between the Mbazwane river in the east, to the Lebombo Mountains in the west. Though living throughout the open palm vegetation and in the wooded areas, they are usually close to a pan or stream, somewhere near a perennial supply of water.
2. On the margins of the Flood Plain, between the Kwa Mnyayesa Store and the Nibela Peninsula.

Nowhere is there any continuous concentration, the kraals being very scattered as compared with those along the Pongolo Flood Plain. Fairly large herds of cattle and goats are kept by Natives, especially in the lala palm country towards the Mbazwane river.

Crops cultivated on and adjacent to the Flood Plain are largely, maize, sweet potatoes and Ground Nuts. Others include:-

- | | |
|--------------|-------------|
| Kaffir-corn. | Juga Beans. |
| Sugar-cane. | Casava. |
| Pumpkin. | Banana. |
| Mango. | |

During winter the women dig up lily bulbs Nymphaea sp. for consumption.

On the northern side of the Mkuze river, from near the Neshe Pans up-river as far as the Lebombo Mountains, Natives have chopped down and cleared large tracts of riparian forest for cultivation. On the Mkuzi Game Reserve side the river's natural untouched forest remains. On the opposite bank are almost bare river banks; the flats next to the river intersected with sand-bars, with amongst the fields only a few large tree stumps remaining. In other parts a narrow fringe of riparian forest trees remains, but behind it is bare ground.

No Natives have punts or any other sort of boat on the Mkuze river. So far as I am aware, Natives in this area do not either "fonya" net or set "mona" traps for fish. The only form of fishing is done with lines.

Three stores serve the greater part of the Native population of the flood plain area. They are Tshongwe and Mbazwane in the north, and Kwa Mnyayesa on the south bank.

NOTES ON MAMMALS.

Mammals occurring in the Mkuzi Game Reserve are not dealt with in this paper. Only those animals noted from sight records on and adjacent to the flood plain away from the Game Reserve, are listed:-

- | | |
|--|------------------------|
| Inyala. | Bushbuck. |
| Reedbuck. | Grey Duiker. |
| Red Bush-Duiker. | Suni Antelope. |
| Steenbuck. | Chacma Baboon. |
| Vervet Monkey. | Rusty-spotted Genet. |
| Banded Mongoose. | Slender Mongoose. |
| Bushpig. | Antbear. |
| Cane Rat. | Tonga Yellow Squirrel. |
| Elephant Shrew. | |
| Nsamango Monkey - confined entirely to the Mbazwane river. | |

NOTES ON BIRDS.

Only aquatic birds noted on the Flood Plain are mentioned. The length of time spent on this Flood Plain area did not permit of a comprehensive list of birds.

Birds noted nesting and breeding on the Mkuze Flood Plain.

Blacksmith Plover.	Black-winged Stilt.
Wood Stork.	White-breasted Cormorant.
Reed Cormorant.	Darter.

Common aquatic birds noted from sight records (including the above).

White-faced Duck.	Spurwing Goose.
Goliath Heron.	Dwarf Goose.
African Jacana.	Little Egret.
Caspian Tern.	Common Tern.
Yellow-bill Duck.	White-backed Duck.
Red-bill Teal.	Spoonbill.
Grey-headed Gull.	Pink-backed Pelican.
White Pelican.	Black Crake.
Squacco Heron.	Dabchick.
Moorhen.	Purple Heron.
Purple Gallinule.	Black-necked Heron.
Fish Eagle.	Cattle Egret.

Reed and Marsh Warblers in the reed-beds and Grey-rumped Swallows on the flood plain margins.

MISCELLANEOUS.

Crocodiles are abundant in the Mosi Pan, but their numbers do not appear to be as large as on the Pongolo Flood Plain. Both Monitor Lizards (Varanus nilotica and V. albigularis) are fairly common, especially the water-loving species nilotica.

Freshwater Turtles occur throughout the pans of the central and western sections of the plain.

SUMMARY PART 2.

1. The climate of the area is described, and found to be largely similar to that of the Pongolo Flood Plain.
2. The surface soils of the area are briefly outlined and the following sequence is found: near the Lebombo foothills hard red loams and brown clay soils; from Ophanzi stream to Mosi Pan loose red sands; east of Mosi Pan loose white sands.
3. Only the Mkuze and Mbazwane rivers are normally perennial; the former does, however, dry up completely in very dry seasons.
4. Numerous seasonal streams and watercourses run into the western section of the plain, the largest being the Umsinduzi.
5. The eastern section is almost entirely a large, permanent swamp, into which the two main rivers lose themselves. This drains into Lake St. Lucia. Numerous marshes and streams are found near this eastern section.