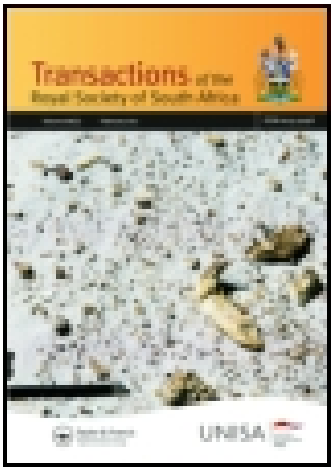

Transactions of the Royal Society of South Africa

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ttrs20

AN ACCOUNT OF THE PLANT ECOLOGY OF THE DUNE FOREST AT LAKE SIBAYI

C. M. Breen [a]

[a] Department of Botany and Microbiology , Rhodes University)

Published online: 22 Mar 2010.

To cite this article: C. M. Breen (1971) AN ACCOUNT OF THE PLANT ECOLOGY OF THE DUNE FOREST AT LAKE SIBAYI, Transactions of the Royal Society of South Africa, 39:3, 223-234, DOI: 10.1080/00359197109519117

To link to this article: http://dx.doi.org/10.1080/00359197109519117

AN ACCOUNT OF THE PLANT ECOLOGY OF THE DUNE FOREST AT LAKE SIBAYI

By C. M. Breen
(Department of Botany and Microbiology, Rhodes University)

(With 3 text-figures and 2 plates)

(Read April 15, 1970)

Opsomming

Die legging, fisiografie en klimaat van die duinwoud in die omgewing van Sibayimeer, word beskryf. Die algemene ekologie van die woud, met besondere verwysing na die samestelling en digtheid van die bome en struike, word uiteengesit. Die waarnemings word bespreek met betrekking tot die oorlewing van die belangrikste bome wat die daklaag vorm. Dit lei tot die gevolgtrekking dat die woud 'n stabiele tipe plantegroei, d.w.s. klimaksduinwoud, verteenwoordig. 'n Voorlopige lys van plante, wat in die duinwoud versamel is, word gegee.

Summary

The location, physiography and climate of the dune forest in the vicinity of Lake Sibayi is given. The general ecology of the forest, with particular reference to composition and density of trees and shrubs, is outlined. The results are discussed in relation to survival of the most important canopy trees. It is concluded that the forest represents a stable vegetation type, i.e. Climax Dune Forest. A preliminary list of plants collected in the dune forest is appended.

Introduction

The coastal dune forest (Coastal Tropical Forest, Acocks, 1953) in the vicinity of Lake Sibayi (32°43'E between approximately 27°19'S and 27°25'S) is part of the Bantu Trust area of Tongaland. The area is administered by the Department of Bantu Administration and, consequently, provision has been made for proper control of the indigenous forests. However, cutting has not been strictly controlled because, until recently, there was no alternative source of timber for the Bantu in the area. The forestry project, which was started in 1959, now serves as a source of employment and as a supply of timber for construction and fuel. The demands on the indigenous forests have, therefore, decreased gradually and, at present, little cutting occurs in the forest.

In some parts of Zululand, the Department of Bantu Administration has successfully made large plantings of *Casuarina* to stabilize the dune system. Between 1948 and 1957, the Department planted *Casuarina* on some of the larger exposed areas at Sibayi (fig. 1) and these areas have been successfully stabilized.

The soil in the Sibayi area is sandy and will not support crops; consequently the Bantu cultivated areas in the forest to utilize the accumulated organic debris which resulted in improved crops. As with cutting in the forest, control had to be applied gradually as alternative sources of livelihood were developed and improved farming methods introduced, e.g. use of fertilizer. At the present time, agriculture in the dune system has been stopped.

In view of the history of the area, it seemed desirable to start ecological investi-

gations on the dune forest. This paper is the result of the preliminary investigations designed to describe the general structure of the forest as a whole and to determine the extent to which the canopy-forming trees have been affected by the practices outlined above.

Topography

The area consists of a ridge of stabilized sand, rising steeply (slope of about 30°) from the lake shore in the west (70 feet above sea-level) to a maximum elevation of 449 feet (Beacon, fig. 1). Eastwards, the surface undulates so that the slope down to the Indian Ocean is less steep than in the west (pl. 3). Towards the NNE., the altitude of the dune system decreases gradually so that the northernmost part of the dune forest investigated is at an altitude of approximately 200 feet.

The dune forest can be divided into three major ecological areas: A steep western aspect, an undulating area eastwards and a marginal coastal fringe.

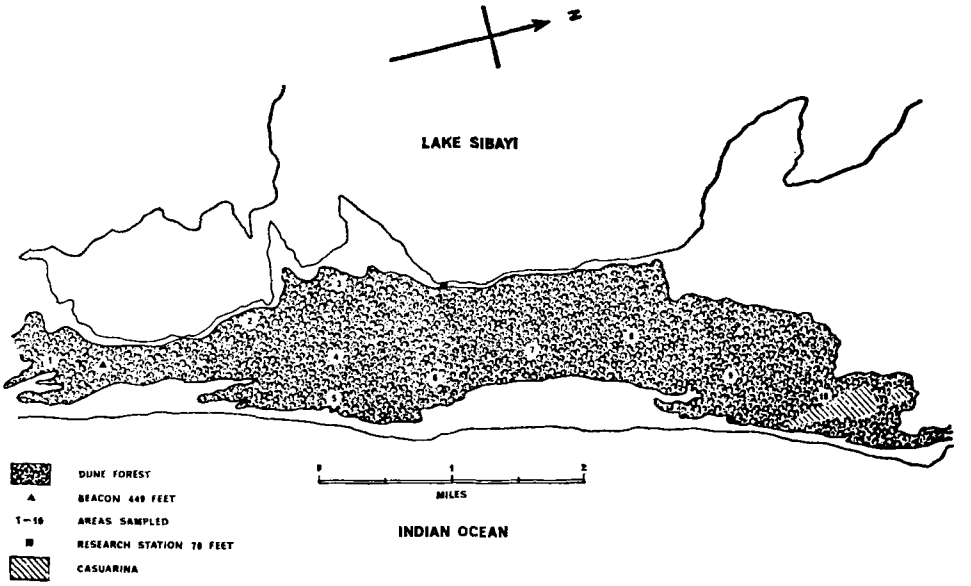

Fig. 1. The distribution of dune forest in the vicinity of Lake Sibayi.

Climate

Climatic data are available from the Weather Bureau reports for three stations in the vicinity of Lake Sibayi: Mbazwane (27°30'S, 32°36'E), Mseleni (27°22'S, 32°32'E) and Ngutshana (27°13'S, 32°34'E). The last station has few records and consequently the data available are not representative. The records for Mbazwane (12 years) and Mseleni (20 years) provide some idea of the climate and are summarized in figure 2. The rainfall of the coastal plains of northern Natal is highest near the sea and decreases inland. Thus, the coastal dune forest in the vicinity of Lake

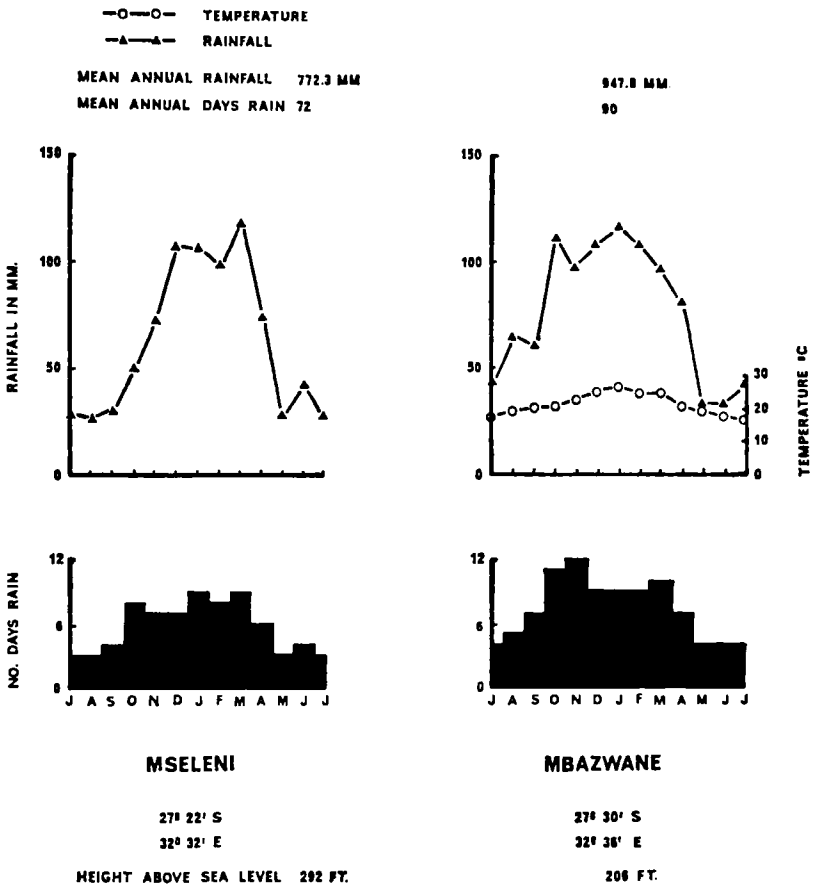

FIG. 2. Summary of climatic data available from stations in the vicinity of Lake Sibayi.

Sibayi is likely to receive more rain than either Mseleni or Mbazwane; probably of the order of 1,000 mm annually.

Generally speaking, the climate is humid with warm, wet summers, and winters which are mild and dry by comparison.

The prevailing winds are north-east (sea breezes) and south-west (rain-bearing) and the greater proportion of the rain results from thunderstorms. Although predominantly a summer-rainfall area, on the average no month is likely to have less than about 30 mm of rain, distributed over three days.

METHOD

The Random Pairs Method (Cottom & Curtis, 1956) was chosen in preference to other plotless methods because the measurements are easy to take in the field and the method allows workers to cover considerable distances, enhancing the overall

impression gained as a result of field observation. There is evidence that, provided sufficient points are taken, the results obtained do not differ significantly from those obtained with the Quarter Method (Cottam & Curtis, 1956).

The method involves taking sampling points along a predetermined line. In order to obtain a random distribution of these lines within the dune forest, ten sample areas were selected as follows: the area was transferred to a grid and, using random numbers, ten areas were selected. Each area was sampled by at least 40 points. The total number of points available for analysis was 430.

Since the main object of the investigation was the structure and survival of the canopy and subcanopy, only trees greater than 6 feet in height were recorded. The height was estimated and recorded in different height classes and the girth at breast height was measured and recorded in girth classes (Table 1).

Results

1. *General observations*

The forest is composed of three strata: canopy, subcanopy and the shrub and herbaceous layer. The height of the canopy varies considerably in relation to aspect, the highest canopy (40–50 feet) occurring on the level ground. On the steep western slope (pl. 1), the canopy is low (10–20 feet) with occasional emergent trees, e.g. *Balanites maughamii*, *Ziziphus mucronata* and *Mimusops caffra*, consequently there is little evidence of a subcanopy. Few of the large trees on this slope remain vertical as the substrate is loose and easily dislodged.

Where the canopy is continuous, the herbaceous stratum is not well developed. However, in areas where the canopy has been broken (e.g. margins of exposed areas) dense undergrowth develops. Thickets of *Isoglossa* sp. up to 10 feet tall are common in these areas. The shrubs *Tricalysia lanceolata*, *Clerodendrum glabrum*, *Grewia occidentalis* and tree saplings, principally *Croton gratissimus*, *Deinbollia oblongifolia* and *Strychnos* sp., are common.

Climbers occur infrequently in the forest, although in areas of succession *Grewia caffra*, *Grewia occidentalis* and *Acacia schweinfurthii* are common. Other creepers collected were *Dalbergia armata*, *Popowia caffra*, *Rhoicissus* spp., *Secamone frutescens* and *Smilax kraussiana*.

Where the forest approaches the lake shore a fringe of *Acacia karroo* occurs. During the course of this work, it became apparent that *A. karroo* is common in the dune forest (Table 1). However, it appeared that *A. karroo* was distributed mainly along the drainage areas of the dune system, in areas where the original forest cover had been removed. The Random Pairs Method of ecological investigation is not suited to illustrate the tendency for plants to occur in such groves. However, even with this method, of the 63 occurrences of *A. karroo*, 36 were recorded as random pairs, i.e. at 18 points only *A. karroo* was recorded. *A. karroo* occurred 27 times in conjunction with other species. In view of the large number of points taken (430), this result shows the tendency for *A. karroo* to occur in stands. Beneath the stands of *A. karroo*, there is little evidence of regeneration of either *A. karroo* or of other forest species.

2. *Results of Plotless Sampling*

To determine the survival of the canopy-forming trees, it is necessary to establish firstly that sufficient members of potential canopy-formers are available to replace any dying in the canopy, and secondly that the species composition of the canopy is unlikely to change, i.e. that the potential canopy-formers in the lower strata are the same species as those presently forming the canopy.

Since height and girth are to some extent representative of age, the use of height and girth classes can supply an index of survival. The prevalence of plants in the middle height and, to a lesser extent, in the middle girth classes (fig. 3) suggests that there is available an abundance of potential canopy-forming plants. However, plants which seldom, if ever, contribute to the canopy, could contribute to this general pattern. A consideration of the numbers of canopy-forming species only (i.e. those recorded in the greater than 30 feet height category), however, reveals a strikingly similar pattern (fig. 3). Thus, there are a large number of young canopy plants.

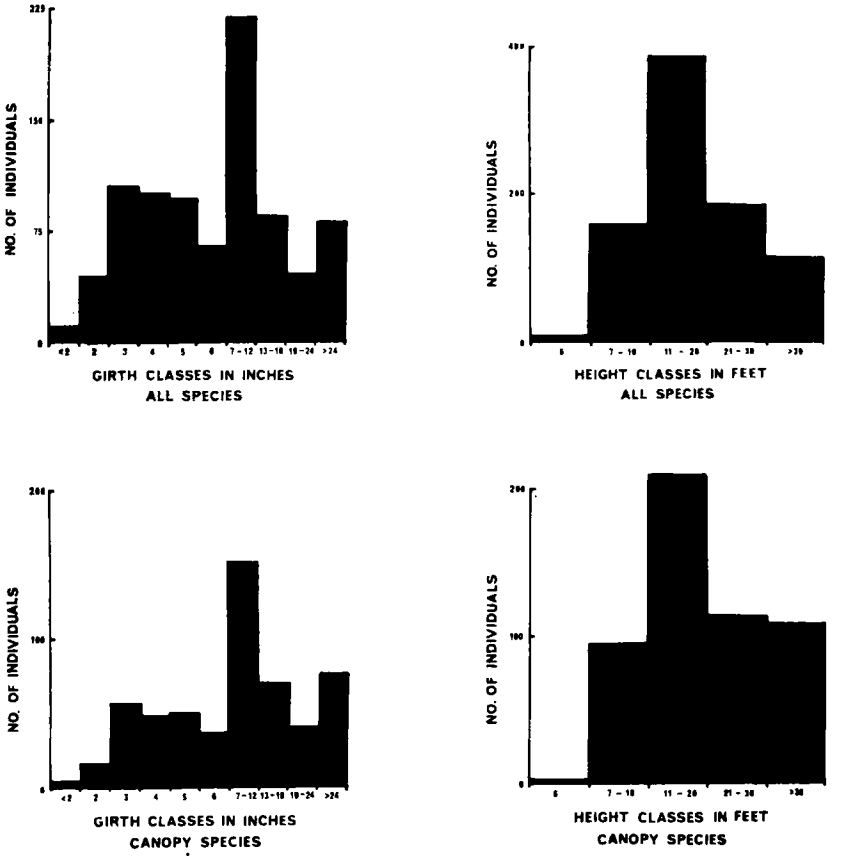

FIG. 3. The distribution of stems in height and girth classes.

TABLE 1

Data compiled from plotless sampling

SPECIES	Number of individuals	Relative density	GIRTH (inches)										HEIGHT (feet)				
			<2	2	3	4	5	6	7–12	13–18	19–24	>24	6	7–10	10–20	21–30	>30
Drypetes natalensis	86	10·0	1	—	3	10	6	4	32	15	11	4	—	8	41	29	8
Acacia karroo	63	7·3	—	2	2	2	4	1	22	12	6	12	—	4	11	21	27
Teclea natalensis	58	6·7	1	5	11	7	5	5	16	3	2	3	—	19	27	10	2
Mimusops caffra	50	5·8	—	—	2	5	6	—	9	4	4	20	—	3	15	9	23
Cassipourea gerrardii	41	4·8	—	1	9	5	5	3	12	3	—	3	—	10	20	6	5
Plectroniella armata	39	4·5	1	2	5	6	3	7	13	1	1	—	—	11	20	8	—
Croton gratissimus	25	2·9	—	—	2	1	2	2	7	3	2	6	—	2	9	7	7
Diospyros inhacaensis	25	2·9	—	—	4	3	4	3	3	5	1	2	—	6	13	4	2
Acalypha glabrata	24	2·8	—	3	6	2	1	5	3	2	1	1	—	8	11	4	1
Ptaeroxylon obliquum	22	2·5	1	1	5	4	1	1	5	2	1	1	—	6	9	7	—
Euclea natalensis	21	2·4	—	1	1	2	1	—	7	4	4	1	—	4	7	5	5
Clausena anisata	20	2·3	2	4	2	2	2	2	4	—	2	—	—	2	13	5	—
Diospyros scabrida	17	2·0	2	1	3	3	2	1	4	—	—	1	—	2	15	—	—
Cassine aethiopica	16	1·9	—	—	2	2	—	2	7	2	1	—	—	3	7	6	—
Deinbollia oblongifolia	16	1·9	—	3	4	3	6	—	—	—	—	—	—	1	7	8	—
Dovyalis longispina	16	1·9	1	—	2	1	2	—	8	1	1	—	1	2	9	3	1
Pavetta gerstneri	15	1·7	1	2	2	4	3	1	1	1	—	—	2	3	9	1	—
Celtis africana	13	1·5	—	—	1	1	2	1	2	3	1	2	—	2	4	3	4
Tricalysia lanceolata	13	1·5	1	2	3	4	2	—	1	—	—	—	1	5	6	1	—
Clerodendrum glabrum	12	1·4	—	—	—	1	5	—	6	—	—	—	—	—	11	1	—
Drypetes gerrardii	11	1·3	—	—	1	—	3	3	3	1	—	—	—	1	7	2	1
Tapura fischeri	11	1·3	1	—	1	6	1	—	2	—	—	—	—	5	6	—	—
Morus mesozygia	10	1·2	—	1	—	1	1	2	3	1	1	—	1	1	6	1	1
Erythroxylum emarginatum	9	1·0	—	1	4	—	1	1	1	—	—	1	—	5	2	1	1
Mimusops obovata	9	1·0	—	—	—	—	—	1	3	2	1	2	—	—	4	3	2
Rawsonia lucida	9	1·0	—	1	1	—	—	1	2	1	1	2	—	2	4	1	2
Tricalysia capensis	9	1·0	—	1	3	3	—	2	—	—	—	—	1	2	5	1	—
Xeromphis obovata	9	1·0	—	—	3	1	1	1	1	1	—	1	—	2	4	2	1
Ziziphus mucronata	9	1·0	—	—	—	2	1	—	1	—	—	5	—	1	3	1	4
Allophylus natalensis	8	0·9	—	1	—	1	1	—	5	—	—	—	—	2	4	1	1
Linociera peglerae	8	0·9	—	—	—	—	—	1	4	3	—	1	—	—	4	4	1
Maytenus nemorosa	8	0·9	1	—	—	—	2	—	3	2	—	—	—	2	4	2	—
Drypetes arguta	7	0·8	—	—	1	1	—	1	3	—	—	1	—	2	3	1	1
Ochna arborea	7	0·8	1	2	1	—	1	—	2	—	—	—	—	3	3	1	—
Strychnos innocua	7	0·8	—	—	1	1	1	—	—	—	2	2	—	2	1	2	2
Vepris lanceolata	7	0·8	2	—	—	1	—	—	1	3	—	—	—	2	1	4	—
Balanites maughamii	6	0·7	—	—	—	1	1	1	1	—	—	2	—	1	3	—	2
Diospyros natalensis	6	0·7	—	—	—	—	—	—	4	2	—	—	—	—	3	3	—
Coffea racemosa	5	0·6	—	2	—	—	2	1	—	—	—	—	—	1	3	1	—
Cola natalensis	5	0·6	—	—	2	1	—	2	—	—	—	—	—	1	4	—	—
Ephippiocarpa orientalis	5	0·6	—	—	—	3	1	—	1	—	—	—	—	2	3	—	—
Ficus natalensis	5	0·6	—	—	—	1	—	—	2	1	—	1	—	—	1	3	1
Lecomtedoxa henriquesii	5	0·6	—	—	1	—	1	—	—	—	2	1	—	1	1	2	1

Pancovia golugensis	5	0·6	—	—	1	—	2	1	1	—	—	—	—	—	4	1	—
Trichilia emetica	5	0·6	—	—	1	1	—	—	—	1	—	2	—	1	2	2	—
Canthium obovatum	4	0·5	1	—	—	—	—	1	—	1	—	1	—	1	—	1	2
Cussonia spicata	4	0·5	—	—	1	1	2	—	—	—	—	—	—	1	3	—	—
Fagara capensis	4	0·5	—	—	1	—	—	1	2	—	—	—	—	1	2	1	—
Manilkara concolor	4	0·5	—	—	1	—	—	—	—	1	—	2	—	—	2	—	2
Olinia radiata	4	0·5	—	—	1	—	1	1	1	—	—	—	—	1	2	1	—
Sideroxylon inerme	4	0·5	—	—	—	1	—	—	2	—	1	—	—	—	2	2	—
Strychnos henningsii	4	0·5	—	—	2	1	—	1	2	—	—	—	—	2	1	1	—
Tarenna barbertonensis	4	0·5	1	2	—	1	—	—	—	—	—	—	2	1	1	—	—
Turraea floribunda	4	0·5	—	—	—	—	1	1	2	—	—	—	—	—	4	—	—
Bridelia cathartica	3	0·3	—	—	1	1	—	—	—	1	—	—	—	1	1	1	—
Conopharyngia elegans	3	0·3	—	2	1	—	—	—	—	—	—	—	—	3	—	—	—
Diospyros whyteana	3	0·3	1	1	—	—	—	—	1	—	—	—	1	1	1	—	—
Erythroxylum pictum	3	0·3	—	—	1	—	2	—	—	—	—	—	—	—	2	—	—
Maytenus acuminata	3	0·3	—	—	2	—	—	—	—	—	—	1	—	1	1	1	—
Blighia unijugata	2	0·2	—	—	—	—	2	—	—	—	—	—	—	1	—	1	—
Canthium setiflorum	2	0·2	—	—	1	1	—	—	—	—	—	—	—	1	1	—	—
Cassine peragua	2	0·2	—	—	—	1	—	—	1	—	—	—	—	—	2	—	—
Enterospermum littorale	2	0·2	—	—	1	—	1	—	—	—	—	—	—	—	2	—	—
Allocassine laurifolia	1	0·1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—
Antidesma venosum	1	0·1	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—
Austromimusops dispar	1	0·1	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—
Canthium spinosum	1	0·1	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—
Canthium ventosum	1	0·1	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—
Chaetachme aristata	1	0·1	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—
Cleistanthus schlechteri	1	0·1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Craibia zimmermannii	1	0·1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—
Crotalaria capensis	1	0·1	—	—	—	—	1		—	—	—	—	—	1	—	—	—
Dodonaea viscosa	1	0·1	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—
Ekebergia capensis	1	0·1	—	1	—	—	—	—	—	—	—	1	—	—	—	—	1
Enteromorpha sp.	1	0·1	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—
Erythrococca berberidea	1	0·1	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—
Euclea divinorum	1	0·1	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—
Ficus burt-davyii	1	0·1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Grewia occidentalis	1	0·1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—
Ochna natalitia	1	0·1	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—
Olea capensis	1	0·1	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—
Peddiea africana	1	0·1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Pittosporum undulatum	1	0·1	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—
Rinorea ilicifolia var. *ilicifolia*	1	0·1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
Suregada africana	1	0·1	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—
Xylotheca kraussiana var. *glabrifolia*	1	0·1	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—
TOTAL—ALL SPECIES			20	43	105	100	96	64	219	85	46	82	9	159	388	189	115
TOTAL—CANOPY SPECIES ONLY			4	16	56	48	49	37	151	70	40	77	2	89	216	126	115

Total species 86
Mean area occupied by an individual 18·45 sq. ft

Mean distance apart 5′ 4″
Density per acre 2361

The data in Table 1 indicate that *Drypetes natalensis*, *Acacia karroo*, *Teclea natalensis*, *Mimusops caffra*, *Cassipourea gerrardii*, *Croton gratissimus*, *Diospyros inhacaensis*, *Ptaeroxylon obliquum* and *Euclea natalensis* are the most common plants which contribute to the canopy. However, since their relative density does not correspond directly with their occurrence in the greater than 20 feet classes (Table 2), they may be separated into the components of the canopy (greater than 20 feet) and the subcanopy (less than 20 feet) (Table 3).

Of the ten more common plants of the subcanopy listed in Table 3, five are typical of the canopy. Thus the canopy-forming species are present in the lower strata. Not only are the canopy-forming species present in the lower strata, they are common enough to ensure the continuation of the canopy in its present form. It would seem unlikely, therefore, that there will be any significant change in the canopy in the near future.

TABLE 2

The major components of the greater than 20 feet height categories

SPECIES	*Relative density*	*Number of occurrences*
Acacia karroo	63	48
Drypetes natalensis	86	37
Mimusops caffra	50	32
Croton gratissimus	25	14
Teclea natalensis	58	12
Cassipourea gerrardii	41	11
Euclea natalensis	21	10
Ptaeroxylon obliquum	22	7
Celtis africana	13	7

TABLE 3

For explanation, see text

Canopy	*Subcanopy*
Acacia karroo	*Drypetes natalensis*
Mimusops caffra	*Teclea natalensis*
Drypetes natalensis	*Cassipourea gerrardii*
Croton gratissimus	*Plectroniella armata*
Cassipourea gerrardii	*Mimusops caffra*
Euclea natalensis	*Croton gratissimus*
Celtis africana	*Clausena anisata*
Ziziphus mucronata	*Acacia karroo*
	Acalypha glabrata
	Clerodendrum glabrum

The shrub layer is formed mainly by young canopy formers and by other predominantly shrub types such as *Plectroniella armata*, *Acalypha glabrata*, *Clausena anisata*, *Clerodendrum glabrum* and *Cassine aethiopica*.

DISCUSSION

The areas of exposed sand evident in aerial photographs taken in 1942 (pl. 2) are generally confined to the hollows between the sand dunes. The drainage and accumulation of organic material in these hollows provide the most suitable substrate for agriculture. Thus, there can be little doubt that the exposed areas are the result

of agricultural practices which were common in the dune system prior to 1948. These practices have been controlled since about 1948 and had certainly ceased by 1959 when the forestry project was started in the area by Mr. B. H. Groenewald. However, Bantu were still resident along the forest margin in 1959. These families had moved by the author's first visit in 1966 although there are still families near the northern margin. These latter families are probably responsible for the slight encroachment in the area (pl. 3 and 4).

In traverses through the forest, there is little evidence of tree felling and discussions with the Bantu and with a former Chief Forester (Mr. B. H. Groenewald) suggest that the Bantu are not 'species' selective in their cutting. It is likely, therefore, that they restrict most of their felling to the forest margin, particularly in the north.

Control has been effected for about twenty years. During this period, the exposed areas have been recolonized and there has been a general increase in the density of the vegetation. Whether exposed areas still exist is not possible to discover since the latest available aerial photographs were taken in 1964. The exposed areas evident in these photographs have, in all probability, been further reduced.

The presence of groves of *A. karroo* in areas which were previously exposed suggests they may represent a seral stage in the development of dune forest, as has been suggested by Edwards (1967). The lack of regeneration of climax species in these groves may be due to the relatively short period of recolonization.

The marginal fringe of *A. karroo* along the lake shore probably represents a subclimax and not a seral stage in dune forest formation. This subclimax is developed in conjunction with the greater availability of water, a factor which may be of importance in the recolonization of the exposed areas in the drainage system.

In spite of evidence of tree-felling and encroachment in the north, the canopy-forming species are abundant in the middle girth and height categories. This suggests that the future of the canopy is assured. However, at this stage it is not possible to discover whether this will result in an increase in the density of the canopy.

Conclusions

1. The control of agriculture and cutting in the dune forest has resulted in considerable improvement in the forest.

2. Regeneration is such that the character of the forest is unlikely to change in the near future and, therefore, the forest represents a Climax Forest. The canopy and subcanopy trees have a high survival rate as evidenced by their distribution in the height and girth classes.

3. Apart from the limited encroachment as a result of agricultural practices since 1942, cutting by the local inhabitants, on the present scale, does not appear to be having any detrimental effect on the survival of the canopy trees.

Acknowledgements

I should like to express my thanks to Professor B. R. Allanson, the Staff of the Botany Department and the students who have accompanied me; Mrs. Estelle Brink of the Albany Museum, Grahamstown and the staff of the National Herbarium,

Pretoria; Mr. McKay, Chief Agricultural Extension Officer (Zululand) for the Department of Bantu Affairs, and Mr. B. H. Groenewald, Chief Forester, Port Durnford.

This work has been financed by grants from C.S.I.R. and Rhodes University Council.

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Appendix

List of Angiosperms collected in the Dune Forest

GRAMINEAE
Panicum deustum Thunb.
Pennisetum typhoides (Burm.) Stapf & Hubb.
CYPERACEAE
Cyperus maritimus Poir.
DIOSCOREACEAE
Dioscorea sylvatica Eckl.
ORCHIDACEAE
Eulophidium tainioides (Schltr.) Summerh.
ULMACEAE
Celtis africana Burm. f.
Trema guineensis (Schum.) Ficalho
Chaetachme aristata Planch.
MORACEAE
Morus mesozygia Stapf.
Ficus burtt-davyi Hutch.
Ficus natalensis Hochst.
LORANTHACEAE
Loranthus kraussianus Meissn.
SANTALACEAE
Colpoon compressum Berg.
OLACACEAE
Ximenia caffra Sond.
PHYTOLACCACEAE
Limeum viscosum (Gay) Fenzl
ANNONACEAE
Popowia caffra (Sond.) Benth.
LAURACEAE
Cryptocarya sp.
CAPPARIDACEAE
Cladostemon kirkii (Oliv) Pax & Gilg
Capparis citrifolia Lam.
PITTOSPORACEAE
Pittosporum undulatum Vent.
LEGUMINOSAE
Albizia adianthifolia (Schum.) W. F. Wright
Acacia karroo Hayne
Acacia schweinfurthii Bren. & Exell
Bauhinia tomentosa L.
Sophora inhambanensis Klotzsch
Crotalaria capensis Jacq.
Indigofera ? endecaphyla Jacq.
Dalbergia armata E. Mey.
Dalbergia nitidula Welw. ex Benth.
Craibia zimmermannii (Harms) Harms ex Dunn
ERYTHROXYLACEAE
Erythroxylum emarginatum Thonn.
Erythroxylum pictum E. Mey
ZYGOPHYLLACEAE
Balanites maughamii Sprague
RUTACEAE
Fagara capensis Thunb.
Calodendron capensis (L.f.) Thunb.
Vepris lanceolata G. Don
Teclea natalensis (Sond.) Engl.
Clausena anisata (Willd.) Hook f. ex Benth.
MELIACEAE
Ptaeroxylon obliquum (Thunb.) Radlk.
Turraea floribunda Hochst.
Ekebergia capensis Sparrm.
Trichilia emetica Vahl.
DICHAPETALACEAE
Tapura fischeri Engl.

EUPHORBIACEAE
Phyllanthus sp.
Drypetes arguta Hutch.
Drypetes gerrardii Hutch.
Drypetes natalensis Hutch.
Antidesma venosum E. Mey. ex Tul.
Cleistanthus schlechteri (Pax) Hutch. var. *schlechteri*
Bridelia cathartica Bertol. f. subsp. *cathartica* (*?Bridelia schlechteri* in Tinley)
Croton gratissimus Burch.
Erythrococca berberidea Prain.
Acalypha glabrata Thunb.
Tragia meyeriana Meull.-Arg.
Suregada africana (Sond.) Kuntze
Spirostachys africana Sond.

CELASTRACEAE
Maytenus acuminata (L.f.) Loes.
Maytenus nemorosa (Eckl Zeyh.) Marais
Allocassine laurifolia (Harv.) N. Robson
Cassine aethiopica Thunb.
Cassine peragua L.

ICACINACEAE
Apodytes dimidiata E. Mey. ex Arn.

SAPINDACEAE
Allophylus melanocarpus (Sond.) Radlk.
Allophylus natalensis (Sond.) De Winter
Deinbollia oblongifolia (Sond.) Radlk.
Pancovia golugensis (Hiern) Exell & Mendonca
Blighia unijugata Bak.
Dodonaea viscosa Jacq.

RHAMNACEAE
Ziziphus mucronata Willd.

VITACEAE
Rhoicissus digitata (L.f.) Gilg & Brand
Rhoicissus rhomboidea (E. Mey. ex Harv.) Planch.

TILIACEAE
Grewia caffra Meissn.
Grewia occidentalis L.

MALVACEAE
Thespesia acutifolia (Bak.f.) Exell & Mendonca

STERCULIACEAE
Cola natalensis Oliv.

OCHNACEAE
Ochna arborea Burch. ex DC.
Ochna natalita (Meissn.) Walp.

VIOLACEAE
Rinorea ilicifolia (Welw. ex Oliv.) Kuntze var. *ilicifolia*

FLACOURTIACEAE
Rawsonia lucida Harv. & Sond.
Xylotheca kraussiana Hochst. var. *glabrifolia* Wild
Scolopia zeyheri (Nees) Harv.
Dovyalis longispina (Harv.) Harv.
Dovyalis sp.

OLINIACEAE
Olinia radiata J. Hofmeyr & Phill.

THYMELEAECEAE
Peddiea africana Harv.

RHIZOPHORACEAE
Cassipourea gerrardii Alston

MYRTACEAE
Eugenia natalita Sond.
Syzygium cordatum Hochst.

ARALIACEAE
Cussonia spicata Thunb.

SAPOTACEAE
Sideroxylon inerme L.
Mimuspos caffra E. Mey. ex A. DC.
Mimuspos henriquesiana Sim
Mimusops obovata Sond.
Austromimusops sp. cf. *marginata* (N.E. Br.) A. Meeuse
Lecomtedoxa henriquesii (Engl. & Warb.) A. Meeuse
Manilkara concolor (Harv. ex C.H. Wr.) Gerstner

EBENACEAE
Diospyros inhacaensis F. White
Diospyros natalensis (Harv.) Brenan
Diospyros scabrida (Harv. ex Hiern) De Winter
Diospyros whyteana (Hiern) F. White
Euclea divinorum Hiern
Euclea natalensis A. DC.

OLEACEAE
Linociera peglerae (C.H. Wr.) Gilg & Schellenb.
Olea capensis L.

LOGANIACEAE
Strychnos innocua Del. subsp. *gerrardii* (N.E. Br.) Verdoorn
Strychnos henningsii Gilg
Strychnos spinosa Lam.

APOCYNACEAE
Acokanthera oppositifolia (Lam.) L.E. Codd
Acokanthera schimperi (A. DC.) Schweinf. var. *rotundata* Codd
Carissa bispinosa (L) Desf. ex Brenan var. *acuminata* (E. Mey.) Codd
Conopharyngia elegans (Stapf) Stapf
Ephippiocarpa orientalis (S. Moore) Markgf.

ASCLEPIADACEAE
Secamone frutescens Decne.

BORAGINACEAE
Cordia caffra Sond.

VERBENACEAE
Clerodendrum glabrum E. Mey.

ACANTHACEAE
Sclerochiton harveyanus Nees
Isoglossa sp.

RUBIACEAE
Tarenna barbertonensis (Brem.) Brem.
Tarenna junodii (Schinz.) Brem.
Enterospermum littorale Hiern
Xeromphis obovata (Hochst.) Keay
Xeromphis rudis (E. Mey. ex Harv.) L. E. Codd
Rothmannia sp.
Tricalysia capensis (Meissn.) Sim
Tricalysia lanceolata (Sond.) Burtt-Davy
Vangueria chartacea Robyns
Vangueria infausta Burch.
Lagynias sp.
Canthium obovatum Klotzsch
Canthium setiflorum Hiern
Canthium spinosum (Klotzsch) Kuntze
Canthium ventosum (L.) S. Moore
Plectroniella armata (K. Schum.) Robyns
Pavetta ? gerstneri Brem.
Coffea racemosa Lour.
Psychotria capensis (Eckl.) Vatke

CUCURBITACEAE
Momordica involucrata E. Mey. ex Sond.

CAMPANULACEAE
Wahlenbergia undulata A. DC.

COMPOSITAE
Brachylaena discolor A. DC.
Senecio ? littoreus Thunb.

PLATE 1, FIG. 1. Dune forest viewed from Lake Sibayi. Note marginal fringe of *Acacia karroo* and Steep slope (Approximately 30°)

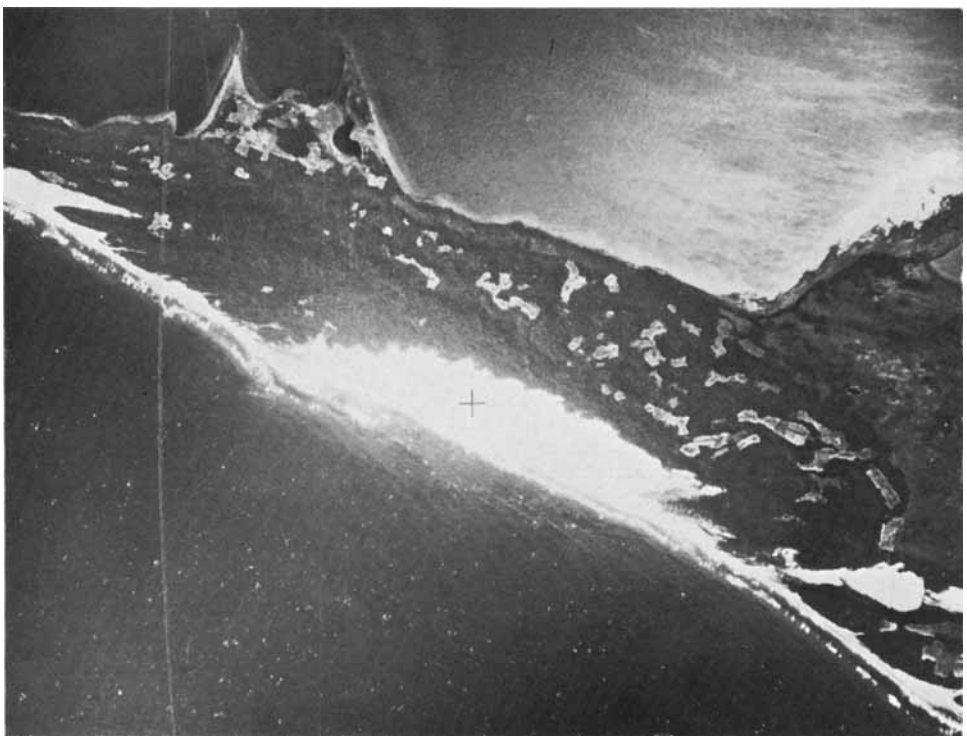

PLATE 1, FIG. 2. Aerial photograph taken in 1942. Note considerable areas of unstable sand, distributed mainly in the hollows.

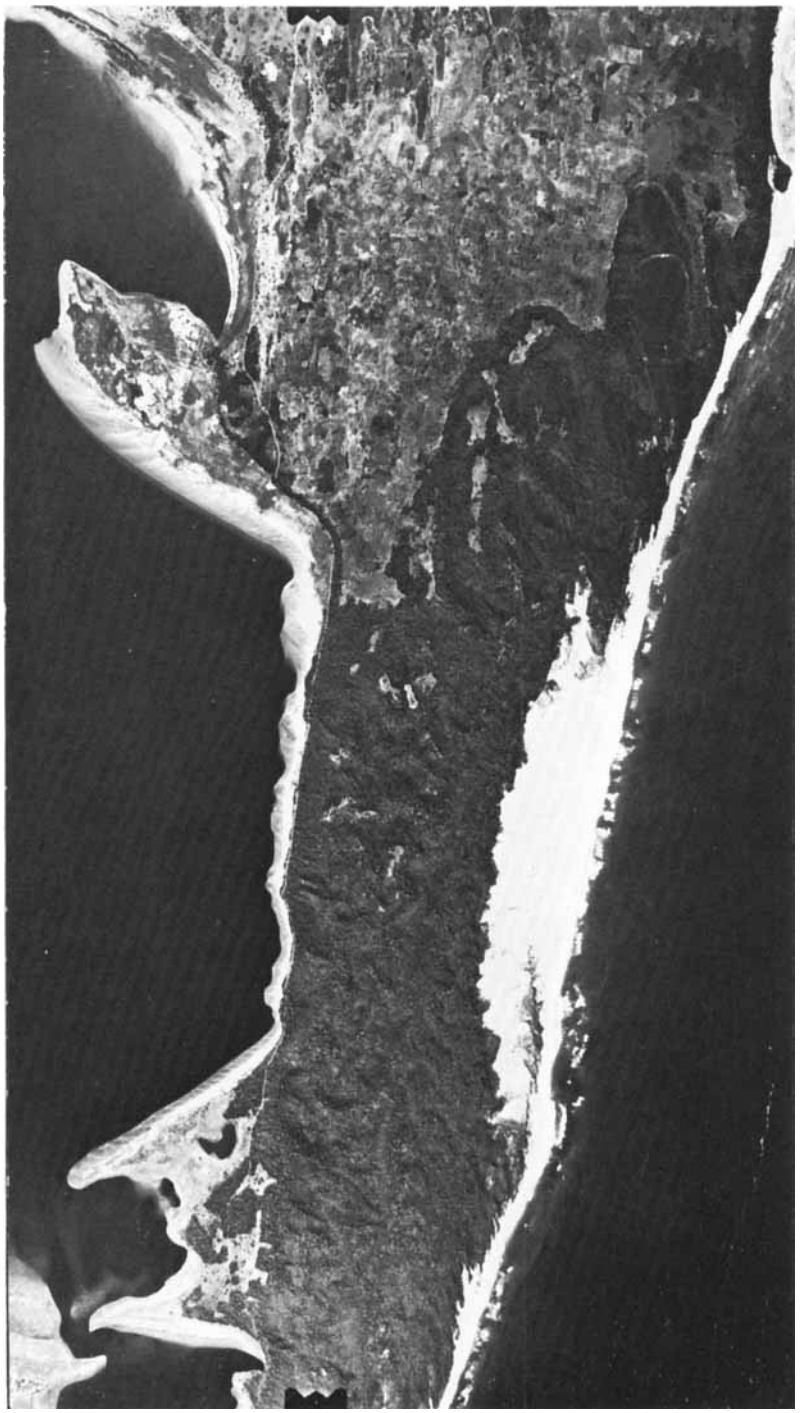

PLATE 2. Aerial photograph taken in 1964. Note colonization of exposed areas.