

## A brief account of coast vegetation near Port Elizabeth

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### ABSTRACT

The environment and vegetation of an area of coast north-east of Port Elizabeth, South Africa, are briefly described. Five major vegetation categories are recognized. These are: 1. *Scaevola thunbergii* Pioneer Vegetation of littoral dunes and *Ficinia lateralis* Sedgeland of calcrete gravel; 2. *Olea exasperata* Bush, *Pterocelastrus tricuspidatus* Bushclumps and Dune Woodland; 3. Sundays River Scrub; 4. Fynbos of calcrete areas; and 5. *Themeda triandra* Grassland. Invasion of the area by *Acacia cyclops* (Australian Wattle) is described. A recommendation for the conservation of the area as a nature reserve is made.

### RÉSUMÉ

#### UN BREF COMPTE-RENDU DE LA VÉGÉTATION CÔTIÈRE PRES DE PORT ELIZABETH

Le milieu et la végétation d'une région côtière au nord-est de Port Elizabeth en Afrique du Sud, sont brièvement décrits. Cinq catégories principales de végétation sont reconnues. Elles sont: 1. La végétation *Scaevola thunbergii* pionnière des dunes du littoral et *Ficinia lateralis* Sedgeland de gravier calcaire; 2. *Olea exasperata* Bush, *Pterocelastrus tricuspidatus* Bushclumps et Dune Woodland; 3. Les buissons de la rivière Sundays; 4. Buissons de la région calcaireuse; et 5. Le *Themeda triandra* du Grassland. L'invasion de la région par l'*Acacia cyclops* (Wattle australien) est décrite. Une recommandation pour la conservation de la région comme réserve naturelle est faite.

### INTRODUCTION

Some years ago the Botanical Research Institute was asked to report on the plant communities and rare and endangered species, if any, to be found within an area proposed for the development of an iron-ore loading berth on the coast opposite St Croix Island, approximately 25 km north-east of Port Elizabeth. An account of the results of the investigation, based on a number of visits to the area by the authors of this paper, was given by Taylor (1976). As no prior detailed ecological studies had been undertaken in the area, a relatively intensive study had to be made for reporting purposes. It is intended that this brief account will make the interesting information collected more readily available than in an unpublished Departmental report.

The area of the investigation, from the Coega River in the west to the Sundays River in the east, is bounded by the sea to the south-east and the national road from Port Elizabeth to Grahamstown to the north-west. The area extends about 18 km along the coast and about 4 km inland (Fig. 1).

Regional accounts by Schonland (1919) and Dyer (1937) have included brief descriptions of vegetation similar to that found in the study area. Olivier (1977) compiled a checklist from a nearby area while Penzhorn *et al.* (1974) described the vegetation of the Ad-do Elephant National Park which contains some of the same veld types although it is not on the coast. Edwards (1971) briefly described the terrestrial vegetation of the Swartkops Estuary area, a few km west of the study area.

### PHYSICAL FEATURES

For approximately 300 m inland from the high water mark the area consists of relatively flat calcrete beds with occasional sand dunes. The ground then

rises, gently at first and later sharply, until it forms a low ridge which runs roughly parallel to the beach, approximately 1 km from the sea and 60 m above sea level. The seaward slope of the ridge consists of deep sand, partly exposed as open dunes and partly bush-covered. Inland of the ridge the land slopes gently downward toward the national road and is relatively flat with occasional depressions and high points. There are no permanent water bodies except for the two rivers bounding the area to the east and west.

Geologically, the area is underlain by shelly and chalky limestones, sandstones and conglomerates of the Alexandria Beds. These are exposed along parts of the ridge, inland of which the Beds are covered by a layer of sandy soil 10 to 40 cm deep.

The area is classified as semi-arid, with a temperate, oceanic climate. The average maximum temperature at Port Elizabeth, 25 km to the south-west, is 25,5°C, the average minimum is 7,1°C, the extreme

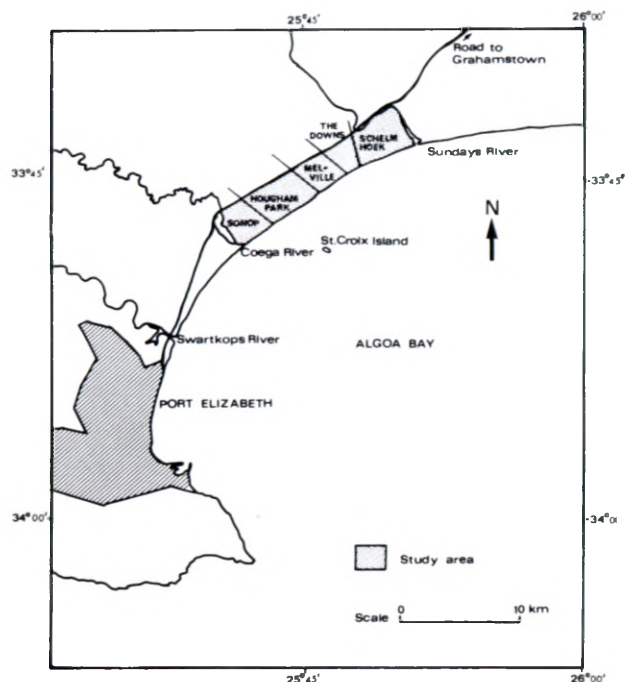


FIG. 1.—Location of the study area.

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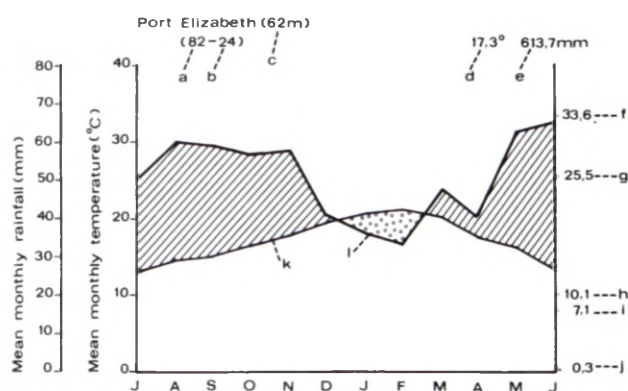


FIG. 2.—Climate diagram for Port Elizabeth. a, duration of rainfall record in years; b, duration of temperature record in years; c, altitude; d, mean annual temperature; e, mean annual precipitation; f, absolute maximum temperature; g, mean daily maximum of hottest month; h, mean daily range of temperature; i, mean daily minimum of coldest month; j, absolute minimum; k, trace of monthly means of temperature; and l, trace of monthly means of precipitation. Data from Anon. (1954) and Anon. (1965).

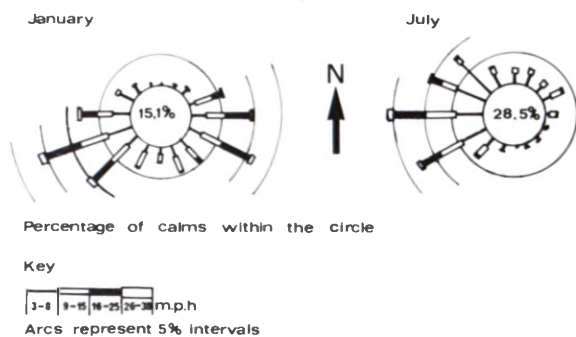


FIG. 3.—Wind roses from Anon (1960) for Port Elizabeth (1 m.p.h. = 1.6 k.p.h.).

maximum is 34°C and the extreme minimum is 0°C (Fig. 2). The prevailing winds are south-west, east and south-east in January and west in July (Fig. 3). The average annual rainfall over a recent five-year period was 456 mm and the long-term average for Port Elizabeth is 614 mm (Anon, 1965).

#### NATURAL VEGETATION

Floristically, the area is by no means poor in species, except for the pioneer vegetation of the littoral dunes. Phytogeographically, this area of coast is surprisingly interesting, containing elements of the fynbos flora of the south-western Cape, the grasslands of the interior plateaux, the subtropical to temperate coastal forests, and the possibly forest-derived woody flora peculiar to the semi-arid valleys of the eastern Cape. Although these elements intermingle to some extent, especially the grassland and fynbos, a single element usually predominates in each of the major vegetation types.

Five major vegetation categories are each briefly described below in terms of habitat, formation class, cover, physiognomy, species numbers in relevés, dominance (if any), phytogeography and probable floristic affinities (where known).

### 1. Pioneer Vegetation

Two communities occur on the coast edge. Descriptions of both are given below.

#### (a) *Scaevola thunbergii* Pioneer Vegetation

This community occurs on the littoral dunes. It is a semi-succulent herbland/dwarf shrubland with 20 to 65% cover, dominated by *Scaevola thunbergii* (Fig. 4). It is a very simple, pioneer community with an average height of 30 cm and rarely exceeds 50 cm. It consists mostly of individual erect stems of *S. thunbergii* with its spreading, fleshy leaves. The only other species are, in order of decreasing abundance, *Tetragonia decumbens*, *Chrysanthemoides monilifera*, *Gazania rigens* and the intrusive plant invader, *Acacia cyclops*.

#### (b) *Ficinia lateralis* Sedgeland of calcrete gravel

This community occurs inland of the littoral dunes and is developed on calcrete. It is a low (15 cm), closed community dominated by the sedge *Ficinia lateralis*, with a few emergent shrubs of *Passerina vulgaris*, which are 60 to 90 cm tall. In places *Helichrysum* sp. (Taylor 9139)\* takes the place of *F. lateralis*. This is another simple community and is not extensive.

### 2. Forest Precursor Communities

Three communities are recognized, all on recent sands, usually old dunes, on top of and on either side of the ridge. All contain, as dominants, species found in the early successional stages of Coast Forest.

#### (a) *Olea exasperata* Bush

Total cover in this woody community is 65 to 85%. It is dominated by *Olea exasperata* which forms an almost closed, woody layer 0.5 to 1.2 m tall (Fig. 5). An open, lower layer, characterized by *Restio eleocharis*, with spreading, succulent and ericoid subshrubs and about 20 cm tall, is present. There is a sparse to very sparse ground layer of small succulents and annuals, 5 to 10 cm tall. Species numbers in relevés were between 30 and 40. The Bush occurs on shallow sand over calcrete on the ridge and is thought to be similar to *Olea exasperata* Bush on the Cape Flats.

#### (b) *Pterocelastrus tricuspidatus* Bushclumps

Within the general area of *Olea* Bush, scattered Bushclumps occur where the blown sand is slightly deeper (25 to 50 cm) over the calcrete of the ridge (Fig. 6). Only a small number of clumps, each from 30 to 50 m<sup>2</sup> in area, are present. Total cover is from 95 to 100%, dominated by *Pterocelastrus tricuspidatus*, which is 3 to 4 m tall, with other woody species including *Olea exasperata*, *Rhus* cf. *glauca*, *Euclea undulata*, *E. natalensis* and *E. racemosa*. Lower layers are sparse and generally poorly defined. Species numbers in relevés were between 20 and 30.

#### (c) Dune Woodland

This closed woodland formation, probably a higher successional stage beyond *Pterocelastrus tricuspidatus* Bushclumps, occurs on deep dune sand sheltered from on-shore winds. The only sample examined was on the lee side of the dune just west of the Sundays River bridge on the national road (Fig. 7). Total cover is 95% and average height from 4 to 5 m. The Woodland is dominated by *Rhus crenata*, with *Sideroxylon inerme* and *Brachylaena discolor* emergent to over 6 m. Lower layers are virtually absent. Species number in a relevé was 23. Dune Woodland is clearly related to similar scrub in the

\*Specimens have been deposited in STE with duplicates in PRE.





FIG. 4.—*Scaevola thunbergii* invading first dunes.



FIG. 5.—*Olea exasperata* is dominant woody sub-shrub in foreground; here less than 0,5 m tall.



FIG. 6.—*Pterocelastrus tricuspidatus* Bushclump with sea and St Croix island in background.





FIG. 7.—Dune woodland on bank of Sundays River. Dominants include *Brachylaena discolor*, *Sideroxylon inerme* and *Rhus crenata*.

Knysna region, with a few additional Natal elements, including *Brachylaena discolor* and *Sansevieria thyrsiflora*.

### 3. Sundays River Scrub

Although containing a few elements also found in the Forest Precursor Communities (e.g. *Sideroxylon inerme*, *Pterocelastrus tricuspidatus* and *Rhus crenata*), this Scrub is nevertheless physiognomically and floristically distinct and probably has a different origin and history. Acocks (1975), in his broad scale treatment, mapped the whole of the study area as Valley Bushveld, a specialized and complex group of vegetation units. In his Memoir, the description of Valley Bushveld Variation (d) (ii), Sundays River Scrub, fits this community very well. Practically all the trees, shrubs and climbers that he lists as of general occurrence in the Sundays River Scrub were found in at least one of the four samples studied, and many of the species of less general occurrence were also present. Acocks considered that the Sundays River Scrub Variation was derived directly from the Alexandria Forest, which he described as a decidedly xerophytic variation of coastal tropical forest. This explains the lack of close relationship with the Forest Precursor Communities, which appear to represent the beginnings of the more typical coastal subtropical-temperate forest in this region. Acocks also considered that the Sundays River Scrub was closely related to the Gouritz River Scrub of the valleys west of the Knysna forest region. A brief investigation of Gouritz River Scrub in the Klein Brak River Valley confirmed Acocks's surmise, but further comparative study is needed to clarify the relationships.

In the area studied, Sundays River Scrub is a bush formation occurring chiefly on light brown, shallow sandy soils in the Coega River Valley, spreading inland onto the flats near the national road. West of the Coega River it occurs extensively on similar flats as far as the Swartkops River. Where relatively undisturbed, it consists of a thicket of stout, often thorny shrubs, with a 2 to 3 m canopy and a total cover of 95 to 100%. In parts where browsing cattle have penetrated in numbers, as in the lower part of

the Coega Valley, the canopy has been reduced to 75 to 80% cover and to 1 to 2 m in height. On the borders of openings and along edges is a sparse, lower layer of soft-leaved herbs and where openings are extensive, smaller (20 to 30 cm), predominantly ericoid dwarf shrubs occur which, in a more detailed treatment, might be considered a separate community. There is also a high proportion of succulents, especially along the margins and in small openings. Many climbing species are present, often sprawling over the top of the canopy.

The community is floristically the richest encountered, with 50 to 60 species being recorded in 300 m<sup>2</sup> plots (Fig. 8). *Euclea undulata* was present in every relevé and was usually dominant. Other species with high frequency, and sometimes attaining dominance or sub-dominance, are *Rhus longispina*, *Cassine tetragona*, *Schottia afra*, *Sideroxylon inerme*, *Azima tetraacantha* and a climber *Rhoicissus tridentata*. *Aloe ferox* is a prominent emergent, sometimes being up to 4 m tall. *Portulacaria afra*, though not in every relevé, appears to be associated with high successional development and high species diversity. *Panicum maximum* was found in every relevé and is a characteristic margin species.

### 4. Calcrete Fynbos

This is a dwarf shrubland formation occurring on very shallow soil (about 10 cm deep) over calcrete on the ridge, or its inland slopes (Fig. 9). Total cover is from 65 to 70%. An upper layer (barely 20 to 30 cm tall) of dwarf or sprawling shrubs (including ericoids) constitutes over 50% of the cover. A few emergents (40 to 50 cm tall) and a lower layer of creeping succulents and very short grasses, 10 cm tall, are present. Species numbers in relevés were between 25 and 35 and characteristically there is no single species dominant in the less disturbed stands, but the family Rutaceae is prominent and a *Restio* sp. (Taylor 9132) is occasionally present. No close affinities are known, but *Ficinia truncata*, a species found in all relevés, relates this community, at a high phytosociological level, to communities in similar habitats along the southern Cape coast, e.g. in the vicinity of Bredasdorp.



FIG. 8.—Open, short phase of Sundays River Scrub.



FIG. 9.—Calcrete Fynbos in foreground (note white pebbles). Sundays River Scrub visible in background where calcrete is replaced by deeper, brown, sandy soils.



FIG. 10.—*Themeda triandra* Grassland with isolated pocket of Sundays River Scrub on right. Note windspray 'pruning' of canopy.





## 5. Grassland

*Themeda triandra* Grassland is found on the flat plateau inland of Calcrete Fynbos, where the soil is not quite as shallow but is still underlain by calcrete (Fig. 10). Its upper layer is similar in height to that of Calcrete Fynbos (10 to 30 cm), but denser with over 50% of the 75 to 95% total cover being contributed by *Themeda triandra*, which is clearly dominant. *Ehrharta calycina* is sometimes subdominant. The ten other grass species found in the three samples studied do not contribute greatly to the cover, but indicate the mixed origin of this community. *Elionurus muticus*, *Eustachys paspaloides*, *Setaria sphacelata* and *Digitaria* sp. (Taylor 9091) are mainly distributed to the north and east, whereas *Cymbopogon marginatus* and *Plagiocloa uniolae* are mainly concentrated to the south-west. Among the forbs, too, there is a mixture of tropical-derived genera, like *Barleria*, *Blepharis*, *Euphorbia* and *Tephrosia*, with genera typical of the fynbos of the south-western Cape, e.g. *Diosma*, *Ficinia*, *Stoebe* and *Passerina*. Due, perhaps to its mixed nature, this community had the second highest species numbers in relevés in the area, namely, 30 to 45.

On overgrazed sites, *Themeda triandra* assumes a minor role and dominance is taken over by *Aspalathus lactea* ssp. *adelphea*, *Osteospermum imbricatum*, *Selago corymbosa*, *Psoralea fruticans* and *Euphorbia rhombifolia*, amongst others. On protected sites, by contrast, individual pioneer elements and isolated small thickets of Sundays River Scrub were noted which, from the nature of their margins, suggest that the Scrub may be spreading at the expense of the Grassland (Fig. 10). According to one local landowner, this is substantiated by accounts of early settlers who referred to the whole area as a grassy plain.

The balance between Grassland and Calcrete Fynbos also appears to be delicate, being influenced by depth of soil and by degree of grazing and trampling. Local farmers consider that fire is of minor importance as an ecological factor because the evenly-spread rainfall (Fig. 2) creates conditions that limit the occurrence and spread of wildfires, and the palatable grazing makes the use of intentional burning to produce new growth unnecessary.

## EXOTIC PLANT INVADERS

About thirty-five years ago a landowner introduced the Australian Wattle, *Acacia cyclops* (also known as Rooikrans), to stabilize the driftsands on his property. This species now forms a thicket on the seaward escarpment and is actively invading the

Forest Initial Communities on the ridge and the Grassland and Fynbos beyond (Fig. 11). The Sundays River Scrub, due to the density of its canopy, is as yet largely free of Wattle, but where openings are being enlarged by cattle trampling, the Australian invader is gradually penetrating.

The farmer maintains that the infestation has not noticeably increased over the years, but judging from the abundant young growth of Wattle, especially along tracks, and its active suppression of the grass cover, colonization by this invader is proceeding apace. The tempo may, however, be less than in the Mediterranean-type climate of the south-western Cape where frequent dry-season fires encourage very dense regeneration from the heavy seed load in the soil.

Infestation in the Forest Precursor Communities, Grassland and Fynbos has now reached the critical stage where further spread of the invader will destroy the structure of the natural vegetation over one quarter to one third of the study area. If these plant communities are worth saving, both for their value as grazing and for their scientific interest and natural beauty, prompt action is necessary.

## CONSERVATION

As far as is known, none of the communities described in this report are conserved at present, except for a few areas of Sundays River Scrub in the Tippers Creek Aloe Reserve at Swartkops, an area too small for viable ecosystem conservation. The Addo National Park consists of Addo Bush which, according to Acocks (1975), is a different variety of Valley Bushveld. The plant communities of the study area are of great variety, scientific interest and economic and recreational value. Some of them, such as Calcrete Fynbos, are not extensive elsewhere. It is our recommendation that the entire study area, bounded on three sides by natural features (Sundays River, Indian Ocean and Coega River) and on the fourth by a major road, should be conserved. A nature reserve of this size would be a worthy asset to the country as a sample of relatively well-maintained vegetation and a place for recreation and scientific study within 25 km of the fast-growing city and third largest port in South Africa, Port Elizabeth.

## UITTREKSEL

*Die omgewing en plantegroei van 'n gedeelte van die kus oos van Port Elizabeth, word kortliks beskryf. Die volgende vyf hoof-vegetasiekategorieë word onderskei: 1. Scaevola thunbergii-pioniervege-*



FIG. 11.—Invasion of grassland by *Acacia cyclops* (Rooikrans).

tasie van strandduine en *Ficinia lateralis-biesieveld* van kalkgruis; 2. *Olea exasperata-bos*, *Pterocelastrus tricuspidatus-bosklompe* en *duinewoud*; 3. *Sondagsrivierstruikgewas*; 4. *Fynbos van kalkgebiede*; en 5. *Themeda triandra-grasveld*. *Indringing deur Acacia cyclops (Rooikrans) in die gebied word beskryf. 'n Voorstel vir die bewaring van die gebied as 'n natuurreserveaat word gemaak.*

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