

Notes on the Vegetation of the Cape Flats

by

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ABSTRACT

Though the Cape Flats, adjoining Cape Town, were among the first explored parts of South Africa, their vegetation, rapidly being altered by encroachment of alien plants, has not been described before. In these notes, five inland and four coastal plant communities, delineated by habitat, are described; their relationships with one another and with coast-flats vegetation elsewhere are suggested. Observations on means of regeneration after fire show that the woody, tropical-derived element regenerates rapidly from coppice, while the "fynbos" or temperate sclerophyll element contains many seed-regenerating species. Succession in the fynbos is thus more complex and prolonged.

INTRODUCTION

Very little has been written on the vegetation of the Cape Flats. Acocks (1953) described it in broadest outline as Coastal Macchia (Veld Type 47). Stephens (1929) described the vegetation of specialized aquatic habitats and Adamson (1959) has discussed the phytogeography of the area. The vegetation of Robben Island (Adamson, 1934) has features in common with the coastal areas of the Cape Flats, but it is impoverished in species and highly modified by rabbit-grazing. The Stellenbosch Flats, treated in detail by Duthie (1929), are alluvial in origin, the soil clayey and the vegetation quite different from that on the sandy dunes of the Cape Flats.

The present notes were made in conjunction with observations on veldburning regeneration.

PHYSICAL FEATURES

The Cape Flats, some 400 square km (150 square miles) in extent, form a broad, sandy isthmus connecting the Cape Peninsula to the mainland. They are bounded on the west by the mountains of the Cape Peninsula, on the north and north-east by the Tygerberg and Bottellary Hills, eastward by the Eerste River and southward by the False Bay coast. The western and northern portions already form part of Greater Cape Town and building activity is steadily encroaching eastward.

A sea-strait formerly separated the mainland from the present peninsula. Most of the area which now forms the Cape Flats was submerged until the coastal elevation of 27 m occurred (Taljaard, 1949) about 175,000 years ago (Walker, 1952). The Cape Flats are composed mainly of sand with inter-layered clay bands. The sand extends to depths of over 30 m below the surface and rests on an uneven foundation of Malmesbury rocks and granite. These surface materials were mainly deposited as beach drifts, subsequently added to by wind action. The Flats have a dune topography with a belt of foredunes fronting the shore and long sand ridges extending inland in the direction of the prevailing south-easterly wind. The dunes are of varying age, those towards Muizenberg being younger and lower. Average elevation is roughly 34 m and maximum elevation 60 m.

ALIEN VEGETATION

By 1850 the encroachment of sand threatened the first hard road across the Flats. To bind the drift the Colonial Secretary, the Hon. John Montagu, "imported Port Jackson trees and Australian Myrtle, which were planted along with hakea" (Mossop, 1927). This work was greatly extended by the newly-created Forest Department after

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J. Storr Lister was appointed Superintendent of Plantations in 1875 or 1876 (Roux, 1961). The most successful species were the two Australian wattles, *Acacia cyanophylla* (Port Jackson) and *A. cyclops* (Rooikrans). These two sand-binders have now spread by natural means, not only over most of the Flats, but also in favourable habitats along the north and east coasts as far as Olifants River and Port Elizabeth, respectively.

The reclamation of the dunes is complete but dense thickets of wattles are rapidly ousting the last vestiges of indigenous vegetation. *Acacia cyclops* is the more widespread of the two species, spreading rapidly from seed carried by birds (especially the Redwing and Pied Starlings) and regenerating with vigour after a fire. Where both wattles occur together, *Acacia cyanophylla* may become dominant in frequently burnt areas, because it coppices from the base of the trunk immediately after a fire, whereas *A. cyclops* is killed outright and must regenerate more slowly from seed. Both wattles, but especially *A. cyclops*, are culled for firewood on reaching a basal diameter of 10–13 cm.

Besides the ubiquitous Acacias, I found *Callitris robusta* (Australian Cypress Pine) regenerating profusely after a fire. At present I know of only one small patch of about 0,2 ha near the Hollandia Flying Club. Because of its abundant regeneration this species may eventually suppress any remaining patches of indigenous vegetation on the Cape Flats.

Eucalyptus gomphocephala, a species widely planted as a windbreak and avenue on the Cape Flats, is also spreading in old veld to a distance of 180 m from its parent trees. Its spread is limited compared with the other species mentioned.

INDIGENOUS VEGETATION

Parts of the Eerste River Forest Reserve along the N2 National Road, especially an area of some 200 hectare near the Cape-Stellenbosch Divisional Boundary, are only lightly invaded by alien plants. Here it is still possible to determine the structure, composition and relationships of indigenous vegetation some 6,5 km inland. Nearer the coast, notably on Strandfontein Coast Forest Reserve, large stretches of indigenous vegetation are still intact, though the ill-advised practice of stabilizing the sandy cuttings of the new coast road with *Acacia cyclops* will soon alter this.

In this account the inland and coast vegetation are described and compared. The field work was done in late summer (February) when many of the plants were not in flower and when few annuals or geophytes could be recognized. This description is, therefore, general and preliminary.

Inland Communities

These communities (except the Fynbos of Reddish Sands) occur on the Eerste River Forest Reserve north of the National Road near the Cape-Stellenbosch Divisional boundary. The soil here consists of fine white sand, riddled with mole holes and littered with snail shells 1–2 cm in diameter. The gently undulating topography is broken by long narrow ridges about 12 m high. These are the original wind-formed dunes running parallel to the prevailing south-easterly winds. Low lying depressions, swampy in winter, have a different vegetation.

On the higher ground of the undulations and ridges are *Euclea-Rhus* and *Metalasia* communities.

(1) *Euclea-Rhus* Inland Dune Scrub occupies chiefly the ridge crests, but in old veld extends to the undulations between crests as well. Typical woody species are *Euclea racemosa*, a frequent dominant; *Rhus lucida*, a fairly frequent co-dominant; and *Rhus glauca*, which is less frequent. *Rhus crenata* and *Olea exasperata* are both rare and local, the latter indicating a degree of development towards a taller bush community.

The Dune Scrub is characteristically dense, 2–3 m tall, consisting of few species in constant association and with no understorey. A few climbers are also found. This vegetation is allied to and probably derived from the subtropical forest flora and is quite distinct in physiognomy and floristics from the “fynbos”, which is the local term for the macchia or sclerophyll vegetation typical of the South-western Cape Province.

(2) *Metalasia* Inland Dune Fynbos, typically about 1 m tall, covers most of the undulating country. Its composition is complex and varies strikingly within short distances, with no obvious change in site conditions. In some places the dominant shrubs are *Passerina* spp.—*Zygophyllum fulvum*—*Mundia spinosa*, at others *Stoebe plumosa*—*Cliffortia falcata*—*Diosma hirsuta*, and at yet others *Metalasia muricata*—*Passerina*. These probably represent different stages in the succession after fire. The oldest fynbos so far seen, which is 1–2 m high, has the highest proportion of *Metalasia muricata* and tentatively the succession after fire may be *Stoebe plumosa* \Rightarrow *Passerina* spp. \Rightarrow *Metalasia muricata*. *Stoebe plumosa*, being a coppicing species, regenerates rapidly after fire and soon dominates the bare areas, whereas *Passerina* spp. and *Metalasia muricata*, which regenerate solely from seed, become dominant at a later stage. Besides the mere fact of burning, however, the season and cycle of burns also help to determine which course the succession will follow.

Because the dominants are so varied, a search was made for species which, though not necessarily dominant or even striking, are confined to this community and can therefore be regarded as character species. Two of these are *Psoralea fruticans*, a virgate legume, and the grass *Ehrharta villosa* (Pypgras). Both are scattered throughout all variations of the Dune Fynbos, even towards the coast and on the limestone formation at Strandfontein where the species composition is rather different. In the sandy openings characteristic of fynbos, *Ehrharta villosa* is, indeed, often dominant, and geophytes and annuals are also common.

A species characteristic of the Dune Fynbos, though not faithful to it, is the woody shrub *Rhus mucronata*. It occurs in almost pure spreading stands of 20–84 m² and 0,6–1 m high, which probably consist of a single individual with a spreading underground rootstock. On the coastal limestone at Strandfontein this species is replaced by *Rhus glauca*. In better developed Dune Fynbos the woody shrub *Myrica quercifolia* commonly occurs as an understorey 30–60 cm high. It spreads in much the same way as *Rhus mucronata* except that it does not occur in pure stands.

The inland depressions bear a different vegetation.

(3) In the low-lying parts, inundated in winter, there is a **Grass-Rush community** in which the families Gramineae, Cyperaceae, Restionaceae and Juncaceae show marked, local, single-species dominance. These dominants are *Imperata cylindrica*, *Scirpus nodosus*, *Chondropetalum tectorum* and *Juncus kraussii*, all with dense masses of rhizomes matted together just below the soil surface. Perhaps partly because of this, and partly because of the poor drainage, the alien wattles are much less frequent in these depressions than in the well-drained sands of the higher ground.

Associated with the grass-rush mixture are bushes, mainly Composites, such as *Senecio halimifolius*, *S. angustifolius*, *Nidorella foetida* and *Othonna parviflora*. Occasionally in open areas the two creeping grasses, *Cynodon dactylon* and *Stenotaphrum secundatum*, are found.

(4) Within the low-lying areas occur small mounds raised about 1,3 m above the general surface. These mounds bear an Inland Dwarf Fynbos quite different to the grass-and-rush of the hollows. It is distinguished from Dune Fynbos by (i) its dwarf character, the plants seldom being over 60 cm tall, usually 30 cm; and (ii) the occurrence of almost pure stands with a single dominant. Here again, however, the actual

dominants vary from place to place, the chief being *Passerina* spp., *Aspalathus hispida* and *Muraltia mitior*. These species are all found within the Dune Fynbos, but not as single dominants nor in this dwarf form.

The mounds may have been formed by the accrual of windblown sand against obstacles such as bushes of the grass-rush community, and if built up further, typical Dune Fynbos would probably result. The occurrence of stunted plants of *Metalasia muricata* on some of the higher mounds lends support to this view, as does the presence of the two character species *Psoralea fruticans* (dwarf form) and *Ehrharta villosa*.

(5) *Thamnochortus*—*Passerina* Fynbos of Reddish sands.

Near the Nuclear Research Institute, where the old National Road is bordered to the south by a line of Eucalypts, is an area of level, well-drained, reddish, fine-textured sand. This sand is commonly found towards the eastern end of the Cape Flats and probably owes its distinctive character to an overlay of detritus from the sedimentary and igneous rocks of the Faure hills. The veld has been very heavily invaded by wattles but a few small patches of indigenous vegetation remain.

The vegetation is similar to parts of the Bredasdorp Strandveld, for example near Uilenkraal. It is two-layered, with an upper discontinuous layer of *Thamnochortus erectus* and *Passerina vulgaris* in scattered clumps, both species about 1,3 m high. In the denser lower layer, 30–60 cm high, *Aspalathus hispida* is common and succulents, such as the creeping *Carpobrotus acinaciformis* (Sour Fig) and *Crassula cymosa*, are associated. Openings, sometimes 25 m² in area, are covered with annuals in spring (*Dimorphotheca*, *Dorotheanthus*, *Ursinia* etc.) but are bare at other seasons except for pioneer clumps of *Cynodon dactylon*.

The two character species of Dune Fynbos, *Psoralea fruticans* and *Ehrharta villosa*, and clumps of *Rhus mucronata*, are found, showing a close relationship between these two communities. On the other hand, the family Proteaceae, virtually absent from the Dune Fynbos, is here represented by *Leucadendron levisanum* in the upper layer and *Serruria* sp. in the lower layer, showing an affinity with the Bredasdorp Strandveld where the family is well represented, especially by *Leucadendron* spp.

COASTAL COMMUNITIES

The strand topography is somewhat similar to the alternating dunes and flats found inland, but the dunes are higher and more evenly spaced with the intervening flats being merely troughs or slacks separating one dune from another. Poorly-drained depressions are found only behind the foredune at the coast. Limestone beds covered by a thin layer of fine calcareous soil are a distinctive feature of this coast environment.

The plant communities of the coast follow the same pattern as those found inland but differ in detail.

(1) *Pterocelastrus* Coast Dune Scrub. *Euclea racemosa* is not as common as further inland, its place as dominant being taken by *Pterocelastrus tricuspidatus* (Kershout). The morphological variation of this species is remarkable. In the Knysna forests it is found "as a large tree, 60 ft to 80 ft in height by 6 ft or 7 ft g.b.h. . . . throughout the forests but is more frequent in the drier than in the moister forests" (Laughton, 1937). Along the coast it occurs quite frequently as a bushy shrub about 2 m high, from the Knysna area right round the south coast to the vicinity of Lambert's Bay.

Floristic features which distinguish Coast Dune Scrub from its inland counterpart are: (i) the virtual absence of *Rhus lucida*, its place being taken by *Rhus glauca*; and (ii) the occurrence of the coastal woody shrub, *Cassine maritima*. In physiognomy, Coast Dune Scrub is lower (1–2 m) with a "wind-sheared" appearance, the tender growing tips being constantly arrested by salt-laden winds from the ocean. It is

more or less evenly spaced in a mosaic of oblong patches, particularly along the foot of the dunes and not on the crests. Where well-developed, these patches coalesce into an almost continuous belt. *Salvia aurea* is associated with the woody element and the climbers *Cynanchum obtusifolium* and *Kedrostis nana* occur.

(2) *Metalasia* Coast Dune Fynbos extends inland about 1,6 km from the coast. Here the fynbos is very similar to the inland community except for the presence of *Myrica cordifolia*, a typical coast species, and in openings a greater proportion of succulents such as *Mesembryanthemae* and *Euphorbia caput-medusae*. Mixed dominance is still apparent. Nearer the coast, however, just behind the littoral dune, *Metalasia muricata* occurs in almost pure stands over large areas.

On the littoral dune itself many succulent and semi-succulent plants appear, such as *Senecio elegans* (which, though an annual, has a succulent form near the coast), *Arctotheca nivea*, *Hebenstreitia cordata*, *Cnidium suffruticosum*, *Tetragonia fruticosa*, *Carpobrotus acinaciformis* and other *Mesembryanthemae*. Marram grass (*Ammophila arenaria*) has been planted to stabilize open sand on the littoral dune. When drift has been stopped in this way, Marram becomes moribund and shrubs like *Metalasia muricata* and *Passerina ericoides*, another typical coast plant, invade the stabilized dune.

(3) The vegetation of depressions near the coast is more mixed than that of inland depressions, with little single-species dominance. Chief plants found on these sites where the salt content of the soil is high, are *Scirpus nodosus*, *Plantago carnososa*, *Sporobolus virginicus*, *Chironia decumbens*, *Cnidium suffruticosum*. *Helichrysum orbiculare*, dominant in areas with less salt in the soil, represents a distinct community or sere.

(4) Coast Dwarf Fynbos of the Limestone Formation. Limestone occurs quite extensively near the coast. It bears a dwarf fynbos which includes many inland species plus a few others, but in different proportions. None of the shrubs are over 30 cm tall, usually less. *Rhus glauca* replaces *R. mucronata* of the inland veld, forming patches only about 20 cm tall by roughly 3 m² in area.

Acocks (1953) regards dwarf fynbos on limestone in the Bredasdorp Division as a distinct veld type; this seems to be true also of limestone vegetation on the Cape Flats. It needs more detailed study.

REGENERATION AFTER FIRE

Wicht (1945) recognizes four ways in which Cape plants can survive fire: regrowth from soil storage organs (geophytes), regeneration from seed, sprouting from rootstocks, and growth from dormant buds when the stems and branches are so well insulated against the heat of fire that they are not normally killed.

An examination of Cape Flats vegetation about three months after it was burnt in the summer of 1961-62 showed the following species in these four categories: (1) Geophytes: *Brunsvigia orientalis* flowering; the first geophyte to be recognized. Others were pushing their leaves above ground, but the majority would only come up after the first rains.

(2) Regeneration from seed: The following burnt plants which showed no sprouting three months after the fire may be regarded as seed-regenerating species: *Passerina vulgaris*, *Phylla ericoides*, *Mundia spinosa*, *Metalasia muricata*, *Acacia cyclops*. Many fynbos species, especially the dominants of the older stages (*Passerina* and *Metalasia*) fall into this category.

(3) Sprouting from rootstocks: *Aspalathus hispida*, all *Asparagus* spp., *Antizoma capensis*, *Chrysanthemoides monilifera*, *Cynanchum obtusifolium*, *Cymbopogon marginatus*, *Diosma hirsuta*, *Euclea racemosa*, *Hermannia* sp., *Imperata cylindrica*, *Myrica quercifolia*, *Psoralea fruticans*, Restionaceae, *Rhus crenata*, *R. lucida*, *R. mucronata*,

Salvia aurea, *Stoebe plumosa*, *Zygophyllum fulvum* and two unidentified grasses. *Imperata* and an *Asparagus* were already flowering and fruiting. Length of sprouts varied from 2,5 cm (*Antizoma*) to 100 cm (*Asparagus*), but most shrubs showed an average growth of about 30 cm. At this short interval after fire, regeneration is mainly from sprouts. Of the 18 regenerating species recorded in four 0,025 ha (0,01 acre) transects, only one unidentified geophyte was not a root-sprouting species (Table 1).

The occurrence of *Stoebe plumosa* in the above list supports the view that *Stoebe*-dominated fynbos is younger than that dominated by *Passerina* or *Metalasia*. The list shows that most components of Woody Scrub regenerate from sprouts. *Rhus glauca*, not found sprouting, may be slower than the others and is unlikely to fall in any of the other categories.

(4) Growth from dormant buds: On the edge of the burn where the bushes were only singed, *Psoralea fruticans*, *Rhus crenata* and *Rhus glauca* sprouted from stem-buds but the above-ground portions would have been completely killed in a severe fire.

OBSERVATIONS AND CONCLUSIONS

(1) In the early stages, sprouting from rootstocks and from the base of the stem is the commonest means of regeneration after fire. Coppicing species are especially common in the scrub and the grass-rush communities. Fynbos contains a few coppicing species in the early stages but later regeneration is from seed. The alien *Acacia cyclops* is a seed-regenerating species. Because of these facts (a) the scrubby dune-crests and the grassy hollows are revegetated before the intervening slopes and undulations where fynbos predominates; (b) the succession in Dune Scrub is simple and comparatively rapid whereas succession in fynbos is more complex and prolonged; (c) the indigenous vegetation regenerates quicker than does the alien *Acacia cyclops*; however, burnt dunes previously fixed by *Acacia cyclops* contain more leaf-mould and matted roots which bind them better than the indigenous species.

(2) In both burnt and unburnt fynbos *Psoralea fruticans* is the only species which can withstand severe competition from *Acacia cyclops*. This tolerance, and its vigorous sprouting, may explain its constant occurrence as a character species in the many variations of fynbos vegetation found on the Cape Flats.

TABLE 1.—Density of regeneration three months after fire in Inland Communities [transects 12 × 3,4 m (39,6 × 11 ft)]

Species	No. of plants		
	Transect 1	Transect 2	% Total number
(a) Grassy Flats			
Grasses (mainly <i>Cymbopogon</i> , <i>Imperata</i>).....	69	177	54,1
<i>Myrica quercifolia</i>	74	98	38,0
<i>Stoebe plumosa</i>	12	—	2,6
<i>Rhus mucronata</i>	9	1	2,2
Restionaceae.....	6	—	1,4
Geophytes.....	4	—	1,0
<i>Zygophyllum fulvum</i>	3	—	0,7
	177	276	100,0

TABLE 1 (continued)

Species	No. of plants		
	Transect 3	Transect 4	% Total number
(b) Dune Slope			
<i>Euclea racemosa</i> (ridge).....	53	51	35,3
<i>Myrica quercifolia</i> (lower slopes).....	27	37	21,8
<i>Rhus mucronata</i> (lower slopes).....	7	32	13,3
Grasses.....	4	9	4,4
Restionaceae.....	1	11	4,1
<i>Salvia aurea</i>	5	5	3,4
<i>Cynanchum obtusifolium</i>	1	8	3,1
<i>Rhus lucida</i>	3	6	3,1
<i>Psoralea fruticans</i>	6	2	2,7
Cyperaceae.....	6	1	2,4
<i>Chrysanthemoides monilifera</i>	1	5	2,0
Geophytes.....	2	2	1,4
<i>Stoebe plumosa</i>	—	3	1,0
<i>Antizoma capensis</i>	1	1	0,7
<i>Diosma hirsuta</i>	2	—	0,7
<i>Aspalathus hispida</i>	1	—	0,3
<i>Asparagus</i> spp.....	1	—	0,3
	121	173	100,0

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PLATE 1.—Bare appearance of the undulating country of the Eerste River Forest Reserve on the Cape Flats, three months after fire.



PLATE 2.—Similar area as in Plate 1 several years after fire showing *Acacia cyanophylla* and a few *A. cyclops* (exotic species) in hollow with scrub, including *Rhus lucida*, on ridges.



PLATE 3.—Dune scrub, mainly *Euclea racemosa*, with low *Rhus mucronata* colony in foreground.



PLATE 4.—Crest of burnt ridge vegetation showing abundant coppice regeneration of *Euclea racemosa*.



PLATE 5.—Example of regeneration after fire from underground storage organs by *Brunsvigia orientalis*. Note young plant emerging from soil at left.



PLATE 6.—Prolific regeneration after fire from seed by exotic species, *Callitris robusta*, with *Acacia cyanophylla* and *A. cyclops* in background on right.