

Plant Formations in the Cape BioProvince

Peter Martin Rhind

Cape Forest

The forests of Capensis are now confined to deep ravines and kloofs, although it is unlikely that a forest climax could be attained in some of the dryer areas except in the few situations where there is a permanent ground water supply. Nevertheless, there is little doubt that the present day patches of forest are the remnants of a once far more extensive community. Past deforestation has been one factor, but fire seems to have been the main culprit as far as forest destruction is concerned. In marked contrast to the general xerophytic character of many fynbos plants with their sclerophyllous leaves, most trees of these forests have evergreen elliptical leaves with dark polished surfaces more typical of wetter conditions. The forest canopy tends to be dense and continuous, but no single tree species can be said to be dominant, and species composition varies according to the degree of soil moisture. In the wetter areas, *Cunonia capensis* is often one of the most abundant species, while in dryer situations *Podocarpus latifolia* and the endemic or near endemic *Elaeodendron capense* (Celastraceae) predominate. Under trees may include *Halleria lucida* and the endemic *Maurocenia frangularia* (Celastraceae), but there is no definite shrub layer except where there are openings in the canopy. Like the trees, the ground layer composition also varies with soil moisture, but among the more common herbaceous species are *Knowltonia vesicatoria* and the two endemics *Nemesia lucida* (Scrophulariaceae) and *Schoenoxiphium capense* (Cyperaceae). Ferns can also be a common feature of the ground layer especially in the wetter areas where many species may be present including the tree fern *Cyathea capensis*. Epiphytes, on the other hand, are not particularly common, but may frequently include *Polypodium lanceolatum*.

Cape Mountain Fynbos

Forming the main vegetation type above an altitude of about 900 m, this is the largest and most important unit of Capensis vegetation. In the west it extends from Cape Agulhas northwards beyond Cedarberg for some 400 km, while the eastern block runs parallel to the Cape south coast for about 600 km. It can be broadly divided into three zones - a proteoid zone on the lower slopes, an ericoid / restioid zone on the upper slopes, ridges and summits, and a hydrophilic zone on the permanently wet or moist areas.

The proteoid zone normally has a three tiered structure with an upper tier of shrubs ranging in height from about 3 m in the west to as much as 6 m in the east. The dominant species are mainly endemic members of the Proteaceae. *Protea neriifolia* is the commonest species, but is replaced by *P. lepidocarpodendron* in the southwest, *P. laurifolia* in the north, and in the east several other endemic species, such as *P. eximia*, *P. lacticolor*, *P. mundii* or *Leucadendron eucalytifolium* (Proteaceae), may form local dominants, while on boulder fans and scree the endemic *P. nitida* usually becomes the main species. The middle layer has a more dense and complex structure containing ericoides such as the endemic *Erica articularis* (Ericaceae), lower proteoids and restioids such as the endemics *Restio gaudichaudianus* (Restiaceae) and *Tetraria bromoides* (Cyperaceae). The proteoid zone also includes occasional trees. *Maytenus oleoides* and the endemic *Heeria argentea* (Anacardiaceae) can be found scattered along the rocky hillsides from the Hottentot Holland Mountains to the Cedarberg, but where surface rock is even more pronounced such as on scree slopes these are joined by hardier trees such as *Maytenus acuminata*, *Olea africana*, *Olinia ventosa* and the endemic *Podocarpus elongatus* (Podocarpaceae). On the lower slopes *Waddingtonia cupressoides*, an erect, cypress-like shrub, can be found in the mid-layer of proteoid scrub, but when there has

been no recent history of fire, it can grow into an emergent small tree up to 5 m high. However, fire is a common feature of this zone and often reduces the scrub structure to a two-layered or even single-layered form. Other endemic species commonly encountered within this zone include shrubs such as *Brunia nodiflora* (Bruniaceae), *Cliffortia cuneata* (Rosaceae), *Diosma hirsuta* (Rutaceae), *Diospyros glabra* (Ebenaceae), *Elytropappus glandulosa* (Asteraceae), *Gnidia inconspicua* (Thymelaeaceae), *Penaea mucronata* (Penaeaceae), *Phylica spicata* (Rhamnaceae), *Podalyria myrtillifolia* (Fabaceae), *Rhus angustifolia* (Anacardiaceae), grasses such as *Ehrhartia bulbosa*, *Pentaschistus colorata* and other herbaceous species like *Aristea major*, *Bobartia indica*, *Watsonia pyramidata* (Iridaceae) and *Euphorbia genistoides* (Euphorbiaceae).

In the ericoid-restioid zone few of the associated shrubs stand more than about 2 m high due to the rigorous climate. Most of these have the ericoid or penaeoid form rather than the proteoid form and there are seldom any discernable layers to the vegetation. Some of the more common ericoids include endemics such *Psoralea aculeata* (Fabaceae), *Berzelia dregeana* (Bruniaceae), *Blaeria dumosa*, *Scyphogyne muscosa* and *Sympieza articulata* (Ericaceae). In the higher exposed areas especially on the summits, prostrate or decumbent shrubs, such as the endemic *Acmadenia teretifolia* (Rutaceae) and *Erica tumida* (Ericaceae), predominate. Endemic species displaying the penaeoid form include *Penaea mucronata* (Penaeaceae) and *Phylica buxifolia* (Rhamnaceae). The restioids occur either mixed among the ericoids or forming separate stands, and are predominantly represented by rigid tufted species many of which are endemic members of the Restiaceae like *Arthrochortus erinalis*, *Cannamois virgata*, *Chondropetalum mucronatum*, *Elegia racemosa*, *Hypodiscus aristatus*, *Restio perplexus*, *Staberoha cernua*, *Thamnochortus gracilis* and *Wildenowia sulcata*, or various endemic grasses and sedges such as *Ehrhartia ramosa*, *Pentameris macrocalycina* (Poaceae) and *Tetraria capillacea* (Cyperaceae). Trees are absent apart from occasional gnarled specimens of the endemic *Widringtonia cedargensis* (Cupressaceae) in the Cedarberg, which may in the distant past have formed a closed forest of the upper slopes and plateaus. Another species, the endemic *Widringtonia schwarzii*, precariously maintains a small range in the Kouga Mountains to the east. Other endemic species encountered in this zone include many more shrubs such as *Agathelpis angustifolia* (Scrophulariaceae), *Cliffortia polygonifolia* (Rosaceae), *Clutia polygonoides* (Euphorbiaceae), *Coleonema juniperinum* (Rutaceae), *Euryops abrotanifolius* (Asteraceae) and *Nebelia paleacea* (Bruniaceae).

Cape Wet (Hygrophorous) Fynbos

This broad category includes permanently wet or moist habitats such as marshes, swamps, pans and riverbanks, and comprises numerous communities. Nevertheless, many hygrophilous species are widespread within the BioProvince, but it is also true to say that most are also strictly confined to Capensis - even *Prionium serratum* (Juncaceae), the most widespread of wetland species, is rarely encountered outside Capensis. In the absence of fire it is thought that much of the wet fynbos would give way to a forest type community and succession to woodlands has taken place along certain stream banks in protected kloofs. These typically include *Cunonia capensis*, *Halleria lucida*, *Ilex mitis*, *Kiggelaria africana*, *Podocarpus latifolius* and *Rapanea melanophloea*. Riparian scrub dominated by the endemic *Brabeium stellatifolium* (Proteaceae) is an important stage in this succession. It reaches heights of 5 m or so and fringes the lower, less steep parts of rivers such as the Eerste River at Jonkershoek and Elands River in Du Toit's Kloof. The upper layer includes several endemic shrubs and small trees such as *Brachylaena neriifolia* (Asteraceae), *Freylinia lanceolata* (Scrophulariaceae), *Metrosideros angustifolia* (Myrtaceae), *Podalyria calyptrata* (Fabaceae) and *Rhus angustifolia* (Anacardiaceae). Below this is often a layer of smaller shrubs up to 1.5 m tall, which may include *Mryrica*

serrata and the endemic *Diospyros glabra* (Ebenaceae). This layer is also important for various restioids like the endemic *Elegia capensis* and *Ischyrolepis subverticillata* (Restionaceae) and the endemic grass *Pentameria thurarii* (Poaceae). In the wetter areas, close to streams, ferns may predominate often forming a dense layer up to 1 m high. Typical species include *Pteridium aquilinum*, *Todea barbata* and the endemic *Blechnum capense* (Blechnaceae). Stream edges, on the other hand, are often characterised by dense swards of *Prionium serratum*, which in sandy areas can colonise entire streambeds forming spiky mats that can impede water flow. The endemic *Wachendorfa thyrsiflora* (Haemodoraceae), with its conspicuous golden-yellow flowers, is one of several species associated with these mats.

Moving eastwards both *Bradeium stellatifolium* and *Metrosideros angustifolia* decline, while *Laurophyllus capensis* (Lauraceae), endemic to the southern Cape, becomes one of the more important species of wet mountain slopes, and other endemic species like *Leucodendron salicifolium* and *L. eucalyptifolium* (Proteaceae) become important pioneers of upper streams. Further east beyond the Gouritz River the streams are flanked by wet evergreen forest in which the endemic *Virgilia oroboides* (Fabaceae) forms the main species. Other vegetation of wet or moist habitat is more typical of fynbos. In southern localities *Berzelia abrotanoides* and the endemic *Osmitopsis asteriscoides* (Asteraceae) often dominate seepage zones sometimes forming a dense canopy up to 2 m high. The few other associated shrubs include endemic species like *Cliffordia subsetacea* (Rosaceae), *Leucodendron laureolum* (Proteaceae) and *Penaea mucronata* (Penaeaceae). Other wet areas and flushes, especially in the east, are dominated by *Juncus lomatoxyllus* and *Laurembegia repens*, while less common species are *Carpa bracteosa*, *Cyperous tenellus*, *Ficinia indica*, *Utricularia capensis* (not endemic) and several endemics such as *Drosera cuneifolia* (Droseraceae) and *Pulicaria capensis* (Asteraceae). In the rocky mountain streams of the Kogelberg and surrounding areas, a tall wet fynbos dominated *Berzelia lanuginosa* and the endemic *Pseudobaeckia africana* (Bruniaceae) can be found. It is often very dense and can reach heights of 3 m and commonly includes several endemic shrubs such as *Brunia albiflora*, *B. alopecuroides* (Bruniaceae) and *Leucodendron xanthoconus* (Proteaceae) and a number of endemic restioids like *Restio dispa* and *R. purpurascens* (Restionaceae). This community is also characteristic of the wet Table Mountain sandstones east of the Hottentots-Holland divide.

Finally, in addition to shrub-dominated wetlands, there are also many restioid wetlands. These are usually dominated by tussock species and are particularly characteristic of marshy flats where stagnant water occurs. For example, the endemic *Elegia parviflora* (Restionaceae) can form extensive, almost mono-specific stands on the plateau of the southern Cape Peninsula. The endemic *Elegia cuspidata* (Restionaceae) dominates a more complex community on deep, poorly drained plateaus rich in endemic species including other restioids such as *Restio dobiei* (Restionaceae) and *Tetraria flexuosa* (Cyperaceae) shrubs such as *Erica capensis* (Ericaceae) and *Rafnia crassifolia* (Fabaceae), and herbaceous species such as *Prismatocarpus sessilis* (Campanulaceae) and *Ursinia tenuifolia* (Asteraceae).

Cape Arid Fynbos

Arid fynbos is confined to a narrow belt along the inland margins of Capensis where rainfall is close to the lower limit for fynbos, and because of these conditions canopy cover seldom exceeds 50%. It ranges in altitude from about 500 to 1000 m, but structurally it is far simpler than mountain fynbos with less distinct layering, and there is a preponderance of ericoid forms such as *Cliffortia ruscifolia*, *Cullumia rigida* and *Passerina glomerata*. Proteoids, on the other hand, are sparsely distributed, but restioids can be locally

conspicuous. In terms of structure, arid fynbos typically includes a sparse upper layer containing species such as the endemic *Cannamois scirpoides* (Restionaceae) and *Protea laurifolia* (Proteaceae) reaching heights of 2 m, although there may also be a few emergent species, such as the endemic *Protea glabra* (Proteaceae) up to 2.5 m. Below this an indistinct middle layer may be present containing various, often endemic ericoids such as *Diosma hirsuta* (Rutaceae), *Leucadendron pubescens* (Proteaceae) and *Phyllica pulchella* (Rhamnaceae). Moving further landward arid fynbos eventually gives way, sometimes abruptly to the karoo vegetation of the adjacent BioProvince. In places there are what appear to be relict islands of arid fynbos surrounded by karoo vegetation, which are possibly leftovers from the warmer, wetter times of the Tertiary period.

Cape Coastal Fynbos

The coastal zone of Capensis has lower rainfall than in the mountains and because of the oceanic influence temperature fluctuations are less extreme and frosts are unheard of. However, despite the fairly uniform climatic conditions, two main subdivisions of coastal fynbos can be recognized - one on the south coast stretching eastwards from Danger Point to near Mossel Bay, where limestone is the main substratum, the other on the marine sands of the west coast from Cape Flats northwards to the Elands River. Certain species, such as the endemic restioid *Thamnochortus erectus* (Restionaceae), however, are found throughout both of these subtypes. On the south coast ericoids and restioids occur beneath a canopy of proteoids. Many species are confined to this zone and the structure typically includes an upper layer of the endemic proteoids *Protea obtusifolia*, *P. susannae*, *Leucodendron coniferum* and *L. muirii* (Proteaceae) and a lower layer containing many other endemic species such as the ericoids *Clutia ericoides* (Euphorbiaceae), *Erica spectabilis* (Ericaceae), *Lightfootia calcarea* (Campanulaceae), *Phyllica selaginoides* (Rhamnaceae), and the restioids *Chondropetalum microcarpum*, *Restio eleocharis* and *Thamnochortus paniculatus* (Restionaceae). Other endemic species characteristic of south coast fynbos includes the grass *Pentaschistes patuliflora* (Poaceae), and shrubs like *Hermannia trifoliata* (Sterculiaceae), *Pelargonium betulinum* (Geraniaceae) and *Senecio arnicaeiflorus* (Asteraceae). West coast fynbos, on the other hand, has a very different structure being mainly composed of ericoids and has a much more open canopy, but still has its own assemblage of species that are absent or seldom found on the south coast. The characteristic proteoids include several endemic species like *Leucospermum hypophyllocarpodendron* subsp. *canaliculatum*, *L. rodolentum* (Proteaceae) and *Protea scolymocephala* (Proteaceae). Typical ericoids include *Leyssera gnaphaloides*, *Limonium longifolium* and the endemic *Cliffortia juniperina* (Rosaceae) and *Phyllica cephalantha* (Rhamnaceae), while the restioids include *Willdenowia arescens* and the endemic grass *Pentaschistes trisetia* (Poaceae). There are also several distinctive geophytes such as *Caesia contorta*, *Homeria miniata* and the endemic *Antholyza ringens* (Iridaceae).

Cape Strandveld

This veld type comprises broad leaved-sclerophyll woody scrub of coastal dunes. On the seaward slopes the main pioneer species is the endemic grass *Agropyrum distichum* (Poaceae). Other colonists of these unstable dunes include the grass *Ehrhartia villosa* and several succulent or semi-succulent species such as *Arctotheca populifolia*, *Carpobrotus acinaciformis*, *Chenolea diffusa*, *Hebenstreitia cordata* and the endemic *Silene crassifolia* (Caryophyllaceae). Where there is a degree of stability natural succession initially leads to the development of a sub-climax shrub community with species like *Calpoon compressum*, *Chironia baccifera*, *Chrysanthemoides monilifera*, *Metalasia muricata*, *Myrica cordifolia* and the endemic *Passerina ericoides* (Thymelaeaceae). Several of these can exist in a dwarf form in exposed places such as on the top of dunes or reach heights of up to 3 m in

more sheltered areas. Eventually with increased stabilization this gives way to a strandveld climax, although this develops best in wetter areas such as dune slacks. On the south coast the main strandveld species are *Pterocelastrus tricuspidatus* and *Sideroxylon inerma*, while the more arid west coast dunes are characterised by *Diospyros austro-africana*, *Solanum guineense* and the endemic *Diospyros glabra* (Ebenaceae), *Euclea tomentosa* (Ebenaceae) and *Rhus dissecta* (Anacardiaceae).

Cape Coastal Renosterveld

Confined to an elevated platforms between strandveld and coastal fynbos, renosterveld bears little resemblance to fynbos with both proteoid and restioid elements virtually absent. The name is African for rhinoceros veld, a possibly reference to the historic habitation of the black rhinoceros. The dominant species, *Elytropappus rhinocertis* (Asteraceae), is a near endemic, densely branched, grey shrub with cupressoid leaves. It gives the landscape a drab, uniform appearance, but this belies the great species-richness of these scrublands, which are comparable to fynbos. Unfortunately overgrazing and repeated burning has disturbed much of this vegetation and this has favoured the expansion of *Elytropappus*. Consequently, it has proved difficult to determine its original composition. However, in places other asteraceous shrubs like *Chrysocoma tenuifolia*, *Leyssera gnaphoides*, *Pteronia incana* and *Relhania genistaefolia* form local dominants, and it seems likely that these formed the basis of distinct communities before the proliferation of *Elytropappus*. Nevertheless, even in its current form, this veld type still supports many endemic species such as the geophytes *Tritonia crocata* and *Watsonia aletroides* (Iridaceae) and annuals like *Nemesia barbata* (Scrophulariaceae).

Further information required.

References

Acocks, J. P. H. 1975. *Memoirs of the botanical survey of South Africa. Veld types of South Africa.*

Adamson, R. S. 1927. The plant communities of Table Mountain: preliminary account. *Journal of Ecology*, 15: 279-309.

Adamson, R. S. & Salter, T. M. (eds). 1950. *Flora of the Cape Peninsula*. Juta & Co Ltd.

Barraclough, T. G. 2006. What can phylogenetics tell us about speciation in the Cape flora? *Diversity and Distributions*, 12: 21-26.

Born, J., Linder, H. P. & Desmet, P. 2007. The Greater Cape Floristic Region. *Journal of Biogeography*, 34: 147-162.

Cowling, R. M., Richardson, D. M. & Pierce, S. M. 1997. *Vegetation of Southern Africa*. Cambridge University Press.

Goldblatt, P. 1978. An analysis of the flora of southern Africa: its characteristics, relationships, and origins. *Annals of the Missouri Botanical Garden*, 65: 369-436.

Goldblatt, P. & Manning, J. C. 2002. Plant diversity of the Cape Region of Southern Africa. *Annals of the Missouri Botanical Garden*, 89: 281-302.

Herre, H. 1971. *The genera of the Mesembryanthemaceae*. Tafelberg-Uitgewers Beperk Cape Town.

Manning, J. 2008. *Field Guide to the Fynbos*. Struik Publishers.

Maytham Kidd, M. 1996. *Cape Peninsula. South African Wild Flower Guide 3*. Botanical Society of South Africa.

Proches, S., Cowling, R. M., Goldblatt, P., Manning, J. C. & Snijman, D. A. 2006. An overview of the Cape geophytes. *Biological Journal of the Linnaean Society*, 87: 27-43.

Taylor, H. C. 1978. Capensis. In: *Biogeography and Ecology of southern Africa*. Ed. M. J. A. Werger. Dr W Junk Publishers. The Hague.

Wickens, G. E. 1976. The flora of Jebel Marra (Sudan Republic). *Royal Botanical Gardens Kew*. HMSO.