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The vegetation of the southern Langeberg, Cape Province. 2. The plant communities of the Marloth Nature Reserve

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ABSTRACT

The Marloth Nature Reserve, encompassing the mountain catchments of the southern Langeberg immediately above Swellendam, Cape Province, South Africa, is described. The vegetation of the reserve was sampled along a transect representing the variation in plant communities over the range from the lower south to the lower north slopes. Eighty-three sample sites were subjectively located in mature stands of fynbos vegetation (>10 years old). The relevé data were initially classified using TWINSPAN and then refined by Braun-Blanquet (BB) phytosociological procedures. The Afromontane Forest patches which occur mainly on the lower south slopes were not sampled but are briefly discussed. The fynbos plant communities are described, based on tables, and a hierarchical classification is proposed.

UITTREKSEL

Die Marloth Natuurreservaat wat die bergopvanggebiede van die suidelike Langeberge bokant Swellendam, Kaapprovinsie, Suid-Afrika, insluit, word beskryf. Die plantegroei van die reservaat is versamel langs 'n transek wat die variasie in plantgemeenskappe oor die bergreeks vanaf die onderste suidelike tot die onderste noordelike hange verteenwoordig. Drie-en-tagtig monsterpersele is subjektief in volwasse fynbos (>10 jaar oud) uitgelê. Die relevé-data is aanvanklik deur middel van TWINSPAN geklassifiseer en toe deur Braun-Blanquet (BB) fitososiologiese prosedures verfyn. Die Afro-montane woudgemeenskappe wat hoofsaaklik op die onderste suidelike hange voorkom, is nie gemonster nie maar word kortliks bespreek. Die fynbosplantgemeenskappe word kortliks beskryf, gebaseer op tabelle, en 'n hiërargiese klassifikasie word voorgestel.

CONTENTS

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INTRODUCTION

This paper is the second in a series describing the plant communities of the southern Langeberg, Cape Province. The fynbos plant communities occurring in the Marloth Nature Reserve (Swellendam State Forest) are described and classified. The Afromontane Forest patches found in the study area were not sampled but are briefly discussed based on the studies of McKenzie (1978).

STUDY AREA

Location

The Marloth Nature Reserve (MNR) is situated in the mountain catchments of the southern Langeberg above the town of Swellendam (Figure 1). In 1928 a deputation of Swellendam residents petitioned the Minister of Lands and Forestry, General Kemp, to set aside a part of the mountain behind Swellendam as a nature reserve. The well-respected chemist and botanist Dr Rudolf Marloth proposed approximately 190 ha on the lower slopes of the Langeberg behind Swellendam, as a suitable area. This area which included the forest patches of Koloniesbos and Duiwelsbos, was proclaimed as a nature reserve and named in honour of Dr Marloth (Lückhoff 1981).

More recently, in accordance with the policy of the former Directorate of Forestry and Environmental Conservation to extend reserves for more effective management, the MNR was enlarged to more than 11 000 ha in June 1981. At the same time the Swellendam Hiking Trail was opened for recreational hiking in the MNR (Lückhoff 1981). Similar to the Boosmansbos Wilderness Area, the MNR is bounded on the north and south sides largely by agricultural lands and on the west and east sides by privately owned mountain land.

The sample transect selected in the MNR extended from the lower south slopes at the foot of 12 O'Clock Peak to the 'Plaat' or plateau and from there up the south-facing slopes of 12 O'Clock Peak. The transect was then 'broken' and continued from 10 O'Clock Peak down the north-facing slopes into Boskloof Valley and up the opposite south-facing slope to the summit of Hermitage Ridge. From this point samples were taken, roughly following the route of the Swellendam Hiking Trail to Goedgeloof Hut on the extreme lower north slopes of the range. This route gave ready access to the area. Although the transect covered a narrow belt and consequent relatively small area compared with the whole MNR, it allowed for sampling of the variety of fynbos plant communities present (Figure 2).

Physiography

The south slopes of the Langeberg above Swellendam are steep and rise rapidly to the famous 'Clock Peaks' (Figure 3). On the lower south slopes, however, the steepness is broken by the 'Plaat' at an elevation of approximately 500 m. This plateau is the result of downfaulting of the Worcester Fault along this part of the Langeberg Range. On the north side of 10 to 12 O'Clock Peaks the slopes drop steeply into the Boskloof intermontane valley (Figure 4). Between 12 O'Clock Peak and One O'Clock Peak to the west is the deeply faulted, dissected and inaccessible Hermitage Kloof. This kloof lies below Hermitage Peak (1 154 m) and Misty Point or Goedgeloof Peak (1 710 m), the highest peak of the Langeberg. To the north of and overlooking Boskloof Valley is the rocky Hermitage Ridge, which gives way in turn to the dissected area of Zuurplaats and the open high-altitude valley of Langkuilen. North of Langkuilen is Goedgeloof Ridge which lies adjacent to the Little Karoo. West of Misty Point is Protea Valley which extends westwards over Dwariganek into the Twistniet Valley. The topography from Protea Valley westwards to Nooitgedacht River is dominated by a series of peaks; Kruispad Peak (1 365 m), Leeurivierberg (1 628 m), Middelrivierberg (1 405 m) and Klipspringerkop (1 127 m). The south slopes of these peaks are steep but uniform and not deeply

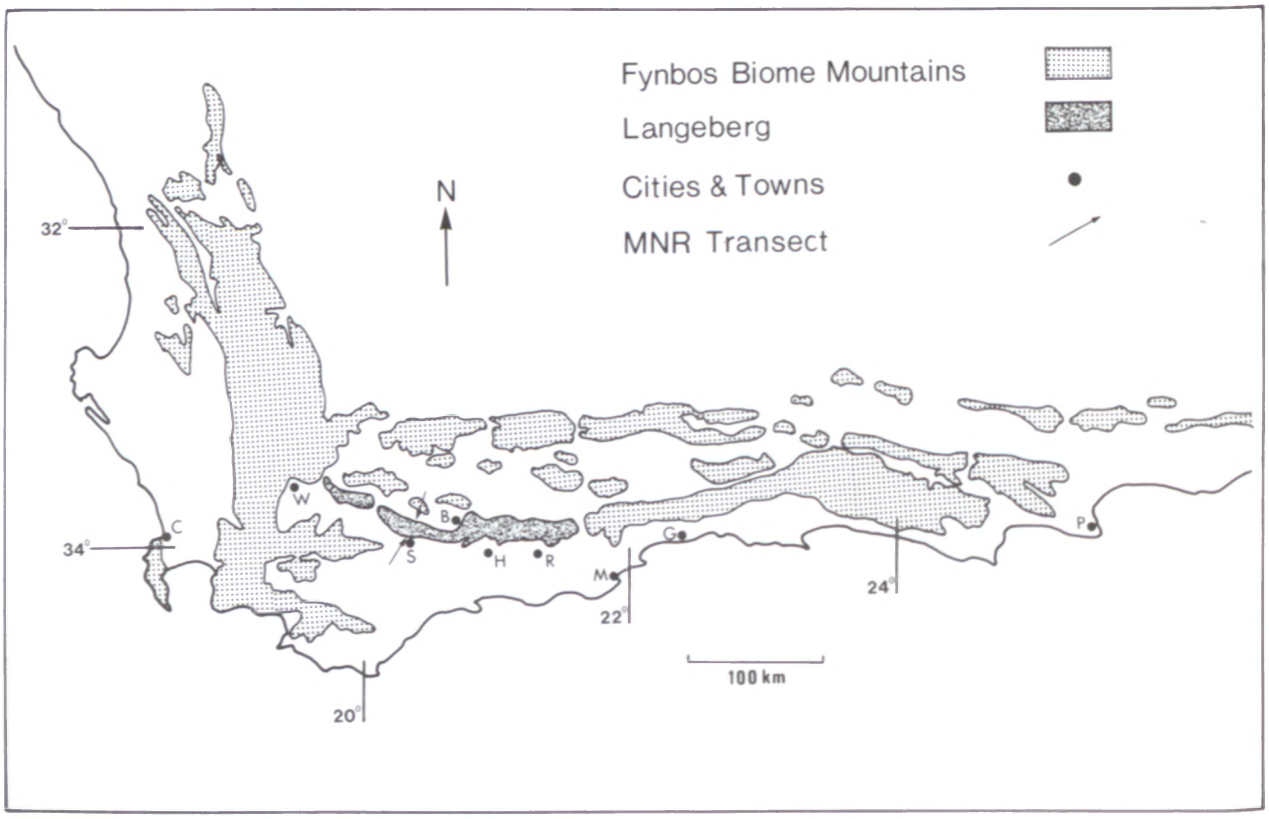

FIGURE 1. — Map of the mountains of the Fynbos Biome showing the position of the Langeberg and the location of the Marloth Nature Reserve (MNR) transect. B, Barrydale; C, Cape Town; G, George; H, Heidelberg; M, Mossel Bay; P, Port Elizabeth; R, Riversdale; S, Swellendam and W, Worcester.

FIGURE 2.—Portion of topographical map 3320CD Scheepersrus, showing part of the MNR with positions of the sample plots. (Map reproduced under Government Printer's copyright authority dated 30 October 1991).

FIGURE 3.—The steep south-facing slopes of the Langeberg above Swellendam. Photograph taken from Twelve O'Clock Peak.

dissected. In contrast, the north slopes are much more dissected and less uniform, particularly when compared with the north slopes below Misty Point.

Leeukloof, Wolfkloof, Hermitage Kloof, and Boskloof drain the mountain catchments of the area to the south and southeast. On the north slopes numerous streams such as the Rietrivier, Knapsakkraalrivier, Warmwaterrivier and Dwarigarivier have their sources at high altitude and drain the dry north-facing slopes, supplying water for agriculture on the north flank of the Langeberg.

Geology

Extending from Goudini, which lies beyond the Langeberg in the northwest, along the lower southwest side of the Langeberg, to the proximity of Sparrebosch (immediately east of Swellendam) is a 'band' of Malmesbury Group sediments. The exposure of these sediments follows the Worcester Fault and in the MNR they are found on the lower slopes of the peaks listed above, but below the 'Plaat' (i.e. below 500 m) (De Bruyn *et al.* 1974).

The main massif of the mountain in the MNR is composed of Table Mountain Group (TMG) sediments. All the high peaks on the south side of the Langeberg Range in the MNR consist of Peninsula Formation sandstone. Hermitage Peak and Misty Point, which have a more northerly position, consist of Nardouw Subgroup sandstones (South African Committee for Stratigraphy, SACS 1980). The distinction can be made by tracking the position of the intervening Cedarberg Formation shaleband. Soils derived from weathered Cedarberg Formation shale are encountered in the Boskloof Valley westwards to Hermitage Kloof. The extreme folding in Hermitage Kloof obscures the position of the shaleband, but it is once again evident in Protea Valley, at Dwariganek and into the Twistniet Valley.

A silcrete mesa extends from the base of the Langeberg below Goedgeloof Ridge northwards. The Nardouw Subgroup sandstones of the northernmost slopes thus make contact with the silcrete cap which in turn covers the Bokkeveld Group shales. The silcrete mesa forms a watershed with streams draining eastwards to the Tradouws River and westwards to the Kingna River.

Soils

The soil forms (Soil Classification Working Group 1991) occurring in MNR are summarized in Table 1, indicating their parent material, diagnostic characteristics and position in the landscape. No attempt has been made to

FIGURE 4.—Boskloof, behind the Clock Peaks, as seen from the high altitude south-facing slopes of Hermitage Ridge.

TABLE 1.—Soils of the Marloth Nature Reserve

Soil form	Parent material	Diagnostic characteristics	Position in landscape
Champagne	Organic matter	>200 mm deep, plant remains	Cool, moist, high alt. slope, S-aspect
Houwhoek	Peninsula Formation sandstones	Orthic A-horizon, E-horizon, podzol-B overlying saprolite	S-facing slopes at mid- to high altitudes, with high rainfall
Cartref	Peninsula Formation sandstones	Orthic A-horizon, E-horizon, lithocutanic B-horizon	S-facing slopes at mid- to high altitudes, with high rainfall
Clovelly	Malmesbury Group and Cedarberg Formation shales	Orthic A-horizon with yellow-brown apedal B-horizon	Below the 'Plaat' and on exposure of Cedarberg shale in Boskloof & Protea Valley
Glenrosa	Peninsula Formation & Nardouw Subgroup sandstones	Orthic A-horizon with litho-cutanic-B	Rocky, N-facing slopes with lower rainfall
Mispah	Peninsula Formation & Nardouw Subgroup sandstones	Orthic A-horizon over hard rock	Ridge crests, rock outcrops and N-aspect rocky slopes

identify all possible soil forms found in MNR, but rather to give a broad overview of major forms; particularly those encountered on the sample transect.

Climate

Climatic data for Langeberg montane environments are scant and the climate measured at the Swellendam and Weltevrede weather stations (Soil and Irrigation Research Institute, SIRI 1986), i.e. those stations closest to the MNR, does not accurately represent the montane climate. Climate diagrams for these stations, Figure 5A & B, represent the climates at the lower south and north extremes of the MNR transect.

The climate of the MNR is typical of the southern Langeberg since it falls within the transition zone between winter and year-round rainfall areas. The mean annual precipitation for the high peaks is estimated to be more than 1 400 mm (Dent *et al.* 1987). However, the climate on the south side of the range is distinctly different from that on the north side. The south slopes of the southern Langeberg experience the highest rainfall in autumn (April) and late winter to spring (August and October) with rainfall in excess of 40 mm for every month except May, the driest month. This bimodality is not evident in the rainfall pattern on the north slopes of the range which are in a rainshadow. Here a peak in rainfall occurs in autumn (April) with a dry period in May preceding a somewhat elevated winter to spring rainfall, Figure 5A. The rainfall exceeds 40 mm only in April and August. The mean summer maximum and mean winter minimum temperatures for Swellendam are 29.4°C (January) and 6.6°C (July) respectively. On the opposite side of the mountain at Weltevrede (33° 56′ S, 20° 37′ E), on the lower north slopes of the Langeberg, the equivalent temperatures are 30.0°C (February) and 2.9°C (July), Figure 5B.

The windiest months at Weltevrede are December and February and at Swellendam, May. Hot, strongly desiccating föhn-like berg winds occur mainly in May, June and July.

METHODS

During 1988, 1989 and 1990, 83 plots were sampled along a predetermined transect in the study area (Figure 2). The area was not stratified since no suitable aerial photographs were available. Consequently plots were subjectively placed in what were taken as the major landscape features and plant communities. The rectangular sample quadrats were 50 m^2, subdivided into 10 equal-sized subplots to facilitate data collection (McDonald 1988, 1993). Only permanently recognizable species were recorded. Geophytes and annuals encountered were noted but not used in the analyses. The Braun-Blanquet cover-abundance scale (Mueller-Dombois & Ellenberg 1974; Werger 1974) was applied. A border zone of 1.5 m from the perimeter of each plot was rapidly searched for any additional species not found in the marked plot.

Only the sclerophyllous fynbos was sampled since the mixed evergreen (Afromontane) forests are well documented by McKenzie (1978).

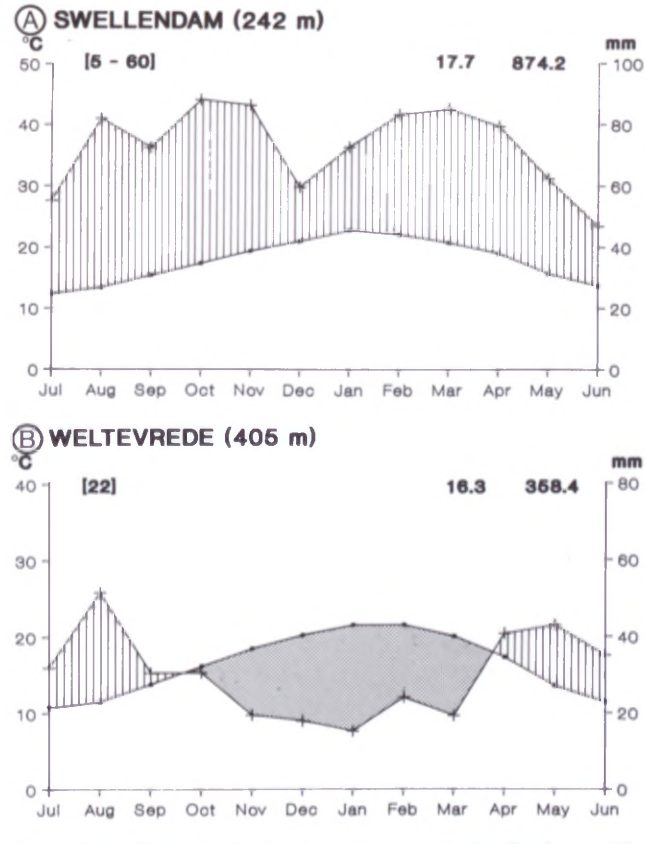

FIGURE 5.—Walter-Lieth climate diagrams for A, Swellendam and B, Weltevrede, on the northern side of the Langeberg.

Phytosociological tables were compiled by obtaining a 'first approximation' classification using TWINSPAN (Hill 1979) and then by successive refinement using Braun-Blanquet procedures with PCTables (Boucher unpublished).

Each community is described following the order in the proposed classification; the structural description follows the system advanced by Campbell *et al.* (1981). Relationships between the communities described here and communities described in other studies of mountain fynbos are given as far as possible. These relationships were determined by comparing the floristic composition of the communities of this study with the respective communities of other studies as indicated below [note that Campbell (1985) gave 'floristics' for each of his lowest level structural units].

VEGETATION

The greater part of the Marloth Nature Reserve is covered by sclerophyllous fynbos typical of the mountains of the western and southern Cape (Taylor 1978; Kruger 1979). Afromontane Forest communities in the MNR are confined to moist kloofs on the south side of the Langeberg range.

Afromontane Forest

Numerous mixed evergreen Afromontane forests (Geldenhuys 1989) are found in the MNR. These forests were exploited for hardwood timber in early colonial days, for wagon-making, furniture and general construction. The accessible forest patches are known variously as Koloniesbos, Duiwelsbos, Doktersbos and Grootbos with less accessible forests being found in Boskloof, Hermitage Kloof, Wolfkloof and Leeukloof. McKenzie (1978) described the '*Rapanea melanophloeos–Hartogiella schinoides–Podocarpus latifolius* Forest Association' as the general type found in the southwestern Cape. This association was divided into three subassociations, two of which are found in the MNR: *Cunonia capensis–Platylophus trifoliatus* Subassociation and *Carissa bispinosa–Canthium ventosum–Canthium mundianum–Pterocelastrus tricuspidatus* Subassociation. Only one of the variations of the *Cunonia capensis–P. trifoliatus* Subassociation, the *Cunonia capensis–Todea barbara* Variation was identified in MNR, whereas two variations of the second subassociation, *Buddleja saligna–Scolopia mundii* Variation and *Rothmannia capensis–Olinia ventosa–Canthium ventosum–Canthium mundianum* Variation were identified (McKenzie 1978).

The three variations of forest subassociations identified in MNR occur on a moisture gradient. The *Cunonia capensis–Todea barbara* Variation occurs in wet situations along streams, the *Rothmannia capensis–Olinia ventosa–Canthium ventosum–Canthium mundianum* Variation is found on seasonally wet to dry sites and the *Buddleja saligna–Scolopia mundii* Variation on relatively dry sites.

Fynbos

The complexity of the fynbos vegetation of the Marloth Nature Reserve has necessitated subdivision of the data into three parts for treatment in separate phytosociological tables (Tables 2, 3 & 4). These subdivisions represent logical separations which have facilitated definition of the fynbos shrubland communities.

The TWINSPAN analysis separated the data into 23 subdivisions. The division at Level 1 indicated the separation of the data into two groups; relevés in Tables 2 & 3 on the one hand and Table 4 on the other. TWINSPAN separated the relevés of Table 4 into two groups at Level 2 and finally into three subdivisions at Level 3; a finer classification than presented in Table 4.

At Level 2, the remaining relevés are separated into two groups; communities A–C and I–O on the one hand and communities D–H on the other. At Level 3 communities A–C (Table 2) are separated from communities I–O which are treated together with communities D–H in Table 3. At the lower levels of the TWINSPAN classification there is some agreement between this analysis and the BB-classification, however, the latter classification is favoured since it yields fewer units that are more easily interpreted and identified in the field.

1. *Cliffortia serpyllifolia* Shrublands of the lower south slopes

The shrublands of the lower south slopes of the Langeberg at Swellendam are conspicuously dominated by *Cliffortia serpyllifolia* which is hardly found higher than the edge of the 'Plaat'. The edge of the 'Plaat' represents the contact between the TMG sediments and the basement rock of the Malmesbury Group with which *C. serpyllifolia* appears to be strongly associated. A logical separation of the lower slope plant communities on Malmesbury Group sediments [Main Quartzite of the Lower Group of the Boland Formation (De Bruyn *et al.* 1974)] (Table 2) from the *Erica hispidula* shrublands (Table 3) of higher elevation on TMG sediments is therefore possible. It is important to note, however, that many of the species are common to both shrubland types.

1.1 *Cliffortia serpyllifolia–Widdringtonia nodiflora* Shrublands

Only one poorly defined shrubland community is included here. This community lies at the transition between the *Erica hispidula* Shrublands of the high elevation zone and the *Cliffortia serpyllifolia–Leucadendron eucalyptifolium* Shrublands.

1.1.1 *Widdringtonia nodiflora–Rhodocoma fruticosa* Shrublands (A)

Differential species: *Rhodocoma fruticosa, Tetraria brevicaulis, Ehrharta ramosa, Tetraria ustulata, Edmondia sesamoides, Ursinia nudicaulis.*

Dominant species: *Cliffortia serpyllifolia, Erica hispidula, Erica versicolor, Penaea cneorum subsp. ruscifolia.*

Structural formation: Mid-high, Mid-dense (Ericoid) Shrubland with a Mid-dense Graminoid Shrubland Understorey.

Relationships: unclear.

TABLE 2.—A phytosociological table of plant communities on the lower south slopes of the Langeberg on a transect through the Marloth Nature Reserve, Swellendam

	Community		
	1		
	1.1		1.2
	A	B	C
Relevé number	*11*11111*11111		
	*35*23333*22223		
	*12*92345*56780		
Altitude (m)	. . .		
	.55.35543.22332		
	.88.17159.44229		
	.00.00500.22000		
Aspect (°)	. 2.12212.22 22		
	.43.72131.99798		
	.05.00500.55005		
Differential species of the Widdringtonia nodiflora--Rhodocoma fruticosa Shrublands (A)			
Rhodocoma fruticosa (Thunb.) Linder	11	.	
Tetraria brevicaulis C.B. Cl.	++	.	
Ehrharta ramosa (Thunb.) Thunb.	++	.	
Tetraria ustulata (L.) C.B. Cl.	3	.	
Edmondia sesamoides (L.) Hilliard	+	.	
Ursinia nudicaulis (Thunb.) N.E. Br.	+	.	
Differential species of the Widdringtonia nodiflora--Hippia pilosa Shrublands (B)			
Hippia pilosa (Berg.) Druce	.	++++	
Athrixia heterophylla (Thunb.) Less subsp. heterop..	.	R + R	
Elegia equisetacea (Mast.) Mast.	.	21	
Osmitopsis osmitoides (Less.) Bremer	.	11	
Merxmuellera stricta (Schrad.) Conert	.	1 2	
Mairea hirsuta DC.	.	+	
Senecio cordifolius L.f.	.	+	
Helichrysum felinum (Thunb.) Less.	.	R	
Restio decipiens (N.E. Br.) Linder	.	+	
Restio arcuatus Mast.	.	+	
Lobelia neglecta Roem. & Schult.	.	0	
Ursinia trifida (Thunb.) N.E. Br.	.	+	
Restio capillaris Kunth	.	+	
Tetraria crassa Levyns	.	R	
Species common to Communities A & B			
Psoralea pinnata L.	11.00 11		
Widdringtonia nodiflora (L.) Powrie	+2. 011		
Elegia capensis (Burm. f.) Schelpe	1. + 1		
Ehrharta setacea Nees ex Trin. subsp. scabra (Stapf	++. R		
Struthiola eckloniana Meisn.	++.0		
Schizaea pectinata (L.) Sw.	1+. +		
Platycaulos compressus (Rottb.) Linder	+. 4		
Centella stenophylla Adamson	R . +		
Gleichenia polypodioides (L.) J.E. Sm.	+ . +		
Differential species of the Leucadendron eucalyptifolium--Erica vestita Shrublands			
Erica vestita Thunb.	. .		0++++
Lanaria lanata (L.) Dur. & Schinz	. .		2+11
Cymbopogon marginatus (Steud.) Stapf ex Burtt Davy	. .		1 2+0
Berkheya sp.	. .		RR+ 0
Erica pubigera Salisb.	. .		1++
Metalasia densa (Lam.) Karis	. .		1++
Protea neriifolia R. Br.	. .		5 0
Cyphia zeyheriana Presl ex Eckl. & Zeyh.	. .		00
Lightfootia tenella Lodd.	. .		+R
Mairea microcephala (Less.) DC.	. .		+
Ursinia scariosa (Ait.) Poir. subsp. scariosa	. .		0
Tetraria cuspidata (Rottb.) C.B. Cl.	. .		+
Species common to Communities B & C			
Leucadendron salignum Berg.	.	1 101. +110	
Leucadendron eucalyptifolium Buek ex Meisn.	.	1003 .3 42	
Restio triticeus Rottb.	.	12 .++111	
Tetraria bromoides (Lam.) Pfeiffer	.	1 11.10 1	
Festuca scabra Vahl	.	1 + +. 11	
Psoralea monophylla (L.) C.H. Stirton	.	+.1 +++	
Protea piscina Rourke	.	+ +.++ +	
Ehrharta dura Nees ex Trin.	.	++.1 11	
Cassytha ciliolata Nees	.	+.+ +1	
Lobelia coronopifolia L.	.	+0+. R0	
Thamnochortus cinereus Linder	.	1 + . 1+	
Stoebe cinerea (L.) Thunb.	.	++ + .+	
Clutia alaternoides L.	.	R R+ . +	
Drosera aliceae Hamet	.	R . R	
Anthospermum galioides Reichb. f. subsp. reflex.	.	+ . ++	
Gnidia galpinii C.H. Wr.	.	00. +	
Centella lanata Compton	.	01 .1	
Tetraria capillacea (Thunb.) C.B. Cl.	.	+ . 1	
Species common to Communities A, B & C			
Cliffortia serpyllifolia Cham. & Schltd.	12.52523.1+022		
Penaea cneorum Meerb. subsp. ruscifolia Dahlg.	22.11+11.3 111		
Erica versicolor Wendl.	42.12+24.R 325		
Erica hispidula L.	21.1512 .12++		
Laurophyllus capensis Thunb.	+3.+1++1.1 +		
Tetraria flexuosa (Thunb.) C.B. Cl.	2 .31223. 224		
Bobartia macrospatha Bak. subsp. macrospatha	+.0 + 1.1+ 1+		
Elegia juncea L.	+1. + +. 01+		
Berzelia intermedia (Dietr.) Schlechtd.	00.+2 +. 1		
Restio inconspicuus Esterhuysen	+.11 +. 11		
Merxmuellera lupulina (Thunb.) Conert	+.1 . 1111		
Erica plukenetii L.	+1. .++ 0		
Anthospermum spathulatum Sprengel subsp.spathulatum	+. ++ .+		
Corymbium glabrum L. var. glabrum	+. 1 . ++		
Pteridium aquilinum (L.) Kuhn	+ . .4 +		
Hypodiscus albo-aristatus (Nees) Mast.	1. . 11		
Ficinia filiformis (Lam.) Schrad.	R. .2+		
Chrysithrix capensis L.	1+. . +		
Erica melanthera L.	+ . . 1+		

This community is represented by only two relevés (131 & 152), found on the rocky ridge marking the edge of the 'Plaat', at an altitude of 580 m. Sample plot 131 was situated on the north-north-east aspect of the ridge, with a slope of 14°, and sample plot 152 was located on the south-south-west aspect of the ridge with a slope of 7°. These differences appear to have affected dominance only. The soils are lithosols and are of the Mispah and Glenrosa Forms at the two sites respectively.

The Mid-dense Graminoid Shrubland is dominant and contains all the differential species. Emergent from this stratum (<1 m) is a Mid-high Open to Mid-dense Shrubland, with dominants as above. In relevé 152, *Laurophyllus capensis* dominates the upper stratum.

1.2 *Cliffortia serpyllifolia—Leucadendron eucalyptifolium* Shrubland

This community includes two shrubland communities both of which are found below the 'Plaat' in a very com-

TABLE 3.—A phytosociological table of the *Erica hispidula* Shrublands along a transect through the Marloth Nature Reserve, Langeberg, Swellendam

	Community 2
	2.1 (D) — 2.2 (E) (F) (G) (H) (J) (I) — 2.3 (L) (M) (N) (K) (O)
Relevé Number	*1222*11112*11111111*1111112*11111*1111*11111*11112*11111111*111112*111*11
	*7000*55550*33344566*3566660*44569*6777*77789*79990*44444788*688990*678*99
	*9456*56787*67957401*8323452*08996*7456*13780*83781*12346209*627123*801*45
Altitude (m)	.1111. 1 11. 11 . . 1 11. .11 1. 111 .11111111.111111.111.11
	.3212.60901.77633687.7677658.60811.9988.00973.93109.34424033.422333.113.31
	.2887.22846.42962008.1600399.80834.4144.43073.24081.32260200.236700.930.08
	.0005.00000.00000000.0000000.00000.0580.00000.00005.00000000.050050.000.00
Aspect (°)	.1221.11112.111 1211.121222 .1 13 .2122. 12 . . 1 .112121.2 .
	.9149.69692.96528966.7271219.53651.3331.37062.33221.29232451.980909.162.52
	.5500.35500.00074000.0450005.00053.5550.05505.50008.38507025.000500.008.07
Differential species of the Erica hispidula--Brunia alopecuroides Shrublands (O)	
Brunia alopecuroides Thunb.	5355 . . . .
Erica curviflora L.	2211 . 1 . . 2. . . . . . .
Hippia integrifolia Less.	2 2 + ...
Carpacoce spermacocea (Reichenb. f.) Sond.	011 . . . .
Mairea microcephala (Less.) DC.	2 + ...
Stylapterus dubius (Steph.) Dahlg.	11 . . . .
Erica omninoglabra H.A. Bak.	2 . . . .
Species common to communities O & E	
Erica conferta Andr.	1+1+. 1+1+ + ... +.+ .
Syncarpha eximia (L.) B. Nord.	0+0 .++0 0 . . . . 0. .
Lobelia pubescens Dryand. ex Ait. var. rotundifolia	R . R . . . .+ .
Helichrysum capense Hilliard	. +RO . . . .
Differential species of the Berzelia intermedia--Grubbia rosmarinfolia Shrublands (F)	
Grubbia rosmarinifolia Berg. subsp. rosmarinifolia	. 255 25+0 00 . . . .
Erica regerminans L.	0 . + 543 . . . .
Spatalla parilis Salisb. ex Knight	. 100 2+ . . . .
Raspalia virgata (Brongn.) Pillans	. 11 . . . .
Differential species of the Berzelia intermedia--Cliffortia grandifolia Shrublands (G)	
Cliffortia grandifolia Eckl. & Zeyh. var. grandifo.	. . 3+ 2323 . . . .
Senecio hastatus L.	. . RR++ . . . .
Species common to communities E, F, G & H	
Restio arcuatus Mast.	++1 .5 3 51.5 3554. 5 . . . . . .
Berzelia intermedia Schlechtd.	115 .4+11 52.3 ++ 0 .+21 . . . . . .
Laurophyllus capensis Thunb.	0 . + + .1+++ 2 . . . .
Gnidia oppositifolia L.	++1 . 0 0 ++ .+11111 .+ 11 . . . . . .

TABLE 3.—A phytosociological table of the *Erica hispidula* Shrublands along a transect through the Marloth Nature Reserve, Langeberg, Swellendam (continued)

Relevé Number	*1222*11112*11111111*1111112*11111*1111*11111*11112*11111111*111112*111*11 *7000*55550*33344566*3566660*44569*6777*77789*79990*44444788*688990*678*99 *9456*56787*67957401*8323452*08996*7456*13780*83781*12346209*627123*801*45
Species common to Communities E, F, G & H	
Tetraria compressa Turrill	RR+ .1 11.0+ 111 .0 + ...
Calopsis membranacea (Pillans) Linder	0+2 . . 211 . . . .
Ursinia serrata (L.f.) Poir.	+ + . +. 0 . . . .
Osmitopsis osmitoides (Less.) Bremer	+++1 . 1 .01++1+ .R 1 . . . + . . .
Gnidia galpinii C.H. Wr.	++ .++ .R . . . .
Thesium carinatum A. DC.	+ . 0 . .+ . . . . . .
Indigofera concava Harv.	++ R. . + R .+ + ...
Differential species of the Pentaschistis malouinensis--Tetraria bromoides Shrublands (J)	
Tetraria bromoides (Lam.) Pfeiffer	. . . . 2++3 . . . . .
Protea aurea (Burm. f.) Rourke subsp. aurea	. . . . 31 . . . . .
Erica pubigera Salisb.	. . . . 1 . . . . .
Leucadendron salignum Berg.	. . . . 1 . . . . .
Leucadendron eucalyptifolium Buek ex Meisn.	. . . +. 0 3 1 . . . . .
Helichrysum pandurifolium Schrank	R . . . +. +11 . . . . .
Species common to communities E, F, G, H & J	
Helichrysum felinum (Thunb.) Less.	0 + . R. 1 +++. .+ + ...+ .
Erica cubica L.	.1210 3 . . 1 4.02 + ...
Elegia capensis (Burm. f.) Schelpe	+11 . 1 2 .10 + . 1 . 1 . . . .
Hypodiscus albo-aristatus (Nees) Mast.	2 . 1. 121 .2 .5 3 . . . . .
Erica cordata Andr.	++ 1 2 . . . . 4 . . . . .
Pteridium aquilinum (L.) Kuhn	+ . 00 . . . + ...
Differential species of the Erica hispidula--Pentaschistis malouinensis Shrublands (I)	
Pentaschistis malouinensis (Steud.) Clayton	. . . . 021 . 212 . . . .
Differential species of the Hypodiscus aristatus--Phylica pinea Shrublands (L)	
Phylica pinea Thunb.	. . . +. . . 00121 . . .
Tetraria thermalis (L.) C.B. Cl.	. . . . . . 11 . . .
Ceratocaryum decipiens (N.E. Br.) Linder	. . . . . . 23 . . .
Erica atropurpurea Dulfer	. . . . .0 . ++ . . .
Species common to communities E, F, G, H, I, J & L	
Widdringtonia nodiflora (L.) Powrie	0+12 .+0+ 11+.+010+12.0 1 .0112. 11 .+ 200 . . .
Blechnum tabulare (Thunb.) Kuhn	+1 R2+2 .1 0 01 .00R210 .1 + . 1 . 1 . . 1 . .
Bobartia macrospatha Bak. subsp. macrospatha	0 +01 . . . . +.000 .+ + . . .
Epischoenus dregeanus (Boeck.) Levyns	+1 . . +1 .1 1 . 1 .111 1. . 2. .
Ursinia scariosa (Ait.) Poir. subsp. subhirsuta	. . 0 + +. . . . ++ . . .
Ehrharta ramosa (Thunb.) Thunb.	. . + . . + . . + . . .
Cassytha ciliolata Nees	.+ . +. . . . + . . .
Species common to communities I, L & M	
Erica versicolor Wendl.	. . . 1. . .+ 31115.20+ +4+3 . .

TABLE 3.—A phytosociological table of the *Erica hispidula* Shrublands along a transect through the Marloth Nature Reserve, Langeberg, Swellendam (continued)

Relevé Number	*1222*11112*11111111*1111112*11111*1111*11111*11112*11111111*111112*111*11
	*7000*55550*33344566*3566660*44569*6777*77789*79990*44444788*688990*678*99
	*9456*56787*67957401*8323452*08996*7456*13780*83781*12346209*627123*801*45
Differential species of the Hypodiscus aristatus--Restio strictus Shrubands (N)	
Restio strictus N.E. Br.	. . . . 131112 .
Species common to communities D--N	
Erica hispidula L.	++11.435+3.3112 122.4355451.4R54 .042 .325 .12+ +.1 2211++.2+3210.514
Elegia juncea L.	1222.12212. +.1111+11.1 10 . 12 .11+ .12111.0111+211.1 2111.+1
Anthochortus crinalis (Mast.) Linder	5555. 2113. 1 31 . 1 . 3 32. . 21. . .+ 1+ .12
Ehrharta setacea Nees ex Trin. subsp. scabra (Stapf	11+.+++ +. 1+ . +.+ 1 . .1 2.+1+ 1.1121+221.223224.1+2
Chrysithrix capensis L.	2 1.011 2. + 111+ . ++ . 1 21. 2 +. 2132. +.0+21 . 2232. 21
Platycaulos compressus (Rottb.) Linder	22 . 1.252222 . 2 1 1 . 21 5. 3 .422 1.+ 1 .1 + . 1++ . 1
Clutia alaternoides L.	0. . + . +. .++++.1++ 1. + R. ++++ + .1+++1+. +
Protea cynaroides (L.) L.	0+1. 0 10.11 10.01 1 0 . 10 . . . + . 10 . 000. 1
Pentaschistis colorata (Steud.) Stapf	+ . 1 2. + . . . 1.12 . +21 .+1121+1 .312222. 2
Senecio cordifolius L.f.	0+1+. ++++. R +.+ ++++ .+ + . + . 1 . . R .R + +.
Blaeria coccinea Klotzsch	++21. 1 13.+++ + + . + . . . 2 12. . 1+ + . ++34.
Petalacte canescens DC.	R+ . 1 1. 0 + ... 1 .3 ++1.+
Kniphofia uvaria (L.) Oken.	0+ +. +. . . + . + .+++ . . + . .++
Mairea hirsuta DC.	+ . 21 . .1 1+ .+ 10 . . 1 . . . .++
Restio fragilis Esterhuysen	1 +. 1. . . . . + ...+
Leucadendron spissifolium (Salisb. ex Knight)	1+ . 0+ . . 2 . + .2 . . . 2 . + .1
Platycaulos anceps (Mast.) Linder	2 1. 1 . 21. . 4 . . 4 . . + . .
Epischoenus quadrangularis (Boeck.) C.B. Cl.	1121. 1 .+1111++ . . . .+ + . . 1 . +.
Species common to communities E--N	
Lobelia neglecta Roem. & Schult.	++ . . + +++. ++ . +++.+ + . + +R.+ + ++ . . +
Edmondia sesamoides (L.) Hilliard	++ . 0 . .+ .0+ +.0 0 .+ .122+2 12.22++0 .+ +
Tetraria brevicaulis C.B. Cl.	++1 R. + +. + R. . 1 .111 1.1++ 1.1+1+1+1+.+ +++ .1 1
Penaea cneorum Meerb. subsp. ruscifolia Dahlg.	223 .++1+ 1 +.+222222.2 2 +. 1 .4 + .+ + 2.0 +211++. 1 . ++
Centella lanata Compton	+ 1 2.1++ ++. 2+++1 .+ + ... 0 .+ + .++
Psoralea pinnata L.	+ + . 0 .+ ++1+ .1 10 . . .+1++ . R 2 . . 1
Erica daphniflora Salisb.	+++ . + . . + .3411. +1 . . 1+ . 2131 .
Tetraria flexuosa (Thunb.) C.B. Cl.	11 . . .12 . 1.212+3.+ 1 . + .1 1. 2
Struthiola eckloniana Meisn.	. + 1. ++ +1.+ . .+ .++1 +. + . .
Corymbium glabrum L. var. glabrum	++ +. R . . . . . .0+1+1 ++.11++++.1 1
Metalasia densa (Lam.) Karis	. R . . R . +. .+ .112++ 2+.11++ . . 1
Chondropetalum mucronatum (Nees) Pillans	.+21+ 4. . . . 02. . 1 .2 + R .
Gleichenia polypodioides (L.) J.E. Sm.	++ 4 . .+1 . . . .+ + . 10+. .
Indigofera sarmentosa L.	R+ . . +R +. + . . .+ +. + . .
Schizaea pectinata (L.) Sw.	+ . .+ R. . . . 1+++. + . . +
Anemone tenuifolia (L.f.) DC.	0R . .+ +. . + ...+1
Bobartia parva J.B. Gillett	. +1 . . . . . ++ . + . R .
Euryops pinnatipartitus (DC.) B. Nord.	+ . . 1. .+ . + . +. . +.
Tetraria capillacea (Thunb.) C.B. Cl.	+ 1 . . . . 22 . .1
Ursinia scariosa (Ait.) Poir. subsp. scariosa	R++ . . . + ... +
Erica bracteolaris Lam.	. . + . + . . 1 . .1 . .1
Othonna quinquedentata Thunb.	1 . . . . +0.R . . . .+
Osteospermum corymbosum L.	+ . . . . . . 0+ . + . .
Centella stenophylla Adamson	. . 2. . . .1 2.+ . .
Restio triticeus Rottb.	11 . + ... + . .

TABLE 3.—A phytosociological table of the *Erica hispidula* Shrublands along a transect through the Marloth Nature Reserve, Langeberg, Swellendam (continued)

Releve Number	*1222*11112*11111111*1111112*11111*1111*11111*11112*11111111*111112*111*11
	*7000*55550*33344566*3566660*44569*6777*77789*79990*44444788*688990*678*99
	*9456*56787*67957401*8323452*08996*7456*13780*83781*12346209*627123*801*45
Species common to Communities E--N	
Restio decipiens (N.E. Br.) Linder	1 . . 3 . . . . . .2 .
Senecio ilicifolius (L.) Thunb.	. . R. .+ . . . . . . +
Ursinia nudicaulis (Thunb.) N.E. Br.	. 0 . . . 1 .+++ . + .OR+++ + . + + .R
Cliffortia heterophylla Wein.	. . 0 . . . . 2+. + . .25
Stoebe spiralis Less.	. . . . . . + .1 1 +1. ++ . 1
Stoebe plumosa (L.) Thunb.	. 0 . . .111+. . . 1 + +. 0 .0+
Centella montana Adamson	. . . . ++ R +. +R . R
Tetraria crassa Levyns	. . . . .1 . .1 + . 1 .1
Restio capillaris Kunth	. . . .1 . . 1 . 1. .
Erica ardens Andr.	. . +.R . . + . . 1+ + . +. +
Erica imbricata L.	. . 4. .0 +0. +2 .+ .0+ . +1 +.
Differential species of the Hypodiscus aristatus--Erica multumbellifera Shrublands (O)	
Staberoha cernua (L.f.) Dur. & Schinz	 41
Erica multumbellifera Berg.	. . . . +2
Species common to communities K, L, M, N & O	
Thamnochortus cinereus Linder	. . . . . .0 +1 . 1+ 1++ .++++01.2+ .++
Hypodiscus aristatus (Thunb.) Krauss	. . . . . . 21 . 1222122. 11 .+2+.20
Cliffortia densa Wein.	. . . R. . . 2+ 1.+110 . 1 . 1.++
Erica vestita Thunb.	. . . . . . 2 2 . 1+2 1. + . +.R
Pentaneris macrocalycina (Steud.) Schweickerdt	. 1. . . . . . 21 1 1 . 2 0.12 .
Stoebe cinerea (L.) Thunb.	. . . . . . + . 1. . .0+
Species common to communities E--O	
Tetraria ustulata (L.) C.B. Cl.	221+ . 1 32 1. 2211 .331 . . 20 .222++.1+ 12 + . 132 .+ +.22
Restio inconspicuus Esterhuysen	1 1. 1 1 . +0 .1 1 . 2 .21011.1+1 .11111+ +. 11121.112. 1
Tetraria cuspidata (Rottb.) C.B. Cl.	1 . + . +.1 . 3 +.11 .1++ +.+1212121.22 11+.+12.++
Erica melanthera L.	2 .02 4.1 0 .+R . . 1 .++2+ .+ + 0 . 41 . 1.35
Drosera aliceae Hamet	R + . + R. RRR .+ R .++ . R+. . . ++R.R +.++
Ursinia trifida (Thunb.) N.E. Br.	RR . . ++++ . . .+ . . +++.++++++.R +.R
Merxmuellera lupulina (Thunb.) Conert	. 11 +. . . 1 +. 2.1+ .+ 2 + . 2 21.1 1.++
Calopsis nonostylis (Pillans) Linder	. 2 . . . .R 22. .1 + 1.+ + . 2. +
Ficinia filiformis (Lam.) Schrad.	. + . . .+ . + . + .1 R + 1. 1 . . +
Elegia asperiflora (Nees) Kunth	. +1 . . . . +
Tetraria compar (L.) Lestib.	. + . . 1 + ... + . . .

plex geological zone of metamorphism, at the contact between rock of the Malmesbury Group and the Table Mountain Group (see De Bruyn *et al.* 1974). These shrublands reflect the presence of soils derived from shales and other more nutrient-rich sediments.

1.2.1 *Leucadendron eucalyptifolium—Hippia pilosa* Shrublands (B)

Differential species: see Table 2.

Dominant species: *Cliffortia serpyllifolia, Erica hispidula, Erica versicolor, Penaea cneorum* subsp. *ruscifolia, Tetraria flexuosa*.

Structural formation: varies from a Low Closed Graminoid Shrubland with Mid-high Emergent Shrubs to a Mid-high to Tall Closed Shrubland with an Open to Mid-dense Graminoid Understorey.

Relationships: Enon Mesotrophic Proteoid Fynbos (Campbell 1985).

This community (Figure 6) is found at a mean altitude of 447 m (310–570 m) on the cool lower slopes below the 'Plaat'. The parent rock is Peninsula Formation sandstone and all the soils are classified as

TABLE 4.—A phytosociological table of plant communities on the extreme north slopes of the Langeberg, on a transect through the Marloth Nature Reserve, Swellendam

	Community	
	4	
	4.2	4.1
	P	Q
Relevé number	*1112*11111 *4550*88889 *9010*34569	
Altitude (m)	.11 . .0098.98768 .6600.00384 .0000.00500	
Aspect (°)	.2323.21253 .5002.50053	
Differential species of the L. eucalyptifolium--Erica melanthera Shrublands (P)		
Staberoha cernua (L.f.) Dur. & Schinz	11 2	
Ursinia nudicaulis (Thunb.) N.E. Br.	++ R	
Erica melanthera L.	24 0	
Penaea cneorum Meerb. subsp. ruscifolia Dahlg.	11 +	
Psoralea pinnata L.	+R+	
Erica spectabilis Klotzsch	RR	
Struthiola ecklioniana Meisn.	++	
Restio inconspicuus Esterhuysen	1	
Lightfootia tenella Lodd.	0	
Chrysithrix capensis L.	+	
Phylica mairei Pillans	+	
Elegia juncea L.	1	
Tetraria involucrata C.B. Cl.	0	
Tetraria capillacea (Thunb.) C.B. Cl.	1	
Phylica pinea Thunb.	1	
Thamnochortus cinereus Linder	+	
Gleichenia polypodioides (L.) J.E. Sm.	+	
Festuca scabra Vahl	1	
Aspalathus verbasciformis Dahlg.	+	
Lobelia neglecta Roem. & Schult.	0	
Erica hispidula L.	+	
Ficinia cf.paradoxa (Schrad.) Nees	+	
Tetraria brevicaulis C.B. Cl.	+	
Cliffortia pterocarpa (Harv.) Weim.	1	
Erica vestita Thunb.	1	
Restio scaberulus N.E. Br.	+	
Bobartia parva J.B. Gillett	+	
Pentaschistis acinosa Stapf	1	
Edmondia sesamoides (L.) Hilliard	0	
Differential species of the Leucadendron eucalyptifolium--Hypodiscus argenteus Shrublands (Q)		
Hypodiscus argenteus (Thunb.) Mast.	.	1+101
Lobelia capillifolia (Presl) A. DC.	.	+++++
Lanaria lanata (L.) Dur. & Schinz	.	2112
Heteropogon contortus (L.) Roem. & Schult.	.	++1
Ehrharta ramosa (Thunb.) Thunb.	.	0 + 0
Agathosma ovata (Thunb.) Pillans	.	22 1
Ficinia nigrescens (Schrad.) Raynal	.	++ +
Willdenowia glomerata (Thunb.) Linder	.	1++
Stoebe aethiopica L.	.	0 + +
Tetraria sp. McDonald 1848	.	++
Ursinia scariosa (Ait.) Poir. subsp. scariosa	.	+0
Ficinia monticola Kunth	.	+ +
Maytenus oleoides (Lam.) Loes.	.	0+
Corymbium glabrum L. var. glabrum	.	+ 1
Leucospermum calligerum (Salisb. ex Knight) Rourke	.	22
Syncarpha paniculata (L.) B. Nord.	.	++
Selago sp. 183/20	.	++
Prismatocarpus brevilobus A. DC.	.	++
Centella glabrata L. var. glabrata	.	+
Crassula atropurpurea (Haw.) Dietr. var. atropurpu..	.	+
Felicia filifolia (Vent.) Burtt Davy subsp. bodkin..	.	+
Anthospermum spathulatum Sprengel subsp.spathulatum.	.	1
Lobelia coronopifolia L.	.	+
Rhodocoma fruticosa (Thunb.) Linder	.	+
Thoracosperma galpinii N.E. Br.	.	2
Tetraria crassa Levyns	.	+
Erica plukenetii L.	.	+
Widdringtonia nodiflora (L.) Powrie	.	0
Restio strictus N.E. Br.	.	+
Askidiosperma paniculatum (Mast.) Linder	.	1
Species common to Communities P & Q		
Leucadendron eucalyptifolium Buek ex Meisn.	2334	33++3
Tetraria ustulata (L.) C.B. Cl.	2213	22221
Stoebe spiralis Less.	+0++	+++ +
Elegia galpinii N.E. Br.	1 30	211 2
Restio filiformis Poir.	1+	21121
Elegia fistulosa Kunth	1	1++11
Restio triticeus Rottb.	1+1	2 1+
Hypodiscus aristatus (Thunb.) Krauss	23 +	0 2 0
Anthospermum galioides Reichenb. f. subsp. reflexi.	0 1	11+ +
Hypodiscus striatus (Kunth) Mast.	102	2 1+
Anomalanthus sp. McDonald 1012	22	12 2
Pentaschistis colorata (Steud.) Stapf	1	111 1
Tetraria cuspidata (Rottb.) C.B. Cl.	+	1+ +1
Tetraria thermalis (L.) C.B. Cl.	21	0 0
Tetraria flexuosa (Thunb.) C.B. Cl.	12 3	1
Merxmuellera lupulina (Thunb.) Conert	++ +	1
Ceratocaryum decipiens (N.E. Br.) Linder	0	1
Mastersiella purpurea (Pillans) Linder	1	+
Ischyrolepis capensis (L.) Linder	+	1
Pelargonium fruticosum (Cav.) Willd.	+ +	
Schizaea pectinata (L.) Sw.	+	+

Glenrosa Form. Aspect of the sample sites is mainly southerly, ranging from east-south-east to south-south-west. Mean gradient is 23.4° (14°–32°, n = 5). Rock cover is low (<1%) with one exception of 25% in plot 133. Litter cover is conversely high ranging from 70–85%, with vegetation cover 100% in all samples.

This community is weakly differentiated but has strong affinity to the *Penaea cneorum–Widdringtonia nodiflora* Shrublands described below. The most striking feature is the dominance of *Cliffortia serpyllifolia*.

1.2.2 *Leucadendron eucalyptifolium–Erica vestita* Shrublands (C)

Differential species: *Erica vestita*, *Lanaria lanata*, *Cymbopogon marginatus* and others, see Table 2.

Dominant species: *Cliffortia serpyllifolia*, *Erica hispidula*, *Leucadendron eucalyptifolium*, *Penaea cneorum* subsp. *ruscifolia*.

Structural formation: Mid-high to Tall Sparse to Closed Proteoid Shrubland with a Low Closed Graminoid Shrubland Understorey or a Low Closed Ericoid Shrubland with a Mid-dense Graminoid Understorey.

Relationships: Enon Mesotrophic Proteoid Fynbos (Campbell 1985).

This community (Figure 7) is found on the complex zone of Malmesbury Group sediments which are exposed below the 'Plaat'. There is strong correlation between this community and the relatively nutrient rich soils of the Malmesbury Group sediments. The soils of relevés 127, 128 & 130 were 0.2–0.3 m deep and classified as Glenrosa Form, whereas those of relevés 125 and 126 exceed 1.0 m and were classified as Clovelly Form soils. The five relevés were sampled at a mean elevation of 283 m (242–320 m) with a mean gradient of 12.2° (5°–20°). Cover of exposed rock was recorded as nil except for sample plot 127 where a high value of 90% was recorded. Vegetation cover averaged 96% and litter cover 66%. Four of the five sample sites had a westerly aspect with the remaining one on a northeast-facing slope.

Erica vestita is a prominent, easily identifiable differential species in this community. It has three colour forms, two of which are found on the Langeberg. The colour form found in the *Leucadendron eucalyptifolium–Erica vestita* Shrublands below the 'Plaat' is pink, whereas in the *Erica hispidula–Hypodiscus aristatus* Shrublands (described below) the flowers are crimson red. Of further particular note in this community are *Lanaria lanata*, *Cymbopogon marginatus* and *Erica pubigera* which appear to favour soils with a high clay fraction.

FIGURE 6.—The *Widdringtonia nodiflora–Hippia pilosa* Shrublands on the lower south slopes of MNR below the 'Plaat', with tall *Leucadendron eucalyptifolium* in the foreground.

2. *Erica hispidula* Shrublands of the high elevation zone

The *Erica hispidula* Shrublands described in this paper are broadly equivalent to those described by McDonald (1993). *E. hispidula* is present in all but one community, the *Hypodiscus aristatus–Erica multumbellifera* Shrublands. Speculation as to the reason for this absence is given below in the description of the latter community. *Restio inconspicuus*, which assumes a distinctive yet subordinate position to *E. hispidula* in the shrublands of Boosmansbos Wilderness Area (McDonald 1993), is less prominent in MNR.

2.1 *Erica hispidula–Brunia alopecuroides* Shrublands (D)

Differential species: *Brunia alopecuroides, Carpacoce spermacocea, Erica curviflora, Erica omninoglabra, Hippia integrifolia, Mairea microcephala, Stylapterus dubius.*

Dominant species: *Anthochortus crinalis, Brunia alopecuroides.*

Structural formation: Low to Mid-high Closed Brunioid Shrubland with Closed Restioid Understorey.

Relationships: *Brunia alopecuroides–Restio bifidus* Community (Kruger 1974); *Simocheilus carneus–Restio anceps* Community (Bond 1981), Ruitersberg Wet Ericaceous Fynbos (Campbell 1985).

Similar to the *Erica hispidula–Spatalla nubicola* Shrublands of BWA (McDonald 1993), the *Erica hispidula–Brunia alopecuroides* Shrublands are found mainly on the high altitude south- to southwest-facing slopes of the peaks and ridges of the MNR, in the cool, moist 'mist zone' (Figure 8). The substratum consists of decomposed organic material, forming a deep acid peat, which is classified as Champagne Form soil.

Although the Community is found on the Clock Peaks, it was not sampled here. Most sample plots (204, 205 & 206) were located on the high-altitude south-facing slopes of Hermitage Ridge, overlooking Boskloof, with one sample (Relevé 179) situated above the south tributary of Zuurplaats Stream.

The *Erica hispidula–Brunia alopecuroides* Shrublands typically have a low to mid-high (1.0–1.5 m) closed brunioid-ericoid overstorey, dominated by *Erica curviflora* and *Brunia alopecuroides*. The understorey is dominated by *Anthochortus crinalis* with other herbaceous species playing an inconspicuous role.

FIGURE 7.—The *Leucadendron eucalyptifolium–Erica vestita* Shrublands found on the complex zone of Malmesbury Group sediments below the 'Plaat'.

FIGURE 8.—The *Erica hispidula–Brunia alopecuroides* Shrublands found on the high altitude south slopes in the 'mist zone'.

Of particular note in this community is the presence of *Erica omninoglabra* (single occurrence in relevé 179), a rare Langeberg endemic species found sprawling amongst the matted restioid understorey, *Klattia partita* (Iridaceae), a shrubby species with non-fugaceous flowers and the endemic *Stylapterus dubius* (Penaeaceae).

2.2 *Erica hispidula–Berzelia intermedia* Shrublands

These shrublands include four communities which range from the typical form of the *Erica hispidula–Berzelia intermedia* Shrublands (E) to the *Berzelia intermedia–Erica conferta* Shrublands on organically rich soils.

Erica hispidula–Berzelia intermedia Shrublands 'Typicum' (E)

Differential species: none.

Dominant species: *Erica hispidula, Tetraria ustulata.*

Structural formation: Low Closed Ericoid Shrubland with sparse Mid-high Emergent Shrubs.

Relationships: Keurbos Wet Ericaceous Fynbos (Campbell 1985).

The *Erica hispidula–Berzelia intermedia* Shrublands (Figure 9) have no differential species but have many species in common with communities F, G and H. These shrublands may therefore be considered as the 'background' of the mosaic of communities found mainly, but not exclusively, on the south- to southeast-facing slopes of Hermitage Ridge and below the Clock Peaks. The relevés (140, 148, 159, 169) representing this community were located at elevations ranging from 600–1 200 m, with a moderate mean gradient of 22.5°. The soils are derived from Peninsula and Goudini Formation sandstone and are classified as Cartref Form. They are well drained and shallow with a mean depth of 0.15 m (0.1–0.2 m) and with a generally low average surface rock cover of 5% (2–10%). Projected vegetation canopy cover, in contrast, is high, ranging from 95–100%.

The dominant stratum of the *Erica hispidula–Berzelia intermedia* Shrublands is a Closed Graminoid Shrubland ($\leq$1.0 m) with dominance shared by the woody shrubs, *Erica hispidula* and *Fenaea cneorum* subsp. *ruscifolia*, the sedges *Tetraria ustulata* and *Tetraria flexuosa* and the ubiquitous *Restio inconspicuus*.

2.2.1. *Berzelia intermedia–Erica conferta* Shrublands (F)

Differential species: *Helichrysum capense.*

Dominant species: *Anthochortus crinalis, Erica hispidula, Elegia juncea.*

Structural formation: Low Closed Ericoid Shrubland either with Sparse Mid-high Emergent Shrubs or a Tall Closed Brunioid Shrubland Overstorey.

Relationships: Ruitersberg Wet Ericaceous Fynbos (Campbell 1985); *Simocheilus carneus–Restio anceps* Community (Bond 1981); *Erica hispidula–Spatalla nubicola* Shrublands (McDonald 1993).

This community (Figure 10) is represented by five relevés (155, 156, 157, 158, 207). The only true differential species is *Helichrysum capense* since other species characterizing this community, namely *Erica conferta, Lobelia pubescens* and *Syncarpha eximia* are shared with

FIGURE 9.—The *Erica hispidula–Berzelia intermedia* Shrublands occurring mainly on the south-facing slopes of the Clock Peaks and Hermitage Ridge, forming a 'background' to the mosaic of communities.

FIGURE 10.—The *Berzelia intermedia–Erica conferta* Shrublands occurring on moist south-facing slopes below the Clock Peaks and on Hermitage Ridge.

the closely allied *Erica hispidula–Brunia alopecuroides* Shrublands. On the sample transect the community is found on the south- and southeast-facing slopes of 12 O'Clock Peak at elevations around 1 000 m, on shallow 'organic phase' Cartref Form soils. It is also found on the upper south-southwest-facing slopes of Hermitage Ridge, above Boskloof (relevé 207), where it forms part of a mosaic with the *Erica hispidula–Brunia alopecuroides* Community.

The dominant stratum of this community is a low closed ericoid layer dominated by *Erica hispidula* but with a number of other *Erica* species such as *E. cordata*, *E. conferta* and *E. daphniflora*. *Anthochortus crinalis*, *Elegia juncea* and *Tetraria ustulata* are the most important graminoid elements. Emergent from the low stratum in some stands is the fern *Blechnum tabulare*, with a mid-high to tall shrub stratum dominated by *Berzelia intermedia*.

2.2.2 *Berzelia intermedia–Grubbia rosmarinifolia* Shrublands (G)

Differential species: *Erica regerminans*, *Grubbia rosmarinifolia*, *Spatalla parilis*, *Raspalia virgata*.

Dominant species: *Erica hispidula*, *Grubbia rosmarinifolia*, *Platycaulos compressus*.

Structural formation: Mid-high to Tall Closed Shrubland with Closed Graminoid Shrubland Understorey.

Relationships: *Brunia alopecuroides–Restio bifidus* Community (Kruger 1974); *Chondropetalum–Berzelia* Upper Hygric Fynbos (Boucher 1978); Keurbos Wet Ericaceous Fynbos (Campbell 1985).

On the sample transect this community (Figure 11) is found as localized stands on the south-facing midslopes below the Clock Peaks. One sample (Relevé 147) was located at 1 320 m on the south-facing slopes of Goedgeloof Ridge, immediately west of Het Goedgeloofnek. On the mid-slopes of 12 O'Clock Peak at elevations from 600–800 m the community forms part of a mosaic with other communities in the broader *Erica hispidula–Berzelia intermedia* Shrublands.

The *Berzelia intermedia–Grubbia rosmarinifolia* Shrublands are mainly associated with local, apparently seasonally waterlogged sites. All the relevés typical of this community (136, 137, 139, 147, 154 & 160), were situated where the soils are boggy. In contrast, relevé 161 which is atypical, and where *G. rosmarinifolia* was recorded outside the plot (see Table 3), was located on a more rocky, well-drained substrate.

FIGURE 11.—The *Berzelia intermedia–Grubbia rosmarinifolia* Shrublands mainly localized on the south-facing mid-slopes of the Clock Peaks. Note the mid-high *G. rosmarinifolia* forming the overstorey.

Grubbia rosmarinifolia is strongly differential for this community. It forms a mid-high to tall, open to closed shrubland. The understorey may be subdivided into two strata in some stands. In some cases a mid-high open to closed ericoid stratum is found immediately below the tall stratum followed by a closed restioid field layer. In other stands the ericoid and restioid components combine to form a low closed field stratum.

In the samples taken, *Spatalla parilis* (Proteaceae) is restricted to the *Berzelia intermedia–Grubbia rosmarinifolia* Shrublands. *Restio arcuatus* together with *Platycaulos compressus* dominates the restioid component and *Erica regerminans* and *E. cubica* form the greater part of the ericoid component.

2.2.3 *Berzelia intermedia–Cliffortia grandifolia* Shrublands (G)

Differential species: *Cliffortia grandifolia, Senecio hastatus*.

Dominant species: *Cliffortia grandifolia, Erica hispidula, Penaea cneorum* subsp. *ruscifolia, Restio arcuatus*.

Structural formation: Low Closed Ericoid Shrubland with Closed Restioid Understorey and Mid-high to Tall Open Shrubland Overstorey.

Relationships: Keurbos Wet Ericaceous Fynbos (Campbell 1985).

The *Berzelia intermedia–Cliffortia grandifolia* Shrubland community (Figure 12) also occurs as part of the *Erica hispidula–Berzelia intermedia* Shrubland mosaic. It was sampled mainly on the southeast- to southwest-facing midslopes of 12 O'Clock Peak but occurs in patches over an extensive area on the south slopes below the Clock Peaks at elevations from around 600–700 m (above the 'Plaat'). The soils are 'organic phase' Cartref Form.

The community also occurs on the lower north- to northeast-facing slopes below the Clock Peaks, in the Boskloof Valley. These stands are represented by relevé 202 situated near Boskloof Hut at an altitude of about 900 m. Here the soils are of Glenrosa Form.

Cliffortia grandifolia is a striking species. It is a tall, sparingly branched shrub with a thin trunk, often reaching five metres in height. This species clearly characterizes the community structurally due to its stature and floristically due to its faithfulness. *Cliffortia grandifolia* forms a mid-high to tall open stratum above a low closed graminoid shrubland understorey, dominated by *Erica hispidula* and *Restio arcuatus*. *Penaea cneorum* subsp. *ruscifolia* also contributes significantly to the low stratum (Table 3).

2.3 *Erica hispidula–Pentaschistis malouinensis* Shrublands

Differential species: *Pentaschistis malouinensis*.

Dominant species: *Chrysithrix capensis, Erica hispidula, Tetraria flexuosa*.

Structural formation: Low to Mid-high Closed Graminoid Shrubland.

Relationships: *Simocheilus carneus–Restio anceps* Community (Bond 1981); Ruitersberg Wet Ericaceous Fynbos (Campbell 1985).

This community has no differential species, but shares *P malouinensis* with the *Pentaschistis malouinensis–Tetraria bromoides* Shrublands and many other species with communities E–H (see Table 3). These shrublands are distinctly graminoid in character, having an abundance of restios (*Elegia, Platycaulos, Restio*), grasses (*Pentaschistis*) and sedges (*Chrysithrix, Epischoenus, Tetraria*). The shrub component is dominated by ericas.

These shrublands are found on north- and south-facing slopes overlooking Boskloof and on north-facing slopes in the Langkuilen Valley at altitudes which range from 770–1 330 m. The gradients of sites sampled ranged from almost level (3°) to moderate (29°). The shallow soils are derived from Peninsula and Goudini Formation sandstone and are classified mainly as Cartref and Mispah Forms. The soil of relevé 188, located at the almost level site, consists of organic material in excess of 0.3 m and was classified as Champagne Form. Rock cover was generally less than 10% except for relevé 172 where 80% was recorded.

The dominant stratum of the *Erica hispidula–Pentaschistis malouinensis* Shrublands is a Low Closed Graminoid Shrubland ($\leq$ 1.0 m) with dominance shared between the woody ericoid shrubs, *Erica hispidula* and

FIGURE 12.—The *Berzelia intermedia–Cliffortia grandifolia* Shrublands occurring in patches over extensive areas of the south slopes of the Clock Peaks and in Boskloof. Note the characteristic tall, slender *Cliffortia grandifolia*.

FIGURE 13.—The *Pentaschistis malouinensis–Tetraria bromoides* Shrublands found in Boskloof.

Blaeria coccinea and certain graminoids, particularly *Chrysithrix capensis* and *Tetraria flexuosa*. *Psoralea pinnata* and *Widdringtonia nodiflora* occur as sparse emergent shrubs up to 2 m high in some stands.

2.3.1 *Pentaschistis malouinensis–Tetraria bromoides* Shrublands (J)

Differential species: *Erica pubigera, Helichrysum pandurifolium, Leucadendron eucalyptifolium, Leucadendron salignum, Protea aurea, Tetraria bromoides.*

Dominant species: *L. eucalyptifolium, P aurea, T. bromoides.*

Structural formation: either a Closed Graminoid Shrubland with Mid-high Open Shrubland Overstorey or a Mid-high Closed Shrubland with Tall Mid-dense Proteoid Shrubland Overstorey.

Relationships: *Tetraria bromoides–Erica plukenetii* Community (Kruger 1974); *Protea–Tetraria* Dry Short Fynbos (Boucher 1978); *Protea aurea–Pteridium aquilinum* Community (Bond 1981); Boesmansbos Azonal Restioid Fynbos (Campbell 1985); *Restio inconspicuus–Protea aurea* Shrublands (McDonald 1993).

The Cedarberg Formation shales crop out in a narrow band in a west-east direction in the Boskloof Valley. Drainage is to the east and where the shales are exposed, they support stands of the *Pentaschistis malouinensis–Tetraria bromoides* Shrublands. Three of the sample sites (Relevés 167, 175, 176) were located on shale-derived yellow-brown, Clovelly Form soils with mean pH 3.8 for the A-horizon. The fourth relevé (174) was situated on Glenrosa Form soil (pH 3.6) derived from Nardouw Subgroup sandstone. The estimated mean annual precipitation for the area where these shrublands are found is 800 mm. Elevation ranges from 840–950 m and the gradient from level (4°) to moderate (36°). Vegetation cover is usually high (mean 95%) and mean surface rock cover conversely low at 2.5%.

This community (Figure 13) is classified structurally as Low to Mid-high Closed Graminoid Shrublands with a Mid-high to Tall Open (Proteoid) Shrub Overstorey (see Campbell *et al.* 1981). Floristically these shrublands are not well defined compared with the equivalent community, the *Restio inconspicuus–Protea aurea* Shrublands found in the Boosmansbos Wilderness Area (McDonald 1993). In Boskloof, MNR, *Tetraria bromoides* is the most constant differential species with *Protea aurea* and *Leucadendron eucalyptifolium* each found in two of the four plots. *Protea aurea* was most abundant in a sheltered position on the edge of the riparian forest dominated by *Virgilia oroboides* (Relevé 175). The otherwise marked absence of stands of *P. aurea*-dominated vegetation on the Cedarberg shaleband in Boskloof suggests that this serotinous, seed regenerating species may have been adversely affected by past land use régimes (e.g too frequent or unseasonal fires). *L. eucalyptifolium* is somewhat more common but its distribution is patchy. This could indicate scattered outcropping of shale, but since this species also occurs on sandstones of the Nardouw Subgroup, no clear reason can be given for its local distribution pattern.

2.4 *Erica hispidula–Hypodiscus aristatus* Shrublands (K)

Differential species: none.

Dominant species: *Cliffortia heterophylla, Erica hispidula, Restio inconspicuus.*

Structural formation: either a Low to Mid-high, Mid-dense to Closed Shrubland or a Mid-high Closed Shrubland with a Low Mid-dense Graminoid Understorey.

Relationships: Nuweberg Mesic Ericaceous Fynbos (Campbell 1985).

This community (Figure 14) is found mainly on north- to northeast-facing slopes of the Clock Peak ridge, overlooking Boskloof, but also on the crest of 10 O'Clock Peak and on north-facing slopes above Langkuilen Valley.

FIGURE 14.—The *Erica hispidula–Hypodiscus aristatus* Shrublands found on the north- to northeast-facing slopes of the Clock Peak ridge. *Cliffortia heterophylla* dominates the overstorey in this stand.

FIGURE 15.—The *Hypodiscus aristatus–Phylica pinea* Shrublands found on the north-facing slopes of Goedgeloof Ridge and on rock outcrops in the Boskloof Valley.

Elevation of the shrublands ranges from about 1 000 m to 1 300 m on moderate slopes with a mean gradient of 27° (24°–28°). Rock cover varies from site to site over a range from 10–80%, with vegetation cover ranging from 70–95%. Estimated annual precipitation is from 800–900 mm.

The A-horizon of the soils have a mean pH 3.4. They are derived from Peninsula Formation and Goudini Formation sandstone and are classified as Cartref Form (Relevés 168 & 170) and Mispah Form (Relevé 181).

As indicated above, the community is structurally variable. The reason for presence of a mid-high closed stratum dominated by *Cliffortia heterophylla* in relevés 168 & 170 is not clear.

The *Erica hispidula–Hypodiscus aristatus* Shrubland community is the typical or 'background' community of the shrublands where *Cliffortia densa, Erica vestita, Hypodiscus aristatus, Pentameris macrocalycina, Stoebe cinerea* and *Thamnochortus cinereus* are common elements (see Table 3). It may be argued that description of the *Erica hispidula–Hypodiscus aristatus* Shrublands based on three relevés is tenuous. However, this indicates inadequate sampling, not the non-existence of the community.

2.4.1 *Hypodiscus aristatus–Phylica pinea* Shrublands (L)

Differential species: *Ceratocaryum decipiens, Phylica pinea, Tetraria thermalis.*

Dominant species: *Erica versicolor, Phylica pinea, Tetraria ustulata.*

Structural formation: Mid-high, Mid-dense Graminoid Shrubland.

Relationships: *Tetraria thermalis–Hypodiscus aristatus* Community (Kruger 1974), *Erica viridescens–Hypodiscus aristatus* Community (Bond 1981), Nuweberg Mesic Ericaceous Fynbos (Campbell 1985).

This community (Figure 15) is generally Open to Mid-dense Graminoid Shrublands with a Mid-high Open to Closed Ericoid Shrubland Overstorey (see Campbell *et al.* 1981). This community is found on the north-facing slopes of Goedgeloof Ridge and on rock outcrops in the Boskloof Valley. The rocky substrate, with a usual high percentage of boulders and exposed bedrock, results in shallow lithosols ($\leq$0.20 m) classified here as Glenrosa and Mispah Forms. In Boskloof the community was sampled at 920 m (Relevés 178 & 201) whereas on Goedgeloof Ridge the mean altitude for the three sample plots (Relevés 193, 197, 198) was 1 173 m. The area sampled by the latter plots is mesic and represents a transition zone from the cooler, moister areas south of Goedgeloof Ridge to the drier lower slopes (see Table 4 and communities P & Q).

Phylica pinea is the most constant differential species in this community. Both *Tetraria thermalis* and *Ceratocaryum decipiens* have a wider distribution on the dry, north-facing slopes (see Table 4), therefore their differential value is diminished. *Erica atropurpurea* is faithful to this community but has a low cover-abundance. Dominance in the mid-high shrub stratum is held by *Erica versicolor*, which typically favours north-facing rocky outcrops (McDonald 1993). The lower stratum does not have a strikingly dominant species but *Tetraria ustulata* does stand out as having a higher cover-abundance than most.

2.4.2 *Hypodiscus aristatus–Erica versicolor* Shrublands (M)

Differential species: none.

Dominants: *Edmondia sesamoides, Ehrharta setacea* subsp. *scabra, Erica hispidula, Hypodiscus aristatus, Tetraria cuspidata.*

Structural formation: Open to Closed Graminoid Shrubland.

FIGURE 16.—The *Hypodiscus aristatus–Restio strictus* Shrublands are found at elevations from 1 200–1 400 m on exposed rocky sites with shallow soil.

Relationships: Nuweberg Mesic Ericaceous Fynbos (Campbell 1985); *Hypodiscus aristatus–Erica versicolor* Shrublands (McDonald 1993).

The habitats in which the *Hypodiscus aristatus–Erica versicolor* Shrublands and *Hypodiscus aristatus–Restio strictus* Shrublands occur are very similar. This is reflected in the structural and floristic similarity of these communities. They differ only in the respective presence and absence of *Erica versicolor* and *Restio strictus* and relative dominance of the graminoid species. The most apparent difference is that the *Hypodiscus aristatus–Erica versicolor* Shrublands are found on north-facing slopes as opposed to the south aspect of the *Hypodiscus aristatus–Restio strictus* Shrublands. This aspect difference appears to control the presence or absence of *Restio strictus* and *Erica versicolor*, therefore the difference between the communities is subtle.

Dominance of *Hypodiscus aristatus* in the graminoid component is important to note. *Rhodocoma alpina* Linder & Vlok (Restionaceae) a species endemic to this community (H.P. Linder pers. comm.) was not found in any of the relevés but was collected separately.

2.4.3 *Hypodiscus aristatus–Restio strictus* Shrublands (N)

Differential species: *Restio strictus.*

Dominants: *Chrysithrix capensis, Edmondia sesamoides, Erica hispidula, Ehrharta setacea* subsp. *scabra, Pentaschistis colorata.*

Structural formation: Closed Graminoid Shrubland.

Relationships: Nuweberg Mesic Ericaceous Fynbos (Campbell 1985).

This community (Figure 16) is found at elevations from 1 200–1 400 m. These Low Graminoid Shrublands (<1 m) vary from mid-dense to closed, depending on the locality. They may occur either on exposed rocky sites with shallow pockets of sandy soil or on sites with deeper soil and less rock exposed on the surface. The soils derived from Nardouw Subgroup sandstone vary in depth from 15–30 mm and are classified as Cartref and Mispah Forms. Aspect is mainly south- and southeast-facing, on slopes with a moderate gradient (mean 16°). The community receives an estimated mean annual precipitation of 1 000–1 200 mm, the soils are highly leached and litter accumulation is low.

This community is distinct and well differentiated by *Restio strictus.* Although ericoid shrubs are well represented, the graminoid nature of the *Hypodiscus aristatus–Restio strictus* Shrublands stands out. *Ehrharta setacea* subsp. *scabra, Pentaschistis colorata* and *Chrysithrix capensis* dominate with *Restio inconspicuus* and *Restio strictus* and various sedges playing a subordinate role. *Ursinia trifida* has low cover-abundance but is remarkably constant in the relevés and it is interesting to note the presence of *Erica daphniflora.* Notable absences are *Lobelia neglecta, Psoralea pinnata* and *Kniphofia uvaria,* but of prime importance is the absence of *Erica versicolor.* This absence distinguishes the community from the *Hypodiscus aristatus–Erica versicolor* Shrublands.

FIGURE 17.—The *Hypodiscus aristatus–Erica multumbellifera* Shrubland found on the north slopes of Goedgeloof Ridge.

2.4.4 *Hypodiscus aristatus–Erica multumbellifera* Shrublands (O)

Differential species: *Erica multumbellifera, Staberoha cernua.*

Dominant species: *Erica melanthera, Staberoha cernua, Tetraria ustulata.*

Structural formation: Closed Graminoid Shrubland.

Relationships: some affinities to the Acid Sand Flats Community (Boucher 1978).

The description of this community (Figure 17) is based on two relevés, 194 & 195. This small sample size places a question on the validity of this community concept but since it is distinctly different from all other communities described, it is retained for completeness. These shrublands show affinity to the shrublands of high elevation on shallow soils (Table 3).

The *Hypodiscus aristatus–Erica multumbellifera* Shrublands were sampled at 1 180 and 1 300 m on the north slopes of Goedgeloof Ridge. The sites were almost level with a mean gradient of 6°. The Cartref Form soils were 0.2–0.4 m deep and almost no rock was exposed on the surface. Litter was very low and vegetation cover exceeded 95%.

Relevé 194 had a more abundant graminoid component than Relevé 195, whereas *Erica melanthera* was more abundant in the latter sample. Presence of *E. melanthera* suggests impeded drainage in the soil, and a possible explanation for the existence of this community is wet soil conditions for part of the year and extremely dry soil for the remainder. This would preclude species intolerant of such conditions. A similar regime was found by Boucher (1978) in the 'Acid sand flats communities' where *Erica multumbellifera* was also found. Further sampling of the *Hypodiscus aristatus–Erica multumbellifera* Community over a wider range may provide more information about the habitat factors determining the distribution of this community.

This community is transitional between the communities of the cool, moist high elevations and those of the highly insolated, drier north-facing slopes of Goedgeloof Ridge described below. The transition is reflected in the species shared with both groups of communities.

3. *Leucadendron eucalyptifolium* Shrublands of the extreme north slopes

The two shrubland communities included in this section show strong floristic affinities to the shrublands on the lower south slopes on the sample transect. This is most likely due to the apparent equivalent nutrient status of the soils of the two extreme ends of the transect. Further investigation of these respective communities and their underlying environmental relationships is necessary before this hypothesis can be conclusively tested.

3.1 *Leucadendron eucalyptifolium–Erica melanthera* Shrublands (P)

Differential species: *Erica melanthera, Penaea cneorum* subsp. *ruscifolia, Psoralea pinnata, Staberoha cernua, Ursinia nudicaulis* (i.e. species occurring in at least three of four relevés).

Dominant species: *Leucadendron eucalyptifolium, Tetraria ustulata*.

Structural formation: Open to Closed Graminoid Shrubland with Mid-high to Tall Open Proteoid Shrubland Overstorey.

Relationships: *Protea neriifolia–Leucadendron eucalyptifolium–Erica triceps* Community (Bond 1981); Robinson Mesic Proteoid Fynbos (Campbell 1985).

This community (Figure 18) is found on the moderately steep (22°) north-facing slopes of Goedgeloof Ridge between 800–1 060 m. They are found mostly on shallow Glenrosa Form soils, but one notable exception was relevé 150 where the soil was sandy, 1.5 m deep with a bleached E-horizon and a podzolised B-horizon. This localized soil

FIGURE 18.—The *Leucadendron eucalyptifolium–Erica melanthera* Shrublands are found on the moderately steep north-facing slopes of Goedgeloof Ridge.

FIGURE 19.—The *Leucadendron eucalyptifolium–Hypodiscus argenteus* Shrublands found in a mosaic with the *Leucadendron eucalyptifolium–Erica melanthera* Shrublands on the moderately steep north-facing slopes of Goedgeloof Ridge.

was classified as Lamotte Form, which is exceptional for this area. Surface rock cover is highly variable, ranging from 6–85% and the habitat is well drained.

As delimited here, the *Leucadendron eucalyptifolium–Erica melanthera* Shrubland is not floristically clearly defined. It appears that although a community definition is possible, the community represents fragments of two or perhaps more undersampled and undefined communities. They are grouped together by virtue of commonness of a few widespread 'differential' species but the 'strings' of single occurrences in Table 4 support the above conclusion. As defined, the community shows affinity to the communities of the lower south slopes and the high elevation zone described above under sections 1–3. However, high cover-abundance of *Leucadendron eucalyptifolium* and presence of *Elegia galpinii, Hypodiscus striatus* and *Anomalanthus scoparius* clearly place this community apart from those described above.

The *Leucadendron eucalyptifolium–Erica melanthera* Shrublands have two strata. The dominant stratum is an Open to Closed Graminoid Shrubland which does not exceed 1 m in height. Above this is an overstorey of *Leucadendron eucalyptifolium* (proteoid shrubs) which varies from open to mid-dense and from mid-high to tall (1–>2 m).

3.2 *Leucadendron eucalyptifolium–Hypodiscus argenteus* Shrublands (Q)

Differential species: *Heteropogon contortus, Hypodiscus argenteus, Lanaria lanata, Lobelia capillifolia* (i.e. species with four or more occurrences in five relevés).

Dominant species: *L. eucalyptifolium, Tetraria ustulata, Restio filiformis*.

Structural formation: Open to Closed Graminoid Shrubland with Mid-high Open Proteoid Shrubland Overstorey.

Relationships: in part, this community is equivalent to the *Phylica axillaris–Felicia filifolia* Community (Ruitersbos) and *Passerina obtusifolia–Felicia filifolia* Community (Swartberg) of Bond (1981) and Sebrafontein Dry Asteraceous Fynbos (Campbell 1985).

This community is found on the moderately steep north-facing slopes of Goedgeloof Ridge, in a mosaic with the *Leucadendron eucalyptifolium–Erica melanthera* Shrubland at elevations from 680–900 m. The soils, derived from Nardouw Subgroup sandstone, are classified as Glenrosa and Mispah Form. Surface rock cover exceeds 90% in all relevés representing this community but despite this there is considerable vegetation with a mean projected canopy cover of 78%. Estimated mean annual precipitation is 700–800 mm.

In the *Leucadendron eucalyptifolium–Hypodiscus argenteus* Shrublands (Figure 19), *Leucadendron eucalyptifolium* does not exceed 1.2 m and in two relevés (185 & 186), *Leucospermum calligerum* is the dominant proteoid in the overstorey. The upper stratum varies from a Mid-high Open to Tall Open Proteoid Shrubland and the lower (dominant) stratum varies from an Open to a Closed Graminoid Shrubland.

There are a number of affinities between this Community and the communities of the lower south slopes of the Langeberg above Swellendam. Equally there are numerous similarities between the *Leucadendron eucalyptifolium–Hypodiscus argenteus* Shrublands and the *Cannomois parviflora* Shrublands north of Grootberg (McDonald 1993). The *Leucadendron eucalyptifolium–Hypodiscus argenteus* Shrublands are mesic in character but may once again be represented by a group of relevés which through commonness are associated but which may truly be fragments of other communities, e.g. part of the more arid *Passerina obtusifolia–Leucospermum calligerum* Shrublands. This requires further clarification.

DISCUSSION AND CONCLUSIONS

The classification presented in this study was developed from a phytosociological perspective but with management of the fynbos shrublands of the Langeberg in mind (McDonald 1993). Some of the units defined are limited in extent, and from a management viewpoint it would not be practical to treat them separately from broader vegetation units. However, since the classification is hierarchical, similar communities are grouped together according to the level of the hierarchy. It is therefore possible for any manager of the fynbos shrublands of the Langeberg to select the appropriate level required for any particular management treatment. Those communities grouped at the same level may then be treated similarly.

Two problems have been encountered with the methods used in this study. Firstly, since no initial stratification of aerial photographs of the study area was done, some communities were undersampled. There is no satisfactory way of detecting this before analysis of the data. Both the TWINSPAN and Braun-Blanquet methods of classification have indicated communities that have been undersampled. The most obvious is the *P. malouinensis–Tetraria bromoides* Shrubland found on the Cedarberg shaleband. Another example is the *Hypodiscus aristatus–Erica multumbellifera* Shrubland for which a description is given. Ideally this community requires further sampling upon which an adequate description may be based. Fragments of communities recognized in other parts of the Langeberg are included in the *L. eucalyptifolium* Shrublands of the extreme north slopes of the transect. In the TWINSPAN analysis this was shown by relevés 185 and 186 being separated from relevés 151, 183, 184 and 199 (see also Table 4). Further sampling would clarify whether this is due to too few samples or that the communities are simply poorly represented in this part of the Langeberg. It was not possible to obtain further samples of these communities in this study because the area had been burnt soon after the initial samples were taken.

It may be argued that a community may be characterized by one or two species whose presence is a result of differential post-fire recruitment (Van Wilgen *et al.* 1992). This possibility would increase if the sample size for a given community is small, which in turn could lead to an artificial classification. However, each community is not based solely on the character species but is based on a specific combination of species for each community. These combinations should be seen as the key to identifying each community.

The complexity of the metamorphosed Malmesbury Group sediments that occur below the 'Plaat' is reflected in the vegetation occurring in this part of the MNR. Here fynbos communities characterized by constant presence of *Cliffortia serpyllifolia* are found on soils derived from quartzites and shales. The Afromontane forests also occur on the Malmesbury Group shales, but in this case in moist kloofs.

Although it has been stated that *P. aurea* may be used as a 'marker', indicating the position of the Cedarberg Formation shales in the folded strata along the length of the Langeberg (McDonald 1993), this is a misconception. A large stand of fynbos dominated by *P. aurea* is found at the base of 10 O'Clock Peak, below the 'Plaat', on Malmesbury shale-derived soil. The response of *P. aurea* is therefore to the fine-textured shale-derived soils with higher nutrient status, regardless of their lithological origin or stratigraphic position.

The vegetation of the MNR appears more complex than that of the Boosmansbos Wilderness Area (BWA) (McDonald 1993). This could be ascribed to more complex environmental gradients and a greater diversity of habitats. However, detailed analysis of environmental data is needed to substantiate such a claim.

No equivalent of the *Restio inconspicuus–Leucadendron eucalyptifolium* Shrubland which is widespread in BWA is found in the MNR. The *Restio inconspicuus–Anthochortus crinalis* Shrublands of BWA and the *Erica hispidula–Berzelia intermedia* Shrublands of MNR are essentially similar. The communities on the Cedarberg Formation shale of the two areas are similar except that the *Pentaschistis malouinensis–Tetraria bromoides* Shrubland is poorer in species. The *Cliffortia serpyllifolia* Shrublands of the lower south slopes of MNR have no equivalent in BWA. The reason for the absence of these shrublands or their equivalent in BWA is not clear but it may be due

to the absence of shale-derived soils on the lower south slopes of the BWA transect.

The *Cannomois parviflora* Shrublands of BWA are represented in part by the *Leucadendron eucalyptifolium* Shrublands of the extreme north slopes of the MNR transect, but more extensive sampling and more detailed analysis is necessary to clarify the classification of these communities.

Communities identified in different studies from different mountain ranges can not be simply equated (McDonald 1993). At the landscape scale there does not appear to be much difference between the fynbos vegetation of the Marloth Nature Reserve and the Boosmansbos Wilderness Area (McDonald 1993). Apparent differences are more at the level of communities which are micro-habitat related. Closer examination is therefore required of (i) the patterns of distribution of communities on the Langeberg and (ii) the high turnover of species between communities and landscapes on the Langeberg. This is beyond the scope of the present paper but forms a principal part of further detailed analyses of the vegetation and flora of the Langeberg (McDonald unpublished).

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