

CHAPTER 6

ROCK OUTCROP VEGETATION

6.1 Background

Although several phytosociological studies have been conducted on vegetation types of the northeastern Drakensberg Escarpment and adjacent areas of the Northern Province and Mpumalanga (Deall 1985; Bloem 1988; Matthews 1991; Burgoyne 1995), the rock habitat of the SCPE (Van Wyk & Van Wyk 1997; Van Wyk & Smith 2000) is a vegetation type that has never been studied in detail. The area where the rocky outcrops occur covers approximately 8 000 km² and is characterised by considerable diversity in geology (Kent 1980) and physiography (Land Type Survey Staff 1987). In South Africa rock outcrop communities received very little attention from botanists and environmentalists (Bredenkamp & Deutschlander 1995), probably due to their low agricultural potential. Ultramafic rock outcrops are floristically noteworthy and has high conservation significance (Meirelles *et al.* 1999), in that many endemics with distributions correlated with the geological substrate occur here (Madulid & Agoo 1995).

Various vegetation types have been recognised on the rock outcrops of the northeastern Drakensberg Escarpment (Matthews *et al.* 1991; Matthews *et al.* 1992b), an area adjacent to the SCPE to which it shows a definite floristic affinity (Siebert 1998). The areas where the rocky outcrops of the SCPE occur were mapped as three major veld types by Acocks (1953), namely Mixed Bushveld (18), Sourish Mixed Bushveld (19) and North-Eastern Sandy Highveld (57). A more generalised classification of the same region's vegetation is given by Low & Rebelo (1996), who recognises one broad vegetation type for the area under focus, namely Mixed Bushveld (18).

The vegetation described here only includes those plant communities of rock habitats, identified as the *Hippobromus pauciflorus-Rhoicissus tridentata* Rock Outcrop Vegetation

by Siebert *et al.* (2002a). Major bushveld and grassland communities of the SCPE are discussed elsewhere.

The vegetation of the SCPE can be broadly described as undulating mountain bushveld that is bordered by a moist grassland in the south and an arid bushveld in the north. In this region of undulating hills and mountains, a predominant characteristic feature is the scattered rocky outcrops, often with large boulders. The *Hippobromus pauciflorus-Rhoicissus tridentata* vegetation of rocky habitats forms a mosaic distribution with the other major vegetation types (Siebert *et al.* 2002a). Thirty-four of the Sekhukhuneland endemics/near-endemics occur in the rocky outcrop vegetation types (Siebert 1998).

Four types of rock habitats are recognized for the region, namely, rocky (1) outcrops, (2) ridges, (3) flats and (4) refugia. Rocky outcrops are defined as hills of large boulders stacked upon one another. Rocky ridges are defined as exposed reefs and scattered groups of rocks and boulders on the sides of mountains/hills. Rocky flats are defined as rock beds exposed at ground level. Rocky refugia are defined as extremely rocky areas scattered with boulders around caves, in kloofs and below cliffs.

Temperatures for the areas with rocky habitats range from -4.5°C to 38°C , with a daily average of 18.5°C (South African Weather Bureau 1998). The northern and western parts of the study area (Figure 9) are on average warmer than the southern and eastern parts (Siebert 1998). The northern parts of the region exhibit average daily temperatures of 28.3°C maximum and 7.2°C minimum.

6.2 Classification

The analysis resulted in the identification of 17 plant communities (Table 8) that were subsequently hierarchically classified into 17 associations (Barkman *et al.* 1986). Four major plant communities are recognised on the grounds of the physical environment and are presented as hypothetical alliances, with all 17 of the associations classified under them. No macro-climatic or geological variation plays a role in local differentiation of the plant communities. Plant communities relate to soil type, rockiness and terrain type, with aspect

and slope also of importance. Communities are distinctive and easily distinguishable in the field. This might be attributed to the uniformity of the environmental factors for each of the major communities, causing a distinct distribution pattern of habitats and associated vegetation.

The hierarchical classification of the vegetation reinforces the correlation between habitat and plant communities (Figure 10). The distribution of Sekhukhuneland Centre endemic/near-endemic and Red Data List taxa among various plant communities is listed in Table 9. A summary of selected community attributes is supplied in Table 10. Plant communities of the *Hippobromus pauciflorus*–*Rhoicissus tridentata* Rock Outcrop major vegetation type recognised in the SCPE are classified as follows:

I. *Rhoicissus sekhukhuniensis*–*Ficus abutilifolia* community of rocky outcrops

1. *Vepro reflexae*–*Mimusopetum zeyheri*
2. *Commiphoro marlothii*–*Crotonetum gratissimi*

II. *Cymbopogon excavatus*–*Pavetta* sp. nov. community of rocky ridges

3. *Grewio monticolae*–*Elephantorrhizetum praetermissae*
4. *Melino nerviglumis*–*Cathetum edulis*
5. *Heteropogono contorti*–*Apodytetum dimidiatae*
6. *Gerbero jamesonii*–*Kirkietum wilmsii*
7. *Brachlario serratae*–*Viticetum wilmsii*
8. *Cymbopogono excavati*–*Brachylaenetum rotundatae*
9. *Aloo pretoriensis*–*Xerophytetum retinervis*
10. *Tephrosio purpureae*–*Rhoicissetum tridentatae*
11. *Cymbopogono validi*–*Rhamnetum prinoidis*
12. *Enteropogono macrostachys*–*Hippobrometum pauciflorit*

III. *Aristida transvaalensis*–*Crassula sarcocaulis* community of rocky flats

13. *Munduleo sericeae*–*Euphorbietum cooperi*
14. *Crassulo sarcocaulis*–*Aristidietum transvaalensis*

IV. *Panicum deustum*–*Celtis africana* community of rocky refugia

15. *Clauseno anisatae*–*Diospyretum whyteanae*

16. *Fico sur*–*Combretetum erythrophyllii*

17. *Andrachno ovalis*–*Allophylletum transvaalensis*

6.3 Description

The *Hippobromus pauciflorus*-*Rhoicissus tridentata* Rock Outcrops are predominantly restricted to the slopes and plateaus of undulating ultramafic hills. Surface rocks are predominant and abundant in the habitats, with rock percentage varying from 25% on the rocky flats to more than 50% in the rocky refugia. The vegetation can structurally be classified into forest/woodland (rocky refugia), thicket (rocky outcrops and ridges) and herbland (rocky flats) (Edwards 1983). Rocky habitats constitute an important feature which is a unique island that differs significantly from surrounding areas (Madulid & Ago 1995).

I. *Ficus abutilifolia*-*Rhoicissus sekhukhuniensis* community of rocky outcrops

Environmental data. The vegetation of the alliance is a thicket on ultramafic outcrops. The alliance is found on all aspects of sloped (1–3°) rock intrusions on midslopes, scarps and occasionally in valleys (Table 10). Soil forms are shallow and rocky. The soil surface is covered by 60–90% of rock with a large average diameter of 2.5–8 m (Table 10).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group D (Table 8) and include the trees *Ficus abutilifolia*, *Homalium dentatum*, *Pouzolzia mixta* and *Vepris reflexa* and the herbaceous shrubby climbers *Asparagus buchananii*, *A. intricatus* and *Rhoicissus sekhukhuniensis*. Prominent trees of the association are *Croton gratissimus* and *Maytenus undata*, the dominant grass is *Panicum deustum* and frequent occurring herbaceous taxa include the forb *Commelina africana*, the fern *Pellaea calomelanos* and the succulent *Sarcostemma viminale*.

Notes on floristic diversity. Floristic links with the rest of the data set are visible in species groups AA and AH (Table 8). The weak links supports the recognition of the alliance. The average number of species encountered per sample plot for this alliance is 29, with the total number of plant species being a minimum of 91 taxa (13 relevés) (Table 10). There are 14 plant taxa of conservation value, eight are SCPE endemics, six are SCPE near-endemics and one is a Red Data List taxon (Table 9). Of these taxa, five are restricted to the alliance in the SCPE.

1. *Vepru reflexae–Mimusopetum zeyheri* ass. nova hoc loco

Nomenclatural type: relevé 190 (holotypus)

Environmental data. The vegetation representing this association is a sparse tall thicket on the banks of seasonal streams and rivers. It is mostly found along watercourses that flow towards the Steelpoort River Valley from the mountains. The habitat is a rocky outcrop with gentle sloped sides (1–3°) (Table 10). The dominant soil type is the Bonheim form, a melanic A-horizon underlain with a pedocutanic B. Average rock size varies from 5.5 to 7 m in diameter and covers 70–80% of the soil surface.

Diagnostic and dominant/prominent taxa. In the SCPE this association is characterised by species group A (Table 8). *Heteropyxis natalensis*, *Mimusops zeyheri* and *Pittosporum viridiflorum* is the diagnostic woody species. Other diagnostic species include the climbers *Abrus laevigatus*, *Rhoicissus tomentosa* and *Secamone filiformis*. There are no diagnostic grasses. Other dominant woody species include *Ficus abutilifolia* and *Vepris reflexa*. Prominent grass species include *Cymbopogon validus* and *Panicum deustum*. Prominent forbs are *Orthosiphon labiatus* and *Ruellia patula*.

Notes on floristic diversity. This rock outcrop community is not typical for the SCPE and only a slight floristic affinity exist with other rock habitats of the Centre in species groups K, U and AA (Table 8). The average number of species per relevé is 31, and the total number of species recorded for the association is 46 (three relevés) (Table 10). Five plant taxa of conservation value occur in this association (Table 9), namely one SCPE endemic, *Rhoicissus sekhukhuniensis*, and four SCPE near-endemics.

2. *Commiphora marlothii*–*Crotonetum gratissimi* ass. nova hoc loco

Nomenclatural type: relevé 195 (holotypus)

Environmental data. The vegetation is a sparse short thicket on rocky outcrops in the Steelpoort River Valley. The plant community is associated with exposed norite or pyroxenite outcrops with gently sloped sides (0–1°) on midslopes and scarps of the hills. Surface rock cover percentage is 60–90%, with the stacked exposed boulders reaching diameters between 2.5 and 8 m (Table 10). The dominant soil type is the Mispah form, indicating very shallow soils over rock.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group B (Table 8). Diagnostic trees/shrubs of the association include *Commiphora marlothii*, *Euphorbia sekukuniensis*, *Nuxia congesta*, *Premna mooiensis* and *Steganotaenia araliacea*. Diagnostic woody forbs are *Abutilon pycnodon*, *Ruttya ovata* and *Turraea obtusifolia*, and the succulents *Cyphostemma sulcatum* and *Tetradenia brevispicata*. *Stylochiton* sp. nov. (Siebert 1332) is an undescribed taxon; it is a neo-endemic of the SCPE. *Andropogon schirensis*, *Cymbopogon excavatus*, *Eragrostis nindensis* and *Panicum deustum* are the dominant grasses in this association. Other prominent plants are the woody species *Barleria rotundifolia*, *Combretum molle*, *Croton gratissimus* and *Maytenus undata*.

Notes on floristic diversity. This plant community exhibits a slight floristic link with the rocky ridges of the Centre in species groups K, P, U and AA (Table 8). The average number of species encountered per sample plot is 27, with the total number for this association being 91 (10 relevés) (Table 10). Twelve taxa with conservation status are present in the association (Table 9), eight are SCPE endemics, the highest number for any plant community in the Rocky Outcrop vegetation, four are SCPE near-endemics and one a Red Data List taxon, *Euphorbia sekukuniensis*. Of all the rock habitats, this association has the highest number of plant taxa with a conservation status restricted to it (four).

II. *Pavetta* sp. nov. –*Cymbopogon excavatus* community of rocky ridges

Environmental data. In the SCPE this alliance is characterised by open to closed moist bushclumps on rocky ridges with predominantly shallow black and red clay soil forms. This vegetation occurs on midslopes and scarps of undulating ultramafic hills. It occurs on varying slopes of 1–15° on all aspects. Rocks can cover 45–80% of the soil surface and are an average diameter of 1–5 m (Table 10).

Diagnostic and dominant/prominent taxa. Species group U contain the diagnostic species for this alliance, which are characterised by the trees *Acacia caffra*, *Olinia emarginata* and *Scolopia zeyheri*, the shrubs *Elephantorrhiza praetermissa* and *Pavetta* sp. nov., the forbs *Ruellia patula* and *R. stenophylla*, and the grass *Cymbopogon excavatus* (Table 8). Other prominent species of the alliance include the trees *Combretum molle*, *Cussonia transvaalensis*, *Euclea crispa* and *Hippobromus pauciflorus*, and the ground layer is dominated by the grasses *Themeda triandra* and *Setaria sphacelata*.

Notes on floristic diversity. This alliance is dominant and floristic relationships exist with the other alliances, hence indicating that it forms the basis for the plant communities of rocky habitats (Table 8). The average number of species encountered per sample plot in this alliance is approximately 35, with the total number of plant species being a minimum of 110 taxa (62 relevés) (Table 10). Twenty-eight taxa of conservation value are part of the alliance, of which 14 are restricted to it (Table 9).

3. *Grewia monticolae*–*Elephantorrhizetum praetermissae* ass. nova hoc loco

Nomenclatural type: relevé 130 (holotypus)

Environmental data. This association represents bush clumps on warm north and northeast aspects of hills with norite and pyroxenite rocky ridges. It occurs on midslopes and scarps on red clay soils of the Glenrosa and Mispah forms. It covers gentle to moderate sloped areas (3–7°). Rock cover on the surface is 70–90%, with rocks reaching an average size of 2–4.5 m in diameter (Table 9).

Diagnostic and dominant/prominent taxa. Diagnostic species are presented in species group E (Table 8). Diagnostic herbaceous taxa include forbs such as the herbs *Aspilia mossambicensis* and *Orthosiphon fruticosus* and the succulent *Kleinia stapeliiformis*. Diagnostic grasses are *Aristida rhiniochloa* and *Sporobolus stapfianus*. The diagnostic woody species are *Englerophytum magalismontanum* and *Grewia monticola*. Other important dominant taxa are shrubs, namely *Elephantorrhiza praetermissa*, *Hippobromus pauciflorus*, *Pavetta* sp. nov. and *Xerophyta retinervis* (form). Grasses such as *Aristida transvaalensis*, *Panicum deustum* and *Themeda triandra* are the dominant grasses.

Notes on floristic diversity. This association is strongly linked with the other associations of the alliance. The average number of species encountered per sample plot is 30, with a total number of 89 plant taxa (nine relevés) (Table 10). Four SCPE endemics, seven near-endemics and one Red Data List taxon are found in this association (Table 9). None of the 11 taxa of conservation value are restricted to it.

4. *Melino nerviglumis*–*Cathetum edulis* ass. nova hoc loco

Nomenclatural type: relevé 41 (holotypus)

Environmental data. This association represents dry bush clumps on northern aspects of norite (sometimes pyroxenite) hills. It occurs on red and black clay soils of the Mayo and Milkwood forms on midslopes and scarps. It lies on moderately sloped areas (5–15°). Rock cover on the surface is 45–50%, with rocks reaching an average size of 0.5–1 m in diameter (Table 10).

Diagnostic and dominant/prominent taxa. Diagnostic species are presented in species group F (Table 8). Diagnostic herbaceous taxa include the forbs *Commelina erecta*, *Helichrysum intricatum*, *Hypoestes aristata* and *Sansevieria hyacinthoides*. *Aristida canescens* and *Eragrostis heteromera* are the diagnostic grasses. It is predominantly characterised by trees, which include the diagnostic taxa *Acacia robusta*, *Catha edulis*, *Euphorbia ingens*, *Ficus craterostoma*, *Schrebera alata* and *Sclerocarya birrea*. Other important dominant taxa are trees such as *Acacia ataxacantha*, *Hippobromus pauciflorus*

and *Ziziphus mucronata*, and grasses such as *Panicum deustum*, *Setaria sphacelata* and *Themeda triandra*.

Notes on floristic diversity. The association has a strong grassland-savanna affinity in species group H with association 5 (Table 8), which is to be expected because of the vegetation type's abundance on rocky outcrops in the grasslands of the Roossenekal Subcentre. The average number of species encountered per sample plot is 46, together with association 5 the highest number recorded per relevé for any of the vegetation units of rocky habitats. It has a total number of 105 plant taxa (eight relevés) (Table 10). Four SCPE endemics, of which two are Red Data List taxa namely *Elephantorrhiza praetermissa* and *Zantedeschia pentlandii*, and five near-endemics are found in this association (Table 9).

5. *Heteropogono contorti*–*Apodytetum dimidiatae* ass. nova hoc loco

Nomenclatural type: relevé 81 (holotypus)

Environmental data. This association represents moister bush clumps of rocky ridges restricted to southern aspects. It prefers midslopes and scarps of norite hills with a gentle to moderate slope (3–15°). It occurs on black clay soils of the Mayo and Milkwood forms. Approximately 45–60% of the soil surface is covered by rocks, with an average size of 0.5–1 m in diameter (Table 10).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group G (Table 8). The diagnostic species found in this association are predominantly woody ones, namely *Buddleja auriculata*, *B. salviifolia*, *Diospyros lycioides* subsp. *nitens*, *Jasminum quinatum*, *Rhus rigida* and *Triaspis glaucophylla*. The only diagnostic forb is *Pupalia lappacea*. Other conspicuous woody species are *Apodytes dimidiata*, *Combretum molle*, *Hippobromus pauciflorus* and *Rhoicissus tridentata*. Dominant grasses include *Heteropogon contortus*, *Panicum deustum*, *Setaria sphacelata* and *Themeda triandra*.

Notes on floristic diversity. Species group H (Table 8) shows a strong floristic resemblance to plant community 4 (Table 10) due to their similar geographical distribution.

The average number of species encountered per sample plot is 46, together with association 4 the highest average number recorded per relevé in the data set. The total number of plant species for this association is 110 (seven relevés), the richest diversity of species recorded for any rock habitat association (Table 10). Of the 10 taxa of conservation value in this association, three are SCPE endemics, six SCPE near-endemics and of these three are Red Data List taxa (Table 9). Three of these taxa are restricted to the association, namely *Berkheya insignis* (endemic form), *Eucomis montana* (Rare (R) in the Red Data List) and *Gnidia caffra* (endemic form).

6. *Gerbero jamesonii*–*Kirkietum wilmsii* ass. nova hoc loco

Nomenclatural type: relevé 20 (holotypus)

Environmental data. An association dominated by a dense herbaceous cover on ridges that are situated on midslopes and scarps of norite hills. It occurs on red clay soils of the Mispah form, with the soil surface covered by 70–80% rock, of a relatively large average size of 4–7 m in diameter (Table 10). Slope of the habitat is usually 1–3°.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group I (Table 8). Diagnostic herbs, such as the fern *Cheilanthes hirta*, the succulents *Aloe aculeata*, *Kalanchoe rotundifolia*, *Plectranthus xerophilus* and *Sansevieria aethiopica*, and the forbs, *Gloriosa superba* and *Tripteris auriculata*, dominate the community. Two undescribed *Cyphostemma* species are also diagnostic. *Sporobolus ioclados* and *Trachypogon spicatus* are the diagnostic grasses. Dominant woody species are trees *Barleria rotundifolia*, *Catha transvaalensis*, *Croton griseus*, *Kirkia wilmsii* and the small shrub *Chrysanthemoides monilifera*. Conspicuous grasses include *Andropogon schirensis* and *Eragrostis nindensis*.

Notes on floristic diversity. Two noteworthy floristic relationships exist with other associations, namely with association 2 in species group C and a unique combination of associations in species group AG (Table 8). The average number of species encountered per sample plot is 39, with the total number for the association being 103 (seven relevés) (Table 10). Six SCPE endemics, six near-endemics and four Red Data List taxa (most for any

association) are found in this association (Table 9). Of its 13 taxa of conservation value, one of three associations sharing this highest number, three near-endemics are restricted to the association, namely *Aloe reitzii* var. *reitzii* (Indeterminate (I) in Red Data List), *Chlorophytum cyperaceum* and *Plectranthus xerophilus*.

7. *Brachiario serratae-Viticetum wilmsii* ass. nova hoc loco

Nomenclatural type: relevé 71 (holotypus)

Environmental data. This association is a dry bush clump of any aspect, situated on exposed norite and magnetite ridges, on midslopes and scarps of hills. It occurs on red and black clay soils of the Mispah form (ortic A-horizon) and Milkwood form (melanic A-horizon) underlain by hard rock. The soil surface is covered by 50–60% rock, of an average size of 2.5–3 m in diameter (Table 10). Slope of the habitat is usually 3–7°.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group L (Table 8). The dominant diagnostic species are forbs such as *Rhynchosia spectabilis*, *Ruellia cordata* and *Pearsonia aristata*, the succulent *Aloe verecunda*, the sedge *Bulbostylis burchellii*, and the grasses *Aristida junciformis*, *Brachiaria serrata* and *Tristachya rehmannii*. Prominent woody species are *Apodytes dimidiata*, *Catha transvaalensis*, *Olea capensis* subsp. *enervis* and *Vitex obovata* subsp. *wilmsii*. Important conspicuous taxa include *Aloe castanea* and *Sphedamnocarpus pruriens*.

Notes on floristic diversity. The community has a marked floristic grassland affinity in species group Y with associations 13 and 14 (Table 8). The average number of species encountered per sample plot is 40, with the total number for this association being relatively high at 109 species (seven relevés) (Table 10). Five SCPE endemics, eight SCPE near-endemics, together with association 8 the highest number for the rocky habitats, and three Red Data List taxa were recorded (Table 9). It has 13 taxa of conservation value, which are the highest number recorded in three vegetation units. One SCPE near-endemic, *Lotononis wilmsii*, is restricted to the association.

8. *Cymbopogono excavati–Brachylaenetum rotundatae* ass. nova hoc loco

Nomenclatural type: relevé 51 (holotypus)

Environmental data. This association represents bush clumps on all aspects of hills with norite and ferrogabbro rocky ridges. It usually occurs at higher altitudes than the other associations, and is found on midslopes and scarps on red clay soils of the Mayo and Mispah forms. It lies on gently sloped areas (1–5°). Rock cover on the surface is 60–80%, with rocks reaching an average size of 3–5 m in diameter (Table 9).

Diagnostic and dominant/prominent taxa. Diagnostic species are presented in species group M (Table 8). Diagnostic herbaceous taxa include the forbs *Pachycarpus transvaalensis*, *Pearsonia sessilifolia*, *Rhynchosia hirta*, *Senecio oxyriifolius* and *Solanum supinum*. Diagnostic woody species are the tree *Brachylaena rotundata*, the shrub *Grewia villosa* and the bushy *Felicia filifolia*. The diagnostic grass is *Diheteropogon amplexens*. Other important dominant taxa are trees such as *Catha transvaalensis*, *Olea capensis* subsp. *enermis* and *Ziziphus mucronata*, and grasses such as *Cymbopogon validus*, *Heteropogon contortus* and *Themeda triandra*.

Notes on floristic diversity. No prominent floristic links are evident. The average number of species encountered per sample plot is 34, with a high total number of 109 plant taxa (seven relevés) (Table 10). Five SCPE endemics, eight near-endemics, together with association 7 the highest number for any of the vegetation units, and three Red Data List taxa, are found in this association (Table 9). There are 13 taxa of conservation value, this is the highest number for in the data set and is equalled by associations 6 and 7. One taxon is restricted to it, namely the near-endemic *Pachycarpus transvaalensis*.

9. *Aloo pretoriensis–Xerophytetum retinervis* ass. nova hoc loco

Nomenclatural type: relevé 136 (holotypus)

Environmental data. This association is an open, sparse bush clump of norite and pyroxenite ridges, on midslopes and scarps of hills. It occurs on black and red clay soils of the Glenrosa and Mispah forms against cool south and southeast aspects. The soil surface is

covered by 60–80% rock, which is of an average size of 2.5–3.5 m in diameter (Table 10). Slope of the habitat is usually 1–5°.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group O (Table 8). The community is dominated by diagnostic forbs such as *Convolvulus sagittatus*, *Dalechampia galpinii*, *Gnidia variabilis*, *Jatropha latifolia* var. *latifolia* and *Justicia protracta*. The diagnostic shrub is *Gymnosporia glaucophylla* and the diagnostic succulent is *Aloe pretoriensis*. Dominant woody species include the shrubs *Hippobromus pauciflorus*, *Pavetta* sp. nov. and *Vitex obovata* subsp. *wilmsii*. Important conspicuous grasses include *Aristida transvaalensis*, *Cymbopogon excavatus* and *Themeda triandra*.

Notes on floristic diversity. The community has several floristic relationships with the rest of the data set. The average number of species encountered per sample plot is 33, with 89 species the total number for this association (six relevés) (Table 10). Of the 12 taxa of conservation value, no taxa are restricted to it. Six SCPE endemics and six SCPE near-endemics, of which two Red Data List taxa, were recorded (Table 9).

10. *Tephrosio purpureae–Rhoicissetum tridentatae* ass. nova hoc loco

Nomenclatural type: relevé 320 (holotypus)

Environmental data. This is a vegetation type typical of rocky ridges in the southern region of the SCPE. It is a bush clump plant community of moist grassland on midslopes and scarps of undulating norite or pyroxenite hills. The habitat is rather a level slope of 1–3°, restricted to south and west aspects. Soils are typical red and black clays of the Mayo and Milkwood forms. Average rock size is 1–3.5 m in diameter and cover 50–70% of the soil surface (Table 10).

Diagnostic and dominant/prominent taxa. Species group Q (Table 8) contains the characteristic species for this association, with the diagnostic grassland forb species *Dioscorea sylvatica*, *Helichrysum albilanatum*, *Rhynchosia minima*, *Tephrosia purpurea* and *Zornia linearis*. Other diagnostic taxa are the grasses *Digitaria argyrograpta*,

Eragrostis curvula and *Hyparrhenia filipendula*, and the trees *Canthium mundianum*, *Rhus sekhukhuniensis* and *Rhus discolor* (suffrutex). Other dominant taxa of the association include the trees/shrubs *Hippobromus pauciflorus*, *Olea capensis* subsp. *enermis* and *Rhoicissus tridentata*, and the grass *Cymbopogon excavatus*.

Notes on floristic diversity. This association's floristic relationships are typical for the alliance (Table 8). The average number of species encountered per sample plot is 34, with the total number of plant species for this association being 75 (three relevés) (Table 10). A high number of taxa of conservation value are found in this association (12), and of these six are SCPE endemics, six SCPE near-endemics and three Red Data List taxa (Table 9). Two taxa with conservation status are restricted to the association, namely the near-endemic *Helichrysum albilanatum* and the Rare (R) endemic *Rhus sekhukhuniensis*.

11. *Cymbopogono validi*–*Rhamnetum prinoidis* ass. nova hoc loco

Nomenclatural type: relevé 4 (holotypus)

Environmental data. The association is a moist riverbank thicket of rocky mountain streams in the valleys between undulating norite and pyroxenite hills. It lies on a gentle slope of 1–3°. Soils are characteristically a moist humus-rich sandy loam on a rocky substrate. Approximately 60–70% of the soil surface is covered by rocks, with an average size of 3.5–5.5 m in diameter (Table 10).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group R (Table 8). Diagnostic tree species are prominent, namely *Cassinopsis ilicifolia*, *Leucosidea sericea* and *Rhammus prinoides*. Diagnostic forbs are *Freesia laxa*, *Kalanchoe paniculata* and *Thunbergia atriplicifolia*. *Scleria dieterlenii* is the diagnostic sedge and *Sporobolus fimbriatus* the diagnostic grass. Other important trees are *Chionanthus foveolatus* and *Olinia emarginata*. *Aristida transvaalensis*, *Cymbopogon validus*, *Eragrostis racemosa* and *Panicum deustum* are the dominant grasses.

Notes on floristic diversity. The association follows the floristic affinities of the alliance, but is characterised by the absence of species in group Z (Table 8). The average number of

species encountered per sample plot in this association is 34, with the total number of plant species being 64 taxa (five relevés) (Table 10). Four taxa occur in this association, namely two SCPE endemics and two SCPE near-endemics (Table 9). No plant taxa with conservation value are restricted to it.

12. *Enteropogono macrostachys–Hippobrometum pauciflorii* ass. nova hoc loco

Nomenclatural type: relevé 334 (holotypus)

Environmental data. This vegetation type is a degraded bush clump of cool south and east slopes of norite hills. It covers moderately sloped midslopes and scarps (3–9°). The community is restricted to sandy loam soils. Approximately 20–40% of the soil surface is covered by rocks, with an average diameter of >500 mm (Table 9).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group T (Table 8). Only one non-grassy species, the shrubby *Psiadia punctulata*, is diagnostic of the association. *Cynodon dactylon*, *Enteropogon macrostachys*, *Eragrostis lehmanniana* and *Panicum coloratum* are the diagnostic grasses. Prominent trees of the association are *Acacia caffra*, *Euclea crispa*, *Hippobromus pauciflorus* and *Rhoicissus tridentata*.

Notes on floristic diversity. No clear-cut floristic links exist with other plant communities of rocky ridges, but it is characterised by the absence of species in group Z (Table 8). Over utilization of veld is indicated by species groups U, AA and AH (Table 8). The average number of species encountered per sample plot is 20 and the total number for this association being 35 (three relevés) (Table 10). These numbers are the lowest recorded for this study of rocky habitats. None of the five plant taxa with conservation value are restricted to it and comprise three SCPE endemics, two near-endemics and one Red Data List taxon (Table 9).

III. *Crassula sarcocaulis*-*Aristida transvaalensis* community of rocky flats

Environmental data. Alliance of rocky flats on footslopes, midslopes and scarps of predominantly norite hills and to a lesser extent pyroxenite hills. The habitat occurs on all aspects and is gently to moderately sloped (1–9°). Approximately 60–90% of the soil surface is covered by rocks with a relatively large average diameter of >10 m (Table 10). Soils are sandy and humus-rich.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group X (Table 8). The vegetation unit is dominated by forbs, with the most predominant diagnostic taxa including *Crassula swaziensis*, *Craterostigma wilmsii*, *Oldenlandia herbacea* and *Pearsonia cajanifolia*. The diagnostic grasses are *Aristida adscensionis*, *Eragrostis capensis*, *E. pseudosclerantha* and *Melinis repens*. Other prominent plant taxa of the association include the fern *Pellaea calomelanos*, the shrubby *Xerophyta retinervis*, the succulents *Aloe castanea* and *Crassula sarcocaulis*, and the grasses *Aristida transvaalensis* and *Eragrostis racemosa*.

Notes on floristic diversity. A strong floristic affinity exists with the alliance of rocky ridges, which is confirmed by species group Z (Table 8). The average number of species encountered per sample plot is 29, with the total number of plant species being a minimum of 75 taxa (14 relevés) (Table 10). This alliance has 10 plant taxa with conservation value, of which two are SCPE endemics, seven SCPE near-endemics and four Red Data List taxa. No taxa are restricted to the alliance.

13. *Munduleo sericeae*-*Euphorbietum cooperi* ass. nova hoc loco

Nomenclatural type: relevé 30 (holotypus)

Environmental data. The habitat is shrubby and grassy rocky flats of the Roosenekal Subcentre. It occurs on north, south and west aspects of footslopes, midslopes and scarps of undulating norite hills. It lies on gentle slopes (1–3°) and is found predominantly on moist, humus-rich sandy soils. Approximately 20–80% of the soil surface is covered by rocks, with an average size of >10 m in diameter (Table 10).

Diagnostic and dominant/prominent taxa. Characteristic species are presented in species group V (Table 8). There are diagnostic herbaceous species for this association, namely the fern *Cheilanthes involuta*, the geophyte *Stylochiton natalense*, and the forbs *Dioscorea dregeana* and *Orthosiphon amabilis*. Diagnostic trees/shrubs include a short-stemmed form of the succulent *Euphorbia cooperi* and *Vangueria infausta*. *Aristida scabrivalvis* and *Microchloa caffra* are the diagnostic grasses. The succulent *Crassula swaziensis* and woody *Myrothammus flabellifolia* are dominant forbs of the association. Prominent shrubs are *Euclea crispa*, *Mundulea sericea* and *Rhoicissus tridentata*. *Aristida transvaalensis*, *Eragrostis pseudosclerantha*, *E. racemosa* and *Heteropogon contortus* are frequent occurring grasses.

Notes on floristic diversity. A strong floristic relationship exists with association 14 in species group X, and with the other associations in species groups Z and AA (Table 8). The average number of species encountered per sample plot in this association is 30, with the total number of plant species being 66 taxa (six relevés) (Table 10). None of the seven plant taxa of conservation value, namely two SCPE endemics, four near-endemics and three Red Data List taxa are restricted to the association (Table 9).

14. *Crassulo sarcocaulis*-*Aristidietum transvaalensis* ass. nova hoc loco

Nomenclatural type: relevé 58 (holotypus)

Environmental data. This is a grassy rocky flat of humus-rich sandy soils. It covers moderately sloped footslopes of 3–9° on all aspects of undulating norite and pyroxenite hills. The habitat occurs on footslopes, midslopes and scarps. Approximately 60–90% of the soil surface is covered by large rocks, with an average size of >10 m in diameter (Table 10).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group W (Table 8). Herbs are diagnostic of this community, namely the fern *Cheilanthes eckloniana* and fern-ally *Selaginella dregei*, the forbs *Kedrostis foetidissima*, *Thesium burkei* and *Xerophyta villosa*, and the succulents *Crassula alba*, *Euphorbia schinzii*, *Kalanchoe luciae* and *Kleinia longiflora*. *Rhus wilmsii* is a diagnostic woody suffrutex. Other taxa of importance are the grasses *Aristida transvaalensis* and *Melinis*

nerviglumis. The succulents *Aloe castanea* and *Crassula sarcocaulis* are conspicuous members of the association.

Notes on floristic diversity. Floristically the association is strongly related to association 13 in species group X and shows a strong link with association 7 in species group Y (Table 8). The average number of species encountered per sample plot is 27, with the total number of plant species being 75 taxa (eight relevés) (Table 10). There are 10 taxa of conservation value occurring in the association, namely two SCPE endemics, seven near-endemics and four Red Data List taxa (Table 9) that are the highest number of Red Data taxa recorded for an association.

IV. *Celtis africana*-*Panicum deustum* community of rocky refugia

Environmental data. In the SCPE this alliance represents dense woodlands or thickets of rocky refugia. It is a rare vegetation type and can be found on southerly aspects of valleys, and mountain footslopes, midslopes and crests. The habitat is characterised by large norite boulders of minimum 2 m high and the average rock diameter approximately 0.5–2.5 m, while covering approximately 10–70% of the soil surface. It is characterised by gentle to moderate slopes (1–7°). Soil types are characterised as a red or black clay base on unconsolidated material and include the Mayo (lithocutanic B-horizon) and the Oakleaf (neocutanic B-horizon) forms.

Diagnostic and dominant/prominent taxa. Species group AF (Table 8) contains the diagnostic species for this alliance in the SCPE, which are the trees *Calodendrum capense* and *Celtis africana*, the shrubs *Diospyros whyteana* and *Ehretia whyteana*, and the succulent *Aloe arborescens*. Other prominent plant taxa include the woody species *Acacia ataxacantha*, *Allophyllus africanus*, *Halleria lucida*, *Hippobromus pauciflorus* and *Ziziphus mucronata*. *Panicum deustum* is the dominant grass of the alliance.

Notes on floristic diversity. A strong floristic affinities exist with associations 4, 5 and 6 in species group AG (Table 8), which shows its relationship with the SCPE. The average number of species encountered per sample plot is 36, with the total number of plant species

being a minimum of 68 taxa (11 relevés) (Table 10). There are four taxa of conservation value associated with the alliance, namely one SCPE endemic and three SCPE near-endemics (Table 9). Of these taxa two are restricted to the alliance.

15. *Clauseno anisatae–Diospyretum whyteanae* ass. nova hoc loco

Nomenclatural type: relevé 67 (holotypus)

Environmental data. In the Roossenekal Subcentre this association represents wooded rocky refugia, sometimes associated with boulders around caves, boulders in kloofs and below cliffs, or stonewalls of old kraals. It is a vegetation unit on red clay soils of the Mayo and Oakleaf forms. These units occur on footslopes and midslopes of undulating norite hills. The gentle slopes vary from 3–7° and east-south-west aspects are predominant. Rock cover percentage vary from 10–40% and average rock diameter is 1–1.5 m (Table 10).

Diagnostic and dominant/prominent taxa. Species group AB contains the diagnostic species for this association (Table 8). Trees are diagnostic of the association, namely the succulent *Aloe marlothii*, *Clausena anisata*, *Clerodendrum glabrum*, *C. myricoides*, *Ficus thonningi* and *Obetia tenax*. A few diagnostic forbs are *Abutilon austro-africanum*, *Cyathula cylindrica*, *Hermannia floribunda* and *Scadoxus puniceus*. Diagnostic grasses include *Brachiaria brizantha*, *Digitaria sanguinalis*, *Setaria verticillata* and *Urochloa mossambicensis*. Other important dominant taxa include the woody species *Acacia ataxacantha*, *Allophyllus transvaalensis*, *Celtis africana* and *Diospyros whyteana*, the forb *Pavonia burchellii*, and the grasses *Panicum deustum* and *P. maximum*.

Notes on floristic diversity. A floristic link exist with association 16 in species group AD and association 17 in species group AF (Table 8). The average number of species encountered per sample plot is a high 41 (Table 10). The total number of plant species for this association is 68 (six relevés). One taxon of conservation value occurs in this association, namely an undescribed endemic *Cyphostemma* species (Siebert 1383).

16. *Fico sur*–*Combretetum erythrophyllii* ass. nova hoc loco

Nomenclatural type: relevé 182 (holotypus)

Environmental data. This vegetation type is woodlands next to rivers in the valleys between mountains. The habitat lies between norite outcrops on black and red clay soils derived from alluvium. It lies on gentle slopes of 3–5°. Soils are predominantly the Mayo and Oakleaf forms. Approximately 20–70% of the soil surface is covered by rocks, with an average diameter of 0.5–2.5 m (Table 10).

Diagnostic and dominant/prominent taxa. The diagnostic species are represented by species group AC (Table 8), and include the woody species, *Acacia galpinii*, *Combretum erythrophyllum*, *Ficus sur*, *Flueggea virosa*, *Melia azedarach* (naturalised alien) and *Spirostachys africana*. The diagnostic forbs are *Achyranthes aspera*, *Barleria obtusa*, and the climbers *Cardiospermum corindum* and *Secamone acutifolia*. *Celtis africana* and *Schotia brachypetala* are other prominent trees of the association. Important dominant grasses include *Panicum deustum* and *P. maximum*.

Notes on floristic diversity. The association shows a strong floristic link exist with association 15 in species group AD, and a specific afromontane link with association 17 in species group AF (Table 8). The average number of species encountered per sample plot is 33, with the total number for this association being 64 (three relevés) (Table 10). It has one taxon of conservation value, namely one near-endemic (Table 9).

17. *Andrachno ovalis*–*Allophylletum transvaalensis* ass. nova hoc loco

Nomenclatural type: relevé 406 (holotypus)

Environmental data. This is an association of relict Afromontane Forests on the crest of the Leolo Mountains. It is associated with norite substrates and boulders of 2–6m high. The habitat has a southerly aspect and a gentle slope of 1–3°. Approximately 20–40% of the soil surface is covered by rocks with an average diameter of 500–750 mm (Table 10). Soil is black clay of the Oakleaf form.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group AE (Table 8). The vegetation unit is dominated by diagnostic woody species, namely *Andrachne ovalis*, *Gymnosporia* sp. nov. A, *Ilex mitis*, *Kiggelaria africana*, *Prunus africana* and *Senna occidentalis*. Diagnostic forbs include *Polygala virgata*, *Senecio tamoides*, *Solanum aculeastrum* and *Urtica lobulata*. Other conspicuous taxa are the tree *Halleria lucida*, the climber *Clematis brachiata* and the grass *Panicum deustum*.

Notes on floristic diversity. Strong floristic affinities exist with associations 15 and 16 (species group AF) in species groups AF and AG (Table 8). However, this is not a true rock outcrop vegetation type, but due to the undersampling of these forests (2 relevés), it was group here. Only two species depauperated forests were encountered. The average number of species encountered per sample plot is 35, with the total number of plant species numbering 65 taxa (two relevés) (Table 10). This association has two taxa with a conservation status, namely the near-endemics *Gymnosporia* sp. nov. A (*Van Wyk & Siebert 13351*) and *Nemesia zimbabwensis* (Table 9). Both these taxa are restricted to the association. Its relict status gives the community special conservation significance as a plant community (perhaps the rarest in the SCPE).

6.4 Vegetation key

A vegetation key is presented to aid with the identification of the various plant communities (Table 11). The definitions are broad indications of typical groups and should be seen as a guideline. A diagnostic characteristic of the vegetation or habitat is given, followed by the most diagnostic and visual species of a group. The first species is restricted to the specific group only, and the second is dominant in the group, but also occurs in other groups. Where one species is given, no species was restricted to the group only.

6.5 Ordination

On a larger scale the rocky outcrop vegetation is characterised as naturally sparsely vegetated due to the relatively high surface cover of rock, with many taxa typical for this habitat in the northern provinces of South Africa. When compared with other habitats of the

SCPE, the environmental factors for this major vegetation group is relatively homogeneous. A combination of factors such as terrain type (slope), soil texture (clay/sand content) and rockiness (rock size and rock cover), affects the species composition of these plant communities. The ordination indicated the gradients which are mainly caused by rockiness.

The scatter diagram displays the distribution of relevés along the first and second ordination axes (Figure 10). The vegetation units are represented as groups, their distribution on the scatter diagram corresponding with certain physical environmental conditions. The rockiness, slope and soil texture determines a definite gradient that is depicted by both the first (eigen value = 0.669) and second axis (eigen value = 0.456). Rockiness, slope and soil texture determines the moisture retention and drainage of the habitat. The gradient on the x-axis expresses rock cover as a percentage of the soil surface, with the left of the scatter diagram representing rocky flats with its continuous layers of rock at the soil surface and the right depicting the large boulders with large areas of open soil between them which are typical for rocky refugia. On the y-axis, the gradient indicates higher moisture availability over the long term at the top of the graph, because clayey soils on moderate slopes with large areas covered with rock remain moist over a longer period. Steep slopes with sandy soils and low rock cover dry out quickly and are at the bottom of the diagram. The first axis also exhibits a gradient with deep soils at the right and shallow soils at the left.

All these gradients correlate closely with each other and have a strong influence on the vegetation structure and species composition. The three most dominant and conspicuous taxa of each growth form (trees/shrubs/suffrutices, forbs/sedges and grasses) are given for each of the eight major vegetation types depicted in the scatter diagram (Table 12).

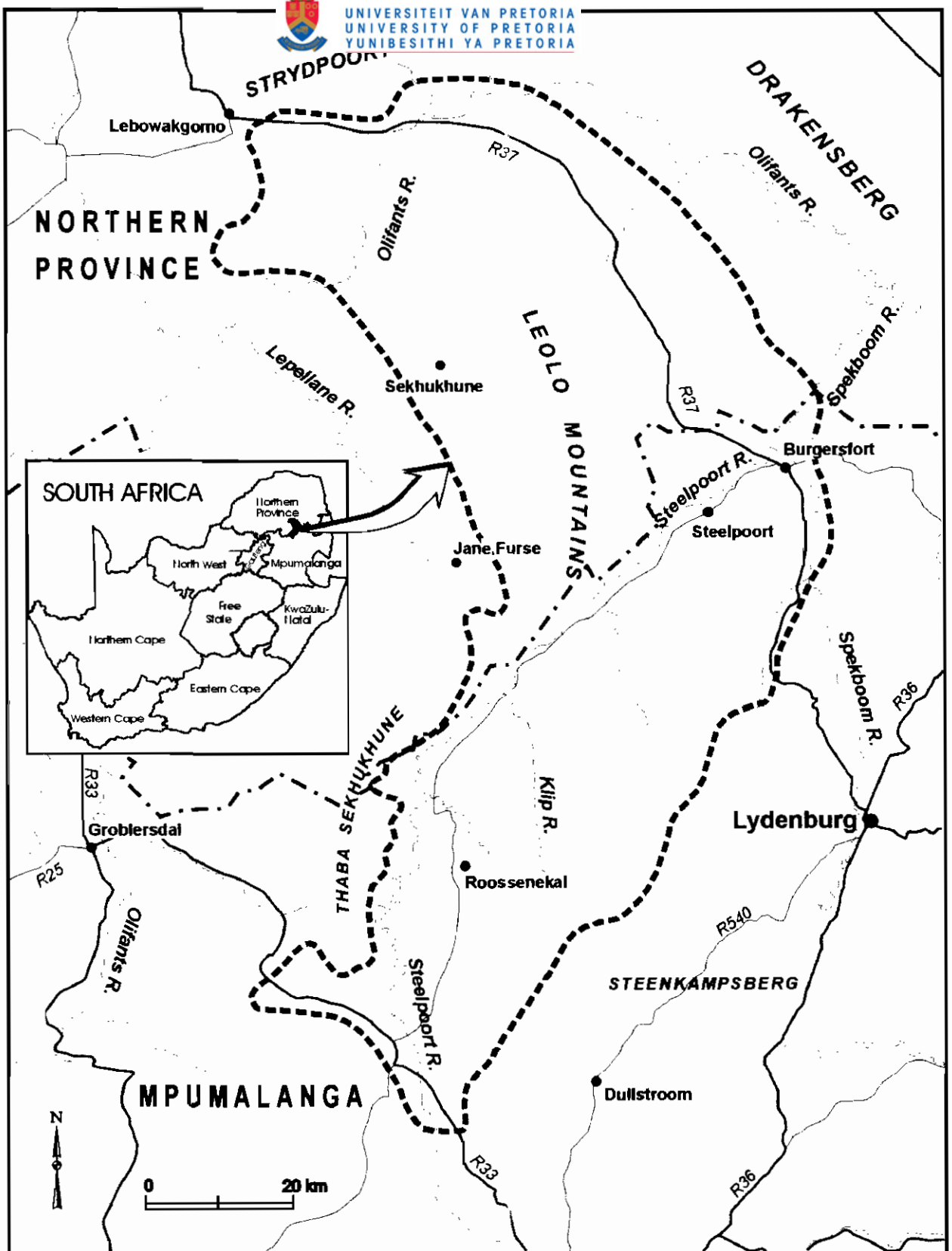


Figure 9 Extend of occurrence of the Rock Outcrop Vegetation of the Sekhukhune Centre of Plant Endemism in the Northern Province and Mpumalanga, South Africa.

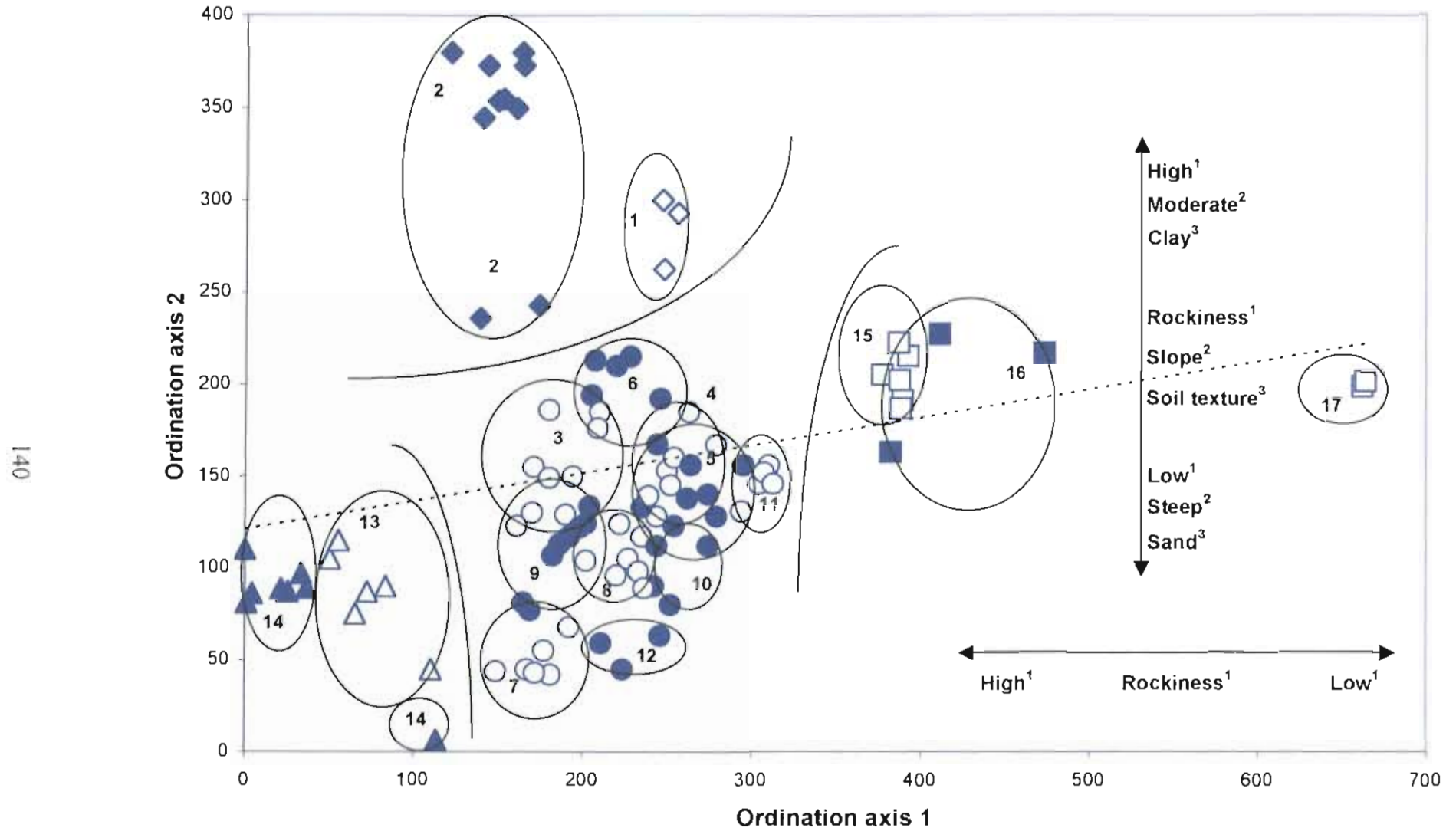


Figure 10 Relative positions of all the releves along the first and second axis of the ordination of the Rocky Outcrop Vegetation of the Sekhukhuneland Centre of Plant Endemism. Numbers correspond with the plant communities in Table 8.

Table 8 A phytosociological table of the Rock Outcrop Vegetation of the Sekhukhuneland Centre of Plant Endemism.

| Species number | I | | | | | | | | | | II | | | | | | | | | | III | | | | | | | | | | IV | | | | | | | | | |
|----------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| Subclass | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Species group A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon zeyheri</i> | | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Rhynchospora stricta</i> | R | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Eschscholzia stricta</i> | R | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | R | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Adiantum longifolium</i> | R | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Species group B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Colobosiphon macrocarpa</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus ovatus</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Adiantum oviforme</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Taraxacum officinale</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Eschscholzia stricta</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Prunella spinescens</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Taraxacum officinale</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Steganopappus amplexatus</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Stylobolus sp. (sp. 1931)</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Oxychloa tenuis strictum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Species group C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Beckia rotundifolia</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis rhodensis</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Andropogon schrederi</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Species group D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Ficus robusta</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Rhynchospora stricta</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Portulaca oleraceae</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Veronica repens</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Hypochaeris glabra</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Asperula lutea</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Asperula stricta</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Species group E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Asperula stricta</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Oxychloa tenuis strictum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Oxychloa tenuis</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Elymus ovatus</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Heliosiphon rufum</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8 continued.

| Relief number | 1 1 2 | 1 1 1 1 2 2 2 2 4 | 1 1 1 1 2 2 2 2 2 | | | 3 | 2 2 3 | 1 1 | | 1 1 2 2 2 | 3 3 3 | 3 3 3 | | 1 2 2 | 1 1 2 4 | 4 4 | | |
|--|-------|---------------------|-------------------|-----------------|---------------|---------------|---------------|---------------|-------------|-----------|-----------|-------|-------------|-----------------|-----------------------|-----------------|-----------------------|--|
| | 2 9 1 | 2 2 8 9 2 4 4 8 8 0 | 2 3 3 5 2 3 3 4 4 | 1 1 2 3 3 4 4 8 | 8 8 8 6 6 9 1 | 1 1 2 5 9 9 1 | 1 2 7 9 0 0 | 4 5 5 5 6 6 9 | 5 0 3 2 4 4 | 1 2 2 | 1 7 7 7 | 3 3 3 | 2 3 3 3 8 | 5 8 6 9 9 3 4 7 | 6 6 7 7 8 0 7 8 2 0 0 | 8 7 1 7 8 4 4 8 | 7 9 0 9 8 3 2 2 7 8 7 | |
| | 5 0 5 | 2 3 5 5 2 3 5 6 6 1 | 9 0 8 3 4 0 1 2 7 | 6 7 7 8 9 0 1 3 | 0 1 2 4 5 6 3 | 8 9 0 0 5 6 7 | 7 5 4 1 9 5 8 | 5 1 5 9 0 2 3 | 4 7 8 5 0 8 | 5 0 4 | 4 2 4 5 6 | 4 8 9 | 1 9 0 2 5 8 | 8 7 1 7 8 4 4 8 | 7 9 0 9 8 3 2 2 7 8 7 | | | |
| Alliance | I | | | I | | | I | | | I | | | I | | | I | | |
| Association | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| Species group G | | | | | | | | | | | | | | | | | | |
| <i>Diospyros lycoides</i> subsp. <i>nitens</i> | | | + R R | | + + + + + | | R R R R | + R | | R R | | | | | | | | |
| <i>Buddleia auriculata</i> | | | | R | | | | | | | | | | | | | | |
| <i>Triplaris glaucophylla</i> | | | | | | | | | | | | | | | | | | |
| <i>Leucanthon cubense</i> | | | | | | | | | | | | | | | | | | |
| <i>Buddleia salweena</i> | | | | | | | | | | | | | | | | | | |
| <i>Rhus rigida</i> | | | | | | | | | | | | | | | | | | |
| <i>Paspale leucophaea</i> | | | | | | | | | | | | | | | | | | |
| Species group H | | | | | | | | | | | | | | | | | | |
| <i>Cratogeomys argusoides</i> | | | | | | | | | | | | | | | | | | |
| <i>Lantana rugosa</i> | | | | | | | | | | | | | | | | | | |
| <i>Afrosticium reconditum</i> | | | | | | | | | | | | | | | | | | |
| <i>Chromolaena boerhaavia</i> | | | | | | | | | | | | | | | | | | |
| <i>Tricholena monochloa</i> | | | | | | | | | | | | | | | | | | |
| <i>Setaria ibidobergensis</i> | | | | | | | | | | | | | | | | | | |
| <i>Pennisetum africanum</i> | R | | | | | | | | | | | | | | | | | |
| <i>Heteromorphus trilobatus</i> | | | | | | | | | | | | | | | | | | |
| Species group I | | | | | | | | | | | | | | | | | | |
| <i>Chamaetrichum nitens</i> | | | | | | | | | | | | | | | | | | |
| <i>Sarcobatus aegyptiacus</i> | | | | | | | | | | | | | | | | | | |
| <i>Kalanchoe rotundifolia</i> | | | | | | | | | | | | | | | | | | |
| <i>Cypholobus</i> sp. B (EF 1873) | | R | | | | | | | | | | | | | | | | |
| <i>Trichopogon spicatus</i> | | | | | | | | | | | | | | | | | | |
| <i>Aloe aculeata</i> | | | | | | | | | | | | | | | | | | |
| <i>Plectranthus xenophylus</i> | | | | | | | | | | | | | | | | | | |
| <i>Triplaris auriculata</i> | | | | | | | | | | | | | | | | | | |
| <i>Cypholobus</i> sp. A (AW 1826) | | R | | | | | | | | | | | | | | | | |
| <i>Sporobolus loatiensis</i> | | | | | | | | | | | | | | | | | | |
| <i>Chorizanthe superba</i> | | | | | | | | | | | | | | | | | | |
| <i>Chrysanthemoides monnifera</i> | | | | | | | | | | | | | | | | | | |
| Species group J | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis chloromeles</i> | | | | | | | | | | | | | | | | | | |
| <i>Dombeya rotundifolia</i> | | | | | | | | | | | | | | | | | | |
| <i>Tetradlea repens</i> | | | | | | | | | | | | | | | | | | |
| <i>Cuscuta paniculata</i> | | | | | | | | | | | | | | | | | | |
| <i>Grewia occidentalis</i> | | | | | | | | | | | | | | | | | | |
| <i>Sesuvium portulacastrum</i> | | | | | | | | | | | | | | | | | | |
| <i>Commersonia bartheletii</i> | | | | | | | | | | | | | | | | | | |
| <i>Orthosiphon lobatus</i> | | | | | | | | | | | | | | | | | | |
| <i>Ficus ingens</i> | | | | | | | | | | | | | | | | | | |
| Species group K | | | | | | | | | | | | | | | | | | |
| <i>Croton gratissimus</i> | | | | | | | | | | | | | | | | | | |
| <i>Kirkia villosa</i> | | | | | | | | | | | | | | | | | | |
| <i>Aloe cryptopoda</i> | | | | | | | | | | | | | | | | | | |
| Species group L | | | | | | | | | | | | | | | | | | |
| <i>Ruellia cordata</i> | | | | | | | | | | | | | | | | | | |
| <i>Tenaxia rubra</i> | | | | | | | | | | | | | | | | | | |
| <i>Acahylla punctata</i> | | | | | | | | | | | | | | | | | | |
| <i>Aloe unguiculate</i> | | | | | | | | | | | | | | | | | | |
| <i>Sulcistraya burchei</i> | | | | | | | | | | | | | | | | | | |
| <i>Peperomia aristata</i> | | | | | | | | | | | | | | | | | | |
| <i>Bracharia serrata</i> | | | | | | | | | | | | | | | | | | |
| <i>Scilla nervosa</i> | | | | | | | | | | | | | | | | | | |
| <i>Rhynchosia spectabilis</i> | | | | | | | | | | | | | | | | | | |
| <i>Lobelia villosa</i> | | | | | | | | | | | | | | | | | | |
| <i>Pentstemon purpureus</i> | | | | | | | | | | | | | | | | | | |

Table 8 continued.

| Restiiv number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|------------------------------|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|
| Alignment | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Species group L, cont | | | | | | | | | | | | | | | | | |
| <i>A. reticulata</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>T. ruficeps</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>T. ruficeps</i> | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | | |
| <i>Species group M</i> | | | | | | | | | | | | | | | | | |
| <i>Prasopis mundula</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>P. mundula</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>Species group N</i> | | | | | | | | | | | | | | | | | |
| <i>Albizia adonifolia</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>M. adonifolia</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>Species group O</i> | | | | | | | | | | | | | | | | | |
| <i>D. ruficeps</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>A. ruficeps</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>Species group P</i> | | | | | | | | | | | | | | | | | |
| <i>A. ruficeps</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>T. ruficeps</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>Species group Q</i> | | | | | | | | | | | | | | | | | |
| <i>T. ruficeps</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>E. ruficeps</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>Species group R</i> | | | | | | | | | | | | | | | | | |
| <i>S. ruficeps</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>S. ruficeps</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| <i>Species group S</i> | | | | | | | | | | | | | | | | | |
| <i>S. ruficeps</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>S. ruficeps</i> | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |

Table 8 continued.

| Relief number | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | |
|--|----------------|-------------|----------|----------|----------|----------|----------|----------|---------|---------|---------|--------|--------|---------|--------|---------|-----------|----------|----------|-------|---------|------------|
| Relief number | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| Species group Y <i>Laburnum anagyroides</i> <i>Hydnora rigidus</i> <i>Crocosmia amplexicaulis</i> <i>Loganiaceae cordata</i> | 11121111222224 | 11111222222 | 11122222 | 11333448 | 88888913 | 67789013 | 11333448 | 88888913 | 0124563 | 8900567 | 1125991 | 127900 | 127900 | 4555669 | 159023 | 4765006 | 503244122 | 17779333 | 17779333 | 23336 | 5999347 | 6078018200 |
| Species group Z <i>Xanthophylla nitens</i> <i>Spandamoecarpus granulata</i> <i>Misodaphne senecalis</i> <i>Raphanostema pappaleif</i> <i>Trochocoma laurifolia</i> <i>Senecio laurifolius</i> <i>Melicope maritima</i> <i>Chamaecrista stracheyi</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| Species group AA <i>Arctostaphylos amabilis</i> <i>Peucedanum cabreanae</i> <i>Aloe caudiformis</i> <i>Carruthersia africana</i> <i>Villosa coccinea</i> ssp. <i>lanceolata</i> <i>Eragrostis arvensis</i> <i>Hexagonia confinis</i> <i>Cymbopogon nardus</i> | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Species group AB <i>Citronella anisata</i> <i>Uncaria macrocarpa</i> <i>Cymbopogon cylindricus</i> <i>Ombaka linearis</i> <i>Abutilon euzooides</i> <i>Cleome latifolia</i> <i>Euphorbia vermiculata</i> <i>Chenopodium glabrum</i> <i>Ficus aemula</i> <i>Homalium barbatum</i> <i>Aster spicatus</i> <i>Placotmoxis albicaulis</i> <i>Scaevola microcarpa</i> <i>Scabovola pumila</i> <i>Erigeron plumosus</i> <i>Bracteantha braunii</i> <i>Digitalis purpurea</i> | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Species group AC <i>Ficus sur</i> <i>Combretum erythrorhizon</i> <i>Acacia galeata</i> <i>Empoasca africana</i> <i>Senecio ciliatus</i> <i>Panicum arundinaceum</i> <i>Mulla senaraii</i> <i>Cardiospermum corollatum</i> <i>Aclyrus africanus</i> <i>Flueggea virosa</i> | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Species group AD <i>Favosia aurea</i> <i>Lycopodium obscurum</i> <i>Trigonotis repens</i> | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

Table 9 Sekhukhuneland Centre endemic/near-endemic and Red Data List plant taxa of the Rock Outcrop Vegetation.

| Taxon | Family | Syntaxa | | | | | | | | | | | | | | | | |
|---|--------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|----|----|----|
| | | I | | II | | | | | | | | | | III | | IV | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>Aloe castanea</i> | ASPH | #r | #r | #+ | #+ | #r | #1 | #1 | #1 | #+ | #r | #r | Sr | #1 | #+ | . | . | . |
| <i>A. pretoriensis</i> | ASPH | . | #r | #r | . | . | . | . | #+ | #1 | . | . | . | . | #+ | . | . | . |
| <i>A. reitzii</i> var. <i>reitzii</i> | ASPH | . | . | . | . | . | 1#r | . | . | . | . | . | . | . | . | . | . | . |
| <i>Asparagus intricatus</i> [form] (W&S1501) | LILI | S+ | S+ | Sr | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Berkheya insignis</i> [form] (S257) | ASTE | . | . | . | . | Sr | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Catha transvaalensis</i> | CELA | . | . | . | . | . | \$1 | \$1 | \$1 | Sr | Sr | S+ | Sr | . | . | . | . | . |
| <i>Chlorophytum cyperaceum</i> | LILI | . | . | . | . | . | #r | . | . | . | . | . | . | . | . | . | . | . |
| <i>Cyphostemma</i> sp. nov. A (W13389) | VITA | . | Sr | . | . | . | S- | Sr | Sr | . | Sr | . | . | . | . | . | . | . |
| <i>C.</i> sp. nov. B (S1383) | VITA | . | Sr | . | Sr | . | S+ | . | . | Sr | . | . | . | . | . | Sr | . | . |
| <i>Elephantorrhiza praetermissa</i> | FABA | . | . | KS1 | KSr | KS+ | KSr | KS+ | KSr | KS+ | KS- | . | KSr | KSr | KSr | . | . | . |
| <i>Eucomis montana</i> | LILI | . | . | . | . | Rr | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Euphorbia sekukuniensis</i> | EUPH | . | RSi | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Gnidia caffra</i> [form] (W12975) | TILI | . | . | . | . | \$+ | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Gymnoeporia</i> sp. nov. A (W&S13351) | CELA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | #+ |
| <i>Helichrysum albilanatum</i> | ASTE | . | . | . | . | . | . | . | . | . | #r | . | . | . | . | . | . | . |
| <i>Jasminum quinatum</i> | OLEA | . | . | . | #r | #+ | . | #r | . | . | #r | . | . | . | . | . | . | . |
| <i>Jatropha latifolia</i> var. <i>latifolia</i> | EUPH | . | . | #r | . | . | . | . | . | #+ | . | . | . | . | . | . | . | . |
| <i>Kleinia stapeliiformis</i> | ASTE | #r | . | #+ | . | . | . | #r | . | #r | . | . | . | . | . | . | . | . |
| <i>Lotononis wilmsii</i> | FABA | . | . | . | . | . | . | #+ | . | . | . | . | . | . | . | . | . | . |
| <i>Nemesia zimbabwensis</i> | SCHR | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | #r | . |
| <i>Orthosiphon fruticosus</i> | LAMI | . | . | S+ | . | . | . | . | . | Sr | Sr | . | . | . | . | . | . | . |
| <i>Pachycarpus transvaalensis</i> | ASCL | . | . | . | . | . | . | #+ | . | . | . | . | . | . | . | . | . | . |
| <i>Pavetta</i> sp. nov. (S22) | RUBI | . | Sr | \$1 | Sr | \$+ | Sr | S+ | Sr | \$1 | S+ | Sr | Sr | . | . | . | . | . |
| <i>Plectranthus verteni</i> | LAMI | . | \$+ | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

Table 9 continued.

| Taxon | Family | Syntaxa | | | | | | | | | | | | | | | | |
|---|--------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|----|----|------------|------------|-----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| <i>P. xerophilus</i> | LAMI | . | . | . | . | . | #+ | . | . | . | . | . | . | . | . | . | . | . |
| <i>Premna moolensis</i> [form] (W&S/3004) | VERB | . | S1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rhoicissus sekhukhuniensis</i> | VITA | S1 | S1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Rhus sekhukhuniensis</i> | ANAC | . | . | . | . | . | . | . | . | . | RSr | . | . | . | . | . | . | |
| <i>R. wilmsii</i> | ANAC | . | . | . | . | . | . | K#+ | K#+ | . | . | . | . | . | . | K#1 | . | |
| <i>Rhynchosia spectabilis</i> | FABA | . | #r | . | . | . | . | #+ | #r | #r | #r | . | . | . | . | #r | . | |
| <i>Scilla natalensis</i> | LILI | . | . | . | . | . | Nr | . | . | . | . | . | . | Nr | N+ | . | . | |
| <i>Stylochaeton</i> sp. (S/332) | ARAC | . | S- | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Triaspis glaucophylla</i> | MALP | . | . | #r | #r | #1 | . | #r | . | . | . | . | . | #r | #r | . | . | |
| <i>Vitex obovata</i> subsp. <i>wilmsii</i> | VERB | #r | . | #+ | #+ | #+ | #r | #1 | #1 | #1 | . | #+ | #r | #+ | #r | . | #r | |
| <i>Xerophyta retinervis</i> [form] (W/3206) | VELL | . | . | S1 | Sr | . | Sr | S+ | S+ | S1 | . | . | . | S+ | S+ | . | . | |
| <i>Zantedeschia pentlandii</i> | ARAC | . | . | . | R#+ | R#r | R#1 | R#+ | R#+ | R#r | R#r | . | . | R#r | R#r | . | . | |
| SCPE endemics | | 2 | 9 | 5 | 4 | 4 | 6 | 5 | 5 | 6 | 6 | 2 | 3 | 2 | 2 | 1 | 0 | |
| SCPE near-endemics | | 3 | 3 | 6 | 5 | 5 | 6 | 8 | 8 | 6 | 6 | 2 | 2 | 4 | 7 | 0 | 1 | |
| Red Data List | | 0 | 1 | 1 | 2 | 3 | 4 | 3 | 3 | 2 | 5 | 0 | 1 | 3 | 4 | 0 | 0 | |
| Restricted to association | | 0 | 4 | 0 | 0 | 3 | 3 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | |
| Total for association | | 5 | 12 | 11 | 9 | 10 | 13 | 13 | 13 | 12 | 12 | 4 | 5 | 7 | 10 | 1 | 2 | |

Endemism: S = endemic, # = near-endemic; **Red Data List:** 1 = Indeterminate, K = Insufficiently Known, R = Rare, N = Not threatened in the northern provinces of South Africa, but in other areas of southern Africa; **Abundance in communities:** 1 = abundant, + = frequent, r = rare, . = absent; **Collectors:** S = Siebert, W = Van Wyk; **Bold blocks represent community/syntaxon specific taxa.**

Table 10 Environmental factors and selected attributes associated with the different plant communities of the Rock Outcrop Vegetation.

| Factors/attributes | Syntaxa | | | | | | | | | | | | | | | | |
|--------------------------------------|---------|-----|--------------------------|--------------------------|--------------------------|-----|-----------|--------------------------|-----------|-----------|------|------|-------|-------|--------------------------|--------------------------|-----|
| | I | | II | | | | | | | | | | III | | IV | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Number of relevés | 3 | 10 | 9 | 8 | 7 | 7 | 7 | 7 | 6 | 3 | 5 | 3 | 6 | 8 | 6 | 3 | 2 |
| Total number of species | 46 | 91 | 89 | 105 | 110 | 103 | 109 | 109 | 89 | 75 | 64 | 35 | 66 | 75 | 68 | 64 | 65 |
| Average number of species per relevé | 31 | 27 | 30 | 46 | 46 | 39 | 40 | 34 | 33 | 34 | 34 | 20 | 30 | 27 | 41 | 33 | 35 |
| Number of endemics/ near-endemics | 5 | 12 | 11 | 9 | 9 | 12 | 13 | 13 | 12 | 12 | 4 | 5 | 6 | 9 | 1 | 1 | 2 |
| Number of Red Data List taxa | 0 | 1 | 1 | 2 | 3 | 4 | 3 | 3 | 2 | 3 | 0 | 1 | 3 | 4 | 0 | 0 | 0 |
| Geology* | H | N/P | N/P | N | N | N | M/N | F/N | N/P | N/P | H | N | N | N/P | N | A/N | N |
| Topographic position** | M/S | M/S | M/S | M/S | M/S | M/S | M/S | M/S | M/S | M/S | M/F | M/S | F/M/S | F/M/S | F/M | V | C |
| Slope (°) | 1-3 | 0-1 | 3-7 | 5-15 | 3-15 | 1-3 | 3-7 | 1-5 | 1-5 | 1-3 | 1-3 | 3-9 | 1-3 | 3-9 | 3-7 | 3-5 | 1-3 |
| Aspect | - | - | NE | N | S | - | NESW | NESW | SE | SW | - | SE | NSW | NESW | ESW | - | S |
| Predominant soil type*** | Bo | Ms | Gs ^{1/} / Ms | My ^{1/} / Mw | My ^{1/} / Mw | Ms | Ms/ Mw | Ms ^{1/} / My | Gs/ Ms | Mw/ My | Sand | Sand | Sand | Sand | My ^{1/} / Oa | My ^{1/} / On | Oa |

Table 10 continued.

| Factors/attributes | Syntaxa | | | | | | | | | | | | | | | | |
|---------------------------|---------------|---------------|---------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|----------|------------|------------|---------------|--------------|-------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Rock cover percentage (%) | 70-80 | 60-90 | 70-90 | 45-50 | 45-60 | 70-80 | 50-60 | 60-80 | 60-80 | 50-70 | 60-70 | 20-40 | 70-80 | 60-90 | 10-40 | 20-70 | 20-40 |
| Average rock size (mm) | 5500- 7000 | 2500- 8000 | 2000- 4500 | 500- 1000 | 500- 1000 | 4000- 7000 | 2500- 3000 | 3000- 5000 | 2500- 3500 | 1000- 3500 | 3500- 5500 | > 500 | > 10000 | > 10000 | 1000- 1500 | 500- 1500 | 500- 750 |

* A = alluvium; F = ferrogabbro; H = harzburgite; M = magnetite; N = norite; P = pyroxenite

** C = crest; S = scarp; M = midslope; F = footslope; V = valley

*** Bo = Bonhoim; Gs = Glenrosa; Ms = Mispah; My = Mayo; Mw = Milkwood; Oa = Oakleaf (X¹ Dominant soil type)

Table 11 A key to the syntaxa of the Rock Outcrop Vegetation of the rocky hills of the Sekhukhuneland Centre of Plant Endemism.

| Leads/description | Go to/syntaxon |
|--|--|
| 1a Tall, moist woodland (<i>Celtis africana</i> & <i>Panicum deustum</i>) | 2 |
| b Short woodland, herbland and grassland (<i>Aloe castanea</i> & <i>Euclea crispa</i>) | 3 |
| 2a Mountain crest (<i>Andrachne ovalis</i> & <i>Diospyros whyteana</i>) | 17. <i>Andrachne ovalis</i> - <i>Allophylletum transvaalensis</i> |
| b Mountain slope and valley (<i>Pavonia burckellii</i> & <i>Ziziphus mucronata</i>) | 4 |
| 3a Average rock size > 9 m (<i>Oidenlandia herbacea</i> & <i>Xerophyta retinervis</i>) | 5 |
| b Average rock size > 9 m (<i>Hippobromus pauciflorus</i>) | 6 |
| 4a Valley (<i>Combretum erythrophyllum</i> & <i>Cassine aethiopica</i>) | 16. <i>Fico sur</i> - <i>Combretetum erythrophyllii</i> |
| b Mountain slope (<i>Clausena anisata</i> & <i>Allophylus africanus</i>) | 15. <i>Clausena anisata</i> - <i>Diospyretum whyteanae</i> |
| 5a Slope 3-9° (<i>Xerophyta villosa</i> & <i>Melinis nerviglumis</i>) | 14. <i>Crassulo sarcocaulis</i> - <i>Aristidetum transvaalensis</i> |
| b Slope 1-3° (<i>Euphorbia cooperi</i> & <i>Mundulea sericea</i>) | 13. <i>Mundulea sericeae</i> - <i>Euphorbietum cooperi</i> |
| 6a Open woodland or grassland (<i>Pavetta</i> sp. nov. & <i>Cymbopogon excavatus</i>) | 7 |
| b Closed woodland (<i>Ficus abutifolia</i> & <i>Croton gratissimus</i>) | 8 |
| 7a Developed soils (<i>Combretum molle</i> & <i>Senecio latifolius</i>) | 9 |
| b Sand (<i>Heteropogon contortus</i>) | 10 |
| 8a Mispah soil (<i>Commiphora marlothii</i> & <i>Barleria rotundifolia</i>) | 2. <i>Commiphora marlothii</i> - <i>Crotonetum gratissim</i> |
| b Bonheim soil (<i>Mimusops zeyheri</i> & <i>Olinia emarginata</i>) | 1. <i>Vepro reflexae</i> - <i>Mimusopetum zeyheri</i> |
| 9a Glenrosa soil (<i>Xerophyta retinervis</i>) | 11 |
| b Other lithosols (<i>Apodytes dimidiata</i> & <i>Setaria sphacelata</i>) | 12 |
| 10a Rock cover 20-40% (<i>Enteropogon macrostachys</i> & <i>Rhacisus tridentata</i>) | 12. <i>Enteropogono macrostachys</i> - <i>Hippobrometum pauciflori</i> |
| b Rock cover 60-70% (<i>Rhamnus prinoides</i> & <i>Cymbopogon validus</i>) | 11. <i>Cymbopogono validi</i> - <i>Rhamnetum prinoidis</i> |
| 11a South-easterly aspects (<i>Aloe pretoriensis</i> & <i>Cussonia transvaalensis</i>) | 9. <i>Aloe pretoriensis</i> - <i>Xerophytetum retinervis</i> |
| b North-easterly aspects (<i>Grewia monticola</i> & <i>Elephantorrhiza praetermissa</i>) | 3. <i>Grewia monticola</i> - <i>Elephantorrhizetum praetermissae</i> |
| 12a Variety of rock substrates (<i>Catha transvaalensis</i>) | 13 |
| b Restricted to porite (<i>Dombeya rotundifolia</i> & <i>Diospyros lycioides</i>) | 14 |

Table 11 continued.

| Leads/description | Ga ta/syntaxon |
|---|--|
| 13a All aspects (<i>Scolopia zeyheri</i>) | 15 |
| b Southerly aspects (<i>Canthium mundianum</i> & <i>Ruellia stenophylla</i>) | 10. <i>Tephrosia purpureae</i> – <i>Rhoicisetum tridentatae</i> |
| 14a Slope 3–15° (<i>Setaria lindenbergiana</i> & <i>Rhus leptodictya</i>) | 16 |
| b Slope 1–3° (<i>Sansevieria aethiopica</i> & <i>Zantedeschia pentlandii</i>) | 6. <i>Gerbero jamesonii</i> – <i>Kirkietum wilmsii</i> |
| 15a Also on ferrogabbro (<i>Brachylaena rotundata</i> & <i>Gerbero jamesonii</i>) | 8. <i>Cymbopogono excavati</i> – <i>Brachylaenethum rotundatae</i> |
| b Also on magnetite (<i>Brachiaria serrata</i> & <i>Ladobouria revoluta</i>) | 7. <i>Brachiaria serratae</i> – <i>Viticoetum wilmsii</i> |
| 16a Southerly aspect (<i>Buddleja auriculata</i> & <i>Halleria lucida</i>) | 5. <i>Heteropogono contorti</i> – <i>Apodyterum dimidiatae</i> |
| b Northerly aspect (<i>Catha edulis</i> & <i>Melinis nervigulumis</i>) | 4. <i>Melino nervigulumis</i> – <i>Catherum edulis</i> |

Table 12 The three most dominant and conspicuous plant taxa of each of the major vegetation types of the Rocky Outcrop Vegetation depicted in the DECORANA scatter diagram.

| Major vegetation type | Trees/shrubs | Forbs/sedges | Grasses |
|---|---|--|--|
| I. <i>Rhoicissus sekhukhuniensis</i> – <i>Ficus abutilifolia</i> | <i>Croton gratissimus</i> <i>Ficus abutilifolia</i> <i>Vepris reflexa</i> | <i>Abutilon pycnodon</i> <i>Rhoicissus sekhukhuniensis</i> <i>Sarcostemma viminalis</i> | <i>Andropogon schirensis</i> <i>Eragrostis nindensis</i> <i>Panicum deustum</i> |
| II. <i>Cymbopogon excavatus</i> – <i>Pavetta</i> sp. nov. | <i>Hippobromus pauciflorus</i> <i>Pavetta</i> sp. nov. <i>Vitex obovata</i> subsp. <i>wilmstii</i> | <i>Cyphostemma woodii</i> <i>Rhoicissus tridentata</i> <i>Senecio latifolius</i> | <i>Cymbopogon excavatus</i> <i>Panicum deustum</i> <i>Themeda triandra</i> |
| III. <i>Aristida transvaalensis</i> – <i>Crassula sarcocaulis</i> | <i>Aloe castanea</i> <i>Euclaea oropa</i> <i>Xerophyta retinervis</i> | <i>Crassula sarcocaulis</i> <i>Crassula swaziensis</i> <i>Myrcihammus flabellifolia</i> | <i>Aristida transvaalensis</i> <i>Eragrostis pseudosclerantha</i> <i>Melinis nervigumis</i> |
| IV. <i>Panicum deustum</i> – <i>Celtis africana</i> | <i>Alliophyllum africanum</i> <i>Celtis africana</i> <i>Diaspyros whyteana</i> | <i>Aloe arborescens</i> <i>Lippia javanica</i> <i>Pavonia burcheitti</i> | <i>Panicum deustum</i> <i>Panicum maximum</i> <i>Urochloa mosambicensis</i> |

CHAPTER 7

OPEN MOUNTAIN BUSHVELD

7.1 Background

Although a number of phytosociological studies have been conducted on the bushveld (the local term equivalent to savanna) of ultramafic substrates in southern Africa (Werger *et al.* 1978; Van der Meulen 1979; Breebaart & Deutschlander 1997), several vegetation types on this type of substrate still remain poorly investigated. An example is the Mountain Bushveld identified by Siebert *et al.* (2002a) on the norite, pyroxenite and anorthosite hills and mountains of the SCPE (Van Wyk & Van Wyk 1997; Van Wyk & Smith 2001). Ultramafic mountains and hills are floristically noteworthy in that they harbour many endemics with distributions associated with this particular geological substrate (Iturralde 1995; Madulid & Agoos 1995; Siebert *et al.* 2001).

In many instances the distinction between two different plant communities in the SCPE is so pronounced, that a mere visual observation is all that is needed to observe the geological boundaries. Even when the underlying rocks are relatively similar, differences in vegetation can be observed. It has been noted that the most toxic ultramafic soils are the ones with the most depauperated vegetation types (Wild 1974). One of the most comprehensive surveys of vegetation in a single ultramafic region was conducted by Jaffré (1980) on the serpentine flora of New Caledonia. This series of papers on the vegetation of the 4 000 km² of ultramafic rock of the eastern Rustenburg Layered Suite is probably the most extensive in recent time.

Various vegetation types have been recognised on the adjacent dry dolomitic hills and mountains of the northeastern Drakensberg Escarpment (Matthews 1991; Matthews *et al.* 1992), an area adjacent to the SCPE with which it shows a definite floristic affinity (Siebert 1998). Acocks (1953) mapped the bushveld in the SCPE as three major veld types, namely

Mixed Bushveld (18), Sourish Mixed Bushveld (19) and North-Eastern Sandy Highveld (57). A more generalised classification of the same region's vegetation is given by Low & Rebelo (1996), who recognises only one major vegetation type, namely Mixed Bushveld (18). Only the plant communities of the *Combretum hereroense*-*Grewia vernicosa* Open Mountain Bushveld (Siebert *et al.* 2002a) are described in this chapter.

The area dealt with (Figure 11) is characterised by considerable diversity in geology (Kent 1980) and physiography (Land Type Survey Staff 1987; 1988; 1989), with the vegetation broadly described as undulating mountain bushveld, bordered by a Northeastern Sandy Highveld Grassland-mountain bushveld ecotone in the south and a mountain bushveld-Mixed Bushveld ecotone in the north. Most of the undulating hills and mountains of the region are predominantly covered by bushveld. The *Combretum hereroense*-*Grewia vernicosa* bushveld vegetation type is intermingled with the other major vegetation types of the SCPE, due to the heterogeneity in the environmental factors of the region (Siebert *et al.* (2002a). Fourty seven of the Sekhukhuneland endemics/near-endemics occur in this vegetation type (Siebert 1998).

Landform patterns exhibit complex behaviour (Werner 1999) and play an important role in the development of the local flora (White 1981; Siebert 1998). Two major physiographic entities are characteristic of the area of focus, namely, (1) mountain slopes and (2) valleys. Mountain slopes are defined as the scarps, midslopes and upper footslopes of undulating hills and mountains. Valleys are defined as the low-lying valleybottoms and lower footslopes between the hills and mountains, which are usually traversed by a stream, river or drainage channel.

The average annual rainfall is 578 mm (South African Weather Bureau 1998), but the rainfall pattern is strongly influenced by the local topography (Siebert 1998). Rainfall varies from as little as 400 mm in some of the valleys, to an estimated 550 mm on the lower slopes of the Leolo Mountains (Erasmus 1985). Temperatures for the study area range from 0°C to 38°C, with a daily average of 20°C (Weather Bureau 1998). The northern and western parts of the study area are on average warmer than the southern and eastern parts (Siebert 1998) and exhibit average daily temperatures of 28.3°C maximum and 7.2°C minimum.

7.2 Classification

The final TWINSpan division of the main table (415 relevés) separated the *Kirkia wilmsii*–*Terminalia prunioides* Closed Mountain Bushveld from the *Combretum hereroense*–*Grewia vernicosa* Open Mountain Bushveld (Siebert *et al.* 2002a). This was a marginal division, with both bushveld vegetation types sharing the majority of their species and occurring in the same terrain types on mountain/hill slopes and in valleys. An eigenvalue of 0.39 (n = 194) was obtained at the division level, which indicates a suitable gradient between the two vegetation types for an accurate TWINSpan. Ten significant preferential species were used for the division of the two vegetation types and are listed in Table 13, together with five non-preferential ones.

Analysis of the *Combretum hereroense*–*Grewia vernicosa* Open Mountain Bushveld resulted in the identification of 20 plant communities, which are grouped as eight associations and 18 sub-associations (Table 14). These were subsequently hierarchically classified. Two major groups are recognised on the grounds of the physical environment, namely mountain slopes or valleys. Hence, macro-climatic and/or geological variation plays a role in the development of the Open Mountain Bushveld, but terrain type (topography) is responsible for local differentiation of the plant communities. The major plant communities relate to soil character and slope, which are determined by the terrain type. Associations are distinctive and easily distinguishable in the field. This might be attributed to the uniformity of the environmental factors for each of the six major vegetation groups that created a distinct distribution pattern of habitats and associated vegetation.

The hierarchical classification of the vegetation reinforces the correlation between habitat and plant communities (Figure 12). The distribution of Sekhukhuneland Centre endemic/near-endemic and Red Data List taxa among various plant communities is listed in Table 15. A summary of selected community attributes is supplied in Table 16.

Plant communities of the *Combretum hereroense*–*Grewia vernicosa* Open Mountain Bushveld recognised in the Centre are classified as follows:

I. *Enneapogon scoparius*–*Combretum molle* community of mountain slopes

1. *Enteropogono macrostachyo*–*Sclerocaryetum birreae*
 - 1.1 *Enteropogono macrostachyo*–*Sclerocaryetum birreae asparagetosum sekukuniensis*
 - 1.2 *Enteropogono macrostachyo*–*Sclerocaryetum birreae grewietosum vernicosae*
2. *Enneapogono scoparii*–*Acacietum leiorachis*
 - 2.1 *Enneapogono scoparii*–*Acacietum leiorachis chloretosum virgatae*
 - 2.2 *Enneapogono scoparii*–*Acacietum leiorachis grewietosum flavescens*
 - 2.3 *Enneapogono scoparii*–*Acacietum leiorachis brachylaenetosum ilicifoliae*
 - 2.4 *Enneapogono scoparii*–*Acacietum leiorachis commiphoretosum mollis*
3. *Phyllantho glaucophyllae*–*Brachylaenetum ilicifoli*
 - 3.1 *Phyllantho glaucophyllae*–*Brachylaenetum ilicifoli setarietosum sphacelatae*
 - 3.2 *Phyllantho glaucophyllae*–*Brachylaenetum ilicifoli brachiarietosum serratae*
4. *Tristachyo leucothricis*–*Cussonietum transvaalensis*
 - 4.1 *Tristachyo leucothricis*–*Cussonietum transvaalensis myrothamnetosum flabellifolius*
 - 4.2 *Tristachyo leucothricis*–*Cussonietum transvaalensis melinetosum nerviglumis*
 - 4.3 *Tristachyo leucothricis*–*Cussonietum transvaalensis argylobietosum wilmsii*
 - 4.4 *Tristachyo leucothricis*–*Cussonietum transvaalensis combretetosum zeyheri*

II. *Loudetia simplex*–*Combretum hereroense* community of valleys

5. *Eragrosti lehmanniana*–*Hippobrometum pauciflori*
 - 5.1 *Eragrosti lehmanniana*–*Hippobrometum pauciflori rhoetosum batophyllae*
 - 5.2 *Eragrosti lehmanniana*–*Hippobrometum pauciflori sorgetosum bicoloris*
 - 5.3 *Eragrosti lehmanniana*–*Hippobrometum pauciflori elionuretosum mutici*
6. *Aristido rhiniochloa*–*Gnidietum polycephalae*
7. *Loudetio simplicis*–*Eucleetum linearis*
 - 7.1 *Loudetio simplicis*–*Eucleetum linearis diheteropogonetosum amplexentis*
 - 7.2 *Loudetio simplicis*–*Eucleetum linearis heteropogonetosum contorti*
 - 7.3 *Loudetio simplicis*–*Eucleetum linearis andropogonetosum chinensis*
8. *Petalidio oblongifolii*–*Raphionacmetum procumbentis*

7.3 Description

The *Combretum hereroense*–*Grewia vernicosa* Open Mountain Bushveld is predominantly restricted to the warm slopes and valleys of undulating ultramafic hills and mountains. Surface rocks are predominant and abundant in the various habitats, with average rock size varying between 200 and 1 000 mm (20–70% surface cover) on the slopes of hills and between 100 and 400 mm (10–50% surface cover) in the valleys. The vegetation can be classified into broad-leaved woodlands (Edwards 1983). A noteworthy feature of this bushveld type is the fact that it constitutes a unique habitat or “island” which differs significantly from the surrounding habitats regarding microhabitat and vegetation.

I. *Enneapogon scoparius*–*Combretum molle* community of mountain slopes

Environmental data. The vegetation is an open broad-leaved bushveld of mountain slopes. The alliance is found on all aspects, but predominantly southern aspects. It occurs on steep slopes (3–18°) on mainly midslopes, but also to a lesser degree on scarps, crests and footslopes (Table 16). Soil is shallow and constitutes rocky Mispah and Glenrosa forms. The soil surface is covered by 20–70% of rock with an average diameter of 0.3–1 m (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group S (Table 14) and include the trees *Combretum apiculatum*, *C. molle*, *Dombeya rotundifolia*, *Kirkia wilmsii* and *Ozoroa spahaerocarpa* and the shrubby climbers *Acacia ataxacantha* and *Asparagus laricinus*. Diagnostic grasses include *Enneapogon scoparius*, *Eragrostis chloromelas* and *Panicum maximum*. Diagnostic herbaceous taxa include the forbs *Justicia protracta*, *Thesium burkei* and *Tephrosia purpurea*. *Pellaea calomelanos* is the diagnostic fern and *Aloe castanea* the diagnostic succulent.

Notes on floristic diversity. Floristic links with the other alliance is visible in species groups W, AC, AF, AG and AH (Table 14). The weak links supports the recognition of the alliance. The average number of species encountered per sample plot for this alliance is 38, with the total number of plant species being a minimum of 130 taxa (55 relevés) (Table 16).

There are 35 plant taxa of conservation value, 21 are SCPE endemics, 12 are SCPE near-endemics and eight are Red Data List taxa (Table 15). Of these taxa, 11 are restricted to this alliance in the SCPE.

1. *Enteropogono macrostachyo–Sclerocaryetum birreae* ass. nova hoc loco

Nomenclatural type: relevé 413 (holotypus)

Environmental data. The vegetation representing this association is sparse short woodland on the lower slopes and foothills of the north-south trending Leolo Mountains. It is mostly found on the east and west aspects of the mountain range. The habitat is rocky with moderate slopes (3–7°) (Table 16). The dominant soil type is the Glenrosa form, an ortic A-horizon over a lithocutanic B. Average rock size varies from 200 to 750 mm in diameter and covers 10 to 70% of the soil surface.

Diagnostic and dominant/prominent taxa. Characteristic species are represented by species group A (Table 14). *Sclerocarya birrea* is the diagnostic tree of the association, *Hibiscus coddii* and *Stylochaeton natalensis* the diagnostic forbs, and *Enteropogon macrostachys* the diagnostic grass. Other dominant woody species include *Croton gratissimus*, *Dichrostachys cinerea* and *Grewia vernicosa*. *Heteropogon contortus* and *Themeda triandra* are the most dominant grasses and *Hibiscus coddii* the most conspicuous forb.

Notes on floristic diversity. This bushveld community is scarce in the SCPE and only a slight floristic affinity exist with other slope bushveld communities of the SCPE in species groups G and S (Table 14). Twelve taxa with conservation status are present in the association (Table 15), the lowest number recorded for an association in this paper. Nine are SCPE endemics and three are SCPE near-endemics, of which three are Red Data List taxa. Three of these plant taxa are restricted to the association. The average number of species encountered per sample plot is 31, with the total number for this association being a minimum of 64 plant taxa (six relevés) (Table 16).

1.1 *Enteropogono macrostachyo-Sclerocaryetum birrae asparagetosum sekukuniensis*
sub-ass. nova hoc loco

Nomenclatural type: relevé 413 (holotypus)

Environmental data. The vegetation is sparse woodland on the western midslopes of the Leolo Mountains and its foothills. This association characterises exposed ferrogabbro with moderately sloped sides of 7° (Table 16). The surface rock cover percentage is relatively high, namely 60–70%, with the exposed rocks reaching average diameters for the study area, which is 500–750 mm in diameter (Table 16). The dominant soil type is the Glenrosa form.

Diagnostic and dominant/prominent taxa. In the SCPE this association is characterised by species group B (Table 14). *Combretum petrophilum*, *Croton menyhartii* and *Pavetta eylesii* are the diagnostic woody species of this syntaxon. Diagnostic forb species include *Asparagus intricatus*, *A. sekukuniensis*, *Boerhavia erecta* and *Hermannia floribunda*. The diagnostic grasses are *Botriochloa insculpta* and *Digitaria eriantha*. *Enteropogon macrostachys*, *Eragrostis chloromelas* and *Heteropogon contortus* are the most prominent grasses. *Corchorus asplenifolius*, *Evolvulus alsinoides* and *Tephrosia purpurea* are the dominant forbs. Other prominent plants are the woody species *Grewia vernicosa*, *Dichrostachys cinerea* and *Sclerocarya birrea*, and the suffrutex *Gymnosporia* sp. B (*Van Wyk 13052*).

Notes on floristic diversity. This plant community exhibits a strong floristic link with the slopes of Thaba Sekhukhune (sub-association 2.1) and the slopes of the Schurinksberg (sub-association 2.2) in species group G (Table 14). Eight plant taxa of conservation value occur in this sub-association (Table 15), namely five SCPE endemics and three SCPE near-endemics, of which three are Red Data List taxa. Three plant taxa of conservation value are restricted to this sub-association, namely an endemic form of *Asparagus intricatus*, the SCPE endemic *Asparagus sekukuniensis* (Insufficiently Known on the Red List) and the SCPE near-endemic *Combretum petrophilum* (Rare on the Red List). This is the highest number of taxa with conservation value restricted to a sub-association in this paper. The

average number of species per relevé is 40, and the total number of species recorded for the association is 45 (two relevés) (Table 16).

1.2 *Enteropogono macrostachyo–Sclerocaryetum birreae grewietosum vernicosae* sub-ass. nova hoc loco

Nomenclatural type: relevé 337 (holotypus)

Environmental data. The vegetation is short open woodland on the northern and eastern midslopes and foothills of the Leolo Mountains. It is associated with predominantly exposed pyroxenite and norite (to the west of the study area it becomes ferrogabbro). The sub-association is found on gentle to moderate slopes (3–7°) (Table 16). Soils are predominantly of the Glenrosa form (in certain communities the Steendal form (melanic A-horizon over a soft carbonat horizon) intersperse with the lithosols). The soil surface is covered by 10–40% of rock with a diameter of 200–500 mm (Table 16).

Diagnostic and dominant/prominent taxa. Characteristic species of the association are represented by species group C (Table 14). Woody species diagnostic of the association include *Diospyros lycioides* subsp. *sericea*, *Rhigozum obovatum*, *Rhus gueinzii*, *Vangueria infausta*, the semi-succulent shrub *Senecio barbertonicus* and the woody climber *Rhoicissus tomentosus*. The diagnostic grasses are *Aristida transvaalensis*, *Sporobolus ioclados* and *S. nitens*. *Hemizygia albiflora* is the diagnostic forb. Other prominent trees of the sub-association are *Combretum hereroense*, *Croton gratissimus*, *Euclea crispa*, *Grewia vernicosa* and *Sclerocarya birrea*. Dominant grasses are *Eragrostis lehmanniana*, *Heteropogon contortus* and *Themeda triandra*. *Psiadia punctulata* is the most conspicuous forb of the sub-association.

Notes on floristic diversity. A notable floristic link exists with sub-associations 2.1 and 2.2, in species group G (Table 14). There are six plant taxa of conservation value in the association, the lowest number of all the sub-associations. Four taxa are SCPE endemics, two are SCPE near-endemics (both figures are of the lowest for the paper) and one is a Red Data List taxon (Table 15). None are restricted to the sub-association. The average number

of species encountered per sample plot in this association is 27, with the total number of plant species being 64 taxa (4 relevés) (Table 16).

2. *Enneapogono scoparii–Acacietum leiorachis* ass. nova hoc loco

Nomenclatural type: relevé 249 (holotypus)

Environmental data. In the SCPE this association occurs as tall, dry woodland stands on mountain slopes running into the Steelpoort River Valley. The habitat of the association is heterogeneous with no two communities exhibiting the same environmental factors. It occurs on relatively steep slopes on all aspects of various geological substrates. Rock cover and average rock size vary considerably, namely 20–75% of the soil surface and a relatively large diameter of 0.4–1.5 m, respectively (Table 16).

Diagnostic and dominant/prominent taxa. Species group D contains the diagnostic species for this association, which are characterised by the tree *Acacia senegal* var. *leiorachis*, the shrub *Grewia flava*, and the grass *Aristida meridionalis* (Table 14). Other prominent species of the sub-association include the trees/shrubs *Brachylaena ilicifolia*, *Kirkia wilmsii*, *Tinnea rhodesiana* and *Triaspis glaucophylla*, the forbs *Asparagus larinicus*, *Commelina africana* and *Thesium burkei*, the succulent *Aloe cryptopoda*, and the grasses *Panicum maximum* and *Themeda triandra*.

Notes on floristic diversity. A strong floristic affinity exists with associations 3 and 4 in species groups R and S (Table 14), and a slight link exists with the valley vegetation in species groups W and AC. Twenty-one taxa of conservation value are part of the association, of which one is restricted to it (Table 15). There are 13 SCPE endemics, seven near-endemics and two Red Data List species. The average number of species encountered per sample plot in this sub-association is 39, with the total number of plant species being a minimum of 122 taxa (20 relevés) (Table 16).

2.1 *Enneapogono scoparii–Acacietum leiorachis chloretosum virgatae* sub-ass. nova hoc loco

Nomenclatural type: relevé 291 (holotypus)

Environmental data. This sub-association is tall, open woodland of the peripheral hills running along the western borders of the Centre. It occurs on the midslopes of the Thaba Sekhukhune and its associated foothills on northern and eastern aspects. The substrate is granofire and ferrogabbro, which give rise to Glenrosa form soils. The soil surface is covered by 30–40% rock, of an average size of 500–600 mm in diameter (Table 16). Slope of the habitat is moderately steep, usually 7–9°.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group E (Table 14). Diagnostic herbs include *Indigofera holubii*, *Justicia odora* and *Vigna unguiculata*. *Acacia nigrescens*, *Bridelia mollis*, *Grewia monticola*, *Maytenus senegalensis*, *Peltophorum africanum* and *Strychnos madagascariensis* are the diagnostic woody species. *Aristida bipartita*, *Chloris virgata*, *Eragrostis rigidior* and *Pogonarthria squarrosa* are the diagnostic grasses. The sub-association is dominated by small trees/shrubs of which *Acacia ataxacantha*, *Combretum apiculatum*, *C. molle*, *Dombeya rotundifolia*, *Kirkia wilmsii*, *Tinnea rhodesiana* and *Triaspis glaucophylla*, are the most dominant. Conspicuous succulents are *Aloe castanea* and *A. marlothii*. Dominant grasses include *Aristida canescens*, *Diheteropogon amplexans*, *Enneapogon scoparius*, *Sporobolus stapfianus* and *Themeda triandra*.

Notes on floristic diversity. It is doubtful whether this sub-association belongs with either association 1 or 2. This sub-association was included into association 2 on grounds of TWINSpan. The community has a floristic identity with association 1 in species group G, and association 2 in species group D (Table 14). It is, however, excluded from association 2 in species groups R and S. Six taxa are of conservation significance—together with sub-association 1.2 the lowest number recorded for the paper. Three SCPE endemics, three near-endemics (both of the lowest numbers for the paper) and one Red Data List taxon, *Rhus sekhukhuniensis*, are found in this sub-association (Table 15). No taxa with

conservation status are restricted to it. The average number of species encountered per sample plot is 36, with the total number for this variant being 55 (four relevés) (Table 16).

2.2 *Enneapogono scoparii–Acacietum leiorachis grewietosum flavescens* sub-ass. nova
hoc loco

Nomenclatural type: relevé 271 (holotypus)

Environmental data. This sub-association represents tall, open woodland with a well developed grass layer, of northern, southern and western aspects. The habitat is mostly restricted to pyroxenite, anorthosite and magnetite hills, where the grasslands of the Leolo and Roosenekal Subcentres meet the bushveld of the Steelpoort Subcentre (Siebert *et al.* 2002a). It occurs on midslopes and scarps, on ortic A-horizon and lithocutanic B-horizon soils of the Glenrosa and Mispah forms, as well as patches of pedocutanic soils types. It lies on gently sloped areas (3–5°). Rock cover on the surface is 20–30%, with rocks reaching a medium size of 0.4–1 m in diameter (Table 16).

Diagnostic and dominant/prominent taxa. No diagnostic species occur in this sub-association; it is characterised by the absence of the diagnostic species presented for sub-association 2.1 in species group F (Table 14). Dominant herbaceous taxa include the forbs *Barleria saxatilis*, *Leucas capensis*, *Monechma divaricatum*, *Orthosiphon fruticosus* and *Petalidium oblongifolium*. Dominant woody taxa include *Acacia senegal* var. *leiorachis*, *Brachylaena ilicifolia*, *Grewia flavescens*, *Jasminum multipartitum* and *Terminalia prunoides*. Dominant grasses are *Aristida canescens*, *Enneapogon scoparius*, *Sporobolus stapfianus* and *Themeda triandra*.

Notes on floristic diversity. The association has a grassland affinity with the Roosenekal Subcentre that is not obvious in Table 14. Species group G (Table 14) shows the relationship with association 1. Six SCPE endemics and six near-endemics were recorded in this sub-association (Table 15). Of its 12 taxa of conservation value, only one, a form of *Bauhinia tomentosa*, is restricted to it. This is the only sub-association in the study area with no Red Data List taxa present. The average number of species encountered per sample plot is 34. It has a total number of 78 plant taxa (four relevés) (Table 16).

2.3 *Enneapogono scoparii–Acacietum leiorachis brachylaenetosum ilicifoliae* sub-ass. nova hoc loco

Nomenclatural type: relevé 156 (holotypus)

Environmental data. This sub-association represents shorter open woodlands of hill slopes in the Steelpoort River Valley where it is restricted to southern aspects. It prefers midslopes and scarps of norite, pyroxenite and anorthosite hills with a moderate to steep slope (5–12°). It occurs on lithosols of the Mispah and Glenrosa forms. Approximately 35–60% of the soil surface is covered by rocks, with a medium size of 0.4–1 m in diameter (Table 16).

Diagnostic and dominant/prominent taxa. Characteristic species are represented by species group H (Table 14). The diagnostic species found in this variant are predominantly herbaceous, namely *Dolichos trilobus*, *Dyschoriste fischeri*, *Euryops transvaalensis*, *Felicia clavipilosa*, *Indigofera lydenburgensis* and the undescribed taxon, *Stylochaeton* sp. (Siebert 1332). The only diagnostic woody species is *Berchemia zeyheri*. Other conspicuous woody species are *Acacia senegal* var. *leiorachis*, *Brachylaena ilicifolia*, *Diospyros lycioides* subsp. *nitens*, *Dombeya rotundifolia*, *Grewia flava*, *Ormocarpum kirkii*, *Tarchonanthus camphoratus* and *Vitex obovata* subsp. *wilmsii*. Dominant grasses include *Aristida congesta*, *Enneapogon scoparius*, *Eragrostis curvula*, *Panicum deustum*, *P. maximum* and *Themeda triandra*.

Notes on floristic diversity. Floristic affinities for the sub-association are the same as for the association. However, in addition, it shows a floristic affinity with associations 4 and 5 in species group W (Table 14). Eleven SCPE endemics, seven SCPE near-endemics and one Red Data List species, *Elephantorrhiza praetermissa*, are found in this sub-association (Table 15). Of its 18 taxa of conservation value, not one is restricted to the sub-association. The average number of species encountered per sample plot is 42, which is the highest average in this paper (Table 16). It also has the second highest total number of plant taxa of all the sub-associations, namely 122 (six relevés) (Table 16).

2.4 *Enneapogono scoparii-Acacietaum leiorachis commiphoretosum mollis* sub-ass. nova
hoc loco

Nomenclatural type: relevé 249 (holotypus)

Environmental data. This vegetation type is tall woodland, dominated by herbs, and associated with scarps on all aspects of exposed norite, pyroxenite and anorthosite hills in the Steelpoort River Valley. The sub-association occurs on soils of the Mispah form. It lies on relatively steep sloped areas (9–15°). Rock cover of the surface is high, between 45 and 75%, with a relatively large average rock diameter between 0.5–1.5 m (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species for this sub-association are listed in species group I (Table 14). Diagnostic trees/shrubs are *Commiphora mollis* and *Sterculia rogersii*, and diagnostic forbs are *Clerodendrum ternatum* and *Ipomoea magnusiana*. No diagnostic grasses occur. Prominent small trees/shrubs for this vegetation unit are *Acacia senegal* var. *leiorachis*, *Combretum apiculatum*, *Elephantorrhiza praetermissa*, *Jasminum multipartitum*, *Kirkia wilmsii* and *Terminalia prunoides*. *Enneapogon scoparius*, *Heteropogon contortus*, *Panicum deustum* and *Themeda triandra* dominate the grass layer. The herbaceous layer is prominent and includes species such as *Asparagus laricinus*, *Chaetacanthus costatus*, *Commelina africana*, *Jatropha latifolia*, *Justicia protracta*, *Psiadia punctulata* and *Xerophyta retinervis*.

Notes on floristic diversity. Floristic affinities for the sub-association are the same as for the association. However, in addition, it shows a floristic affinity with associations 4 and 5 in species group W (Table 14). Fifteen plant taxa with conservation value are part of this sub-association, of which eight are SCPE endemics, seven are SCPE near-endemics and one is a Red Data List taxon (Table 15). No taxa with conservation value are restricted to the sub-association. The average number of species encountered per sample plot is 40, with the total number of plant species being 99 (six relevés) (Table 16).

3. *Phyllantho glaucophyllae–Brachylaenetum ilicifoli* ass. nova hoc loco

Nomenclatural type: relevé 175 (holotypus)

Environmental data. This is typical intra-zonal short woodland on exposed rocks of norite, pyroxenite and anorthosite. This vegetation anomaly occurs on midslopes and crests of undulating hills. The habitat has a rather variable slope of 7–12°, restricted to mostly southern aspects. Soils are typical of the Glenrosa form. Average rock diameter is 0.1–1.5 m and it covers 30–70% of the soil surface (Table 16).

Diagnostic and dominant/prominent taxa. Species group J, K and Q (Table 14) contains the characteristic species for this association, with no species shared exclusively between the sub-associations. Therefore the diagnostic species will be listed under each of the sub-associations. Dominant taxa of the association include the trees/shrubs *Brachylaena ilicifolia*, *Diospyros lycioides* subsp. *nitens*, *Elephantorrhiza praetermissa*, *Euclea* sp. (Siebert 934), *Rhus keettii*, *Timnea rhodesiana* and *Vitex obovata* subsp. *wilmsii*. Dominant forbs are also frequent and include *Asparagus suaveolens*, *Berkheya insignis* (form), *Gnidia caffra* (form), *Orthosiphon fruticosus* and *Phyllanthus glaucophylla*. *Pellaea calomelanos* is a common fern in the association. Abundant grasses are *Brachiaria serrata*, *Setaria sphacelata*, *Tristachya leucothrix*, and especially *Heteropogon contortus* and *Themeda triandra*.

Notes on floristic diversity. This association is floristically related to both associations 2 and 4 in species groups D and Q (Table 14). It is debateable whether these associations exist, and it is speculated that they represent ecotones between the *Enneapogono scoparii–Acacietum leiorachis* and *Tristachyo leucothricis–Cussonietum transvaalensis*. Of the 20 taxa of conservation value in this association, 13 are SCPE endemics and seven SCPE near-endemics, of which two are Red Data List taxa (Table 15). The Red Data List taxa, *Elephantorrhiza praetermissa* and *Jamesbrittenia macrantha*, are present in both sub-associations. No taxa of conservation value are restricted to the association only. The average number of species encountered per sample plot is 36. The total number of plant species for this association is a minimum of 71 (12 relevés) (Table 16).

3.1 *Phyllantho glaucophyllae-Brachylaenetum ilicifoli setarietosum sphacelatae* sub-ass.
nova hoc loco

Nomenclatural type: relevé 171 (holotypus)

Environmental data. This is woodland with a well-developed grass layer on midslopes of southern aspects. It occurs on hills of pyroxenite, norite and anorthosite. Soils are of the Glenrosa form (ortic A-horizon) and are underlain by rock. The soil surface is amply covered by 40–70% rock, of a relatively large average size of 0.5–1.5 m in diameter (Table 16). Slope of the habitat is usually steep and average 7–12°.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group J (Table 14). The community is characterised by diagnostic species, such as the forb *Barleria lancifolia*, the succulent *Aloe verecunda*, and the grasses *Hyparrhenia hirta* and *Setaria lindenbergiana*. Dominant woody species are *Brachylaena ilicifolia*, *Combretum apiculatum*, *Hippobromus pauciflorus*, *Tarchonanthus camphoratus* and *Vitex obovata* subsp. *wilmsii*. *Themeda triandra* and *Setaria sphacelata* are the most dominant grasses, with other conspicuous grasses including *Brachiaria serrata*, *Heteropogon contortus* and *Tristachya leucothrix*. Prominent forbs are *Barleria saxatilis*, *Justicia protracta*, *Leucas capensis*, *Orthosiphon fruticosus* and *Phyllanthus glaucophylla*.

Notes on floristic diversity. The community has a floristic affinity with associations 2 and 4 (Table 14). Ten SCPE endemics, six near-endemics and two Red Data List taxa are found in this sub-association (Table 15). Altogether it has 16 taxa of conservation value of which none are restricted to the sub-association. The average number of species encountered per sample plot is 40, with the total number for this variant being 71 (four relevés) (Table 16).

3.2 *Phyllantho glaucophyllae–Brachylaenetum ilicifoli brachiarietosum serratae* sub-ass. nova hoc loco

Nomenclatural type: relevé 124 (holotypus)

Environmental data. This sub-association represents short woodlands on the crests or midslopes of pyroxenite, norite and anorthosite hills. It usually occurs on soils of the Glenrosa form. The habitat lies on relatively level sloped areas. Rock cover on the surface is 30–40%, with rocks reaching an average size of 100–300 mm in diameter (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species are presented in species group K (Table 14). Diagnostic herbaceous taxa include forbs such as *Helichrysum harveyanum*, *Hermannia boraginiflora*, *Thesium magalismontanum*, and the fern-ally, *Selaginella dregei*. The tree, *Acacia caffra*, is the diagnostic woody species. No diagnostic grasses occur. Other important dominant taxa are small trees/shrubs such as *Brachylaena ilicifolia*, *Elephantorrhiza praetermissa*, *Grewia vernicosa*, *Tinnea rhodesiana* and *Vitex obovata* subsp. *wilmsii*, and the suffrutex *Euclea* sp. (Siebert 934). Grasses such as *Brachiaria serrata*, *Enneapogon scoparius*, *Heteropogon contortus*, *Themeda triandra* and *Tristachya leucothrix* are the most dominant in the sub-association. *Berkheya insignis*, *Justicia protracta*, *Kyphocarpa angustifolia*, *Phyllanthus glaucophylla*, *Rhynchosia spectabilis* and *Tephrosia purpurea* are the prominent forbs.

Notes on floristic diversity. This sub-association has a floristic link with association 4 (Table 14). Eleven SCPE endemics, six near-endemics and two Red Data List taxa are found in this sub-association (Table 15). There are 17 taxa of conservation value in this sub-association, with none of these restricted to it. The average number of species encountered per sample plot is 35, with a total number of 60 plant taxa (five relevés) (Table 16).

4. *Tristachyo leucothricis–Cussonietum transvaalensis* ass. nova hoc loco

Nomenclatural type: relevé 169 (holotypus)

Environmental data. This association represents open tall woodlands on cool, predominantly southernly aspects of ferrogabbro, norite, pyroxenite and anorthosite hills. It

occurs on midslopes and scarps on clay lithosols of the Glenrosa and Mispah forms. It lies on relatively steep sloped areas (5–18°). Rock cover on the surface is average, between 25–60%, with rocks reaching a large average size of 0.5–1.5 m in diameter (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species are presented in species group L (Table 14). Diagnostic herbaceous taxa include forbs such as *Gerbera ambigua* and *Senecio scitius*. Diagnostic woody species are the trees *Cussonia transvaalensis* and *Faurea saligna*, and the suffrutex *Gymnosporia* sp. nov. B (*Van Wyk 13052*). Other important dominant taxa are small trees/shrubs, namely *Acacia ataxacantha*, *Catha edulis*, *Diospyros lycioides* subsp. *nitens*, *Elephantorrhiza praetermissa*, *Rhoicissus tridentata* and *Vitex obovata* subsp. *wilmsii*. Grasses dominate the association, especially *Heteropogon contortus*, *Setaria sphacelata*, *Themeda triandra* and *Tristachya leucothrix*. Prominent forbs are *Berkheya insignis*, *Orthosiphon fruticosus*, *Rhynchosia spectabilis*, *Senecio latifolius* and the fern *Pellaea calomelanos*.

Notes on floristic diversity. The association has a strong link with association 3 in species group R and associations 2 and 5 in species group W (Table 14). Thirty taxa of conservation value are part of this association, the highest number recorded for any of the associations and sub-associations in the study area. Eighteen SCPE endemics, 11 SCPE near-endemics and six Red Data List taxa are found in this association (Table 15). Of its 30 taxa of conservation value, four taxa are restricted to it. The average number of species encountered per sample plot is 41, with a minimum total number of 130 plant taxa (17 relevés) (Table 16).

4.1 *Tristachyo leucothricis–Cussonietum transvaalensis myrothamnetosum flabellifolius* sub-ass. nova hoc loco

Nomenclatural type: relevé 237 (holotypus)

Environmental data. In the SCPE this sub-association represents a wooded herbland on Glenrosa form soils. The habitat is found on midslopes and crests of undulating pyroxenite, norite and anorthosite hills (Table 16). Slope has an inclination to be level, but can be up to

5°. Southernly aspects are the norm. Rock cover percentage is average and varies from 25–60% and rock size between 300–500 mm in diameter (Table 16).

Diagnostic and dominant/prominent taxa. Species group M contains the characteristic species for this sub-association (Table 14), with diagnostic species including herbaceous taxa, namely the grass *Eragrostis pseudosclerantha*, the forbs *Myrothamnus flabellifolius*, *Oldenlandia herbacea* and *Xerophyta villosa*, and the fern *Ceterach cordatum*. Other prominent taxa include the grasses *Eliomurus muticus*, *Enneapogon scoparius* and *Heteropogon scoparius*, the forbs *Jamesbrittenia macrantha*, *Orthosiphon fruticosus* and *Senecio latifolius*, the succulents *Aloe cryptopoda* and *Euphorbia schinzii*, and the woody species *Elephantorrhiza praetermissa*, *Ozoroa sphaerocarpa*, *Rhus keetii* and *Vitex obovata* subsp. *wilmsii*.

Notes on floristic diversity. This sub-association follows the floristic link of the association (Table 14). Ten SCPE endemics, five near-endemics and two Red Data List taxa are present in this sub-association (Table 15). There are 15 taxa of conservation value in this sub-association, with none of these restricted to it. The average number of species encountered per sample plot is 32, with a total number of 63 plant taxa (three relevés) (Table 16).

4.2 *Tristachyo leucothricis–Cussonietum transvaalensis melinetosum nerviglumis* sub-ass. nova hoc loco

Nomenclatural type: relevé 208 (holotypus)

Environmental data. This sub-association is open, sparse woodland of ferrogabbro and pyroxenite hills, on midslopes and scarps of southern aspects. It occurs on red clay soils of the Glenrosa and Mispah forms. The soil surface is covered by 30–60% rock, which is of a large average size of 0.5–1 m in diameter (Table 16). Slope of the habitat is usually steep, between 7–15°.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group N (Table 14). The community is characterised by diagnostic forbs such as

Barleria wilmsiana, *Drimiopsis atropurpurea*, *Plectranthus xerophilus* and *Schistostephium heptalobum*. *Melinis nervigulumis* is the diagnostic grass. No diagnostic woody species occur. Dominant woody species are the shrubs *Elephantorrhiza praetermissa*, *Pavetta* sp. nov. and *Rhoicissus tridentata*, and the small trees *Acacia ataxacantha*, *Faurea saligna* and *Vitex obovata* subsp. *wilmsii*. Important conspicuous grasses include *Andropogon schirensis*, *Diheteropogon amplexans*, *Heteropogon contortus*, *Tristachya leucothrix* and *Themeda triandra*. Abundant forbs in the sub-association are *Commelina africana*, *Senecio latifolius*, *Sphedamnocarpus pruriens* and the fern *Pellaea calomelanos*.

Notes on floristic diversity. The sub-association shows the same floristic relationships as the association (Table 14). This plant community has the highest conservation value of all the sub-associations in the study area. The highest number of SCPE endemics, namely 15, the highest number of SCPE near-endemics, namely 10, and the highest number of Red Data List taxa, namely five, are found in this sub-association (Table 15). Of its 25 taxa of conservation value, the highest recorded for the sub-associations, one taxon, the near-endemic *Plectranthus xerophilus*, is restricted to it. The average number of species encountered per sample plot is 42, together with sub-association 2.3 the highest average recorded in this study (Table 16). The total number of plant taxa recorded for this sub-association is 130 (six relevés) (Table 16), also the highest recorded in the study area..

4.3 *Tristachyo leucothricis*–*Cussonietum transvaalensis argylobietosum wilmsii* sub-ass. nova hoc loco

Nomenclatural type: relevé 169 (holotypus)

Environmental data. The sub-association is short woodland with a well developed grass layer on the scarps of undulating norite, pyroxenite and anorthosite hills. It lies on south-facing steep slopes of 7–18°. Soils are characteristically a red clay soil of the Mispah form. Approximately 40–60% of the soil surface is covered by rocks, with a large average size of 0.5–1 m in diameter (Table 16).

Diagnostic and dominant/prominent taxa. No diagnostic species represent this sub-association. However, species group O contains the characteristic species of the community, with the sub-association being recognised due to the absence of the taxa in species group N (Table 14). Important trees/shrubs of the association are *Cussonia transvaalensis*, *Diospyros lycioides* subsp. *nitens*, *Elephantorrhiza praetermissa*, *Pavetta* sp. nov., *Rhoicissus tridentata*, *Tarchonanthus camphoratus* and *Vitex obovata* subsp. *wilmsii*. Prominent forbs are *Argyrolobium wilmsii*, *Berkheya insignis*, *Orthosiphon fruticosus* and the fern *Pellaea calomelanos*. *Enneapogon scoparius*, *Heteropogon contortus*, *Setaria sphacelata*, *Themeda triandra* and *Tristachya leucothrix* are the most abundant grasses.

Notes on floristic diversity. The sub-association shows the same floristic relationships as the association. It has a strong floristic link with sub-association 4.1 in species group O (Table 14). Twenty-three taxa of conservation value occur in this sub-association, the second highest number in the study area (Table 15). These are 14 SCPE endemics, second highest for the study, eight SCPE near-endemics and four Red Data List taxa, also the second highest number for the study (Table 15). One plant taxon with conservation value is restricted to it, namely *Scilla natalensis*, a species classified as Vulnerable in the Free State and KwaZulu-Natal. The average number of species encountered per sample plot in this sub-association is 41, with the total number of plant species being 96 taxa (seven relevés) (Table 16).

4.4 *Tristachyo leucothricis–Cussonietum transvaalensis combretetosum zeyheri* sub-ass. nova hoc loco

Nomenclatural type: relevé 235 (holotypus)

Environmental data. This vegetation type is tall open woodland of cool south and east slopes of pyroxenite hills. It lies on moderately sloped midslopes and scarps (5–9°). The community is restricted to soils of the Glenrosa form. Approximately 30–45% of the soil surface is covered by rocks, with a large average diameter of 0.5–1.5 m (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group P (Table 14). Only one grass species, *Setaria incrassata*, is diagnostic of the

sub-association. *Nidorella hottentotica* and *Solanum panduriforme* are the diagnostic forbs, and *Combretum zeyheri* and *Elaeodendron transvaalensis* the diagnostic trees. Prominent trees of the sub-association are *Combretum apiculatum*, *C. molle*, *Cussonia transvaalensis*, *Diospyros lycioides* subsp. *nitens*, *Dombeya rotundifolia* and *Vitex obovata* subsp. *wilmsii*. Dominant herbaceous taxa include the forbs *Asparagus suaveolens*, *Rhynchosia spectabilis* and *Senecio latifolius*, and the grasses *Heteropogon contortus*, *Themeda triandra* and *Tristachya leucothrix*.

Notes on floristic diversity. The sub-association shows the same floristic relationships as the association. Sixteen plant taxa with conservation value occur in this sub-association and comprise ten SCPE endemics, six SCPE near-endemics and two Red Data List taxa (Table 15). No plant taxon with conservation value is restricted to it. The average number of species encountered per sample plot is 41 and the total number of plant species for this sub-association is 95 (four relevés) (Table 16).

II. *Loudetia simplex*–*Combretum hereroense* community of valleys

Environmental data. In the SCPE this alliance is characterised by open bushveld anomalies on undulating footslopes and valleys, which forms an extensive mosaic with the typical vegetation of such areas, namely microphyllous thornveld. It is restricted to deep sandy to loam soils. It occurs on varying slopes of 1–5° on all aspects. Rocks can cover 30–65% of the soil surface and are an average diameter of 100–400 mm (Table 16).

Diagnostic and dominant/prominent taxa. Species group AE contains the diagnostic species for this alliance, which includes the tree *Bolusanthus speciosus*, the grasses *Andropogon chinensis*, *Aristida adscensionis*, *Elionurus muticus* and *Loudetia simplex* and forbs such as *Aloe burgersfortensis*, *Dicoma gerrardii* and *Rhynchosia komatiensis* (Table 14). Other prominent species of the alliance include the shrubs *Combretum hereroense*, *Rhus keetii* and *Tinnea rhodesiana*, with the ground layer dominated by the grasses *Diheteropogon amplexans* and *Heteropogon contortus*.

Notes on floristic diversity. This alliance shows several floristic relationships with the other alliance, hence indicating that it forms part of the Open Mountain Bushveld (Table 14). The average number of species encountered per sample plot in this alliance is approximately 32, with the total number of plant species being a minimum of 98 taxa (36 relevés) (Table 16). Thirty-seven taxa of conservation value are part of the alliance, comprising 21 SCPE endemics, 16 SCPE near-endemics and seven Red Data List taxa, of which 13 are restricted to it (Table 15).

5. *Eragrosti lehmanniana*–*Hippobrometum pauciflori* ass. nova hoc loco

Nomenclatural type: relevé 133 (holotypus)

Environmental data. Association on alluvium and scattered patches of exposed pyroxenite of valleys and footslopes. This vegetation type is characteristic of the large river valleys of the SCPE. It occurs predominantly as scattered thickets in dongas or eroded areas. Soils are sandy (Hutton form) or have a pedocutanic B-horizon (Bonheim and Valsrivier form). The habitat occurs on all aspects and is gently sloped (1–3°). Approximately 10–50(–80)% of the soil surface is covered by stones with a relatively large average diameter of 100–350 mm (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented in species group T (Table 14). The vegetation unit is dominated by trees and shrubs, with diagnostic woody species including *Acacia karroo*, *Mimusops zeyheri* and *Schotia brachypetala*. *Eragrostis lehmanniana* is the only diagnostic grass. No forbs are diagnostic of the association. Prominent plant taxa of the association include the forbs *Polygala hottentotta* and *Psiadia punctulata*, the grasses *Brachiaria serrata*, *Diheteropogon amplectens*, *Loudetia simplex* and *Panicum deustum*, and the woody species *Cassine aethiopica*, *Combretum hereroense*, *Hippobromus pauciflorus* and *Tinnea rhodesiana*.

Notes on floristic diversity. A strong floristic affinity exists with the mountain bushveld of the region in species group W (Table 14), due to the suitable microhabitats created by the dongas. This association has 24 plant taxa with conservation value, the third highest of all the associations. Of these 15 are SCPE endemics, nine SCPE near-endemics and two are

Red Data List taxa (Table 15). One taxon is restricted to the association. The average number of species encountered per sample plot is 26, with the total number of plant species being a minimum of 60 taxa (11 relevés) (Table 16).

5.1 *Eragrostio lehmanniana*–*Hippobrometum pauciflori rhoetosum batophyllae* sub-ass. nova hoc loco

Nomenclatural type: relevé 252 (holotypus)

Environmental data. The vegetation type is a scattered thicket on the slopes of dongas in the large valleys to the east of the Leolo Mountains. It occurs on no specific aspect and these are gently sloped (1–3°). It is found predominantly on deep (> 1 000 mm) soils of the Bonheim and Valsrivier forms. A low rock cover of approximately 10–20% characterise the soil surface, with an average size of 100–150 mm in diameter (Table 16).

Diagnostic and dominant/prominent taxa. Characteristic species are presented in species group U (Table 14). There are no diagnostic herbaceous species for this sub-association. *Catha transvaalensis*, *Dodonaea angustifolia*, *Olea europaea* and *Rhus batophylla* are the diagnostic trees/shrubs. *Bolusanthus speciosus*, *Brachylaena ilicifolia*, *Combretum hereroense* and *Hippobromus pauciflorus* are the dominant trees, *Psiadia punctulata* and *Rhynchosia komatiensis* the prominent forbs, and *Andropogon chinensis*, *Aristida adscensionis*, *Diheteropogon amplectens*, *Eragrostis lehmanniana* and *Panicum deustum* the most abundant grasses.

Notes on floristic diversity. Floristic relationships are the same as for the association. There are ten plant taxa of conservation value in this sub-association (Table 15), namely eight SCPE endemics, two SCPE near-endemics (together with sub-association 1.2 the lowest number recorded in the study) and one Red Data List taxon, *Rhus batophylla*. None of these taxa are restricted to the sub-association. The average number of species encountered per sample plot in this sub-association is 25, with the total number of plant species being 37 taxa (five relevés) (Table 16). Both these values are the second lowest numbers recorded during the study.

5.2 *Eragrosti lehmanniana*–*Hippobrometum pauciflori sorgetosum bicoloris* sub-ass.
nova hoc loco

Nomenclatural type: relevé 137 (holotypus)

Environmental data. This is scattered thicket of eroded sandy and clay soils. It lies in gently sloped valleys of 1–3° on all aspects. The substrate is alluvium and soils are predominantly of the Hutton and Bonheim forms. Approximately 10–50% of the soil surface is covered by large rocks, with a diameter of 100–250 mm (Table 16).

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group V (Table 14). Small trees/shrubs are diagnostic of this community, namely *Acacia tortilis*, *Carissa bispinosa*, *Euclea divinorum*, *Rhus engleri* and *Ximenia americana*. No diagnostic herbs occur, but *Panicum natalense* and *Sorghum bicolor* are the diagnostic grasses. Other taxa of importance are the grasses *Brachiaria serrata*, *Diheteropogon amplexans*, *Heteropogon contortus*, *Loudetia simplex*, *Panicum deustum* and *Themeda triandra*. The conspicuous forbs are the succulent *Aloe burgersfortensis*, and the herbaceous *Dicoma gerrardii*, *Petalidium oblongifolium* and *Psiadia punctulata*. Most abundant small trees/shrubs are *Balanites maughamii*, *Bolusanthus speciosus*, *Combretum hereroense* and *Terminalia prunoides*.

Notes on floristic diversity. Floristic relationships are the same as for the association. There are 19 taxa of conservation value in this sub-association, namely 11 SCPE endemics, eight SCPE near-endemics and one Red Data List taxon (Table 15). One taxon with conservation value, namely the near-endemic *Rhus engleri* (common on the adjacent Springbok Flats) is restricted to it. The average number of species encountered per sample plot is 16, with the total number of plant species being 20 taxa (three relevés) (Table 16). Both these values are the lowest recorded for this major vegetation type.

5.3 *Eragrosti lehmanniana*–*Hippobrometum pauciflori eliomuretosum mutici* sub-ass.
nova hoc loco

Nomenclatural type: relevé 332 (holotypus)

Environmental data. In the SCPE this sub-association represents dense, tall thicket. It is common on southerly and westerly aspects of footslopes merging into valleys. The habitat is characterised by erosion on alluvium and exposed layers of pyroxenite rock. Average rock diameter is approximately 100–350 mm, covering a high percentage (40–80%) of soil surface (Table 16). It is characterised by gentle slopes (1–3°). Soil types are characterised as a red apedale B-horizon under an ortic A-horizon, and is classified as the Hutton form (Table 16).

Diagnostic and dominant/prominent taxa. There are no diagnostic species for this sub-association. The community is recognised on grounds of the absence of species from species groups U and V (Table 14), which are diagnostic for the other two sub-associations of the association. Prominent plant taxa include the woody species *Acacia karroo*, *Combretum hereroense*, *Euclea crispa*, *Grewia vernicosa* and *Tinnea rhodesiana*. Conspicuous forbs are *Commelina africana*, *Dicoma gerrardii* and *Indigofera hiliaris*. *Aristida congesta*, *Brachiaria serrata*, *Eliomurus muticus*, *Heteropogon contortus*, *Loudetia simplex* and *Panicum deustum* are the most abundant grasses.

Notes on floristic diversity. Floristic relationships are the same as for the association. There are 11 taxa with conservation value occurring in the association, namely seven SCPE endemics, four SCPE near-endemic and one Red Data List taxon (Table 15). The average number of species encountered per sample plot is 39, with the total number of plant species being 60 taxa (three relevés) (Table 16).

6. *Aristido rhiniochloo*–*Gnidiatum polycephalae* ass. nova hoc loco

Nomenclatural type: relevé 387 (holotypus)

Environmental data. This association represents disturbed valley thornveld. It is associated with the areas between rural settlements and the associated abandoned fields. It is a

vegetation unit on predominantly red Hutton soils clay soils, which are interspersed with areas of the Bonheim form. This community occurs in large river valleys that are heavily disturbed by agriculture, mining and rural settlement. The slope is more or less level (1°). Rock cover percentage varies from 30 to 40% and average rock diameter is from 50–150 mm (Table 16).

Diagnostic and dominant/prominent taxa. Species group X contains the diagnostic species for this association (Table 14). Trees are diagnostic of the sub-association, namely the succulents *Agave sisalana* (an alien) and *Euphorbia tirucalli*, and the small tree/shrubs *Acacia nilotica*, *Nuxia gracilis* and *Rhus sekhukhuniensis*. Diagnostic forbs include *Chascanum hederaceum*, *Geigeria burkei*, *Gnidia polycephala* and *Pechuel-Loeschea leubnitzia*. *Aristida rhiniochloa*, *Eragrostis capensis*, *Stipagrostis hirtigluma* var. *patula* and *Urochloa panicoides* are the diagnostic grasses. Other important dominant taxa include the woody species *Bolusanthus speciosus*, *Combretum hereroense*, *Euclea crispa*, *Grewia vernicosa*, *Rhus keetii* and the suffrutex *Euclea* sp. (Siebert 934). Prominent forbs are the succulent *Aloe cryptopoda*, and the herbaceous *Dicoma gerrardii*, *Jamesbrittenia* sp. (Van Wyk 13026), *Ledebouria marginata* and *Polygala* sp. (Siebert 449).

Notes on floristic diversity. A floristic link exists with association 7 in species group AB and other associations in species groups AF and AG (Table 14). There are 21 taxa with conservation value occurring in this association, namely 12 SCPE endemics, nine SCPE near-endemics and four Red Data List taxa (Table 15). Of these three are restricted to it, namely the Endangered endemic *Euphorbia barnardii*, and the disjunct near-endemics *Gnidia polycephala* and *Nuxia gracilis* (Insufficiently Known Red Data List species). The average number of species encountered per sample plot is 35, and the total number of plant species for this association is 98 (four relevés) (Table 16).

7. *Loudetia simplicis*–*Eucleetum linearis* ass. nova hoc loco

Nomenclatural type: relevé 218 (holotypus)

Environmental data. This vegetation type is open shrublands in the valleys between mountains. The habitat is predominantly underlain by alluvium, as well as by norite,

pyroxenite and magnetite. It lies on gentle slopes of 1–5°, on all aspects. Soils are predominantly the Valsrivier form, but are interspersed with patches of either the Bonheim or Mispah forms. Soil surface cover by rock is average for the study area, 10–65%, with a diameter averaging between 100–500 mm (Table 16).

Diagnostic and dominant/prominent taxa. The diagnostic species are represented by species group Y (Table 14), with the woody species, *Euclea linearis*, dominating the association. The following forbs are diagnostic, *Evolvulus alsinoides*, *Giegeria ornativa*, *Helichrysum uninervium*, *Jamesbrittenia burkeana*, *Kohautia caespitosa*, *Pterothrix spinescens* and *Seddera capensis*. There are no diagnostic grasses. *Rhus keetii*, *Tinnea rhodesiana* and *Vitex obovata* subsp. *wilmsii* are other prominent shrubs of the association. Important dominant grasses include *Andropogon chinensis*, *Aristida canescens*, *Diheteropogon amplexans*, *Loudetia simplex* and *Themeda triandra*. Common forbs are *Dicoma gerrardii*, *Indigofera hilaris* and *Rhynchosia komatiensis*.

Notes on floristic diversity. The association shows a slight floristic link with association 6 in species group AB (Table 14). This association has the second highest number of taxa with conservation status, namely 26. Of these 15 are SCPE endemics, 11 SCPE near-endemics and four Red Data List taxa (Table 15). Three taxa of conservation value are restricted to the association, specifically the near-endemic *Helichrysum uninervium* and the biogeographically significant disjunct *Pterothrix spinescens*. The average number of species encountered per sample plot is 35, with the total number for this association being a minimum of 85 plant taxa (17 relevés) (Table 16).

7.1 *Loudetia simplicis–Euclea linearis diheteropogonetosum amplexantis* sub-ass.
nova hoc loco

Nomenclatural type: relevé 146 (holotypus)

Environmental data. This sub-association is an open shrubland on all aspects of footslopes and valleys in the Steelpoort River Valley. It is associated with alluvium on norite and pyroxenite substrates. The habitat is relatively level, although undulating, with a gentle slope of 1–3°. Approximately 10–40% of the soil surface is covered by rocks with an

average diameter of 100–300 mm (Table 16). A sandy layer intersperse with the Bonheim and Valsrivier soil forms.

Diagnostic and dominant/prominent taxa. Diagnostic species are represented by species group Z (Table 14). The vegetation unit is dominated by diagnostic herbaceous species, namely the succulents *Euphorbia enormis* and *Fockea angustifolia*, and the forbs *Anthospermum rigidum*, *Blepharis saxatilis*, *Cleome angustifolia*, *Crabbea angustifolia* and *Laggera decurrens*. Other conspicuous taxa are the small trees/shrubs *Combretum hereroense*, *Euclea linearis*, *Rhus keetii* and *Timnea rhodesiana*, the forbs *Berkheya insignis*, *Blepharis subvolubilis*, *Dicoma gerrardii*, *Evolvulus alsinoides* and *Petalidium oblongifolium*, and the grasses *Andropogon chinensis*, *Aristida canescens*, *Diheteropogon amplexans*, *Loudetia simplex* and *Themeda triandra*.

Notes on floristic diversity. Floristic affinities are the same as for the association. This sub-association has, together with sub-association 4.3 the second highest number of taxa with a conservation status, namely 23. This comprises 13 SCPE endemics, 10 SCPE near-endemics and three Red Data List taxa (Table 15). None of these taxa are restricted to the sub-association. The average number of species encountered per sample plot is 37, with the total number of plant species being 85 (nine relevés) (Table 16).

7.2 *Loudetia simplicis–Eucleetum linearis heteropogonetosum contorti* sub-ass. nova hoc loco

Nomenclatural type: relevé 218 (holotypus)

Environmental data. In the SCPE this sub-association is an open shrubland of undulating, eroded surfaces of footslopes and valleys. The habitat is characterised by alluvium and patches of exposed norite and magnetite rocks, hence the occurrence of the soil forms Valsrivier (pedocutanic B-horizon) and Mispah (hard rock). It occurs on all aspects and gentle slopes of 1–5°. Rock cover and average size are an average 50–65% of the soil surface and 200–400 mm in diameter, respectively (Table 16).

Diagnostic and dominant/prominent taxa. Species group AA contains the diagnostic species for this sub-association, which are characterised by the suffrutex *Rhus wilmsii* (Table 14). Diagnostic herbaceous taxa include the sedge *Bulbostylis burchellii*, and the forbs *Corchorus asplenifolius*, *Lotononis calycina*, *L. wilmsii* and *Striga elegans*. Other prominent species of the sub-association include the shrubs *Combretum hereroense*, *Grewia vernicosa* and *Tinnea rhodesiana*, the forbs *Dicoma gerrardii* and *Senecio latifolius*, and the grasses *Aristida canescens*, *Diheteropogon amplexans*, *Loudetia simplex* and *Themeda triandra*.

Notes on floristic diversity. Floristic affinities are the same as for the association. Twenty-one taxa of conservation value are part of this sub-association, of which one, *Rhus wilmsii*, the SCPE near-endemic, Insufficiently Known Red Data List taxon, is restricted to it. Of these 13 are SCPE endemics, eight are SCPE near-endemics and three are Red Data List taxa (Table 15). The average number of species encountered per sample plot in this sub-association is 30, with the total number of plant species being 73 taxa (four relevés) (Table 16).

7.3 *Loudetia simplicis–Eucleetum linearis andropogonetosum chinensis* sub-ass. nova hoc loco

Nomenclatural type: relevé 307 (holotypus)

Environmental data. This sub-association represents open shrublands, of undulating landscapes on footslopes and valleys, dominated by a well-developed grass layer. Mostly restricted to freely drained soils on mostly westerly and southerly aspects, it prefers alluvium substrates characterised by patches of norite and pyroxenite (with no soils) exposed by natural erosion. Slopes are gentle (1–3°). It occurs on soils of the Valsrivier form. Rocks cover approximately 30–50% of the soil surface, with a diameter averaging 300–500 mm (Table 16).

Diagnostic and dominant/prominent taxa. There are no diagnostic species for the sub-association. The diagnostic species for the association are the characteristic species for this sub-association in the SCPE. Conspicuous forbs of the sub-association are *Dicoma*

gerrardii, *Geigeria ornativa* and *Seddera capensis*. Dominant woody species include *Euclea linearis*, *Tinnea rhodesiana* and *Vitex obovata* subsp. *wilmsii*. The sub-association is dominated by the following grasses, *Andropogon chinensis*, *Aristida adscensionis*, *A. canescens*, *Eliomurus muticus*, *Fingerhuthia africana*, *Loudetia simplex* and *Themeda triandra*.

Notes on floristic diversity. Floristic affinities are the same as for the association. Of the 19 taxa of conservation value in this sub-association, 11 are SCPE endemics, eight are SCPE near-endemics and three are Red Data List taxa (Table 15). Of these none are restricted to the sub-association. The average number of species encountered per sample plot is 34 and the total number of plant species for this sub-association is 85 (four relevés) (Table 16).

8. *Petalidio oblongifolii*–*Raphionacmetum procumbentis* ass. nova hoc loco

Nomenclatural type: relevé 284 (holotypus)

Environmental data. The habitat is a scattered open shrubland of magnetite and ferrogabbro outcrops on midslopes, footslopes and valleys. The community is usually encountered as patches amidst any of the communities discussed in this paper. It prefers southerly aspects, which are moderately sloped (1–7°), and is found predominantly on deep shallow soils of the Mispah and Glenrosa forms. A rock cover is average and approximately 30–50% of the soil surface, with a medium to small average size of 250–500 mm in diameter (Table 16).

Diagnostic and dominant/prominent taxa. Characteristic species are presented in species group AD (Table 14). The diagnostic herbaceous species for this association are *Chlorophytum polyphyllum*, *Clerodendrum louwalbertsii*, *Gerbera jamesonii*, *Indigofera enormis*, *Ipomoea obscura*, *Kleinia longiflora*, *Limeum pterocarpum*, *Phyllanthus parvulus*, *Raphionacme procumbens* and *Ruellia cordata*. *Eragrostis superba* is the only diagnostic grass. There are no diagnostic woody species. *Euclea crispa*, *Combretum hereroense* and *Grewia vernicosa* are the dominant small trees/shrubs, *Berkheya insignis*, *Petalidium oblongifolium*, *Phyllanthus glaucophylla* and *Rhynchosia komatiensis* the

prominent forbs, and *Diheteropogon amplexens* and *Themeda triandra* the most abundant grasses.

Notes on floristic diversity. Floristic relationships exist between this association and all the others of the study area and this is evident in species groups AF to AL (Table 14). There are 19 plant taxa of conservation value in the association (Table 15), namely 11 SCPE endemics and eight SCPE near-endemics, of which one is a Red Data List taxon. None of these taxa are restricted to the sub-association. The average number of species encountered per sample plot in this association is 36, with the total number of plant species being 84 taxa (four relevés) (Table 16).

7.4 Vegetation key

A vegetation key is presented to facilitate plant community identification (Table 17). The definitions are broad indications of typical groups and should be seen as a guideline. A diagnostic characteristic of the vegetation or habitat is given, followed by the most diagnostic and visual species of a group. The first species is restricted to the specific group only, and the second is dominant in the group, but also occurs in other groups. Where one species is given, no species was restricted to the group only.

7.5 Ordination

On a larger scale the Open Mountain Bushveld is characterised by a naturally tree-depauperated flora, dominated by a low diversity of small trees/shrubs and many taxa not typical for the region. On a smaller scale an extremely heterogeneous environment determines the plant communities within the Open Mountain Bushveld. A combination of many factors such as terrain type (valley or slope), soil structure (eroded areas or soil forms), heavy metal soils (anomalies) or anthropogenically altered areas (fields or mine dumps), affects the species composition of these plant communities. The ordination indicated the gradients caused by the soil structure.

The scatter diagram displays the distribution of relevés along the first and second ordination axes (Figure 12). The vegetation units are represented as groups, their distribution on the scatter diagram corresponding with certain physical environmental conditions. The terrain type, and consequently soil character, determines a definite gradient that is depicted by both the first (eigen value = 0.518) and second axis (eigen value = 0.453). Soil character influences the moisture availability and drainage. The gradient on the x-axis expresses moisture availability over the short term, where water can filter deep into the soils on the right (Hutton, Bonheim and Valsrivier) after precipitation. On the y-axis, the gradient indicates higher moisture availability over the long term at the bottom of the graph, because carbonate horizons (Steendal) absorb water and apedale horizons (Hutton and Bonheim) dry out quickly. Unlike the other soils, Valsrivier soils can retain water and make it available over a longer period, hence explaining its position at the bottom right of the diagram. The scatter diagram also indicates the slope gradient (undulating to level) on the first axis, which links with the soil type and structure. Both the first and second axis also exhibits a gradient with deep soils at the top or right and shallow soils at the bottom or left.

All these gradients correlate closely with each other and have a strong influence on the vegetation structure and species composition. The three most dominant and conspicuous taxa of each growth form (trees/shrubs/suffrutices, forbs/sedges and grasses) are given for each of the eight major vegetation types depicted in the scatter diagram (Table 18).

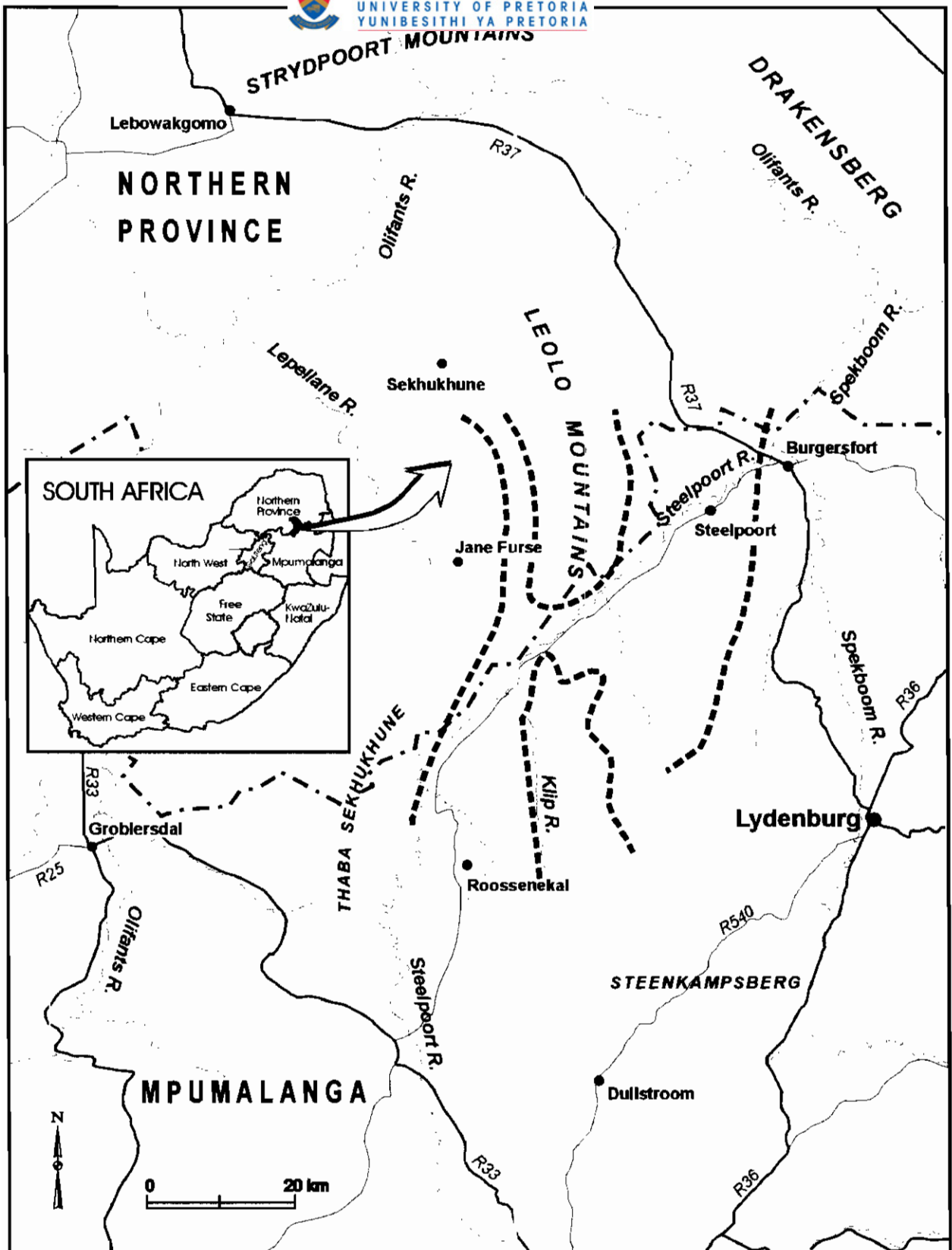


Figure 11 Extent of occurrence of the Open Mountain Bushveld of the Sekhukhuneland Centre of Plant Endemism in the Northern Province and Mpumalanga, South Africa.

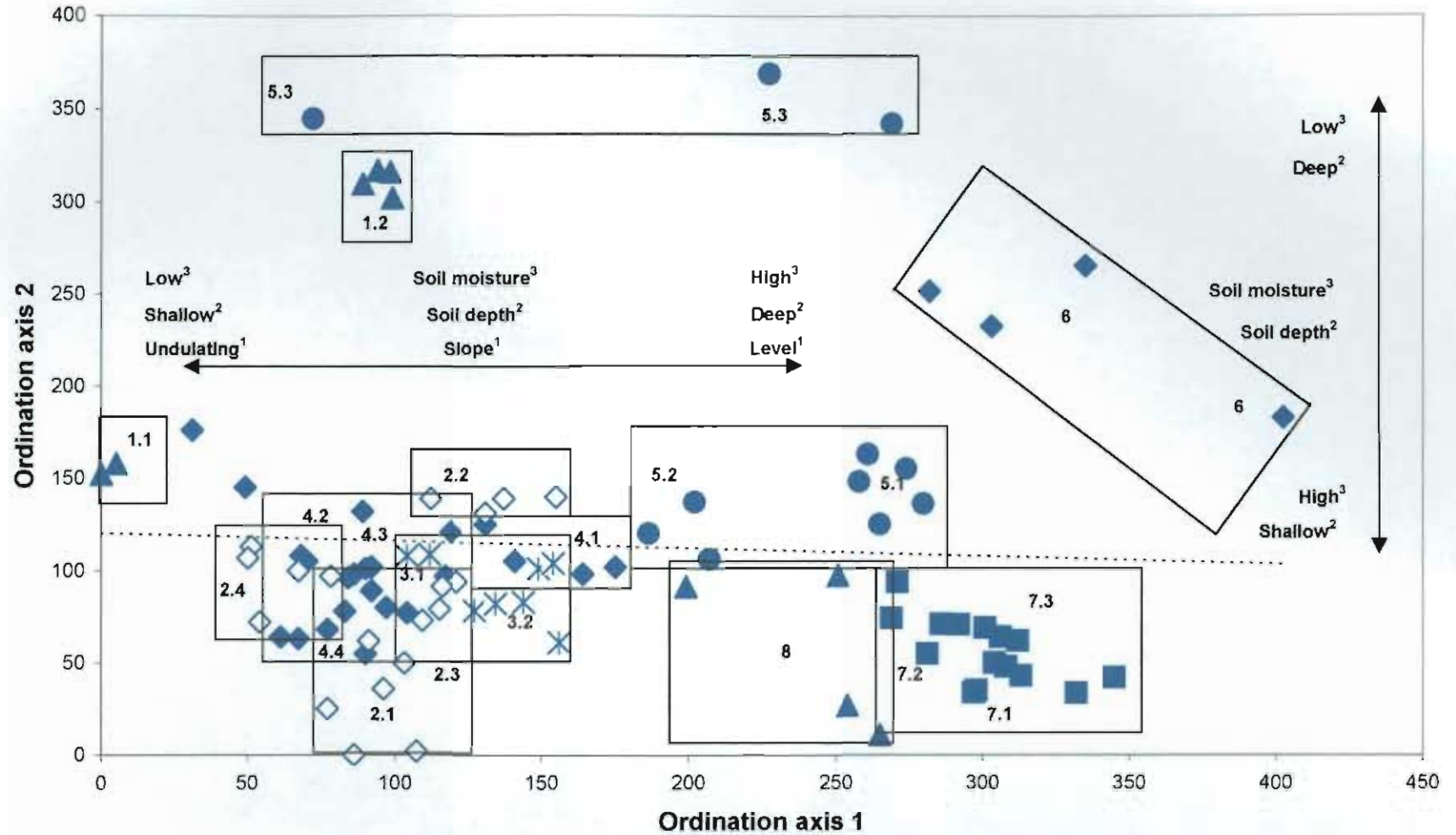


Figure 12 Relative positions of all the releves along the first and second axis of the ordination of the Open Mountain Bushveld of the Sekhukhuneland Centre of Plant Endemism. Numbers correspond with the plant communities in Table 14.

Table 13 Preferential species for each of the Open and Closed Mountain Bushveld types (figures represent the number of relevés (n) in which a species was recorded).

| Species | Open Bushveld (n = 91) | Closed Bushveld (n = 103) | Difference |
|---|------------------------|---------------------------|------------|
| Preferentials for Open Mountain Bushveld | | | |
| <i>Vitex obovata</i> subsp. <i>wilmsii</i> | 67 | 4 | 63 |
| <i>Tinnea rhodesiana</i> | 55 | 12 | 43 |
| <i>Brachylaena ilicifolia</i> | 44 | 4 | 40 |
| <i>Euclea crispa</i> (form) | 40 | 3 | 37 |
| <i>Themeda triandra</i> | 70 | 35 | 35 |
| Preferentials for Closed Mountain Bushveld | | | |
| <i>Panicum deustum</i> | 24 | 73 | 49 |
| <i>Dichrostachys cinerea</i> | 14 | 56 | 42 |
| <i>Terminalia prunioides</i> | 24 | 58 | 34 |
| <i>Boscia albitrunca</i> | 6 | 36 | 30 |
| <i>Grewia flava</i> | 4 | 34 | 30 |
| Non-preferentials for Mountain Bushveld | | | |
| <i>Heteropagon contortus</i> | 50 | 50 | 0 |
| <i>Indigofera hiliaris</i> | 22 | 23 | 1 |
| <i>Jasminum multipartitum</i> | 19 | 18 | 1 |
| <i>Corbichonia decumbens</i> | 20 | 23 | 3 |
| <i>Petalidium oblongifolium</i> | 21 | 27 | 6 |

Table 14 continued.

| Relevé number | 4 4 | 2 3 3 3 | 2 2 3 3 | 2 2 2 2 | 1 1 1 1 2 2 | 1 1 1 2 2 2 | 1 1 2 2 2 | 1 1 1 2 2 | 2 2 2 | 1 2 2 2 2 | 1 1 1 2 2 2 2 | 2 2 2 3 | 1 1 2 2 2 | 1 1 1 | 3 3 3 3 | 3 3 3 4 | 1 1 1 1 1 1 2 2 2 | 2 2 2 3 | 2 2 3 3 | 1 2 2 2 | |
|-----------------------------------|---------|---------|---------|---------|-------------|-------------|-----------|-----------|-------|-------------|---------------|---------|-----------|-------|---------|---------|-------------------|---------|---------|---------|-----|
| | 1 1 | 1 3 3 3 | 0 0 0 0 | 5 5 8 7 | 5 5 7 8 0 1 | 2 8 6 3 4 5 | 3 7 6 8 | 2 7 0 0 0 | 0 3 3 | 4 3 0 1 3 3 | 8 6 6 0 4 0 8 | 0 2 3 8 | 8 7 5 7 7 | 3 3 3 | 3 3 3 3 | 8 8 9 0 | 2 4 4 6 9 9 0 8 8 | 1 2 8 1 | 5 5 0 0 | 4 1 8 8 | |
| | 3 4 | 0 3 6 7 | 1 7 2 3 | 5 7 0 1 | 2 6 4 6 4 6 | 8 0 2 3 9 9 | 9 1 4 3 | 4 5 6 5 5 | 7 7 9 | 6 5 8 9 4 8 | 4 7 9 3 8 0 2 | 9 6 5 9 | 6 3 2 2 9 | 2 3 7 | 1 2 5 | 7 8 7 3 | 7 4 6 3 3 9 0 1 8 | 8 1 5 0 | 1 4 1 7 | 2 4 4 7 | |
| Association | 1 . 1 . | 2 . | 2 . | 2 . | 2 . | 3 . | 3 . | 4 . | 4 . | 4 . | 4 . | 5 . | 5 . | 5 . | 6 . | 7 . | 7 . | 7 . | 8 . | | |
| Sub-association | 1 2 | 1 | 2 | 3 | 4 | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 6 | 1 | 2 | 3 | 8 | | |
| Species group E cont. | | | | | | | | | | | | | | | | | | | | | |
| <i>Pectophorum africanum</i> | | | + | | | | | | | | | | | | | | | | | | |
| <i>Justicia odora</i> | | R | R + A + | | | | | | | | | | | | | | | | | | + |
| <i>Aristida bipartita</i> | | | R R R | | | | | | | | | | | | | | | | | | R |
| <i>Pogonathria squarrosa</i> | | | + | | | | | | | | | | | | | | | | | | |
| <i>Indigofera holubii</i> | | | R + | | | | | | | | | | | | | | | | | | |
| <i>Stychnos madagascariensis</i> | | R | + | R | | | | | | | | | | | | | | | | | |
| Species group F | | | | | | | | | | | | | | | | | | | | | |
| <i>Sporobolus stapfianus</i> | | | + 1 | | + 1 | | | | | | | | | | | | | | | | |
| <i>Waltheria indica</i> | | R | R + R + | | R R | | | | | | | | | | | | | | | | R R |
| <i>Commiphora africana</i> | | | R + | | R R | | | | | | | | | | | | | | | | |
| <i>Monochma divaricatum</i> | | | R + | | R + | | | | | | | | | | | | | | | | |
| <i>Aloe marlothii</i> | | | + 1 | | | | | | | | | | | | | | | | | | |
| Species group G | | | | | | | | | | | | | | | | | | | | | |
| <i>Dichrostachys cinerea</i> | | R + | + | | + | | 1 | | | | | | | | | | | | | | |
| <i>Grewia flavescens</i> | | R | + | R 1 | | | | | | | | | | | | | | | | | |
| <i>Croton gratissimus</i> | | + | R 1 1 | | R | | | | | | | | | | | | | | | | |
| Species group H | | | | | | | | | | | | | | | | | | | | | |
| <i>Felicia clavipilosa</i> | | | | | R | | | | | | | | | | | | | | | | |
| <i>Berchemia zeyheri</i> | | | | | + | | | | | | | | | | | | | | | | |
| <i>Euryops transvaalensis</i> | | | | | R + R R | | | | | | | | | | | | | | | | |
| <i>Dolichos trilobus</i> | | | R | R | | | | | | | | | | | | | | | | | |
| <i>Dyschoriste fischeri</i> | | | | | R R R | | | | | | | | | | | | | | | | |
| <i>Stylochaeton</i> sp. (SS 1332) | | R | | | R R R R | | | | | | | | | | | | | | | | |
| <i>Indigofera lydenburgensis</i> | | | | | R + R | | | | | | | | | | | | | | | | |
| Species group I | | | | | | | | | | | | | | | | | | | | | |
| <i>Commiphora mollis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Sterculia rogersii</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Clerodendrum lamatum</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Ipomoea magnusiana</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group J | | | | | | | | | | | | | | | | | | | | | |
| <i>Hyparrhenia hirta</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Baeria lancofolia</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Aloe varocunda</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Setaria lindenbergiana</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group K | | | | | | | | | | | | | | | | | | | | | |
| <i>Selaginella dragei</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Acacia caffra</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Thesium magellmontanum</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Hermannia boreginiflora</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Helichrysum harveyanum</i> | | | | | | | | | | | | | | | | | | | | | |

Table 14 continued.

| Relève number | 4 4 | 2 3 3 3 | 2 2 3 3 | 2 2 2 2 | 1 1 1 1 2 2 | 1 1 1 2 2 2 | 1 1 1 2 2 2 | 1 1 1 2 2 2 | 2 2 2 | 1 2 2 2 2 | 1 1 1 2 2 2 2 | 2 2 2 3 | 1 1 2 2 2 | 1 1 1 | 3 3 3 | 3 3 3 4 | 1 1 1 1 1 2 2 2 | 2 2 2 3 | 2 2 3 3 | 1 2 2 2 | |
|--|-----|---------|---------|---------|-------------|-------------|-------------|-------------|-------|-------------|---------------|---------|-----------|-------|-------|---------|-------------------|---------|---------|---------|--|
| | 1 1 | 1 3 3 3 | 9 9 0 0 | 5 5 6 7 | 5 5 7 8 0 1 | 2 8 8 3 4 5 | 3 7 8 8 | 2 7 9 0 6 | 0 3 3 | 4 3 0 1 3 3 | 8 8 8 0 4 6 8 | 0 2 3 9 | 6 7 5 7 7 | 3 3 3 | 3 3 3 | 8 8 9 0 | 2 4 4 6 8 8 0 6 6 | 1 2 8 1 | 5 5 0 0 | 4 1 8 8 | |
| | 3 4 | 0 3 6 7 | 1 7 2 3 | 5 7 8 1 | 2 8 4 8 4 6 | 8 0 2 3 9 9 | 9 1 4 3 | 4 5 8 5 5 | 7 7 9 | 6 5 8 0 4 9 | 4 7 9 3 8 0 2 | 9 6 5 9 | 6 3 2 2 9 | 2 3 7 | 1 2 5 | 7 8 7 3 | 7 4 6 3 3 9 0 1 8 | 8 1 5 0 | 1 4 1 7 | 2 4 4 7 | |
| Aliance | I | | | | | | | | | | | | | | | | | | | | |
| Association | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | 7 | 7 | 8 | |
| Sub-association | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 8 | |
| Species group L | | | | | | | | | | | | | | | | | | | | | |
| <i>Gerbers ambigua</i> | . | . | . | . | . | . | . | . | R R | + | + | R | . | + | + | R | . | R | . | . | |
| <i>Senecio scifus</i> | . | . | . | . | . | . | . | . | R | + | R | . | . | R | R | . | R | . | R | . | |
| <i>Faurea saligna</i> | . | . | . | . | . | . | . | . | R | . | + | + | + | + | + | + | + | . | . | . | |
| <i>Gymnosporia sp. (AW 13052)</i> | R | + | . | . | . | . | . | . | R | . | + | + | + | + | + | + | + | R | R | R | |
| <i>Cussonia transvaalensis</i> | . | . | 1 | . | . | + | . | . | + | . | . | . | . | . | . | . | . | . | . | . | |
| Species group M | | | | | | | | | | | | | | | | | | | | | |
| <i>Xerophyta villosa</i> | . | . | . | . | . | . | . | . | + | 1 | . | . | . | . | . | . | . | . | . | . | |
| <i>Myrothamnus flabellifolius</i> | . | . | . | . | . | . | . | . | + | + | R | . | . | . | . | . | . | . | . | . | |
| <i>Ceterach cordatum</i> | . | . | . | . | . | . | . | . | R | + | R | . | . | . | . | . | . | . | . | . | |
| <i>Eragrostis pseudosclerantha</i> | . | . | . | . | . | . | . | . | + | + | R | . | . | . | . | . | . | . | . | . | |
| <i>Otdanandia herbacea</i> | . | . | . | . | . | . | . | . | + | + | R | . | . | . | . | . | . | . | . | . | |
| Species group N | | | | | | | | | | | | | | | | | | | | | |
| <i>Melinis nervigulmis</i> | . | . | R | + | R | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Plectranthus xerophilus</i> | . | . | . | . | . | . | . | . | + | + | R | + | R | . | . | . | . | . | . | . | |
| <i>Bartaria wilmsiana</i> | . | . | . | . | . | R | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Drimopsis atropurpurea</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Schistostephium heplalobum</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| Species group O | | | | | | | | | | | | | | | | | | | | | |
| <i>Andropogon schirensis</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Ruellia stenophylla</i> | . | . | . | . | . | . | . | . | R | R | . | . | . | . | . | . | . | . | . | . | |
| <i>Sphedamnocarpus pruriens</i> | . | . | . | . | . | R | . | . | R | R | . | . | . | . | . | . | . | . | . | . | |
| <i>Argyrolobium wilmsii</i> | . | . | . | . | . | . | . | . | R | R | + | + | + | + | + | + | + | + | + | + | |
| <i>Thamnosma africana</i> | . | . | . | . | . | . | . | . | R | 1 | + | . | . | . | . | . | . | . | . | . | |
| <i>Pavetta zeyheri</i> | . | . | . | . | . | + | R | . | . | . | + | + | + | + | + | + | + | R | . | . | |
| <i>Ozoroa albicans</i> | . | . | . | . | . | . | . | . | R | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Pearsonia aristata</i> | . | . | . | . | . | . | . | . | R | . | . | . | . | . | . | . | . | . | . | . | |
| Species group P | | | | | | | | | | | | | | | | | | | | | |
| <i>Nidorella hotentotica</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Combretum zeyheri</i> | . | . | 1 | . | . | . | R | R | . | . | . | . | . | . | . | . | . | . | R | R | |
| <i>Eleoedendron transvaalensis</i> | R | R | . | . | . | . | + | . | R | R | . | . | . | . | . | . | . | . | . | . | |
| <i>Solanum panduriforme</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Setaria incrassata</i> | . | . | . | . | . | . | . | . | R | . | . | . | . | . | . | . | . | . | . | . | |
| Species group Q | | | | | | | | | | | | | | | | | | | | | |
| <i>Catha edulis</i> | . | . | . | . | . | R | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Setaria sphaecoloba</i> | . | . | . | . | . | . | . | . | + | + | + | + | + | + | + | + | + | + | + | + | |
| <i>Tristachya leucodirix</i> | . | . | . | . | . | . | . | . | + | + | + | + | + | + | + | + | + | + | + | + | |
| <i>Rhynchosia spectabilis</i> | . | . | . | . | . | . | . | . | R | + | + | + | + | + | + | + | + | + | + | + | |
| <i>Jamesbracteella macrantha</i> | . | . | . | . | . | . | . | . | R | + | + | + | + | + | + | + | + | + | + | + | |
| Species group R | | | | | | | | | | | | | | | | | | | | | |
| <i>Diospyros lycioides ssp. nitens</i> | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | |
| <i>Orthosiphon fruticosus</i> | . | 1 | . | . | . | . | . | . | + | + | + | + | + | + | + | + | + | + | + | + | |
| <i>Asparagus suevicolans</i> | + | . | . | . | . | . | . | . | + | + | + | + | + | + | + | + | + | + | + | + | |

Table 14 continued.

| Relevé number | 4 4 | 2 3 3 3 | 2 2 3 3 | 2 2 2 2 | 1 1 1 1 2 2 | 1 1 1 2 2 2 | 1 1 1 2 2 2 | 1 1 1 2 2 | 1 1 1 2 2 | 2 2 2 | 1 2 2 2 2 | 1 1 1 2 2 2 2 | 2 2 2 3 | 1 1 1 2 2 2 | 1 1 1 | 3 3 3 | 3 3 3 4 | 1 1 1 1 1 2 2 2 | 2 2 2 3 | 2 2 3 3 | 1 2 2 2 |
|-----------------------------------|-----|---------|---------|---------|-------------|-------------|-------------|-----------|-----------|-------------|---------------|---------------|-----------|-------------|-------|---------|-------------------|-----------------|---------|---------|---------|
| | 1 1 | 1 3 3 3 | 0 9 0 0 | 5 5 8 7 | 5 5 7 8 0 1 | 2 6 6 3 4 5 | 3 7 8 8 | 2 7 9 0 6 | 0 3 3 | 4 3 0 1 3 3 | 8 6 6 0 4 6 8 | 0 2 3 9 | 8 7 5 7 7 | 3 3 3 | 3 3 3 | 8 9 9 0 | 2 4 4 6 9 0 6 6 | 1 2 8 1 | 5 5 0 0 | 4 1 8 8 | |
| | 3 4 | 0 3 6 7 | 1 7 2 3 | 5 7 9 1 | 2 6 4 8 4 8 | 8 0 2 3 9 9 | 9 1 4 3 | 4 5 6 5 5 | 7 7 9 | 6 5 8 8 4 8 | 4 7 9 3 8 0 2 | 8 6 5 9 | 6 3 2 2 9 | 2 3 7 | 1 2 5 | 7 8 7 3 | 7 4 6 3 3 9 0 1 6 | 8 1 5 0 | 1 4 1 7 | 2 4 4 7 | |
| A. Alliance | 1 | | | | | | | | | | | | | | | | | | | | |
| A. Association | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | 7 | 7 | 8 | |
| Sub-association | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | |
| Species group W | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>Panicum deustum</i> | | | | + | A 1 | A 1 | 1 1 1 R 1 R | | | | | | | | | | | | | | |
| <i>Psidium punctulata</i> | R | + | R | | 1 1 + R 1 | 1 | 1 + + + | | | | | | | | | | | | | | |
| <i>Hippobromus pauciflorus</i> | | R | + | | 1 + 1 | 1 | 1 + + + | | | | | | | | | | | | | | |
| <i>Balanites maughanii</i> | | + | | | 1 + | R | R R | R | 1 | R | | | | | | | | | | | |
| <i>Indigofera nebrowiana</i> | | | | | R R | R | R R R | R | R | | | | | | | | | | | | |
| <i>Rhoicissus tridentata</i> | | | R | | + | + | + | + | + | + | | | | | | | | | | | |
| <i>Cassia aethiopica</i> | | R | | | | R | R | R | R | | | | | | | | | | | | |
| Species group X | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>Aristida rhinoceros</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Euphorbia tirucalli</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Gnidia polycephala</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Agave sisalana</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Rhus sikhukhuniensis</i> | | | + | | | | | | | | | | | | | | | | | | |
| <i>Urochloa panicoides</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Stipagrostis hirtigluma</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Nuxia gracilis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Acacia nilotica</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis capensis</i> | | | | R | | R | | | | | | | | | | | | | | | |
| <i>Chascanum hederaceum</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Geigeria burkei</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Pectus-Loeschea leubnitzii</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group Y | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>Euclea limaris</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Evolvulus alsinoides</i> | + | | | + | | | R | | | | | | | | | | | | | | |
| <i>Helichrysum unimervium</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Koeleria caespitosa</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Geigeria ornativa</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Jamiesonbrittenia burkeana</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Pterothrix spinescens</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Seddera capensis</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group Z | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>Euphorbia anomia</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Crabbea angustifolia</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Fockea angustifolia</i> | | | | R | | | | R | | | | | | | | | | | | | |
| <i>Cleome angustifolia</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Blepharis saxatilis</i> | | + | | | | | R | | | | | | | | | | | | | | |
| <i>Anthospermum rigidum</i> | | | | | | | | | | R | | | | | | | | | | | |
| <i>Laggera decurrens</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group AA | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>Lotononis willmsii</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Bulbostylis burcheilii</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Lotononis calycina</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Corchorus esplanifolius</i> | R | R | | | | | | | | | | | | | | | | | | | |

Table 14 continued.

| Relève number | 4 4 | 2 3 3 3 | 2 2 3 3 | 2 2 2 2 | 1 1 1 1 2 2 | 1 1 1 2 2 2 | 1 1 2 2 | 1 1 1 2 2 | 2 2 2 | 1 2 2 2 2 | 1 1 1 2 2 2 2 | 2 2 2 3 | 1 1 2 2 2 | 1 1 1 1 | 3 3 3 | 3 3 3 4 | 1 1 1 1 1 2 2 2 | 2 2 2 3 | 2 2 3 3 | 1 2 2 2 | |
|--------------------------------------|-----|---------|---------|---------|-------------|-------------|---------|-----------|-------|-------------|---------------|---------|-------------|---------|-------|---------|-------------------|---------|---------|---------|-----|
| | 1 1 | 1 3 3 3 | 9 9 0 0 | 5 5 6 7 | 5 5 7 9 0 1 | 2 6 8 3 4 5 | 3 7 6 8 | 2 7 9 0 8 | 0 3 3 | 4 3 0 1 3 3 | 8 8 8 0 4 8 8 | 0 2 3 9 | 6 7 5 7 7 | 3 3 3 | 3 3 3 | 8 8 8 0 | 2 4 4 8 9 9 0 6 6 | 1 2 8 1 | 5 5 0 0 | 4 1 8 8 | |
| | 3 4 | 0 3 8 7 | 1 7 2 3 | 5 7 9 1 | 2 6 4 8 4 8 | 8 0 2 3 9 9 | 9 1 4 3 | 4 5 8 5 5 | 7 7 9 | 6 5 8 9 4 8 | 4 7 9 3 8 0 2 | 8 6 5 9 | 6 8 3 2 2 9 | 2 3 7 | 1 2 5 | 7 8 7 3 | 7 4 6 3 3 9 0 1 6 | 8 1 5 0 | 1 4 1 7 | 2 4 4 7 | |
| Association | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | 7 | 7 | 8 | |
| Sub-association | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | |
| Species group AA cont. | | | | | | | | | | | | | | | | | | | | | |
| <i>Rhus wilmsii</i> | | | | | | | | | | | | | | | | | | | R + R | | |
| <i>Striga siegens</i> | | R | | | | | | | | R | | | R | | | | | | R + R | | |
| Species group AB | | | | | | | | | | | | | | | | | | | | | |
| <i>Fingerhuthia africana</i> | | R R | | + | | | | | | | | | | | | + | | | | | |
| <i>Jamesbrittenia</i> sp. (AW 13026) | | | | | | | | | | | | | R R | | | | | | | | |
| Species group AC | | | | | | | | | | | | | | | | | | | | | |
| <i>Aristida canescens</i> | | | 1 + | 1 R | R + | | R R + | | R | | | + | + | | R | 1 | 1 + | 1 + | 1 + | 1 + | 1 + |
| <i>Kyphocarpa angustifolia</i> | | | + | + | R | R R | | | R R | | | | | | | | | | | | |
| <i>Rhus leptodictya</i> | | R | | | | | | | | | | | | | | | | | | | |
| <i>Melthia prostrata</i> | | | + | + | + | | | | | | | | | | | | | | | | |
| <i>Brachylaena villosa</i> | | | R | | | | | | | | | | | | | | | | | | |
| <i>Aloe cryptopoda</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Senecio latifolius</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group AD | | | | | | | | | | | | | | | | | | | | | |
| <i>Indigofera enomis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Kleinia longiflora</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Raphionacme procumbens</i> | | R | | | | | | | | | | | | | | | | | | | |
| <i>Eragrostis superba</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Ipomoea obscura</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Phyllanthus parvulus</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Gerbera jamesonii</i> | | R | | | | | | | | | | | | | | | | | | | |
| <i>Limium pterocarpum</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Clerodendrum louvelbartsii</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Chlorophytum polyphyllum</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Ruellia cordata</i> | | | | | | | | | | | | | | | | | | | | | |
| Species group AE | | | | | | | | | | | | | | | | | | | | | |
| <i>Aristida adscensionis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Rhynchosia komaensis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Loudelia simplex</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Polygala hottentotta</i> | | | R R | | | | | | | | | | | | | | | | | | |
| <i>Bolusanthus speciosus</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Andropogon chinensis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Eilonurus muticus</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Indigofera hirsuta</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Dicoma gerardii</i> | | R | | | | | | | | | | | | | | | | | | | |
| <i>Aloe burgerstorferensis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Ladabouria marginata</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Kleinia stapeliiformis</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Thesium multiramulosum</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Polygala</i> sp. (SS 449) | | | | | | | | | | | | | | | | | | | | | |
| Species group AF | | | | | | | | | | | | | | | | | | | | | |
| <i>Brachiaria serrata</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>Berkheya insignis</i> | | | | | | | | | | | | | | | | | | | | | |

Table 14 continued.

| Relevé number | 4 4 | 2 3 3 3 | 2 2 3 3 | 2 2 2 2 | 1 1 1 1 2 2 | 1 1 1 1 2 2 2 | 1 1 2 2 2 | 1 1 1 2 2 | 2 2 2 | 1 2 2 2 2 | 1 1 1 2 2 2 2 | 2 2 2 3 | 1 1 2 2 2 2 | 3 3 3 | 3 3 3 4 | 1 1 1 1 1 2 2 2 | 2 2 2 3 | 2 2 3 3 | 1 2 2 2 | | |
|---|-----|---------|---------|---------|-------------|---------------|-----------|-----------|-------|-------------|---------------|---------|-------------|-------|---------------|-------------------|---------|---------|---------|---|---|
| | 1 1 | 1 3 3 3 | 0 9 0 0 | 5 5 6 7 | 5 5 7 8 0 1 | 2 0 6 3 4 5 | 3 7 8 8 | 2 7 9 0 8 | 0 3 3 | 4 3 0 1 3 3 | 8 8 6 0 4 8 8 | 0 2 3 9 | 6 7 5 7 7 | 3 3 3 | 3 3 3 8 8 9 0 | 2 4 4 6 9 9 0 8 6 | 1 2 8 1 | 5 5 0 0 | 4 1 8 9 | | |
| | 3 4 | 0 3 8 7 | 1 7 2 3 | 5 7 9 1 | 2 6 4 8 4 6 | 8 0 2 3 9 9 | 9 1 4 3 | 4 5 8 5 5 | 7 7 9 | 8 5 8 9 4 8 | 4 7 9 3 8 0 2 | 9 6 5 9 | 6 3 2 2 9 | 2 3 7 | 1 2 5 7 8 7 3 | 7 4 6 3 3 9 0 1 6 | 8 1 5 0 | 1 4 1 7 | 2 4 4 7 | | |
| Alliance | I | | | | | | | | | | | I I | | | | | | | | | |
| Association | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | 7 | 8 | |
| Sub-association | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 6 | 1 | 2 | 3 | 8 | |
| Species group AF cont. | | | | | | | | | | | | | | | | | | | | | |
| <i>Rhus keatlil</i> | | | | | | | R R R | + | + | + | + | | R | | | | | | | | |
| <i>Gnidia cefra</i> | | | | | | | R + | R + | R + | R + | | R + | | R + | R + | | | | | | |
| <i>Euphorbia schinzii</i> | | | | | | | R + | | R + | | + | + | | R | | | | | | | |
| <i>Diheteropogon amplexans</i> | | | | | | | R R | | | | | | | | | | | | | | |
| <i>Ipomoea bathycolpos</i> | | | | | | | R | | R R | | R | | R R | | | | | | | | |
| Species group AG | | | | | | | | | | | | | | | | | | | | | |
| <i>Terminalia prunioides</i> | | | | | | | 1 + 1 1 | | + | + | + | + | + | + | + | + | + | + | + | + | + |
| <i>Petalidium oblongifolium</i> | | | | | | | 1 | + | + | R | R | R R | | R | | | | | | | |
| <i>Aristida congesta</i> | | | | | | | + | + | + | + | R R | | + | R | | | | | | | |
| <i>Eragrostis curvula</i> | | | | | | | + | | R | | 1 + | + | + | + | + | + | + | + | + | + | + |
| <i>Corbichonia decumbens</i> | | | | | | | R | | R | | + | + | + | + | + | + | + | + | + | + | + |
| <i>Raphionacme galpinii</i> | | | | | | | R | | R | | R R R | R R | | R | | | | | | | |
| <i>Euclea</i> sp. (SS 934) | | | | | | | + | + | + | R | | 1 + | + | + | + | + | + | + | + | + | + |
| Species group AH | | | | | | | | | | | | | | | | | | | | | |
| <i>Grewia vermicosa</i> | 1 1 | 1 1 + | + | + | + | + | 1 | A | | | | | | | | | | | | | |
| <i>Heteropogon contortus</i> | + | + | 3 3 3 | | | | 1 | | | | | | | | | | | | | | |
| <i>Blapharis subvolubilis</i> | R | + | + | | | | + | + | | | | | | | | | | | | | |
| <i>Vitex obovata</i> ssp. <i>wilmisii</i> | R | + | + | | | | R | | | | | | | | | | | | | | |
| <i>Themeda triandra</i> | R R | B | 1 | 1 | 1 | A | 1 + | B A | 1 A | 1 B | B + B + 1 1 | B | 1 A | 1 A | 1 1 | B A A + A B | 1 1 1 | | | | |
| <i>Phyllanthus glaucophylla</i> | R R | | | | | | R | R | | | | | | | | | | | | | |
| <i>Euclea crispae</i> | 1 | + | + | + | | | + | + | | | | | | | | | | | | | |
| <i>Combretum harense</i> | 1 | R | + | | | | + | + | | | | | | | | | | | | | |
| <i>Elephantorrhiza preatarmisa</i> | | R R | | | | | + | R | | | | | | | | | | | | | |
| <i>Triaspis glaucophylla</i> | | | | | | | 1 + 1 1 | 1 | | | | | | | | | | | | | |
| <i>Tinnea rhodesiana</i> | | | | | | | + | + | | | | | | | | | | | | | |
| <i>Commelina africana</i> | | | | | | | + | + | 1 | | | | | | | | | | | | |

Table 15 Sekhukhuneland Centre endemic/near-endemic and Red Data List plant taxa of the Open Mountain Bushveld.

| Taxon | Family | Syntaxa | | | | | | | | | | | | | | | | | | | |
|--|--------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | I | | | | | | | | | | | II | | | | | | | | |
| | | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6 | 7.1 | 7.2 | 7.3 | 8 |
| <i>Aloe burgersfortensis</i> | LILI | . | . | . | . | . | . | . | . | . | . | . | . | Sr | \$+ | Sr | S+ | . | . | . | Sr |
| <i>Aloe castanea</i> | LILI | . | . | #1 | #r | #r | #r | . | . | #r | #+ | . | #r | . | . | . | #r | . | . | . | . |
| <i>Argyrolobium wilmsii</i> | FABA | . | . | . | . | . | . | . | . | . | #+ | #1 | . | . | . | . | . | . | . | . | . |
| <i>Asparagus intricatus</i> [form] (W&S1501) | ASPA | S+ | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Asparagus sekukuniensis</i> | ASPA | KS1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Bauhinia tomentosa</i> [form] (S444) | FABA | . | . | . | Sr | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Berkheya insignis</i> [form] (S257) | ASTE | . | . | . | . | . | . | S+ | S1 | S+ | S+ | S1 | S+ | S+ | Sr | Sr | Sr | S1 | S1 | S+ | S1 |
| <i>Brachylaena ilicifolia</i> [form] (W&S13244) | ASTE | . | . | Sr | S+ | S1 | Sr | S+ | S+ | Sr | Sr | Sr | . | S+ | S+ | . | Sr | S1 | S+ | S+ | . |
| <i>Catha transvaalensis</i> | CELA | . | . | . | . | Sr | . | . | . | . | Sr | Sr | . | S+ | Sr | Sr | . | . | . | . | Sr |
| <i>Combretum petrophilum</i> | COMB | R#r | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Elephantorrhiza praetermissa</i> | FABA | . | KSr | . | . | KS+ | KS1 | KS+ | KS1 | KS1 | KS1 | KS1 | KS+ | . | . | KSr | . | KS+ | KS+ | KS1 | KSr |
| <i>Euclea crispa</i> [form] (W&S13205) | EBEN | . | S1 | Sr | S+ | S+ | . | S+ | . | . | . | S+ | Sr | Sr | S1 | . | S+ | Sr | Sr | S+ | S1 |
| <i>Euclea linearis</i> | EBEN | . | . | . | . | . | . | . | . | . | . | . | . | . | #r | . | #r | #1 | #r | #1 | . |
| <i>Euclea</i> sp. nov. (S934) | EBEN | . | . | . | . | S+ | Sr | S+ | S1 | S+ | Sr | Sr | S+ | . | Sr | . | S+ | Sr | S+ | Sr | S+ |
| <i>Euphorbia barnardii</i> | EUPH | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | ES+ | . | . | . | . |
| <i>Euphorbia enormis</i> | EUPH | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | #+ | . | . | #r |
| <i>Euphorbia</i> sp. nov. (W13194) | EUPH | . | . | . | Sr | . | . | . | S+ | S+ | Sr | . | . | . | . | . | . | S+ | S+ | Sr | Sr |
| <i>Gnidia caffra</i> [form] (W12975) | THYM | . | . | . | . | Sr | Sr | Sr | S+ | Sr | Sr | S+ | Sr | . | Sr | Sr | . | S+ | Sr | S+ | Sr |
| <i>Gnidia polycephala</i> | THYM | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | #1 | . | . | . | . |
| <i>Grewia vernicosa</i> | TILI | #1 | #1 | #+ | #+ | #r | #r | #r | #+ | #r | #r | #r | #r | . | #r | #+ | #1 | #+ | #1 | #r | #+ |
| <i>Gymnosporia</i> sp. nov. B (W13052) | CELA | S+ | . | . | . | . | . | . | . | . | . | Sr | Sr | Sr | . | . | . | . | . | . | . |

Table 15 continued.

| Taxon | Family | Syntax | | | | | | | | | | | | | | | | | | | |
|--|--------|--------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6 | 7.1 | 7.2 | 7.3 | 8 |
| <i>Helichrysum uninervium</i> | ASTE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | #+ | . | #r | . |
| <i>Hibiscus barnardii</i> | MALV | RSr | . | . | . | . | . | . | . | . | RSr | . | . | . | . | . | . | . | . | . | . |
| <i>Indigofera lydenburgensis</i> | FABA | . | . | . | . | #r | #r | . | . | . | . | #r | . | . | . | . | . | . | . | . | . |
| <i>Ipomoea bathycolpos</i> var. <i>sinuatodentata</i> | CONV | . | . | . | . | . | . | Sr | Sr | Sr | Sr | Sr | Sr | Sr | Sr | Sr | . | Sr | Sr | . | \$+ |
| <i>Jamesbrittenia macrantha</i> | SCHR | . | . | . | . | . | . | KSr | KSr | KS+ | KSr | KS+ | KSr | . | . | . | . | KSr | KS+ | KS+ | . |
| <i>Jamesbrittenia</i> sp. nov. (W13026) | SCHR | . | . | . | . | . | . | . | . | . | . | . | . | \$r | . | . | S+ | S+ | \$r | \$+ | . |
| <i>Jatropha latifolia</i> var. <i>latifolia</i> | EUPH | . | . | #r | #r | #r | #+ | #r | . | #r | #r | #r | #r | . | . | . | . | . | . | . | #r |
| <i>Kleinia stapeliiformis</i> | ASTE | . | . | . | . | . | . | . | . | . | . | . | . | #r | . | #r | #r | #+ | . | #r | . |
| <i>Leucas capensis</i> [form] (W&S13007) | LAMI | . | Sr | . | S+ | S+ | . | S+ | . | . | Sr | . | . | \$r | . | Sr | . | \$r | . | . | . |
| <i>Nuxia gracilis</i> | LOGA | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | K#+ | . | . | . | . |
| <i>Orthosiphon fruticosus</i> | LAMI | . | Sr | . | S1 | S+ | Sr | S+ | Sr | S+ | \$+ | S1 | S+ | . | . | . | Sr | . | . | . | \$r |
| <i>Ozoroa albicans</i> | ANAC | . | . | . | . | . | . | . | . | . | K#r | K#r | . | . | . | . | . | . | . | . | . |
| <i>Pavetta</i> sp. nov. (S22) | RUBI | . | . | . | Sr | Sr | Sr | . | . | . | \$+ | \$+ | Sr | . | Sr | . | . | . | . | . | . |
| <i>Petalidium oblongifolium</i> | ANAC | . | . | #+ | #r | #r | #r | #r | #r | #r | #r | . | . | #1 | #r | #r | #r | #1 | #r | #r | #1 |
| <i>Plectranthus xerophilus</i> | LAMI | . | . | . | . | . | . | . | . | #r | . | . | . | . | . | . | . | . | . | . | . |
| <i>Polygala</i> sp. nov. (S449) | POLY | . | . | . | . | . | . | . | . | . | . | . | . | . | Sr | S1 | Sr | Sr | S+ | Sr | . |
| <i>Pterothrix spinescens</i> | ASTE | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | #+ | . | #r | . |
| <i>Rhus batophylla</i> | ANAC | . | . | . | . | . | . | . | . | . | . | . | . | RS1 | RSr | . | RSr | RSr | . | RSr | . |
| <i>Rhus engleri</i> | ANAC | . | . | . | . | . | . | . | . | . | . | . | . | . | #r | . | . | . | . | . | . |
| <i>Rhus keetii</i> | ANAC | . | . | . | . | . | #r | #+ | #+ | #r | #r | #r | . | #r | . | #+ | #1 | #+ | #+ | #r | . |
| <i>Rhus sekhukhuniensis</i> | ANAC | . | . | R\$r | . | . | . | . | . | . | RSr | . | . | . | . | RS+ | . | . | . | . | . |
| <i>Rhus wilmsii</i> | ANAC | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | K#+ | . | . | . |
| <i>Scilla natalensis</i> | LILI | . | . | . | . | . | . | . | . | . | . | Nr | . | . | . | . | . | . | . | . | . |
| <i>Stylochaeton</i> sp. nov. (S1332) | ARAC | Sr | . | . | S+ | \$r | . | . | . | . | Sr | . | . | . | . | . | . | . | . | . | . |
| <i>Triaspis glaucophylla</i> | MALP | . | . | #1 | #+ | #+ | #+ | #r | #r | . | #r | #r | #+ | . | #+ | #r | . | #r | #r | #r | #r |

Table 15 continued.

| Taxon | Family | Syntaxa | | | | | | | | | | | | | | | | | | | |
|--|--------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|----|
| | | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6 | 7.1 | 7.2 | 7.3 | 8 |
| <i>Vitex obovata</i> subsp. <i>wilmsii</i> | VERB | #r | #+ | . | #r | #1 | #+ | #1 | #1 | #+ | #1 | #1 | #+ | #+ | #r | #+ | #+ | #1 | #r | #+ | #+ |
| <i>Xerophyta retinervis</i> [form] (W13208) | VELL | . | . | . | . | \$+ | \$1 | . | \$+ | \$+ | \$r | \$1 | . | . | . | . | . | . | \$+ | . | . |
| SCPE endemics | | 5 | 4 | 3 | 6 | 11 | 8 | 10 | 11 | 10 | 15 | 14 | 10 | 8 | 11 | 7 | 12 | 13 | 13 | 11 | 11 |
| SCPE near-endemics | | 3 | 2 | 3 | 6 | 7 | 7 | 6 | 6 | 5 | 10 | 8 | 6 | 2 | 8 | 4 | 9 | 10 | 8 | 8 | 8 |
| Red Data List | | 3 | 1 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 5 | 4 | 2 | 1 | 1 | 1 | 4 | 3 | 3 | 3 | 1 |
| Restricted to syntaxon | | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 0 | 0 |
| Restricted to association | | 3 | | 1 | | | 0 | | | 4 | | | 1 | | | 3 | | 3 | | 0 | |
| Total for syntaxon | | 8 | 6 | 6 | 12 | 18 | 15 | 16 | 17 | 15 | 25 | 23 | 16 | 10 | 19 | 11 | 21 | 23 | 21 | 19 | 19 |
| Total for association | | 12 | | 21 | | | 19 | | | 30 | | | 24 | | | 21 | | 26 | | 19 | |

Endemism: \$ = endemic, # = near-endemic; **Red Data List:** I = Indeterminate, K = Insufficiently Known, R = Rare, N = Not threatened in the northern provinces of South Africa, but in other areas of southern Africa; **Abundance in communities:** 1 = abundant, + = frequent, r = rare, . = absent; **Collectors:** S = Siebert, W = Van Wyk; **Bold** blocks represent community/syntaxon specific taxa.

Table 16 Environmental factors and selected attributes associated with the different plant communities of the Open Mountain Bushveld.

| Factors/attributes | Syntaxa | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|---------|-------------------------|-----|-------------------------|-------------------------|-------------|-----------|-----------|-----------|-------------------------|-----------|-----|-------------------------|-------------------------|-----|-------------------------|-------------------------|-------------------------|-----------|-------------------------|
| | I | | | | | | | | | | | | II | | | | | | | |
| | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6 | 7.1 | 7.2 | 7.3 | 8 |
| Number of relevés | 2 | 4 | 4 | 4 | 6 | 6 | 4 | 5 | 3 | 6 | 7 | 4 | 5 | 3 | 3 | 4 | 9 | 4 | 4 | 4 |
| Total number of species | 45 | 64 | 55 | 78 | 122 | 99 | 71 | 60 | 63 | 130 | 96 | 95 | 37 | 20 | 60 | 98 | 85 | 73 | 85 | 84 |
| Average number of species per relevé | 40 | 27 | 36 | 34 | 42 | 40 | 40 | 35 | 32 | 42 | 41 | 41 | 25 | 16 | 39 | 35 | 37 | 30 | 34 | 36 |
| Number of endemics/near-endemics | 8 | 6 | 6 | 12 | 18 | 15 | 16 | 17 | 15 | 25 | 23 | 16 | 10 | 19 | 11 | 21 | 23 | 21 | 19 | 19 |
| Number of Red Data List taxa | 3 | 1 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 5 | 4 | 2 | 1 | 1 | 1 | 4 | 3 | 3 | 3 | 1 |
| Geology* | F | P/N | G/F | P/M/ A | P/N/ A | P/N/ A | P/N/ A | P/N/ A | P/N/ A | F/P | P/N/ A | P | Q | Q | Q/P | Q | Q/P/ N | Q/P/ M | Q/P/ N | Q/F/ M |
| Topographic position** | M | M/F | M | M/F | M/S | S | M | M/C | M/S | M/S | S | M/S | V | V | F | V | F/V | F/V | F/V | M/F/ V |
| Slope (°) | 7 | 3-7 | 7-9 | 3-5 | 5-12 | 9-15 | 7-12 | - | -/5 | 7-15 | 7-18 | 5-9 | 1-3 | 1-3 | 1-3 | 1 | 1-3 | 1-5 | 1-3 | 1-7 |
| Aspect | W | N/E | N/E | N/S/ W | S | N/E/ S/W | S | - | -/S | S | S | S/E | - | N/E/ S/W | S/W | N/S/ W | N/E/ S/W | N/W/ S | W/S | W/S |
| Predominant soil type*** | Gs | Gs ¹ / Sn | Gs | Gs ¹ / Hu | Gs ¹ / Ms | Ms | Gs | Gs | Gs | Ms ¹ / Gs | Ms | Gs | Va ¹ / Bo | Bo ¹ / Hu | Hu | Hu ¹ / Bo | Va ¹ / Bo | Va ¹ / Ms | Va | Ms ¹ / Gs |

Table 16 continued.

| Factors/attributes | Syntaxa | | | | | | | | | | | | | | | | | | | |
|---------------------------|---------|---------|----------|----------|----------|----------|----------|---------|---------|----------|----------|----------|---------|---------|---------|--------|---------|---------|---------|---------|
| | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 | 5.3 | 6 | 7.1 | 7.2 | 7.3 | 8 |
| Rock cover percentage (%) | 60-70 | 10-40 | 30-40 | 20-30 | 35-60 | 45-75 | 40-70 | 30-40 | 25-60 | 30-60 | 40-60 | 30-45 | 10-20 | 10-50 | 40-80 | 30-40 | 10-40 | 50-65 | 40-50 | 30-50 |
| Average rock size (mm) | 500-750 | 200-500 | 500-1000 | 400-1000 | 400-1000 | 500-1500 | 500-1500 | 100-300 | 300-500 | 500-1000 | 500-1000 | 500-1500 | 100-150 | 100-250 | 100-350 | 50-150 | 100-300 | 200-400 | 300-500 | 250-500 |

* A = anorthosite; F = ferrogabbro; G = granofire; M = magnetite; N = norite; P = pyroxenite; Q = Alluvium

** C = crest; S = scarp; M = midslope; F = footslope; V = valley

*** Bo = Bonheim; Gs = Glenrosa; Hu = Hutton; Ms = Mispah; Sn = Steendal; Va = Valsrivier (X¹ Dominant soil type)

Table 17 A key to the syntaxa of the Open Mountain Bushveld of the hills and valleys of the Sekhukhuneland Centre of Plant Endemism.

| Leads/description | Go to/syntaxon |
|---|--|
| 1a Slope bushveld (<i>Ozoroa sphaerocapa</i> & <i>Themeda triandra</i>) | 2 |
| b Valley bushveld (<i>Bolusanthus speciosus</i> & <i>Diheteropogon amplexans</i>) | 3 |
| 2a Southern aspects (<i>Tristachya leucothrix</i> & <i>Elephantorrhiza praetermissa</i>) | 4 |
| b All aspects (<i>Acacia senegal</i> var. <i>leiorachis</i> & <i>Psiadia punctulata</i>) | 5 |
| 3a Predominantly clay soils (<i>Geigeria ornativa</i> & <i>Loudetia simplex</i>) | 6 |
| b Predominantly loam soils (<i>Acacia karroo</i>) | 7 |
| 4a Midslope and scarp (<i>Cussonia transvaalensis</i> & <i>Rhoicissus tridentata</i>) | 8 |
| b Midslope and crest (<i>Kirkia wilmsii</i>) | 9 |
| 5a Maximum rock size < 1000mm (<i>Grewia flava</i> & <i>Enneapogon scopartus</i>) | 10 |
| b Maximum rock size < 750mm (<i>Enteropogon macrostachys</i> & <i>Blepharis subvolubilis</i>) | 11 |
| 6a Lithosols predominant (<i>Raphionacme procumbens</i> & <i>Ozoroa sphaerocarpa</i>) | 8. <i>Petalidio oblongifolii</i> – <i>Raphionacmetum procumbentis</i> |
| b Lithosols rare (<i>Euclea linearis</i> & <i>Aristida canescens</i>) | 12 |
| 7a Disturbed, old fields (<i>Euphorbia urucali</i> & <i>Aristida congesta</i>) | 6. <i>Aristido rhiniochloo</i> – <i>Gnidiolum polycephalae</i> |
| b Disturbed, dongas (<i>Eragrostis lehmanniana</i> & <i>Hippobromus pauciflorus</i>) | 13 |
| 8a Slope moderate (<9°) (<i>Jamesbrittenia macrantha</i>) | 14 |
| b Slope steep (<18°) (<i>Pavetta</i> sp. nov. & <i>Xerophyta retinervis</i>) | 15 |
| 9a Rock size < 500mm (<i>Acacia caffra</i> & <i>Rhynchosia spectabilis</i>) | 3.2 <i>Phyllantho glaucophyllae</i> – <i>Brachylaenetum ilicifoli brachiarietosum serratae</i> |
| b Rock size > 500mm (<i>Setaria lindenbergiana</i> & <i>Catha edulis</i>) | 3.1 <i>Phyllantho glaucophyllae</i> – <i>Brachylaenetum ilicifoli setarietosum sphacelatae</i> |
| 10a Pyroxenite and anorthosite (<i>Terminalia prunioides</i>) | 16 |
| b Ferrogabbro and granofire (<i>Chloris virgata</i> & <i>Aloe castanea</i>) | 2.1 <i>Enneapogono scoparti</i> – <i>Acacietum leiorachis chloretosum virgatae</i> |
| 11a Norite (<i>Diospyros lycioides</i> subsp. <i>sericea</i> & <i>Grewia vernicosa</i>) | 1.2 <i>Enteropogono macrostachyo</i> – <i>Sclerocaryetum birreae grewietosum vernicosae</i> |
| b Ferrogabbro (<i>Croton menyhartii</i> & <i>Gymnosporia glaucophylla</i>) | 1.1 <i>Enteropogono macrostachyo</i> – <i>Sclerocaryetum birreae asparagetosum sekukuniensis</i> |
| 12a Rock cover > 40% (<i>Aristida adscensionis</i>) | 17 |
| b Rock cover < 40% (<i>Blepharis saxatilis</i> & <i>Petalidium oblongifolium</i>) | 7.1 <i>Loudetia simplicis</i> – <i>Eucleetum linearis diheteropogonetosum amplexans</i> |
| 13a Rock cover percentage < 80% (<i>Heteropogon contortus</i>) | 18 |
| b Rock cover percentage < 20% (<i>Rhus batophylla</i> & <i>Rhynchosia komatiensis</i>) | 5.1 <i>Eragrostio lehmanniana</i> – <i>Hippobrometum pauciflori rhoetosum batophyllae</i> |

Table 17 continued.

| Leads/description | Go to/syntaxon |
|---|---|
| 14a Rock size > 500mm (<i>Combretum zeyheri</i> & <i>Combretum hereroense</i>) | 4.4 <i>Tristachyo leucothricis</i> – <i>Cussonietum transvaalensis combretetosum zeyheri</i> |
| b Rock size < 500mm (<i>Myrothamnus flabellifolius</i> & <i>Mundulea sericea</i>) | 4.1 <i>Tristachyo leucothricis</i> – <i>Cussonietum transvaalensis myrothamnetosum flabellifolius</i> |
| 15a Ferrogabbro (<i>Tarchonanthus camphoratus</i>) | 4.3 <i>Tristachyo leucothricis</i> – <i>Cussonietum transvaalensis argylobietosum wilmsii</i> |
| b Norite (<i>Melinis nervigulumis</i> & <i>Chaetacanthus costatus</i>) | 4.2 <i>Tristachyo leucothricis</i> – <i>Cussonietum transvaalensis melinetosum nervigulumis</i> |
| 16a Lithosols (<i>Panicum deustum</i>) | 19 |
| b Deeper soils (<i>Monechma divaricatum</i>) | 2.2 <i>Enneapogono scoparii</i> – <i>Acacietum leiorachis grewietosum flavescens</i> |
| 17a Norite (<i>Eliomurus muticus</i>) | 7.3 <i>Loudetio simplicis</i> – <i>Eucleetum linearis andropogonetosum chinensis</i> |
| b Magnetite (<i>Rhus wilmsii</i> & <i>Senecio latifolius</i>) | 7.2 <i>Loudetio simplicis</i> – <i>Eucleetum linearis heteropogonetosum contorti</i> |
| 18a Footslopes (<i>Euclea crispa</i>) | 5.3 <i>Eragrosti lehmanniana</i> – <i>Hippobrometum pauciflori elionuretosum mutici</i> |
| b Valleys (<i>Panicum natalense</i> & <i>Brachylaena ilicifolia</i>) | 5.2 <i>Eragrosti lehmanniana</i> – <i>Hippobrometum pauciflori sorgetosum bicoloris</i> |
| 19a All aspects (<i>Commiphora mollis</i> & <i>Jucticia protracta</i>) | 2.4 <i>Enneapogono scoparii</i> – <i>Acacietum leiorachis commiphoretosum mollis</i> |
| b Southern aspects (<i>Berchemia zeyheri</i> & <i>Diospyros lycioides</i> subsp. <i>nitens</i>) | 2.3 <i>Enneapogono scoparii</i> – <i>Acacietum leiorachis brachylaenetosum ilicifoliae</i> |

Table 18 The three most dominant and conspicuous plant taxa of each of the major vegetation types of the Open Mountain Bushveld depicted in the DECORANA scatter diagram.

| Major vegetation type | Trees/shrubs | Forbs/sedges | Grasses |
|---|---|--|---|
| 1. <i>Enteropogono macrostachyo-Slerocaryetum birreae</i> (<i>Enteropogon macrostachys-Sclerocarya birrea</i>) | <i>Croton gratissimus</i> <i>Grewia vernicosa</i> <i>Sclerocarya birrea</i> | <i>Asparagus sekukuniensis</i> <i>Hibiscus coddii</i> <i>Stylochaeton natalensis</i> | <i>Enteropogon macrostachys</i> <i>Heteropogon contortus</i> <i>Themeda triandra</i> |
| 2. <i>Enneapogono scoparii-Acacetum senegal</i> (<i>Enneapogon scoparius-Acacia senegal</i> var. <i>leiorachis</i>) | <i>Acacia senegal</i> var. <i>leiorachis</i> <i>Brachylaena ilicifolia</i> <i>Kirkia wilmsii</i> | <i>Aloe cryptopoda</i> <i>Jasminum multipartitum</i> <i>Justicia protrocta</i> | <i>Aristida meridionalis</i> <i>Enneapogon scoparius</i> <i>Themeda triandra</i> |
| 3. <i>Phyllantho glaucophyllae-Brachylaenetum ilicifoli</i> (<i>Phyllanthus glaucophyllus-Brachylaena ilicifolia</i>) | <i>Brachylaena ilicifolia</i> <i>Diospyros lycioides</i> subsp. <i>nitens</i> <i>Vitex obovata</i> subsp. <i>wilmsii</i> | <i>Berkheya insignis</i> <i>Gnidia caffra</i> <i>Phyllanthus glaucophylla</i> | <i>Heteropogon contortus</i> <i>Themeda triandra</i> <i>Tristachya leucothrix</i> |
| 4. <i>Tristachyo leucothricis-Cussonietum transvaalensis</i> (<i>Tristachya leucothrix-Cussonia transvaalensis</i>) | <i>Cussonia transvaalensis</i> <i>Elephantorrhiza praetermissa</i> <i>Vitex obovata</i> subsp. <i>wilmsii</i> | <i>Orthosiphon fruticosus</i> <i>Rhynchosia komatiensis</i> <i>Rhynchosia spectabilis</i> | <i>Heteropogon contortus</i> <i>Themeda triandra</i> <i>Tristachya leucothrix</i> |
| 5. <i>Eragrosti lehmanniana-Hippobrometum pauciflori</i> (<i>Eragrostis lehmanniana-Hippobromus pauciflorus</i>) | <i>Combretum hereroense</i> <i>Hippobromus pauciflorus</i> <i>Tinnea rhodesiana</i> | <i>Polygala hottentota</i> <i>Psiadia punctulata</i> <i>Senecio latifolius</i> | <i>Eragrostis lehmanniana</i> <i>Loudetia simplex</i> <i>Panicum deustum</i> |
| 6. <i>Aristido rhiniochloo-Gnidietum polycephalae</i> (<i>Aristida rhiniochloo-Gnidia polycephala</i>) | <i>Combretum hereroense</i> <i>Euphorbia tirucalli</i> <i>Grewia vernicosa</i> | <i>Dicoma gerrardii</i> <i>Gnidia polycephala</i> <i>Pechuel-Loeschea leubnitzia</i> | <i>Aristida congesta</i> <i>Aristida rhiniochloa</i> <i>Stipagrostis hirtigluma</i> var. <i>patula</i> |
| 7. <i>Loudetio simplicis-Eucleetum linearis</i> (<i>Loudetia simplex-Euclea linearis</i>) | <i>Euclea linearis</i> <i>Rhus keetii</i> <i>Vitex obovata</i> subsp. <i>wilmsii</i> | <i>Dicoma gerrardii</i> <i>Kyphocarpa angustifolia</i> <i>Rhynchosia komatiensis</i> | <i>Diheteropogon amplexens</i> <i>Loudetia simplex</i> <i>Themeda triandra</i> |
| 8. <i>Petalidido oblongifolii-Raphionacmetum procumbentis</i> (<i>Petalidium oblongifolium-Raphionacme procumbens</i>) | <i>Combretum hereroense</i> <i>Grewia vernicosa</i> <i>Vitex obovata</i> subsp. <i>wilmsii</i> | <i>Berkheya insignis</i> <i>Petalidium oblongifolium</i> <i>Raphionacme procumbens</i> | <i>Diheteropogon amplexens</i> <i>Heteropogon contortus</i> <i>Themeda triandra</i> |