CHAPTER 8

SOUTPANSBERG LEACHED SANDVELD COMMUNITIES

Introduction

In an overview of the vegetation of the Soutpansberg Conservancy and the Blouberg Nature Reserve (Chapter 4), the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld was identified as a Major Vegetation Type. The classification of this Major Vegetation Type is addressed in this chapter.

A number of detailed phytociciological studies have been conducted within the leached sandveld communities of the Limpopo Province by Coetzee (1976), Van Der Meulen (1979), Westfall (1981), Westfall *et al.* (1985), Van Den Berg (1993), Winterbach (1998), Henning (2002), Van Staden (2002) and Van Staden & Bredenkamp (2005). These studies were all focussed on small geographical areas concerned with meeting localised conservation and localised vegetation-mapping demands. The arid ecosystems of the Limpopo Province, and for that matter most of the southern African savannas (Du Plessis 2001), have only been sampled in localised patches, such as areas of high conservation value and or high economic value. Large gaps still remain to be filled in order to create a holistic image of the phytosociology of the southern African leached sandveld.

Acocks (1953) mapped the vegetation of this area as Sour Bushveld (20). This Vegetation Type of Acocks is however, an oversimplification of the variety of distinct plant communities within this very heterogeneous landscape. Van Rooyen and Bredenkamp (1998) recognised the uniqueness of this region's vegetation. However, without the necessary data, they too had to lump these communities under the broad term of Soutpansberg Arid Mountain Bushveld. Despite being unique, the communities associated with this sandveld type are generally species poor. The communities associated with the bare rock sheets are the exception to the recorded low species richness.

Vegetation classification

The analysis of the vegetation data resulted in the identification of four plant communities, classified into four syntaxonomic associations (Table 7). The plant communities of the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type are classified as follows:

1. *Myrothamno flabellifolii–Hexalobetum monopetali*
Classified under the proposed *Selaginelletea dregei* described by Mostert *et al.* (*in prep*)

2. *Burkeo africanae–Pseudolachnostylietum maprouneifoliae*
Classified under the *Burkea africana–Perotis patens* Woodland Alliance of the *Combretum molle–Diheteropogon amplectens* Woodland Order (Van Der Meulen 1979), under the *Terminalio sericeae–Combretetea apiculati* (Winterbach *et al.* 2000)

3. *Terminalio sericea–Burkeetum africanae*
Classified under the *Burkea africana–Perotis patens* Woodland Alliance of the *Combretum molle–Diheteropogon amplectens* Woodland Order (Van Der Meulen 1979), under the *Terminalio sericeae–Combretetea apiculati* (Winterbach *et al.* 2000)

4. *Androstachyetum* (Coetzee 1983)
Classified under the proposed *Crotonetea gratissimi* described by Mostert *et al.* (*in prep*)

Table 7 Phytosociological table of the plant communities of the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type

Association no.	**1**	**2**	**3**	**4**
Releve number	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1		
	1 1 1 2 2 6 6 6 6 1 1 2 2 2 2	1 1 2 2 2 2 2 2 2 5 5 5 5 7	1 1 1 1 1 1 1 1 2 2 2 3	
	5 6 9 3 4 0 1 2 3 7 8 0 1 2 5	8 9 1 2 3 5 6 7 8 6 7 8 9 2	8 9 0 1 2 3 4 5 6 7 0 4 9 0	1 2 3 4 5 6 7
Diagnostic species of the *Myrothamno flabellifolii–Hexalobetum monopetali*				
Species Group A				
Hexalobus monopetalus var. *monopetalus*	+ + + + 1 1 1 + a + a + 1 1 +	r r r +		
Myrothamnus flabellifolius	+ + 1 + + + + + + + + + + + +	+ +		
Selaginella dregei	+ + + + + r r r + + + + + +			
Hyperacanthus amoenus	+ + + + + + + + + + + + +			
Ipomoea albivenia	+ + + + + + + + + + + + + 1	+ r		
Euphorbia zoutpansbergensis	+ + r + + r + + + +			
Aloe angelica	+ 1 + + + + + 1 + + + + +			
Euphorbia aeruginosa	+ + + + + + + + + + + + +			
Euphorbia cooperi var. *cooperi*	+ + + + + + + + + + + + +			
Garcinia livingstonei	+ + + + + r r + + + + +	+		
Combretum vendae	+ + + a a 1 1 + + + +			
Commiphora marlothii	+ + + r + + + + + + +	+ r		
Orthosiphon labiatus	+ + + + + + + + + + + +			
Anacampseros subnuda	+ + + + + + r + + +			
Portulaca kermesina	+ + + + + r + r + +			+
Artabotrys brachypetalus	+ + + + + + + + + 1 +	+		

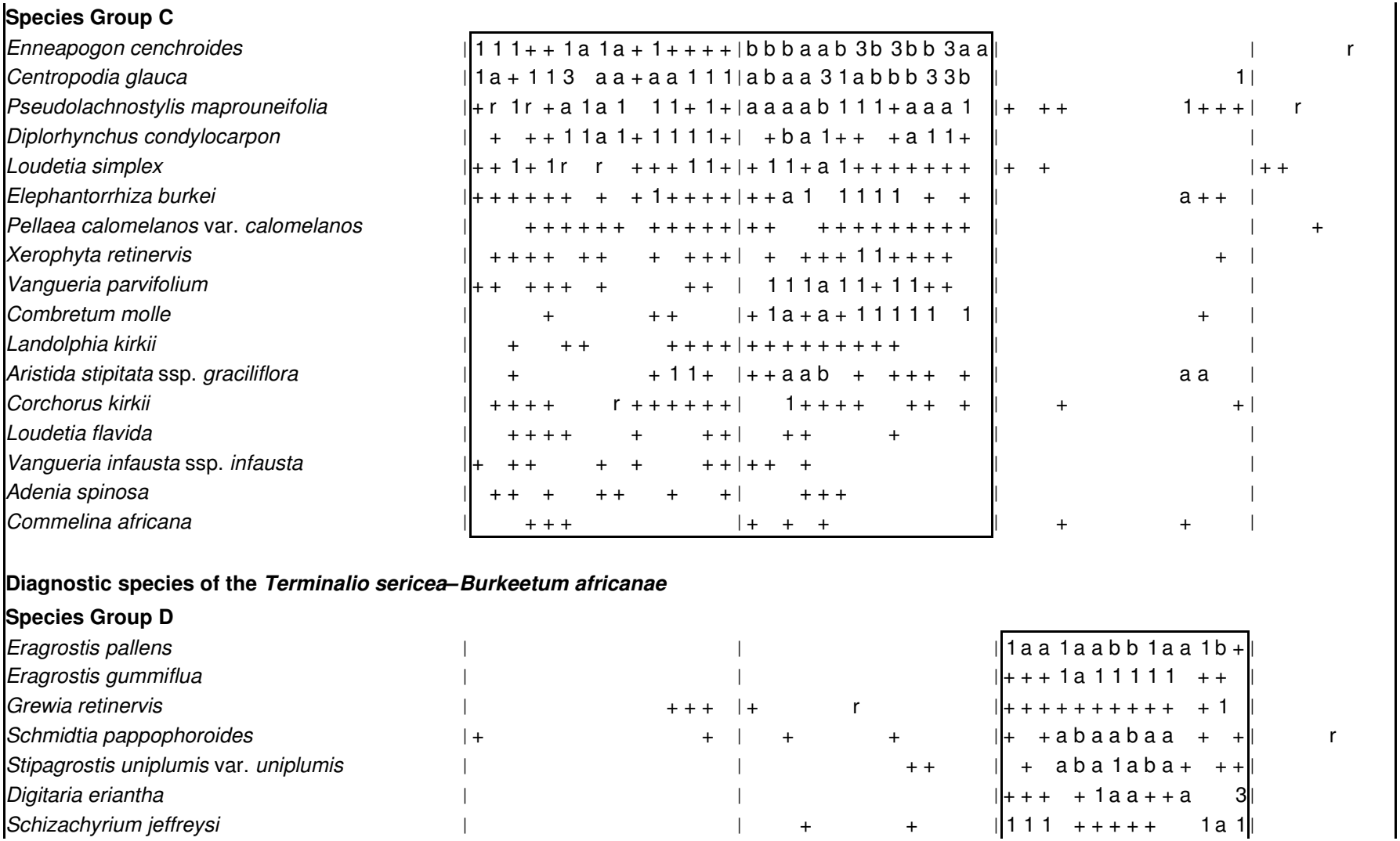
Ficus tettensis		+	+	+	+			r			+	+	+	+	+																																				
Isoglossa hypoestiflora		+	+	+	+	+	+			+	+				+														+																						
Ficus abutilifolia			+		+	+	+		r			+	+	+	+						r			+																											
Dicoma montana		+	+	+		+		+	+		+	+	+																																						
Asparagus laricinus	+	+		+	+	+				+		+			+	+						+																													
Ficus ingens var. *ingens*		+						+	+	+	+		+	+	+																																				
Indigofera cryptantha var. *cryptantha*				+		+	+	+	+		+		+	+				+						+																											
Aloe chabaudii var. *chabaudii*		+		+				+	+	+			+	+	+																																				
Ochna inermis			+		+		+	+	+	+		+										+		+																											
Jasminum multipartitum					+	+	+		+	+		+	+																																						
Justicia montis-salinarum	+		+	+		+		+	+					+																																					
Indigofera schimperi	+		+			+	+		+	+	+																														+										
Barleria rotundifolia	+		+			+	+	+					+	+																																					
Psydrax livida			+	+	+	+					+			+							+				+																										
Corchorus asplenifolius	+				+		+		+		+		+																																						
Psydrax locuples			+	+	+	+					+		+				+									+																									
Avonia rhodesica	+		+	+	+	+	+																																												
Ziziphus mucronata ssp. *mucronata*		r	+			+					+	+		+							r				r								+				+														
Eragrostis trichophora		+			+	+					+		+								+						+																					+					
Vangueria soutpansbergensis	+				+	+	+						+																																						
Cyperus rupestris		+			+				+		+			+																																					
Canthium mundianum		+			+	+						+			+																																				
Pavonia dentata			+					+	+		+	+									+																														
Convolvulus sagittatus	+	+								+	+		+																																						
Ceratotheca triloba	+		+							+	+				+																																				
Euphorbia griseola ssp. *griseola*			+							+	+		+	+																																					
Sida cordifolia								+	+	+			+														+						+								+										
Justicia anagalloides		+		+	+				+																																										
Justicia odora				+								+	+	+								+	+																												

Ceropegia species	+ + + + +			
Asparagus exuvialis for. *exuvialis*	+ + + +			
Albizia brevifolia	+ + +	r		
Euclea natalensis ssp. *angustifolia*	+ + +	+		
Ficus glumosa	+ + +	+		
Oldenlandia herbacea	+ + +			
Isoglossa grantii	+ + +	+		
Panicum schinzii	+ + +			
Euphorbia confinalis	+ + +			
Cleome macrophylla	+ + +			
Vepris reflexa	+ + +			
Kalanchoe sexangularis	+ + +			

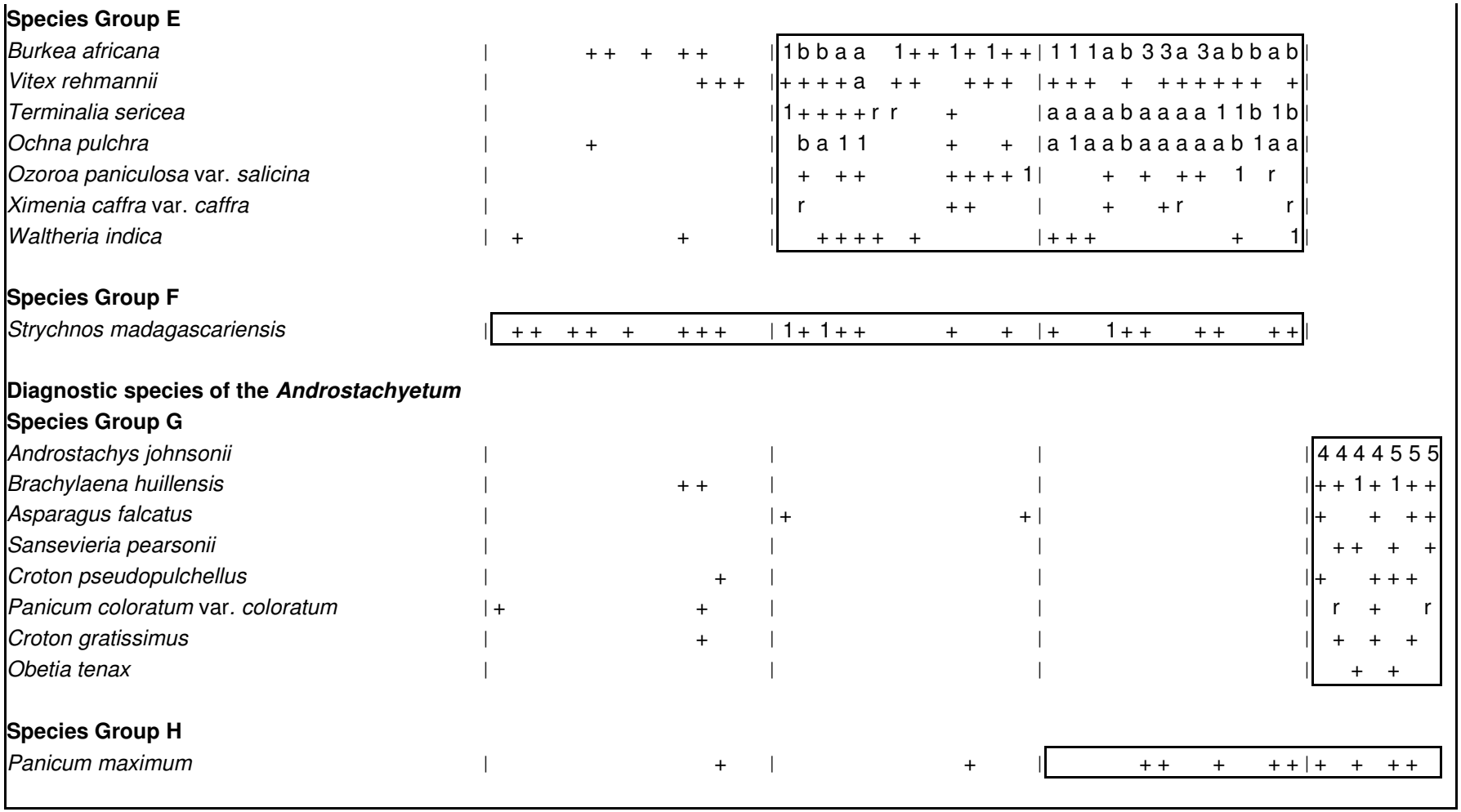
Diagnostic species of the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae*

Species Group B

Tricalysia junodii var. *kirkii*	+	+ + 1 1 + + 1 + 1 + +		
Grewia bicolor		+ + + + 1 + + +		
Mundulea sericea		+ + + 1 1 1 + +		
Lannea discolor	+	+ + 1 + + +	1	
Corchorus confusus		+ + + +		
Toddaliopsis bremekampii	+	+ 1 + +		
Combretum apiculatum ssp. *apiculatum*	r	+ a 1 a	+	
Melinis nerviglumis		+ + +	+	
Ectadiopsis oblongifolia	+ +	+ + +		
Indigofera hilaris		+ + +	+	
Grewia flavescens	+	+ r +	+ +	r


Species Group C
Enneapogon cenchroides
Centropodia glauca
Pseudolachnostylis maprouneifolia
Diplorhynchus condylocarpon
Loudetia simplex
Elephantorrhiza burkei
Pellaea calomelanos var. calomelanos
Xerophyta retinervis
Vangueria parvifolium
Combretum molle
Landolphia kirkii
Aristida stipitata ssp. graciliflora
Corchorus kirkii
Loudetia flavida
Vangueria infausta ssp. infausta
Adenia spinosa
Commelina africana
Diagnostic species of the Terminalio sericea–Burkeetum africanae
Species Group D
Eragrostis pallens
Eragrostis gummiflua
Grewia retinervis
Schmidtia pappophoroides
Stipagrostis uniplumis var. uniplumis
Digitaria eriantha
Schizachyrium jeffreysi

Pterocarpus angolensis		+ +	1 + + + 1 1 1 + 1 +
Euclea natalensis ssp. *natalensis*	r		+ + + + + + + + + +
Aristida canescens ssp. *ramosa*	+		1 1 1 1 1 + + 1 1
Urginea altissima			+ + + + + + + + +
Aristida diffusa ssp. *burkei*			+ + + 1 1 + + a + +
Cineraria parvifolia			+ + + + + + + + +
Parinari capensis ssp. *capensis*			+ + + a 1 a 1 + 1
Tephrosia longipes		+ +	+ + + + + + + +
Peltophorum africanum	+		+ + 1 1 1 1 + +
Setaria sphacelata var. *sphacelata*	+		+ + + + + +
Suregada africana			+ + + + + +
Dichapetalum cymosum			+ + + + + + +
Salacia rehmannii			+ + + + + + +
Strychnos pungens	+ + + + +	r +	+ + + + + + +
Conostomium zoutpansbergense		r	+ + + + +
Elaeodendron transvaalense			+ + + +
Raphionacme procumbens			+ + + +
Pterocarpus rotundifolius ssp. *rotundifolius*		1	a a a +
Grewia monticola	+ +	r +	+ + r +
Bulbostylis hispidula			+ + + +
Cyperus albostriatus			+ + + +
Rhus leptodictya			+ + +
Agathisanthemum bojeri			+ + +
Phylica burchellii			+ + +
Chamaecrista mimosoides	+ +	+	+ + +
Pygmaeothamnus zeyheri var. *zeyheri*			+ 1 1
Elephantorrhiza elephantina		b	+ + +
Rhus pentheri			r + r


Species Group E
Burkea africana
Vitex rehmannii
Terminalia sericea
Ochna pulchra
Ozoroa paniculosa var. salicina
Ximenia caffra var. caffra
Waltheria indica
Species Group F
Strychnos madagascariensis
Diagnostic species of the Androstachyetum
Species Group G
Androstachys johnsonii
Brachylaena huillensis
Asparagus falcatus
Sansevieria pearsonii
Croton pseudopulchellus
Panicum coloratum var. coloratum
Croton gratissimus
Obetia tenax
Species Group H
Panicum maximum

Community description

***Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type**

Acocks (1953) referred to parts of the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type as the Terminalia Veld (18b1) and the Burkea Veld (18b4) of the Mixed Bushveld (18) and the Sour Bushveld (20). Van Rooyen & Bredenkamp (1996) described similar leached sandveld communities for the Waterberg Mountain Range as the Waterberg Moist Mountain Bushveld as part of the savanna biome. Westfall (1981) and Westfall *et al.* (1985) described numerous plant communities from the Waterberg area, which share many floristic elements with the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type of the SC. Some of the leached sandveld plant communities of the Nylsvlei Nature Reserve (Coetzee *et al*. 1979) within the Springbok Flats of the Limpopo Province show strong floristic affinities with those leached sandveld communities described for the SC.

The *Burkea africana–Setaria lindenbergiana* Major Community described by Van Staden (2002) and Van Staden & Bredenkamp (2005) as well as the *Burkea africana–Setaria sphacelata* Undulating Plains, Footslopes, Terraces and Plateaus Community and the *Terminalia sericea–Eragrostis pallens* Deep Sandy Lowlands Community described by Henning (2002) of the Waterberg area share many diagnostic species with the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type of the SC. The coarse vegetation described by Van Den Berg (1993) of the Sour and Mixed Bushveld emphasises the heterogeneity of these Veld Types.

The *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type shares numerous diagnostic species with the *Terminalio sericeae–Combretetea apiculati* described by Winterbach (1998) and Winterbach *et al*. (2000). More specifically, this Major Vegetation Type share numerous diagnostic species with the *Burkea africana–Perotis patens* Woodland Alliance described by Van der Meulen (1979). These species include *Agathisanthemum bojeri, Aristida diffusa, Aristida stipitata, Burkea africana, Bulbostylis hispidula, Chamaecrista*

mimosoides, Combretum molle, Convolvulus sagittatus, Croton gratissimus, Digitaria eriantha, Diplorhynchus condylocarpon, Elephantorrhiza elephantina, Eragrostis gummiflua, Euclea natalensis, Grewia flavescens, Grewia monticola, Hexalobus monopetalus, Lannea discolor, Loudetia simplex, Melinis nerviglumis, Mundulea sericea, Ochna pulchra, Oldenlandia herbacea, Ozoroa paniculosa, Panicum maximum, Pellaea calomelanos, Pseudolachnostylis maprouneifolia, Pterocarpus rotundifolius, Rhus leptodictya, Schizachyrium spp., *Schmidtia pappophoroides, Selaginella dregei, Setaria sphacelata, Strychnos pungens, Tephrosia longipes, Terminalia sericia, Vangueria infausta, Vangueria parvifolium, Vitex rehmannii, Waltheria indica* and *Xerophyta retinervis.* The large number of diagnostic and prominent species shared among these vegetation units, suggests that at least some of the associations of the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type may be classified syntaxonomically under the *Burkea africana–Perotis patens* Woodland Alliance within the *Combretum molle–Diheteropogon amplectens* Woodland Order (Van der Meulen 1979) of the proposed *Terminalio sericeae–Combretetea apiculati* (Winterbach *et al*. 2000).

It is interesting to note that *Combretum apiculatum* does not occur within the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type as a dominant or diagnostic species. However, based on the complex of diagnostic species shared by *Terminalio sericeae–Combretetea apiculati* and the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type, these two vegetation units are syntaxonomically regarded as belonging to the same vegetation class. In a syntaxonomic synthesis of the southern African Mopaneveld, Du Plessis (2001) also described this phenomenon, whereby *Colophospermum mopane* is absent from some of the associations belonging to the *Commiphoro mollis–Colophospermetea mopani*. Based on the complex of diagnostic species shared by the Mopaneveld associations, they are syntaxonomically linked (Du Plessis 2001).

The *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type also shares numerous prominent species with the *Englerophyto magalismontani–Acacietea caffrae* (Mountain Bushveld Class) (Winterbach 1998; Winterbach *et al*. 2000). This syntaxonomic class, however, is

poorly understood and contains enormous variation in vegetation types and plant communities (Winterbach *et al*. 2000; Henning 2002). The distinction between the *Terminalio sericeae–Combretetea apiculati* and *Englerophyto magalismontani–Acacietea caffrae* in the veld is often unclear (Winterbach *et al*. 2000), resulting in an overlap of lower level communities (associations and alliances) within the syntaxonomic hierarchy. The *Englerophyto magalismontani–Acacietea caffrae* may very well be a complex of several separate and unique vegetation classes. Much more researched is needed in order to understand the relative syntaxonomical position and status of the very diverse and complex *Englerophyto magalismontani–Acacietea caffrae.*

The *Androstachyetum* of the SC seems to be an azonal community of the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type. It shares very few diagnostic and dominant species of the Soutpansberg Leached Sandveld communities. It is regarded to be part of the proposed Koppies and Outcrops syntaxonomic class described from the Kruger National Park (Mostert *et al. in prep*.).

Environmental data

Due to the varying topography of the landscape of the Leached Sandveld Major Vegetation Type, it comprises of four distinctly different plant communities, which vary dramatically in both floristic composition and vegetation structure.

The Leached Sandveld Vegetation Type is confined to the warmer northern slopes of the mountain, as well as some of the more arid southern slopes falling within the mountain's rain-shadow on the northern ridges. It is associated with the Mispah and Hutton Soil Forms (MacVicar *et al*. 1991) of Land Types Ae, Fa and Ib derived from sandstone, quartzite and conglomerate of the Wyllies Poort Geological Formation (Botha 2004a, b; Patterson & Ross 2004a, b). The *Terminalio sericea–Burkeetum africanae* in particular is associated with deep regic sands of the Namib Soil Form, which is of an aeolian origin from the Kalahari (Brandl 2002). It also includes the vegetation associated with the almost bare sheets of exposed rock against the warm northern slopes.

This vegetation type is associated with well-drained sandy soils of the relatively dry landscapes of the SC. Its plant communities occur on both very shallow and very deep sands. The shallow soils are situated on steep inclines, while the deep sands are associated with valley bottoms or higher lying sandy plateaus. Nutrients are leached out of these systems and deposited either into lower-laying systems down the catena, or transported deeper underground. The combination of soils derived from nutrient-poor parent materials and the observed leaching effect has left these communities extremely nutrient-poor and unproductive (Coetzee *et al*. 1976; Van Der Meulen 1979; Westfall 1981; Westfall *et al.* 1985).

Altitude ranges from approximately 855 m to 1590 m above sea level. The average annual rainfall is 383 mm (South African Weather Bureau), varying between 356 mm at Waterpoort to 410 mm on the farm Albert. Rainfall events are irregular and localised north of the mountain range (South African Weather Bureau).

Diagnostic taxa

The diagnostic species for *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type are presented in species group M (Table 1, Chapter 4). Diagnostic trees and shrubs characterizing the communities of this major vegetation type include *Diplorhynchus condylocarpon, Elephantorrhiza burkei, Ochna pulchra, Hexalobus monopetalus* var. *monopetalus, Grewia retinervis, Strychnos pungens, Ozoroa paniculosa* var. *salicina, Pterocarpus angolensis, Garcinia livingstonei, Commiphora marlothii, Ficus abutilifolia, Artabotrys brachypetalus, Ficus tettensis* and *Orthosiphon labiatus.*

Diagnostic succulent species include *Aloe angelica, Anacampseros subnuda, Euphorbia cooperi, Euphorbia zoutpansbergensis* and *Portulaca kermesina*.

Some of the diagnostic grass species include *Centropodia glauca, Eragrostis pallens, Schizachyrium jeffreysii, Eragrostis gummiflua, Aristida canescens* subsp. *ramosa, Aristida diffusa* and *Loudetia flavida.*

The diagnostic forbs and field-layer succulents representing this Major Vegetation Type are *Ipomoea albivenia, Selaginella dregii, Euphorbia aeruginosa, Cineraria*

parvifolia, Tephrosia longipes, Indigofera cryptantha var. *cryptantha, Adenia spinosa, Isoglossa hypoestiflora* and *Asparagus laricinus.*

Dominant / prominent taxa

Different woody species are dominant in the different associations of this vegetation type. The most prominent of the species that are found in the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type include *Androstachys johnsonii*, *Diplorhynchus condylocarpon, Elephantorrhiza burkei*, *Garcinia livingstonei, Hexalobus monopetalus* var. *monopetalus, Ochna pulchra, Pterocarpus angolensis* (Species Group M), *Tricalysia junodii* var. *kirkii* (Species Group N), *Burkea africana, Pseudolachnostylis maprouneifolia* (Species Group O), *Terminalia sericea* (Species Group P), *Parinari capensis* subsp. *capensis* (Species Group Q), *Combretum vendae, Vangueria parvifolium* (Species Group R), *Combretum molle, Vitex rehmannii* and *Hyperacanthus amoenus* (Species Group U).

Prominent succulent species include *Aloe angelica, Anacampseros subnuda, Euphorbia cooperi* var. *cooperi, Euphorbia zoutpansbergensis* and *Portulaca kermesina* (Species Group M).

As with the woody species, the different associations revealed different dominant grass species. Some of the grass species that dominate in the different landscapes of this vegetation type are *Aristida canescens* subsp. *ramosa*, *Centropodia glauca, Eragrostis gummiflua, Eragrostis pallens, Schizachyrium jeffreysii* (Species Group M), *Stipagrostis uniplumis* var. *uniplumis, Digitaria eriantha, Enneapogon cenchroides, Schmidtia pappophoroides* (Species Group P) and *Loudetia simplex* (Species Group R).

The most prominent forbs within the field-layer include *Dicoma montana, Ipomoea albivenia* (Species Group M) and *Myrothamnus flabellifolius* (Species Group R).

1. *Myrothamno flabellifolii–Hexalobetum monopetali* ass. nov., hoc loco.

Nomenclatural type: Relevé 124 (holotypus)

Classified under the proposed *Selaginelletea dregei* described by Mostert *et al.* (*in prep*)

Alternative name: *Myrothamnus flabellifolius–Hexalobus monopetalus* var. *monopetalus* rock-sheet community

The *Myrothamno flabellifolii–Hexalobetum monopetali* can be regarded as an azonal plant community, which occupies the extensive rock sheets of the warmer northern slopes of the Soutpansberg. Due to the greater diversity in microhabitats structure among the rock sheets, boulders and crevices, this association contains higher plant species richness than the surrounding Leached Sandveld. The habitat associated with the *Myrothamno flabellifolii–Hexalobetum monopetali* can be described as a mosaic of distinctly different microhabitats. Depending on the specific level of syntaxonomic interpretation, the vegetation of these micro-habitats or micro-ecosystems may be regarded as uniquely different associations. The vegetation associated with these rock sheets exhibit high levels of spatial diversity, varying with the ever-changing micro-topography. This landscape is diverse and shows very little repetition. Temporal flooding of shallow soils is often followed by prolonged periods of severe desiccation. This results in an increased temporal variation in the form of successional colonisation and competition within the herb layer of a given micro-system over relatively short periods of time. For this reason, the focus was placed on strong perennial species during community description, while the herbaceous layer was handled as the more dynamic and fluctuating component of this ecosystem. For the purpose of this report, it is therefore considered as a single association that needs further study.

The *Myrothamnus flabellifolius–Hexalobus monopetalus* var. *monopetalus* Rock-sheet community is relatively rich in species endemic to the Soutpansberg. They include species such as *Aloe angelica, Combretum vendea, Ceratotheca saxicola, Duvalia procumbens, Encephlartos hirsutus, Euphorbia aeriginosa, E. rowlandii, E. zoutpnsbergensis, Pavetta tshikondeni, Orbianthus conjuntus, Stapelia clavicorona, Blepharis* sp. nov., *Tylophora codii* and *Vangueria soutpansbergensis* (Hahn 2002).

The near-endemic species *Sansiveria halii* is shared with Zimbabwe, while *Strophantus lutiolus* is shared with Maputaland (Hahn 2002).

Environmental data

The vegetation of the *Myrothamno flabellifolii–Hexalobetum monopetali* is synonymous with the north facing bare rock sheets of the SC. These rock sheets are exposed to extreme solar radiation and desiccation. The slope is a gentle 15° and the bare rock sheets comprise up to 90% of the exposed surface. The vegetation is locally discontinuous and mostly restricted to the available soil patches. Soil is limited to depressions, cracks and crevices in the bare rock sheets where soil and vegetation particles are trapped and accumulate. Soil depth varies dramatically between patches. Some of these soil patches are underlain by impermeable rock and become waterlogged in the wet season, while they are prone to severe desiccation during the prolonged dry season. The soils of this heterogeneous association mostly belong to the Mispah Soil Form (MacVicar et al. 1991) and are associated with the Fa641 Land Type. The underlying geology is sandstone and quartzite of the Wyllies Poort Geological Formation (Botha 2004a, b; Patterson & Ross 2004a, b).

Vegetation may vary from individual plants to desiccation-resistant bush-clumps containing numerous species. These islands of vegetation within a landscape of predominantly bare rock sheets are often unique in structure and species composition. The vegetation structure of the *Myrothamno flabellifolii–Hexalobetum monopetali* association can generally be described as Low Sparse Woodland (Edwards 1983).

Diagnostic taxa

This association is characterises by the diagnostic species presented in species group A (Table 7). The most prominent diagnostic tree and shrub species include *Hexalobus monopetalus* var. *monopetalus*, *Hyperacanthus amoenus, Euphorbia zoutpansbergensis, Aloe angelica, Aloe chabaudii* var. *chabaudii, Euphorbia cooperi* var. *cooperi, Garcinia livingstonei, Combretum vendae, Commiphora marlothii, Artabotrys brachypetalus, Ficus tettensis, Ficus abutilifolia, Ficus ingens* var. *ingens, Ochna inermis, Psydrax livida, Psydrax locuples, Ziziphus mucronata* subsp.

mucronata, Vangueria soutpansbergensis, Canthium mundianum, Ficus glumosa, Ceratotheca triloba and *Euphorbia confinalis.*

Eragrostis trichophora and *Panicum schinzii* were the only diagnostic grass species recorded for this association at the time when the fieldwork was conducted.

The field layer is characterised by hardy desiccation-resistant species that are capable of enduring extreme environmental fluctuations. They include *Myrothamnus flabellifolius, Selaginella dregei, Ipomoea albivenia, Euphorbia aeruginosa, Orthosiphon labiatus, Anacampseros subnuda, Portulaca kermesina, Isoglossa hypoestiflora, Dicoma montana, Asparagus laricinus, Indigofera cryptantha* var. *cryptantha, Jasminum multipartitum, Justicia montis-salinarum, Indigofera schimperi, Barleria rotundifolia, Corchorus asplenifolius, Avonia rhodesica, Cyperus rupestris, Pavonia dentata, Convolvulus sagittatus, Euphorbia griseola* subsp. *griseola, Sida cordifolia, Justicia anagalloides* and *Justicia odora*.

Dominant / prominent taxa

Prominent trees and shrubs include *Aloe angelica* (Species Group A), *Combretum vendae* (Species Group A), *Euphorbia cooperi* var. *cooperi* (Species Group A), *Euphorbia zoutpansbergensis* (Species Group A), *Garcinia livingstonei* (Species Group A), *Hexalobus monopetalus* var. *monopetalus* (Species Group A), *Hyperacanthus amoenus* (Species Group A), *Diplorhynchus condylocarpon* (Species Group C), *Elephantorrhiza burkei* (Species Group C) and *Pseudolachnostylis maprouneifolia* (Species Group C).

The most prominent grass species include *Centropodia glauca* (Species Group C), *Enneapogon cenchroides* (Species Group C), and *Loudetia simplex* (Species Group C).

Hardy perennials that are resistant to environmental extremes dominate the field layer. They include *Ipomoea albivenia* (Species Group A), *Myrothamnus flabellifolius* (Species Group A), *Pellaea calomelanos* var. *calomelanos* (Species Group C) and *Xerophyta retinervis* (Species Group C).

The large number of diagnostic species suggests that this community is unique and may present an azonal vegetation class on its own, probably with several associations. The *Myrothamno flabellifolii–Hexalobetum monopetali* is currently classified under the *Selaginellaetea dregei* of the rock sheet communities proposed by Mostert *et al.* (*in prep*). Precious little phytosociological studies have been done on the rock sheet communities of the southern African savannas (Du Preez & Bredenkamp 1991). The *Myrothamno flabellifolii–Hexalobetum monopetali* share some of the more prominent plant species within the *Munduleo sericeae–Euphorbietum cooperi* and *Crassulo sarcocaulis–Aristidietum transvaalensis* of the Sekhukhuneland rock outcrop vegetation (Siebert *et al.* 2003). These associations contain numerous succulent and drought-resistant species, which are highly specialized in their ability to withstand desiccation.

2. *Burkeo africanae–Pseudolachnostylietum maprouneifoliae* ass. nov., hoc loco.

Nomenclatural type: Relevé 19 (holotypus)

Classified under the *Burkea africana–Perotis patens* Woodland Alliance of the *Combretum molle–Diheteropogon amplectens* Woodland Order (Van Der Meulen 1979), under the *Terminalio sericeae–Combretetea apiculati* (Winterbach *et al*. 2000)

Alternative name: *Burkea africana–Pseudolachnostylis maprouneifolia* Low Bushland on shallow sandy soils against moderate slopes

Environmental data

The structure of the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae* can be described as Low Bushland (Edwards 1983), dominated by short trees and shrubs (2–5 m), with a relatively dense grass sward. The woody species are somewhat stunted when compared to similar species in other associations. These communities are generally associated with the gentle northern upper slopes of the mountain's northern most ridges. These slopes are covered by shallow sandy soils of the Mispah Soil Form (MacVicar et al. 1991) and are associated with the Fa641 Land Type. The underlying geology is sandstone, quartzite and conglomerate of the Wyllies Poort Geological Formation (Botha 2004a, b; Patterson & Ross 2004a, b). These shallow sandy soils drain well, are leached and relatively nutrient poor, with a clay-content of less than 10%. Surface rock cover is generally high and ranges between 40 and 70%. The

slopes are gentle at 15° and tend to be concave. The generally dense field layer results in very little soil erosion.

Diagnostic taxa

This association is characterises by the diagnostic species presented in species group B (Table 7). The diagnostic woody species are generally weak and include *Tricalysia junodii* var. *kirkii, Grewia bicolor, Mundulea sericea* and *Lannea discolor*.

Only one grass species *Melinis nerviglumis* is included in this group of diagnostic species and cannot be regarded as a very constant character species for the association.

Diagnostic forbs are relatively woody and include *Ectadiopsis oblongifolia, Corchorus confusus* and *Indigofera hilaris*.

Dominant / prominent taxa

Prominent woody species include *Diplorhynchus condylocarpon* (Species Group C), *Combretum molle* (Species Group C), *Pseudolachnostylis maprouneifolia* (Species Group C), *Vangueria parvifolium* (Species Group C), *Xerophyta retinervis* (Species Group C), *Burkea africana* (Species Group E), *Elephantorrhiza burkei* (Species Group F), and *Vitex rehmannii* (Species Group F).

The grass sward is dense and is dominated by *Aristida stipitata* subsp. *graciliflora* (Species Group C), *Centropodia glauca* (Species Group C), *Enneapogon cenchroides* (Species Group C) and *Loudetia simplex* (Species Group C).

Due to the dense grass layer, forbs are not very prominent and are more or less confined to bare patches between rocks. Some of the more prominent and common species include *Corchorus kirkii* (Species Group C), *Landolphia kirkii* (Species Group C) and *Pellaea calomelanos* var. *calomelanos* (Species Group C).

Numerous authors have described rocky leached sandveld communities very similar to the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae* of the SC. These

include the *Burkea africana–Diplorhynchus condylocarpon* variation of the *Burkea africana–Setaria lindenbergiana* Low Thicket of the *Burkea africana–Setaria lindenbergiana* Major Community of the Waterberg (Van Staden 2002; Van Staden & Bredenkamp 2005), the *Burkea africana–Setaria sphacelata* Undulating Plains, Footslopes, Terraces and Plateaus of the Waterberg (Henning 2002), the *Combretum molle–Euclea crispa* closed woodland (Westfall 1981; Westfall *et al.* 1985), the *Combretum molle–Aristida diffusa–Vitex rehmannii* variation of the *Combretum molle–Aristida diffusa* open woodland (Westfall 1981), the *Combretum molle–Landolphia capensis* closed woodland (Westfall 1981; Westfall *et al.* 1985), and the *Barleria bremekampii–Diplorhynchus* Tree Savanna (Coetzee *et al.* 1979) of the Nylsvlei Nature Reserve. The *Barleria bremekampii–Diplorhynchus* Tree Savanna (Coetzee *et al.* 1976) and the *Combretum molle–Aristida diffusa–Vitex rehmannii* variation (Westfall 1981) should be regarded as synonyms of the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae* of the SC. In the context of the syntaxonomic classification done by Van der Meulen (1979), the above mentioned associations and communities should all be regarded as part of the *Burkea africana–Perotis patens* Woodland Alliance on warmer rocky slopes and deeper sands within the *Combretum molle–Diheteropogon amplectens* Woodland Order, under the *Terminalio sericeae–Combretetea apiculati* described by Winterbach *et al*. (2000).

3. *Terminalio sericea–Burkeetum africanae* ass. nov., hoc loco.

Nomenclatural type: Relevé 12 (holotypus)

Classified under the *Burkea africana–Perotis patens* Woodland Alliance of the *Combretum molle–Diheteropogon amplectens* Woodland Order (Van Der Meulen 1979), under the *Terminalio sericeae–Combretetea apiculati* (Winterbach *et al*. 2000)

Alternative name: *Terminalia sericia–Burkea africana* Leached Deep Sandveld

Acocks (1953) described this association as "*Terminalia* Veld Propper (1)" under the Mixed *Terminalia–Dichapetalum* Veld (18b) of the Mixed Bushveld (18).

Environmental data

Structurally, the *Terminalio sericea–Burkeetum africanae* can be described as Short Closed Woodland (Edwards 1983). The tree layer is very dominant, with scantly

distributed shrubs and a field layer dominated by grass species. Species diversity within this community is very low. It is associated with deep regic sands of an aeolian origin from the Kalahari (Brandl 2002). The soil is classified as the Namib Soil Form. Although these wind borne sands are not indicated on the Land Type maps (Botha 2004a & b; Patterson & Ross 2004a & b), they are represented on the 1:250 000 Alldays geological map (Brandl 2002). These patches of fine-grained sands occur in some valley bottoms and terraces where the sand was deposited over many years. Clay content of the soil is less than 10% and nutrient poor. Drainage is very good and the soils are leached. Within these sands, surface nutrients leach deep into the sand and are transported out of reach of the vegetation on the surface.

Diagnostic taxa

This association is characterised by the diagnostic species presented in species group D (Table 7). The diagnostic woody species include *Pterocarpus angolensis, Euclea natalensis* subsp. *natalensis, Parinari capensis* subsp. *capensis, Peltophorum africanum, Suregada africana, Dichapetalum cymosum, Salacia rehmannii, Elaeodendron transvaalense, Pterocarpus rotundifolius* subsp. *rotundifolius, Grewia monticola, Rhus leptodictya, Pygmaeothamnus zeyheri* var. *zeyheri* and *Elephantorrhiza elephantina.*

Some of the diagnostic grass species characterising this association include *Eragrostis pallens, Eragrostis gummiflua, Schmidtia pappophoroides, Stipagrostis uniplumis* var. *uniplumis, Digitaria eriantha, Schizachyrium jeffreysi, Aristida canescens* subsp. *ramosa, Aristida diffusa, Setaria sphacelata* var. *sphacelata* and *Aristida diffusa* subsp. *burkei.*

The field layer is generally poor in herb species, with diagnostic species such as *Urginea altissima, Cineraria parvifolia, Tephrosia longipes, Conostomium zoutpansbergense, Raphionacme procumbens, Bulbostylis hispidula, Cyperus albostriatus, Agathisanthemum bojeri, Phylica burchellii* and *Chamaecrista mimosoides*.

Dominant / prominent taxa

Prominent woody species include *Euclea natalensis* subsp. *natalensis* (Species Group D), *Grewia retinervis* (Species Group D), *Parinari capensis* subsp. *capensis* (Species Group D), *Peltophorum africanum* (Species Group D), *Pterocarpus angolensis* (Species Group D), *Burkea africana* (Species Group E), *Ochna pulchra* (Species Group E), *Terminalia sericea* (Species Group E), *Vitex rehmannii* (Species Group E) and *Strychnos madagascariensis* (Species Group F).

Most of the prominent grasses within the *Terminalio sericea–Burkeetum africanae* include *Aristida diffusa* subsp. *burkei* (Species Group D), *Aristida canescens* subsp. *ramosa* (Species Group D), *Digitaria eriantha* (Species Group D), *Eragrostis gummiflua* (Species Group D), *Eragrostis pallens* (Species Group D), *Schizachyrium jeffreysi* (Species Group D), *Schmidtia pappophoroides* (Species Group D), *Setaria sphacelata* var. *sphacelata* (Species Group D) and *Stipagrostis uniplumis* var. *uniplumis* (Species Group D).

The most dominant herbaceous species are relatively inconspicuous with species such as *Cineraria parvifolia* (Species Group D) and *Tephrosia longipes* (Species Group D). The geophyte *Urginea altissima* (Species Group D) is relatively common in this association.

Numerous authors have described the plant communities associated with the deeper leached sandy soils of the Waterberg and its surrounding areas. Many of these communities closely resemble the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae* of the SC based on diagnostic and dominant species. Some of these include the *Ochna pulchra–Terminalia sericea* Woodland Association on rock outcrop and deeper sand (Van der Meulen 1979), the *Combretum molle–Terminalia sericea* closed woodland (Westfall 1981), the *Combretum molle–Aristida diffusa–Strychnos madagascariensis* variation of the *Combretum molle–Aristida diffusa* open woodland (Westfall 1981), the *Burkea africana–Setaria lindenbergiana* Major Community (Van Staden 2002; Van Staden & Bredenkamp 2005), and the *Terminalia sericea–Eragrostis pallens* Deep Sandy Lowlands Community (Henning 2002). Based on their common floristic and environmental components, they should all be regarded syntaxonomically as part of the *Burkea africana–Perotis patens* Woodland

Alliance on warmer rocky slopes and deeper sands within the *Combretum molle–Diheteropogon amplectens* Woodland Order described by Van Der Meulen (1979), under the *Terminalio sericeae–Combretetea apiculati* described by Winterbach *et al.* (2000).

The leached sands of the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae* and *Terminalio sericea–Burkeetum africanae* are relatively species poor and no Soutpansberg endemic or near-endemic species are known to be associated specifically with them.

4. *Androstachyetum* (Coetzee 1983)

Classified as a sub-community of the *Androstachyetum* desribed by Coetzee (1983).
Nomenclatural type: Relevé 8 of Table 9 in Coetzee 1983
Alternative name: Western Soutpansberg *Androstachys johnsonii* Low Closed Woodland on steep talus slopes

Little is known about the autecology of *Androstachys johnsonii* within the Soutpanberg and Lebombo mountain ranges (Coetzee 1983; Van Rooyen 1978; Van Rooyen *et al.* 1981). Coetzee (1983) provides a speculative description of the environmental factors that he considers being the driving elements behind the structure and composition of this community. Many of the environmental conditions described by Coetzee (1983) are also similar to those experienced by the *Androstachys johnsonii* communities of the western Soutpansberg. Dense fog and mist seems to be one of the driving factors within this relatively arid ecosystem. Some in-depth autecological research on *Androstachys johnsonii* is needed in order to understand and interpret the nature and habits of these communities. The *Androstachys johnsonii* communities of the Western Soutpansberg constitute the western most distribution of *Androstachys johnsonii* and these communities within southern Africa.

The *Androstachys johnsonii* Low Closed Woodland on the steep talus slopes of the SC share floristic elements with the *Androstachys johnsonii* woodlands of the Maputaland Centre of Endemism (Hahn 2002). Floristically similar *Androstachys*

johnsonii woodlands occur on the Mozambican costal plains (Hahn 2002). However, these woodlands are structurally taller and are associated with deep sandy substrates. Soutpansberg endemic species associated with the *Androstachys johnsonii* woodlands are *Orbianthus conjuntus* and *Duvalia procumbens*.

Due to the slow growing nature of *Androstachys johnsonii* within the western Soutpansberg, the wood produced is crooked and twisted, and does not have the same economic potential as the strait poles produced by the *Androstachys johnsonii* woodlands of the Mozambican costal plains (Hahn 2002). The threat and pressure from over-exploitation for construction material should therefore be less than currently experienced in the Maputaland Centre of Endemism. However, the limited distribution of these *Androstachys johnsonii* woodlands within the western Soutpansberg makes these populations vulnerable and wood harvesting and cutting should not be considered. The *Androstachyetum* of the SC should be protected and conserved as part of the western-most populations of *Androstachys johnsonii* woodlands. The exploitation of such a limited and slow growing natural resource is not sustainable within the confines SC.

Environmental data

The vegetation structure of the *Androstachyetum* of the SC can be described as low closed woodland (Edwards 1983). Van Rooyen (1978) described a similar community type in the north of the Kruger National Park as a dry forest. With canopy cover of this community around 75%, the decision of classifying it as closed woodland or as a forest becomes arguable. However, due to a lack of clearly defined strata within this vegetation type, the category of woodland was used in this study.

The *Androstachyetum* of the SC is associated with steep slopes and scarps on some of the southern aspects within the rain-shadow northern ridges of the mountain. These are arid environments with very low water retention capabilities. The steep southern slopes are covered with quartzite talus, which are often several meters thick. The underlying geology is diabase, overlain by this layer of quartzite talus. The underlying diabase weathers to clayey soils. The soils are litholitic, comprising of quarzite boulders overlying clayey soils. This creates a complex soil matrix for the plants involved. Plants without long taproots, such as those from the field layer, do not have

access to the underlying clayey soils. It is unknown whether the *Androstachys johnsonii* trees utilise these underlying clayey soils, or whether they are restricted to the upper layers of quartzitic talus and sand. The soils underlying the talus are deep litholitic soils. The scarps are the rugged quartzite edges of the shear-levels of the Limpopo Fault. The associated landscape contains almost no soil.

The *Androstachyetum* of the SC falls within the Ib and Fa Land Types (Botha 2004a, b; Patterson & Ross 2004a, b), which is associated with the sandstone, quartzite and conglomerate of the Wyllies Poort Geological Formation. The soil is predominantly of the Mispah Form, and is prone to prolonged drought conditions. It receives a small fraction of the orographic mist that spills over the southern most ridges in order to reach these more central and northern ridges. This summer mist and fog may contribute to the plant-available moisture within this ecosystem. Whether *Androstachys johnsonii* can capture moisture in the form of mist is unknown. Further east along the Soutpansberg Mountain Range, these *Androstachys johnsonii* communities also occur along the arid northern slopes where mist and fog only occur extremely rarely.

Diagnostic taxa

This association is characterised by species group G (Table 7). Diagnostic woody species include *Androstachys johnsonii, Brachylaena huillensis* and *Obetia tenax* in the tree layer, and *Croton pseudopulchellus* and *Croton gratissimus* in the shrub layer.

A weak diagnostic grass species is *Panicum coloratum* var. *coloratum*.

The group includes only two weak diagnostic herbaceous species namely *Asparagus falcatus* and the xerophytic *Sansevieria pearsonii*.

Dominant / prominent taxa

The composition of the woody layer is completely dominated by *Androstachys johnsonii* (Species Group G), forming almost mono-specific stands. The field layer is almost non-existent and no other species can be considered as prominent.

The *Androstachyetum* of the SC is an evergreen azonal community associated with the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type within the SC. Although it has been grouped as part of the Leached Sandveld Major Vegetation Type based on communal floristics, it shares very few dominant species with the Soutpansberg Leached Sandveld communities.

The *Androstachys johnsonii–Croton pseudopulchelus* Dry Forest of the northern Kruger National Park (Van Rooyen 1978) is a relatively similar plant community at the eastern extreme of the Soutpansberg. Although the *Androstachys johnsonii–Croton pseudopulchelus* Dry Forest communities are more species rich than the *Androstachyetum* of the SC, they are considered to be sub-communities of the same association.

Coetzee (1983) first described the *Androstachyetum* from the Rhyolite formations where the Olifants River Gorge cuts through the Lebombo Mountain Range in the Kruger National Park. The *Androstachys johnsonii* dominated scrubby thicketed bush of steep talus slopes with deep litholitic soil variant (Coetzee 1983) of this association bare very close resemblance to the *Androstachys johnsonii* community described for the quartzite talus slopes of the SC. The *Androstachyetum* is regarded to be part of the proposed *Crotonetea gratissimi* described from the Kruger National Park (Mostert *et al. in prep*.).

The *Croton gratissimus–Setaria lindenbergiana* Woodland Association on isolated rocky koppies in the Bushveld Basin, which forms part of the *Burkea africana–Perotis patens* Alliance of the *Combretum molle–Diheteropogon amplectens* Woodland Order described by Van Der Meulen (1979) as part of the *Terminalio sericeae–Combretetea apiculati* described by Winterbach *et al*. (2000), share some of the diagnostic floristic elements of the *Androstachyetum* of the SC. However, it is proposed that the *Croton gratissimus–Setaria lindenbergiana* Woodland Association on isolated rocky koppies in the Bushveld Basin be removed from the *Terminalio sericeae–Combretetea apiculati* into the newly proposed *Crotonetalia* of the *Crotonetea gratissimi* (Mostert *et al. in prep*.)

Ordination

The Soutpansberg Leached Sandveld Major Vegetation Type contains a relatively diverse group of plant communities. These differences are very clear when vegetation structure and floristic composition are compared between some of the different communities. The communities are generally poor in species, with only a few species dominating in each association. The vegetation of this semi-arid Major Vegetation Type is dominated and characterised by its woody layer and contain numerous succulent species. The field layer is most often only of a temporary nature, dominated by annual species during times of abundant rainfall. These species become inconspicuous during the dry season and disappear during times of drought.

The scatter diagram displays the distribution of relevés along the second and third ordination axes (Figure 11). The vegetation units are represented as groups and their distribution on the scatter diagram corresponds with certain physical environmental gradients. The second ordination axis (eigen value = 0.760) is represented by the x-axis and the third ordination axis (eigen value = 0.674) is represented by the y-axis. Some environmental gradients that may contribute to the observed separation of associations along the x- and y-axes include surface rock cover, slope, soil depth, soil texture, soil moisture availability, aspect and air-moisture in the form of mist and fog.

The extreme right side of the x-axis represents steep slopes on the southern aspects and crests, covered with quartzite talus. These are arid environments with very low water retention capabilities. The soils are litholitic, comprising of quarzite boulders overlying clayey soils. This creates a complex soil matrix for the plants involved. Plants without long taproots, such as those from the field layer, do not have access to the underlying clayey soils. It is unknown whether the *Androstachys johnsonii* trees utilise these underlying clayey soils, or whether they are restricted to the upper layers of quartzitic talus and sand.

The *Androstachys johnsonii* closed woodland association is very unique and is depicted by the x-axis as floristically “far removed” from the other three associations of this major vegetation type. This unique structural and floristic composition may be due to a very complex interaction between the plant species and the environmental

factors involved. As mentioned by Coetzee (1983), *Androstachys johnsonii* alters and influences its local environment through its unique physiology. It may even have allelopathic effects on the surrounding vegetation, which may very well override the more obvious and measurable environmental effects acting upon it. The environmental gradients observed and measured for the current study within the Soutpansberg Leached Sandveld Major Vegetation Type seems to be insufficient for explaining the ecology of this unique plant community. Little is known about *Androstachys johnsonii* and its interaction with its immediate environment. Autecological research is needed to understand this ecologically and economically important species.

The rocky nature and steep inclines of the landscapes decreases toward the left of the x-axis. The plant communities along the middle of the x-axis are associated with moderate inclines along the northern aspects of the Soutpansberg. Surface rock cover is generally high within the *Burkeo africanae–Pseudolachnostylietum maprouneifoliae*, with some extensive rock sheets associated with the *Myrothamno flabellifolii–Hexalobetum monopetali*. The soils comprise of coarse textured sands, which are shallow and skeletal in places. The soil's water retention capabilities are generally low and water runoff against these slopes is high. Soils are well drained and leached.

The extreme left of the x-axis represents the *Terminalio sericea–Burkeetum africanae*, which is associated with deep, fine-grained, sandy soils with high water retention capabilities. Soils are well drained and leached. The terrain is relatively flat and includes relatively cool high lying sandy terraces along the northern ridges of the Soutpansberg. The surface rock cover is low.

The spatial distribution of communities along the y-axis tends to echo some of the possible environmental gradients responsible for variation in recorded floristic composition. Some of these environmental factors may include soil depth, slope, sand texture, surface rock cover, soil moisture holding capacity and soil moisture availability to plant roots. The bottom of the y-axis represents progressively finer grained sands, deeper soils, flatter slopes, less surface rock cover, higher soil moisture storage capacity and higher soil moisture availability. The top parts of the y-axis

represent progressively higher values of surface rock cover, coarser grained sands, shallower soils, hotter conditions along the northern slopes of the Soutpansberg, higher water runoff from the moderate inclines and lower water retention capabilities for the shallow and skeletal soils.

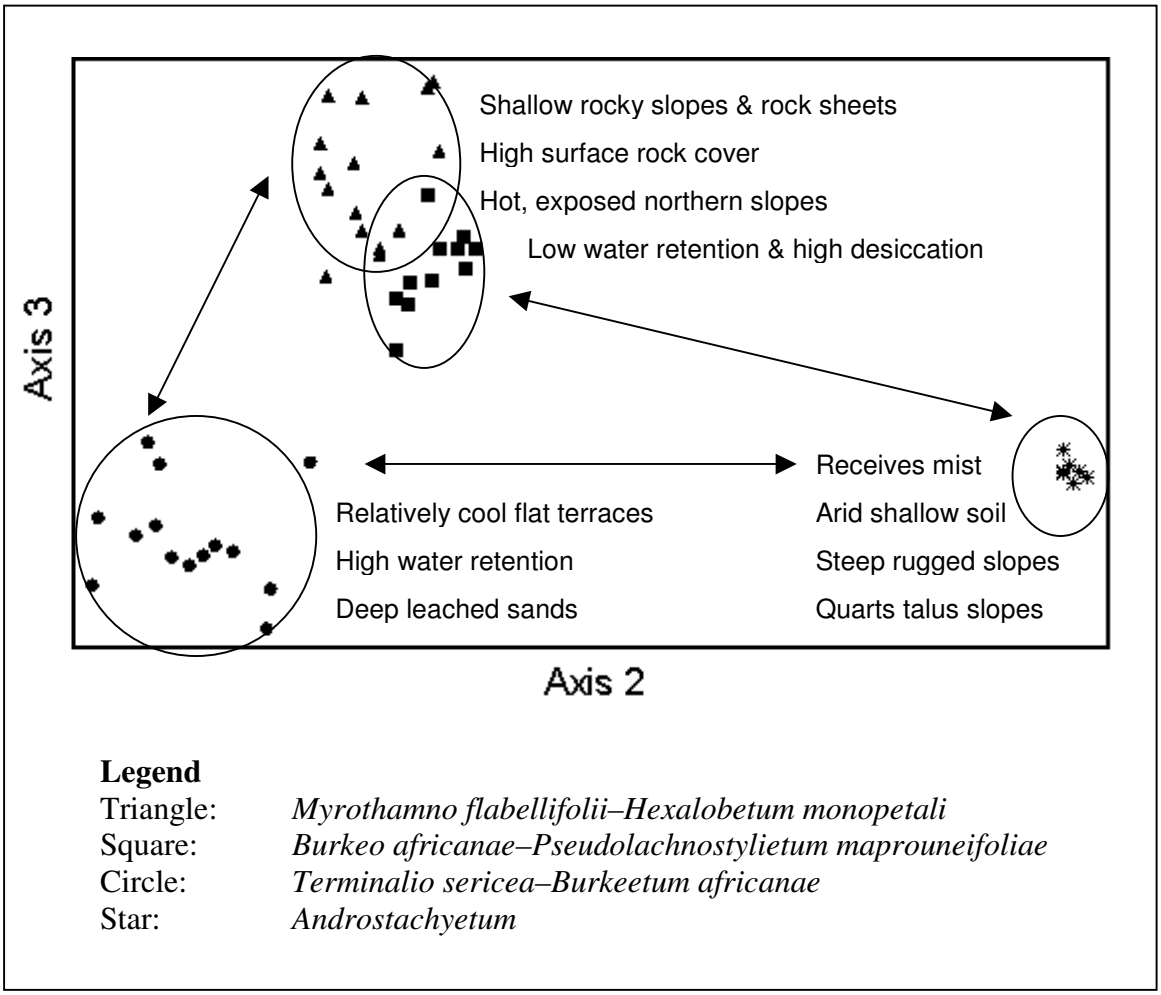


Figure 11 Relative positions of all the relevés along the second and third axes of the ordination of the *Diplorhynchus condylocarpon–Burkea africana* Soutpansberg Leached Sandveld Major Vegetation Type