CHAPTER 5

RESULTS

PHYTOSOCIOLOGY OF THE COMPLETE DATA SET

5.1 Introduction

As already mentioned, the vegetation of all available, adequate and compatible phytosociological data in the Mopaneveld of southern Africa were classified using basic phytosociological procedures (Chapter 4). The major aim of this classification was to identify major vegetation units within the Mopaneveld. These major vegetation units are referred to as vegetation types. For the purpose of this study, a vegetation type is defined as a vegetation unit of high rank in the Mopaneveld of southern Africa. Since Mopaneveld vegetation is suggested to be a vegetation class (Winterbach 1998), a vegetation type within Mopaneveld probably represents a vegetation order. If TWINSPAN distinctly separated a vegetation type into vegetation units, these vegetation units are termed major plant communities. A major plant community within the Mopaneveld therefore represents vegetation on a level lower than vegetation type, probably an alliance.

5.2 Classification hierarchy

A dendrogram was constructed to indicate the hierarchical levels into which TWINSPAN separated the zonal Mopaneveld vegetation (Figure 12). Possible determinants for the separations within the data set include annual rainfall and geology, as indicated in Figure 12. This dendrogram is presented up to the fourth level of division in the TWINSPAN classification. The first TWINSPAN division separated the semi-arid to arid Mopaneveld communities from Namibia (i.e. Western Mopaneveld) from the higher rainfall Eastern Mopaneveld (Figure 12). The second division within the Eastern Mopaneveld, separated communities of the semi-arid and degraded areas from the higher rainfall South African Lowveld Mopaneveld, the riverbank Mopaneveld and the Zimbabwean Mopaneveld.

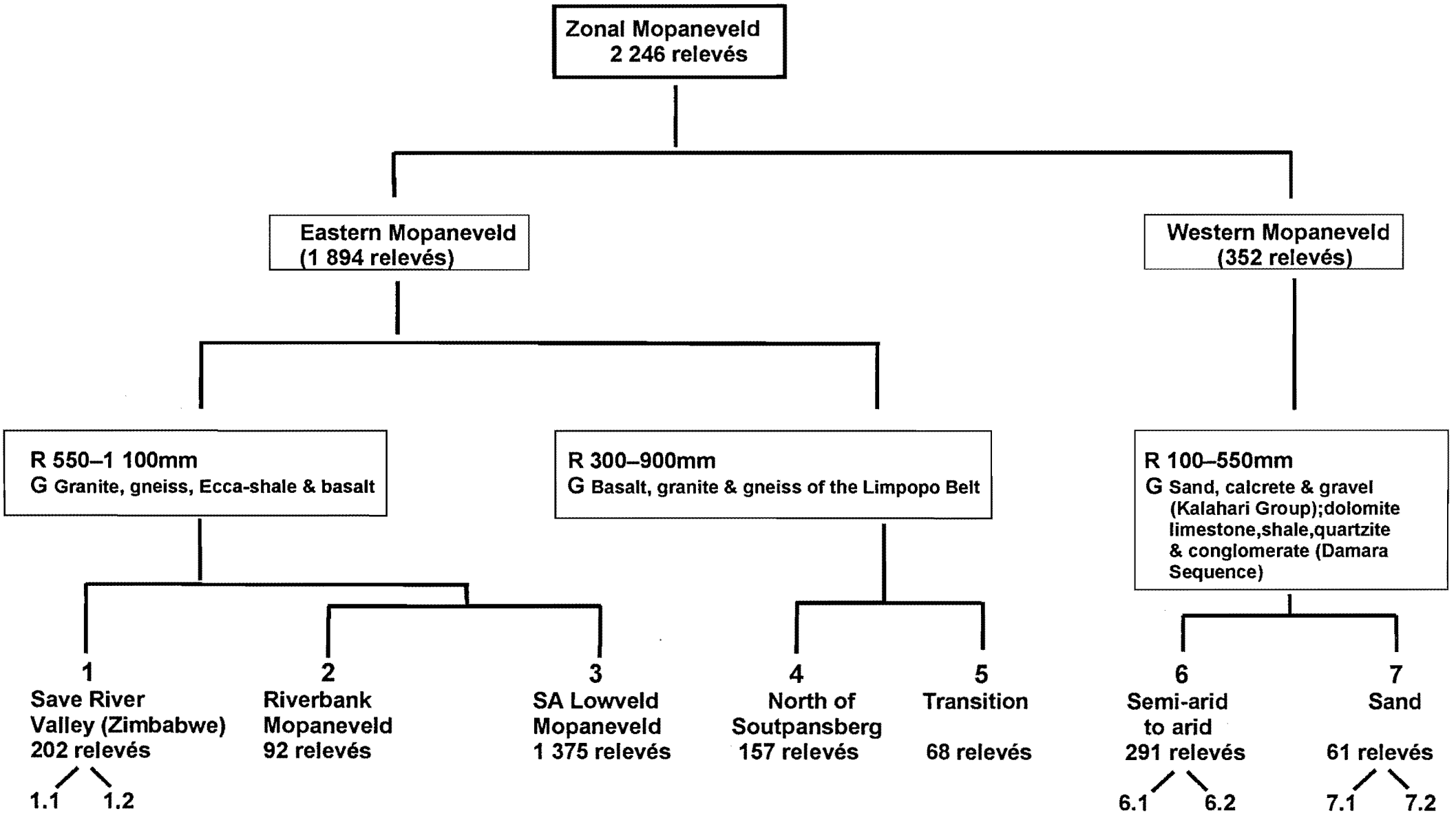

Figure 12 Dendrogram presenting TWINSPAN hierarchy (R=annual rainfall; G= Major rocks)

In the Western Mopaneveld, communities occurring on sandy soils were separated from the semi-arid to arid Mopaneveld on the second level of division (Figure 12). The third level of division within the Eastern Mopaneveld revealed the separation of the Zimbabwean Mopaneveld from the rest of the communities (i.e. riverbank Mopaneveld as well as South African Lowveld Mopaneveld). TWINSPAN also separated the semi-arid Mopaneveld north of the Soutpansberg in South Africa from those communities, which probably represent a transition between the Eastern- and the Western Mopaneveld. The third level of division in the Eastern Mopaneveld and the second level of division in the Western Mopaneveld therefore revealed in the identification of seven different vegetation units, regarded as vegetation types for the purpose of this study (Figure 12). On the fourth level of division, the Mopaneveld in the Save River Valley in Zimbabwe was subdivided into two major plant communities. Likewise did TWINSPAN separate the semi-arid to arid harsh Mopaneveld (6.1 & 6.2) and the Mopaneveld on sandy soils (7.1 & 7.2) in the Western Mopaneveld (Figure 12).

Application of TWINSPAN (Hill 1979a) to the data set, which comprises fifteen pre-selected studies containing Mopaneveld vegetation (Table 2), therefore resulted in the identification of 7 vegetation types and 6 major plant communities. They include the following:

1 *Digitaria milanjiana – Colophospermum mopane* vegetation type
  1.1 *Justicia flava – Colophospermum mopane* major plant community
  1.2 *Setaria sphacelata – Colophospermum mopane* major plant community
2 *Croton megalobotrys – Colophospermum mopane* vegetation type
3 *Cissus cornifolia – Colophospermum mopane* vegetation type
4 *Ptycholobium contortum – Colophospermum mopane* vegetation type
5 *Enneapogon scoparius – Colophospermum mopane* vegetation type
6 *Boscia foetida – Colophospermum mopane* vegetation type
  6.1 *Eragrostis viscosa – Colophospermum mopane* major plant community
  6.2 *Leucosphaera bainesii – Colophospermum mopane* major plant community
7 *Bauhinia petersiana – Colophospermum mopane* vegetation type
  7.1 *Lonchocarpus nelsii – Colophospermum mopane* major plant community
  7.2 *Asparagus nelsii – Colophospermum mopane* major plant community

5.3 Description of the major vegetation units

Mopaneveld is characterised mainly by the constant presence, mostly with high abundance values, of *Colophospermum mopane*, *Dichrostachys cinerea*, *Tragus berteronianus*, *Grewia bicolor* and *Commiphora africana* (species group DD, Table 5). Character species of the Commiphoro mollis – Colophospermetea mopani, a suggested vegetation class in the Central Savanna Biome, South Africa (Winterbach 1998), include woody species such as *Colophospermum mopane*, *Combretum mossambicense*, *Boscia albitrunca*, *Acacia senegal*, *A. nigrescens*, *A. erubescens*, *Terminalia prunioides*, *Grewia bicolor* and *Kirkia acuminata* (Winterbach 1998). Since the study of Winterbach (1998) was restricted to the South African Mopaneveld North of the Soutpansberg, it was however expected that some of these species would lose their character status over the entire distribution area of Mopaneveld. Classification results of the expanded view of Mopaneveld vegetation (Table 5) indicate that, of the character species listed by Winterbach (1998), only *C. mopane* and *G. bicolor* (species group DD, Table 5) remained constantly present over the somewhat broader view of Mopaneveld vegetation.

Since *C. mopane* determines to a large extent the distribution of Mopaneveld vegetation, it is evident that it is a character species in the Mopaneveld of southern Africa. Although it is difficult to comment on the character status of *Grewia bicolor*, it is apparent that this species generally follows the distribution of *Colophospermum mopane*. In the description of *G. bicolor* by Van Wyk & Van Wyk (1997) its association with *C. mopane* is also noted. The distribution of *Kirkia acuminata* and *Acacia erubescens* (species group H, Table 5) seems to be narrower in the expanded view of Mopaneveld vegetation. Although *Combretum mossambicense* occurs along the East (moist)-West (arid) gradient, it is profoundly found in the Mopaneveld north of the Soutpansberg (South Africa) and in the South African Lowveld (species group I, Table 5). *Boscia albitrunca* (species group V) and *Acacia senegal* (species group P) are mainly confined to semi–arid to arid areas, whereas *Acacia nigrescens*, when associated with *Colophospermum mopane*, is profoundly found in the eastern, semi-moist regions (species group L).

A discussion on the seven identified vegetation types within Mopaneveld, southern Africa, follows as an amplification of the suggested Commiphoro mollis – Colophospermetea mopani (Winterbach 1998) of the Central Savanna Biome, South Africa. Table 5 is a reference to all species groups in this section. Data set numbers in brackets refer to those listed in Table 2.

1. *Digitaria milanjiana – Colophospermum mopane* vegetation type (Data set 7)

The *Digitaria milanjiana - Colophospermum mopane* vegetation type is situated in the Sango Ranch, Zimbabwe. A classification and description of this vegetation type was prepared by Hin (2000).

Sango Ranch is situated in the Save Valley Conservancy, Masvingo Province in the southeastern Lowveld of Zimbabwe. It stretches from southern latitudes 20° 10' and 20° 23' and eastern longitudes 32° 00' and 32° 20' covering an area of 443,48 km^2. Mean annual rainfall for Sango Ranch is 526.5 mm between 400 m and 800 m above sealevel (Hin 2000). The major geological material underlying Sango Ranch includes alluvium, granite and gneiss (Hin 2000).

The study of Hin (2000) revealed nine different plant communities in the Sango Ranch, Save Valley Conservancy. Four of the nine communities relate either azonal vegetation and were therefore omitted from the data set during the first step of classification (Chapter 4), or they are interspersed in the *Croton megalobotrys – Colophospermum mopane* vegetation type (type 2). The remaining five plant communities (communities 1 to 5, Hin 2000) represent the *Digitaria milanjiana - Colophospermum mopane* vegetation type.

TWINSPAN markedly separated the vegetation of the Zimbabwean Save River Valley from the riverbank Mopaneveld, the southern Mopaneveld of the Limpopo River Valley in South Africa, and western Mopaneveld of the Cunene River Valley in Namibia (Table 5).

Diagnostic species for the *Digitaria milanjiana – Colophospermum mopane* vegetation type are listed in species group A, Table 5. High frequency values in species group B and C resulted in the expression of two major plant communities within the *Digitaria milanjiana – Colophospermum mopane* vegetation type, namely the *Justicia flava – Colophospermum mopane*

major plant community (1.1), and the *Setaria sphacelata – Colophospermum mopane* major plant community (1.2).

1.1 *Justicia flava – Colophospermum mopane* major plant community

Vegetation representing the *Justicia flava – Colophospermum mopane* major community is confined to the valleys and depressions, typically found in the Sango Ranch Conservancy, Zimbabwe. These low-lying areas are covered with sandy outwash and clayey midslope soils derived from alluvium, gneiss, lava, shale, quartzite and limestone. The soil surface in this major community contains no rock cover (Hin 2000).

Individuals of *Colophospermum mopane* (species group DD) reach heights of 16–20 m on deep alluvial soils. Herbaceous species in these mopane woodlands are in general sparse, but grass species such as *Sporobolus nitens*, *Enteropogon monostachys* (species group B), *Eragrostis rigidior* (species group G), *Urochloa mosambicensis* (species group J) and *Panicum maximum* (species group Y) are prominently present. Hin (2000) noted that the two plant communities, which express the *Justicia flava - Colophospermum mopane* major plant community, are overutilised resulting in high percentage cover of annual species such as *Aristida junciformis* (species group B) and *Tragus berteronianus* (species group DD). Conspicuous woody species in this major plant community other than *C. mopane* include *Zanthoxylum capense*, *Boscia mossambicensis* (species group B), *Grewia monticola*, *Maerua parvifolia* (specis group J) *Acacia tortilis* (species group Y) and *Dichrostachys cinerea* (species group DD).

1.2 *Setaria sphacelata – Colophospermum mopane* major plant community

This closed woodland to thicket, varying from short to tall, is found on broken and rocky terrain with scattered castle koppies and inselbergs (Hin 2000). Soils are in general shallow, coarsely grained, leached and sandy, derived from gneiss, granite and conglomerate (Hin 2000). This major community is often associated with overutilised, trampled areas.

Diagnostic species for the *Setaria spacelata - Colophospermum mopane* major plant community are listed in species group C. The perennial grass *Setaria sphacelata* (species group C) tolerates

a wide range of habitat types, which include riverine habitats as well as rocky midslopes (Van Oudtshoorn 1994). Species composition for this rocky hill community is controversial as several diagnostic species are indicative of riverine habitats, e.g. the shrub *Phyllanthus reticulatus* (species group C) (Van Wyk & Van Wyk 1997). Bredenkamp & Deutschländer (1995) mentioned the floristic relationship between vegetation of rocky hills and rivers from arid Lowveld vegetation in South Africa, Savanna Biome, which implies that both rocky hills and river banks should be considered as relatively moist habitats.

In general the *Setaria sphacelata* - *Colophospermum mopane* major plant community is associated with the well-known *Combretum apiculatum* - *Colophospermum mopane* combination in the Mopaneveld. The frequency of *C. mopane* (species group DD) is markedly lower in this major community due to the habitat, which favours *Combretum apiculatum* (species group R). *C. apiculatum* is the most conspicuous woody species of this major community in association with *Grewia monticola*, *Lannea schweinfurthii* (species group J), *Acacia nigrescens* (species group L), *Dichrostachys cinerea* and *Grewia flavescens* (species group DD). *Kirkia acuminata* (species group H) is associated with the steep, shallow side slopes of the inselbergs. The grass species *Setaria sphacelata* (species group C), *Eragristis rigidior* (species group G), *Urochloa mosambicensis*, *Setaria sagittifolia* (species group J) and *Panicum maximum* (species group Y) are important contributions to the herbaceous component of the *Setaria sphacelata* - *Colophospermum mopane* major plant community.

2. *Croton megalobotrys* – *Colophospermum mopane* vegetation type (Data sets 1, 3, 4, 6, 7, 11 & 14)

Figure 13

Data sets from which this vegetation type was identified cover mainly the Mopaneveld along the Olifants-, Save- and Limpopo Rivers.

The *Croton megalobotrys* – *Colophospermum mopane* vegetation type represents floodplain and upper riverbank vegetation of the Eastern Mopaneveld. A variety of woody plant species indicative of floodplains and riverbanks, characterise this community of which *Croton*

megalobotrys, *Ficus sycomorus*, *Hyphaene coriaceae*, *Phoenix reclinata*, *Spirostachys africana* (species group D) and *Lonchocarpus capassa* (species group J) are abundant. Grass species adapted to wet conditions, such as *Sporobolus fimbriatus* (species group D) contribute to the characterisation of this vegetation type. Other conspicuous grass species include *Panicum deustum* (species group D), *Cymbopogon plurinodis* (species group F), *Cenchrus ciliaris*, *Enneapogon scoparius* (species group Q), *Enneapogon cenchroides*, *Eragrostis lehmanniana* (species group X), *Panicum maximum* (species group Y) and *Aristida adscensionis* (species group CC).

Although *Colophospermum mopane* is known to grow on a wide variety of soils, including "wet" soils of alluvial origin (Van Rooyen 1978; Biggs 1979; O'Connor & Campbell 1986), the high abundance of *Colophospermum mopane* (species group DD) in this community is controversial. This vegetation type however does not represent typical azonal vegetation since those relevés were omitted from the data set (Chapter 4). High frequency values of other terrestrial plant species such as *Combretum hereroense*, *Euclea divinorum* (species group F), *Acacia nigrescens*, *Acacia gerrardii* (species group L), *Combretum imberbe* (species group Q), *Combretum apiculatum* (species group R), *Terminalia prunioides* (species group X), *Sclerocarya birrea* (species group CC) *Colophospermum mopane* and *Dichrostachys cinerea* (species group DD) express its inland, terrestrial affinity.

The *Croton megalobotrys* - *Colophsopermum mopane* vegetation type may therefore probably represent an intrazonal vegetation zone between terrestrial and riparian vegetation (also apparent from the ordination, Figure 19 and discussion in Chapter 8).

Figure 13 The *Croton megalobotrys - Colophospermum mopane* vegetation type.

Figure 14 The *Cissus cornifolia - Colophospermum mopane* vegetation type (Mopane Bushveld).

3. *Cissus cornifolia – Colophospermum mopane* vegetation type (Data sets 1, 3, 5, 6, 8, 11, 13 & 14)

Figures 2 & 14

A large number of relevés (1 375) were classified under the *Cissus cornifolia – Colophospermum mopane* vegetation type, profoundly found in the South African Lowveld Mopaneveld. Data sets from which this vegetation type was derived are mainly from the Kruger National Park and the adjacent Hoedspruit-Klaserie-Timbavati-Umbabat Nature Reserves. It is bordered by the Limpopo River in the north and in the south by the most southern distribution limit of *Colophospermum mopane* in South Africa as identified by Gertenbach (1987) (approximately 24°21'32'' latitude). The *Cissus cornifolia – Colophospermum mopane* vegetation type receives above 400 mm rainfall annually on an altitude varying between 200 m along the floodplains and 500 m on undulating landscapes (Gertenbach 1983).

This vegetation type covers approximately 20 000 km^2. The majority of the area is protected as National Parks and Nature Reserves.

The *Cissus cornifolia - Colophospermum mopane* vegetation type is characterised by species group E, Table 5. Diagnostic woody species include *Dalbergia melanoxylon*, *Clerodendrum ternatum* and *Acacia exuvialis* (species group E). Other than *C. mopane*, species such as *Combretum hereroense* (species group F), *Maerua parvifolia*, *Lannea schweinfurthii* (species group J), *Acacia nigrescens*, *Albizia harveyi* (species group L), *Combretum apiculatum* (species group R), *Sclerocarya birrea* (species group CC), *Dichrostachys cinerea, Grewia bicolor* and *Commiphora africana* (species group DD) are the most common woody species. Many forbs species are diagnostic for this vegetation type of which *Cissus* cornifolia, *Tephrosia polystachya*, *Corchorus asplenifolius*, *Melhania forbesii* and *Walteria indica* (species group E) are the most conspicuous. Important grass species are, amongst others, *Eragrostis rigidior* (species group G), *Urochloa mosambicensis* (species group J), *Eragrostis superba* (species group L), *Schmidtia pappophoroides*, *Brachiaria deflexa* (species group W), *Enneapogon cenchroides* (species group X) and *Panicum maximum* (species group Y).

Differentiation in geological parent material is responsible for the distinct physiognomical variance that is characteristic of the South African Lowveld Mopaneveld: Mopane Shrubveld and Mopane Bushveld (Low & Rebelo 1996, types 9 & 10). Mopane Shrubveld occurs on flat plains of vertic or near-vertic clays derived mainly from igneous gabbro and basalt (Fraser *et al.* 1987). Vegetation of the shrubveld type is generally dominated by a stunted and multi-stemmed shrubby growth of *Colophospermum mopane* (Figure 2c). In contrast with Mopane Shrubveld, Mopane Bushveld is characterised by a fairly dense growth of *Colophospermum mopane* trees occuring on undulating landscapes derived from basalt, shale, solonetzes and coarse sandy soils derived from granite (Figure 2a & 14) (Fraser *et al.* 1987; Van Rooyen & Bredenkamp 1998).

Most of the relevés representing this vegetation type are from phytosociological studies from the Kruger National Park (e.g. data sets 3, 5, 6 & 14, Table 2). TWINSPAN did not clearly separate the *Cissus cornifolia – Colophospermum mopane* vegetation type into major plant communities during classification of the entire data set. A study on the Lowveld Mopaneveld however revealed the identification of four major plant communities within the *Cissus cornifolia – Colophospermum mopane* vegetation type (Chapter 6). These four distinct plant communities cover approximately 7 250 km^2 of the southern African Mopaneveld (Gertenbach 1987) and represent Broad–sclerophyll arid bushveld (Werger & Coetzee 1978).

A brief discussion on the four major communities follows. A more detailed description of the four major communities appears in Chapter 6.

1) The *Colophospermum mopane* communities on sandy soils

The Punda Maria-Pafuri-Wambiya Sandveld (PPW) in the northern section of the Kruger National Park, South Africa, forms a distinct vegetation unit, as indicated by Van Rooyen (1978). However, Acocks (1988) included this area in the Mopani Veld veld type, although it is evident that the PPW Sandveld does not represent true Mopaneveld vegetation. Patches of *Colophospermum mopane*-dominated communities however interrupt the PPW Sandveld (Figure 20). These patches of Mopaneveld, identified as the *Terminalia sericea – Colophospermum mopane* major plant community, represent the first of four major communities within the Lowveld Mopaneveld. It is speculated that the PPW Sandveld, and probably other Sandveld areas in the Savanna Biome, represents a separate vegetation class whereas the *Terminalia*

sericea – *Colophospermum mopane* major community represents a transition between two vegetation classes (Chapter 6).

The *Terminalia sericea* – *Colophospermum mopane* major plant community of the Punda Maria-Pafuri-Wambiya Sandveld area is confined to deep, sandy clay loam to clayey soils derived from alluvium, shale, basalt, andesite and the Malvernia Formation on undulating plains (Van Rooyen 1981b). Species specifically associated with deep, sandy, leached soils, characterise this major community of which *Combretum zeyheri*, *C. collinum*, *Terminalia sericea*, *Mundulea sericea*, *Pteleopsis myrtifolia*, *Guibourtia conjugata*, *Pseudolachnostylis maprouneifolia* (species group A, Table 6), *Diplorhynchus condylocarpon* (species group S, Table 7) and *Afzelia quanzensis* (species group T, Table 7) are some of the prominent trees.

2) The *Colophospermum mopane* communities on clayey soils

The second major community within the *Cissus cornifolia* – *Colophospermum mopane* is identified as the *Acacia nigrescens* – *Colophospermum mopane*, a stunted community spreading over Lowveld bottomlands on heavy clays derived mainly from igneous basalt and gabbro. On these gabbroic vertic clays south of the Olifants River in the Kruger National Park, South Africa, *C. mopane* reaches its southern-most distribution in South Africa (Gertenbach 1987). Shrubmopaneveld is most renowned in the northeastern Kruger National Park on the bottomlands of the Lebombo Mountains. These extensive mopane bushes are confined to fine–textured vertic clays derived from basalt (Fraser *et al.* 1987) as well as clays from the Malvernia Formation (Van Rooyen 1978). Prominent woody species (e.g. *Colophospermum mopane*, *Maytenus heterophylla*, and *Dalbergia melanoxylon*) within these communities are suppressed to a height of 3 m to a maximum of 6 m (Van Rooyen 1978).

3) *Colophospermum mopane* communities on shale

Loamy sand to clayey soils derived from shale of the Ecca Group create habitat for a tall Mopane woodland in which the tallest individuals reach up to 22 m (Van Rooyen 1981c). In the synthesis of the *Cissus cornifolia* – *Colophospermum mopane* vegetation type, this vegetation unit was identified as the *Euclea divinorum* – *Colophospermum mopane* major community. Diagnostic species for this major plant community are listed in species group D (Table 6).

4) *Colophospermum mopane* communities on granite and gneiss

On slightly undulating granitic landscapes, *Combretum apiculatum*-dominated vegetation (in association with trees such as *Terminalia sericea*, *Combretum zeyheri* and *Strychnos madagascariensis*) is confined to the summits on coarse, well-drained soils, while *Colophospermum mopane*–dominated vegetation occurs in the depressions on fine-textured and poorly-drained clays (Fraser *et al.* 1987; Gertenbach 1987). This simultaneous occurrence of two vegetation types is identified as the *Combretum apiculatum – Colophospermum mopane* major community within the *Cissus cornifolia – Colophospermum mopane* vegetation type.

4. *Ptycholobium contortum – Colophospermum mopane* vegetation type (Data sets 1, 2, 3 & 15)

Figure 15

This vegetation type is confined to the Mopaneveld north of the Soutpansberg in the Limpopo River Valley, South Africa. The vegetation of the Messina Experimental Farm (Dekker & Van Rooyen 1995, Data set 2) mostly represents this vegetation type. The *Ptycholobium contortum – Colophospermum mopane* vegetation type stretches from 28°40'–30°40'E and 22°07'– 22°52'S (300–780 m altitude) and covers an area of 2 037 km^2 (Louw 1970). The geology of this area forms mosaic formations of metamorphic types belonging to the Archaean complex (Louw 1970). This vegetation type is characterised by species group H (Table 5).

Several *Commiphora* species are known to be diagnostic for the Mopaneveld north of the Soutpansberg (Louw 1970) of which *Commiphora tenuipetiolata*, *C. edulis* (species group H), *C. mollis* (species group I) and *C. africana* (species group DD) are abundant. Another characteristic feature of this community is the scattered stands of *Adansonia digitata* (species group H) (Figure 15) on sandy, undulating plains derived from granite and gneiss (Dekker & Van Rooyen 1995).

The *Ptycholobium contortum – Colophospermum mopane* vegetation type is floristically related to the *Cissus cornifolia – Colophospermum mopane* vegetation type as indicated by species group I.

5. *Enneapogon scoparius – Colophospermum mopane* vegetation type (Data sets 1 & 8)

Figure 16

The distribution of the *Enneapogon scoparius – Colophospermum mopane* vegetation type is uncertain. No specific set of habitat conditions could support the separation in TWINSPAN. Its existence can however be explained by the following:

1) Vegetation data, which contributed to the identification of this vegetation type, were sampled from degraded areas. According to Beck (1998) some of the areas were overutilised by animals or used for training by the defense force (SANDF) and also served as dumping sites during vegetation surveying. Other areas were sampled during dry periods of sustained droughty conditions. The degraded patches are, however interrupted by more pristine areas, which cause the presence of climax, as well as pioneer species in the vegetation type (e.g. pioneer grass species, such as *Enneapogon scoparius*, species group Q Table 5; *E. cenchroides*, species group X; climax grass species, such as *Digitaria eriantha*, species group X; *Panicum maximum*, species group Y).

2) As this vegetation type is defined from sample plots mostly located in the moister Eastern Mopaneveld (Data sets 1 & 8, Table 2), it is expected that many plant species should indicate affinity to these regions. Species group L, and to a lesser degree species group F confirm this relation. The presence of species group V, and to a lesser degree species group W also indicates some affinity to the drier western regions in Namibia. This may indicate that degradation is an event that changes the more mesic vegetation via the proposed State-and-Transition model (Westoby *et al.* 1989) to show similarities to vegetation of much drier areas. It can therefore be postulated that degradation of moist Mopaneveld will change the vegetation composition to reflect properties of the climax vegetation composition of drier Mopaneveld (Chapter 7).

Figure 15 Scattered individuals of *Adansonia digitata* in the *Ptycholobium contortum - Colophospermum mopane* vegetation type.

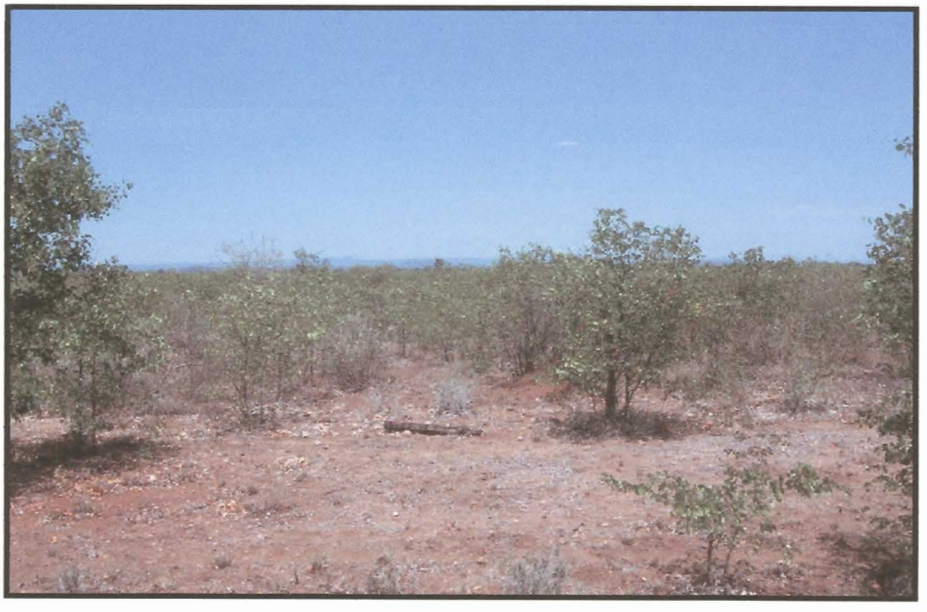

Figure 16 Bare soil under mopane shrubs in the *Enneapogon scoparius - Colophospermum mopane* vegetation type.

6. *Boscia foetida – Colophospermum mopane* vegetation type

This vegetation type represents the semi–arid to arid Mopaneveld of Namibia (<100 mm up to 500 mm rainfall annually). The *Boscia foetida – Colophospermum mopane* vegetation type occurs on altitudes between 1 000 m and 1 500 m above sea level (Van der Merwe 1983). It is strongly associated with harsh environments on mainly shallow sand, gravel and calcrete of the Kalahari Group and dolomites, limestone, shale, quartzite and conglomerate of the Damara sequence. The *Boscia foetida - Colophospermum mopane* vegetation type occurs from Etosha National Park in the south to the Kunene River in Kaokoland in the north, excluding deep sandy soils on which the *Bauhinia peresiana - Colophospermum mopane* vegetation type (vegetation type 7) is confined.

The *Boscia foetida - Colophospermum mopane* vegetation type is characterised by species group M. The conspicuous tree *Boscia foetida*, also known for its association with arid environments, is diagnostic for this community. Prominent woody species for this vegetation type, other than *Colophospermum mopane*, include *Boscia albitrunca* (species group V), *Terminalia prunioides* (species group X) and *Grewia bicolor* (species group DD). Grass species such as *Stipagrostis uniplumis* (species group V), *Enneapogon cenchroides* (species group X), *Pogonarthria fleckii* (species group BB) and *Eragrostis trichopora* (species group CC) are of the most common contributors to the herbaceous layer.

Two major communities were recognised within the *Boscia foetida – Colophospermum mopane* vegetation type.

6.1 *Eragrostis viscosa – Colophospermum mopane* major plant community (Data sets 3, 4, 8, 9, 10, 12 & 15)

Figure 17

Although this community is characterised only by three species (species group N), it comprises elements of extreme habitats. The semi–arid Mopaneveld north of the Soutpansberg (South Africa), the Cuvelai Delta on aeolian sands of the Kalahari Group as well as the arid Koakoland

are represented in the *Eragrostis viscosa – Colophospermum mopane* major community. Shallow soils with a moderately clay content as well as moderate sandy soils overlying calcrete characterise this major community. Vegetation data of the Honnet Nature Reserve, north of the Soutpansberg, South Africa (Visser *et al.* 1996) is however stronger related to this major community than to the *Ptycholobium contortum – Colophospermum mopane* vegetation type. This result can be ascribed to the extreme droughty conditions under which data were sampled, which consequently supports speculations on Mopaneveld being an event–driven system (Chapter 7). The diagnostic grass species, *Eragrostis viscosa* (species group N, Table 5) is known to be associated with Mopaneveld (Van Oudtshoorn 1999). Species of significant value include grasses such as *Stipagrostis uniplumis* (species group V), *Schmidtia pappophoroides* (species group W), *Enneapogon cenchroides*, *Eragrostis lehmanniana* (species group X) and *Eragrostis trichophora* (species group CC) and trees such as *Boscia albitrunca* (species group V), *Terminalia prunioides* (species group X), *Colophospermum mopane* and *Grewia bicolor* (species group DD).

6.2 *Leucosphaera bainesii – Colophospermum mopane* major plant community (Data sets 9 & 10)

Figures 6 & 18

This major community is prevalently found in the Etosha National Park, Namibia. This mixed dry deciduous tree savanna and grassland occurs on calcareous ridges and plains of the Kalahari Group. *Leucosphaera bainesii*, a prominent diagnostic species of this community (species group O, Table 5) is known to be associated with calcareous soils. *Colophospermum mopane* individuals on these sodium rich soils are usually only 2–6 m tall with a very poor–developed herbaceous layer (Le Roux 1980; Timberlake 1995). Calcareous habitats are known to produce high species diversity in southern Africa. This phenomenon can be supported in the number of diagnostic species listed in species group O, Table 5. The most significant species include grasses such as *Enneapogon desvauxii*, *Eragrostis nindensis*, *E. echinochloidea* (species group O), *Cenchrus ciliaris* (species group Q), *Anthephora pubescens* (species group U), *Stipagrostis uniplumis* (species group V), *Enneapogon cenchroides* (species group X), *Urochloa brachyura* (species group AA) and *Aristida adscensionis* (species group CC) and trees such as *Combretum*

apiculatum (species group R), *Catophractes alexandri*, *Acacia reficiens* (species group U), *Boscia albitrunca*, *Commiphora pyracanthoides* (species group V), *Rhigozum brevispinosum* (species group AA), *Colophospermum mopane*, *Dichrostcahys cinerea* and *Grewia bicolor* (species group DD). Prominent forb species include *Leucosphaera bainesii*, *Monelytrum luederitziana*, *Hibiscua caesius*, *Chascanum pinnatifidum* (species group O), *Montinia caryophyllaceae*, *Otoptera burchellii*, *Helinis integrifolius* (species group U) and *Monechma divaricatum* (species group V).

7. *Bauhinia petersiana– Colophospermum mopane* vegetation type

This vegetation type is confined to deep Kalahari-type sands mainly of aeolian origin. The *Bauhinia petersiana – Colophospermum mopane* sandy dry bushveld is best represented in the Etosha National Park (Namibia) on the sandveld areas. Diagnostic species for this major community are listed in species group S. Although *C. mopane* is often associated with heavier, clayey soils in slightly higher rainfall conditions, it is well represented within this vegetation type (species group DD, Table 5). A few odd relevés from Kaokoland, northern Botswana and Zimbabwe are also present in this community, probably due to the sandy soils they occur on. Two communities within the *Bauhinia petersiana – Colophospermum mopane* vegetation type are distinguished. These communities represent dry mopane woodland on deep, sandy soils or mopane shrubveld on shallower sand overlying calcrete (7.1), and moister mopane woodland on deep sandy soils (7.2).

7.1 *Lonchocarpus nelsii – Colophospermum mopane* major plant community (Data sets 4, 7 & 9)

This community represents vegetation associated with Kalahari-type sands of aeolian origin mainly within the arid Namibian Mopaneveld (annual rainfall varying between 200 mm and 350 mm). Several species indicative to soils containing a high sandy content characterise this community. Among them are *Lonchocarpus nelsii*, *Acanthosicyos naudinianus*, *Requienia sphaerosperma* and *Harpagophytum procumbens* (species group T). Habitats representing this community include the Kowares sandy mopane shrubveld (Kaokoland section of the Etosha National Park) and Sandveld areas of the Etosha National park producing sandy shrub

Mopaneveld, often overlying calcrete (Le Roux 1980). The *Lonchocarpus nelsii – Colophospermum mopane* major plant community is related to the *Leucosphaera bainesii – Colophospermum mopane* major community probably due to the calcareous component within both. Conspicuous woody species in the *Lonchocarpus nelsii - Colophospermum mopane* major plant community include *Acacia fleckii*, *Lonchocarpus nelsii*, *Elephantorrhiza suffruticosa* (species group T), *Acacia reficiens*, *A. mellifera*, *Grewia retinervis* (species group U), *Boscia albitrunca*, *Grewia flava*, *Commiphora pyracanthoides* (species group V), *Terminalia prunioides* (specis group X), *Rhigozum brevispinosum* (species group AA), *Acacia erioloba* (species group BB), *Colophospospermum mopane*, *Dichrostachys cinerea*, *Grewia bicolor* and *Commiphora africana* (species group DD). *Stipagrostis uniplumis* (species group V) and *Eragrostis lehmanniana* (species group X) are important grass species.

7.2 *Asparagus nelsii – Colophospermum mopane* major community (Data sets 10 & 12)

This unique community of only 10 relevés represents the moister northeastern Namibian Mopaneveld, adjacent to the Caprivi (annual rainfall ranging between 500 mm and 650 mm). Diagnostic species are shown in species group Z, Table 5. These Mopane woodlands lie in an area of old river drainage lines which are covered by aeolian sand deposits (Mendelsohn & Roberts 1997). Vegetation associated with the *Asparagus nelsii – Colophospermum mopane* dry early–deciduous savanna woodland include species preferably growing on deep sandy soils, such as *Requienia pseudosphaerosperma*, *Hyphaene petersiana*, *Harpagophytum zeyheri* and *Dichapetalum cymosum* (species group Z). Other important species include the small tree *Mudulea sericea* (species group BB), and the grass *Eragrostis trichophora* (species group CC).

Figure 17 The *Boscia foetida - Colophospermum mopane* is a widespread vegetation type in Namibia. This figure represents the Kaokoland Mopaneveld in this vegetation type.

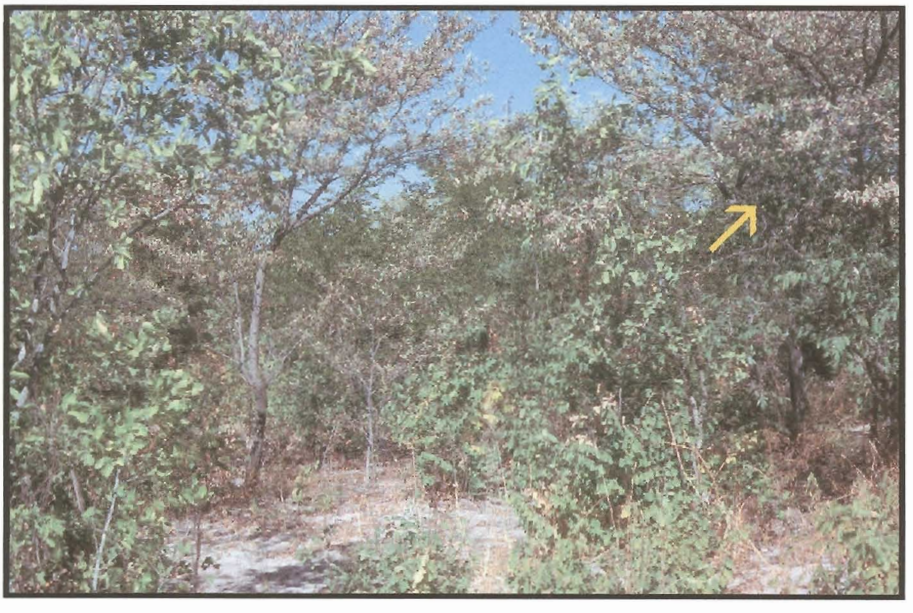

Figure 18 The *Leucosphaera bainesii - Colophospermum mopane* vegetation type occurs on calcareous soils and is often associated with *Terminalia prunioides* (arrow).

5.4 Ordination

The distribution of the vegetation types and major plant communities along the first and third axes of a Detrended Correspondence Analysis (DECORANA) scatter diagram is presented in Figure 19. The distribution of vegetation types and major plant communities along Axis 1 (Eigenvalue = 0.682) follows a gradient of decreasing soil moisture availability. The far right location of the *Leucosphaera bainesii - Colophospermum mopane* major plant community (6.2) in the scatter diagram can be explained by the high calcrete content of the soil associated with this major plant community. Although the annual rainfall in this community is higher than in the Kaokoland Mopaneveld, which was grouped to the *Eragrostis viscosa - Colophospermum mopane* major plant community (6.1) by TWINSPAN, conditions seem to be harsh in the *Leucosphaera bainesii - Colophospermum mopane* due to soil moisture retention in calcareous soils. It is therefore specualted that, although annual rainfall is a major determinant in the separation of the Eastern Mopaneveld (vegetation types 1,2,3,4 and 5) from the Western Mopaneveld (vegetation types 6 & 7) according to TWINSPAN results (Figure12), vegetation types 6 and 7 are not separated according to annual rainfall, but rather by soil moisture availability. In general vegetation types situated to the left of the diagram are associated with a mean annual rainfall above 600 mm, while vegetation types from the middle of the scatter diagram to the right receive between 150 mm and 500 mm annually. Although not as distinct as was expected, the diagram also supports the sequence of vegetation types along a geographical East-West gradient (Axis 1).

Another environmental factor associated with the distribution of vegetation types along Axis 1 of the DECORANA scatter diagram, is probably a decrease in soil nutrients. Poor, leached, calcareous soils are associated with the *Leucosphaera bainesii - Colophospermum mopane* major plant community (6.2) whilst soils of the Eastern Mopaneveld are more nutrient-rich.

The distribution of vegetation types and major plant communities along Axis 3 (Eigenvalue = 0.324) follows a decrease in soil depth and an increase in rockiness (Figure 19).

From Figure 19, it seems as if the Mopaneveld in the semi-arid areas of South Africa, namely the Mopaneveld north of the Soutpansberg, is to some extent related to the Namibian Mopaneveld.

The uncertainty of the distribution of the *Enneapogon scoparius – Colophospermum mopane* vegetation type (vegetation type no. 5) can be explained by its position in the scattered diagram along Axis 1. This vegetation type represents a transition between semi-moist to moist Mopaneveld to the left, and arid Mopaneveld to the right (Figure 19). Due to degradation effects, this vegetation type is not clearly situated in the semi-moist Lowveld Mopaneveld (to the left). The vegetation is driven by degradation towards floristic affinities with semi-arid Mopaneveld north of the Soutpansberg (synrelevés 16, 17 & 18).

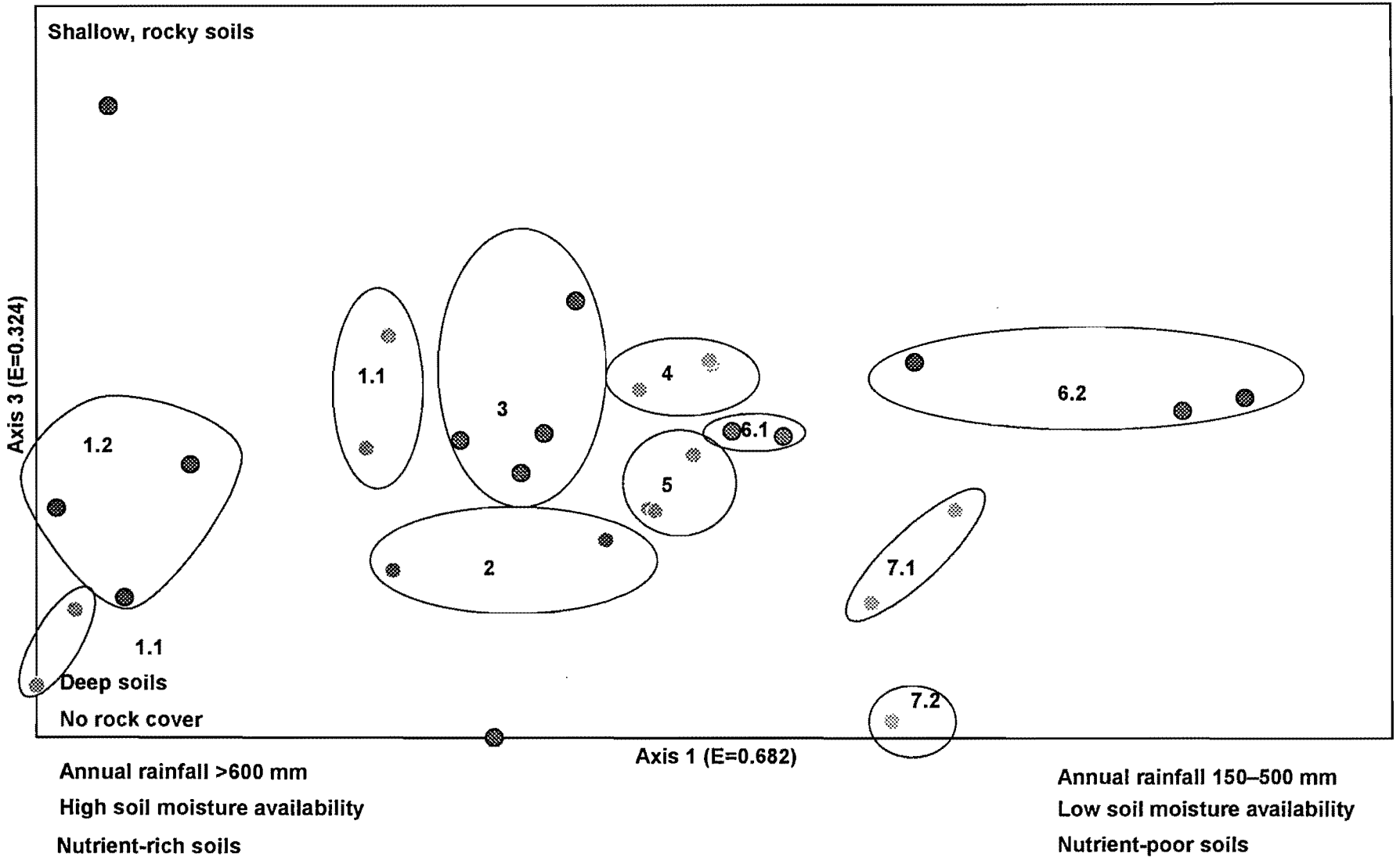

Figure 19 Ordination diagram of axes 1 and 3 illustrating the distribution of Mopaneveld vegetation types along environmental gradients.

Table 5 Synoptic table of the southern African Mopaneveld

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Species group A										
Cyathula uncinulata	70	48								
Indigofera varia	45	20	2			1	6	2	2	
Cucumis zeyheri	44	31								
Digitaria milanjiana	44	75					1			
Diospyros quiloensis	35	33								
Dactylocteni giganteum	34	11	1	3						
Abutilon grandiflorum	27	11			1					
Crotalaria species	11	11						4	4	
Species group B										
Justicia flava	61	4	2	10	1		1			
Sporobolus nitens	52	8		10					2	
Oropetium capense	52	1		11	33			13		
Cissus rotundifolia	40	6		1						
Aristida junciformis	34	9					2	1		
Cyperus species	28						1	8	2	
Hemizygia bracteosa	27	8		4						
Thilachium africanum	24	4		1						
Zanthoxylum capense	21	1		1						
Boscia mossambicensis	20	8	1							
Enteropogon monostachys	20	8								
Stylochiton natalensis	18	6		3						
Plectranthus neochilus	18	1								
Plectranthus caninus	14	3								
Dactyloctenium australe	11	2								
Species group C										
Setaria sphacelata	3	24	2	1	1					
Vigna frutescens	1	18								
Cucumis metuliferus	7	17							2	
Phyllanthus reticulatus	3	14	1	1						
Species group D										
Sporobolus fimbriatus			64	7	1	22	1			
Spirostachys africana			40	5		6	1	8		
Croton megalobotrys		1	34							
Ficus sycomorus			21							
Flaveria bidentis			20							
Panicum deustum			20	2		6				
Phragmites australis			19							
Hyphaene coriacea			8		3					
Phoenix reclinata			8							

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Species group E										
Cissus cornifolia				54						
Tephrosia polystachya				48			1			
Corchorus asplenifolius				34				2		
Aristida congesta s. congeta			2	32	2		8			
Melhania forbesii	14	8	3	28			4	6	16	
Waltheria indica				28			2			
Solanum panduriforme		5	7	28			10			
Dalbergia melanoxylon		9	1	27						
Clerodendrum ternatum				27			1	7	16	
Acacia exuvialis				25						
Limeum fenestratum				24			2		4	
Ruellia patula				24						
Themeda triandra			4	23						
Indigofera vicioides				22						
Bothriochloa radicans			1	22				12		
Acalypha indica			4	21	1			3		
Flueggea virosa		2	2	20	7		2	9		
Asparagus setaceus				20	1		1			
Lantana rugosa	3	1		20			3			
Chamaecrista mimosoides				19						
Ceratotheca triloba				16			1			
Indigofera rhytidocarpa				16						
Bothriochloa insculpta			2	16	2	1				
Tragia dioica				16						
Endostemon tereticauli				16						
Ormocarpum trichocarpum			1	16						
Cyperus rupestris				15						
Kohautia virgata				15						
Maytenus heterophylla		2		15		1		1		
Vernonia fastigiata				15						
Sesamum alatum				15						
Blepharis integrifolia				14				1		
Talinum caffrum				14			2			
Ipomoea crassipes				14						
Vigna unguiculata				13						
Chamaesyce neopolycnemoides				13			2			
Crabbea velutina				13						
Indigofera bainesii				13					2	
Grewia hexamita				12	1	1	3			
Sida dregei			1	12			1			
Andropogon gayanus				12						
Phyllanthus pentandrus				11				3	6	
Microchloa caffra				11			1			
Hibiscus sidiformis				11						
Polygala sphenoptera			1	11						
Cucumis africanus			3	11			1			
Melhania prostrata				11						
Brachiaria xantholeuca			1	11						
Melhania didyma				10						
Ozoroa engleri				10						

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Phyllanthus asperulatus				10						
Perotis patens			1	10						
Crotalaria sphaerocarpa				10			1	1	2	
Species group F										
Combretum hereroense		4	45	21	1	5	5	8		
Euclea divinorum		1	23	18			2	6		
Cymbopogon plurinodis			20	18	1	32		1		
Cassia abbreviata		1	15	11	2	3				
Species group G										
Eragrostis rigidior	38	32	5	36		3	1		2	
Species group H										
Ptycholobium contortum					78					
Tephrosia purpurea					73		1	2	6	
Commicarpus fallacissimus					68			1		
Acalypha villicaulis					63		8			
Achyranthes aspera			5	7	63	1	8	5	6	
Amaranthus schinzianus					61					
Cleome angustifolia				3	51		1			
Calostephane divaricata			1	4	47	1		4	2	
Indigofera heterotricha				6	44					
Kirkia acuminata		10		2	40	1	1	4		
Neuracanthus africanus			1	5	34					
Monechma debile				5	33				4	
Lantana species					33			1		
Asparagus suaveolens					33					
Kohautia cynanchica					33					
Indigofera nebrowniana					33					
Indigofera trita					32			2	2	
Limeum sulcatum				2	28		1	4		
Ocimum americanum				7	28		7			
Jatropha spicata					27					
Grewia villosa	3	1		9	26		3	16		
Solanum coccineum			1	9	25		1			
Geigeria acaulis					25		3	8		
Justicia protracta				4	25					
Commiphora tenuipetiolata					23					
Sesamum triphyllum		1			22		2	1		
Commiphora edulis		9			21					
Leucas sexdentata					21					
Sterculia rogersii		1		2	21					
Pavonia columella			1	1	18					
Gardenia resiniflua		10		1	18		1			
Eragrostis biflora					16			1		
Digitaria velutina					15	1	1			
Adansonia digitata	1				15					
Acacia erubescens	1	7		2	15		1			
Blepharis diversispina					13				6	
Megalochlamys kenyensis					13					
Barleria species	4	2			12					
Priva africana					12					

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Acrachne racemosa					11					
Boerhavia coccinea			1		10	1				
Species group I										
Bulbostylis hispidula				14	39		10		4	10
Hibiscus micranthus				47	69			12	12	
Aristida congesta s. barbicollis			1	43	50	1	1			
Heliotropium steudneri	7	3	1	29	28		1			
Dicoma tomentosa				25	69		8	7	2	
Hermannia boraginiflora				23	59		1			
Seddera capensis				22	65					
Leucas glabrata			2	19	33					
Abutilon austro-africanum			4	19	12					
Phyllanthus maderaspatensis				19	26			10	4	
Commiphora mollis		8	2	18	58	2	4	3		
Phyllanthus species			1	16	55					
Pavonia burchellii				16	30		6	4	2	
Pupalia lappacea			3	15	14		1	7	2	
Chamaecrista absus				15	30			2	4	
Maniscus rehmannianus				14	21					
Ipomoea magnusiana				13	54				2	
Hermbstaedtia odorata			1	12	21		9			
Corbichonia decumbens				10	22					
Combretum mossambicense		5	3	13	11		7	1		
Species group J										
Urochloa mosambicensis	66	67	15	54	2				2	
Maerua parvifolia	37	17	2	26	25					
Commelina benghalensis	48	39	3	26	43		1	3	4	
Kyllinga alba	37	3		9	27		3	1	6	
Grewia monticola	30	45		11	32		2			
Lannea schweinfurthii	3	13	3	22	30	6				
Lonchocarpus capassa	3	8	70	17	4	3				
Setaria sagittifolia	3	18	4	1	12					
Species group K										
Panicum natalense			8			29				
Sansevieria hyacinthoides			17	5	2	29				
Dicoma anomala						13	5			
Thesium utile						13	3		2	
Species group L										
Acacia nigrescens		17	45	41	30	53	1			
Eragrostis superba	1	6	15	26		25	1	4	2	
Albizia harveyi		3	18	23	2	5				
Acacia gerrardii	1	2	22	8	1	44			2	
Species group M										
Triraphis purpurea						1	17	26		
Acacia nilotica			9	4			22	14	2	
Anthephora schinzii							13	21	6	
Boscia foetida			2		1		10	13	2	
Species group N										
Abutilon angulatum			3		1		15	6	4	
Eragrostis viscosa							15			
Willkommia sarmentosa							12	1		

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Species group O										
Leucosphaera bainesii								62		
Enneapogon desvauxii								39	4	
Eragrostis nindensis							7	36	2	
Eragrostis echinochloidea							3	34		
Monelytrum luederitziana								25		
Hibiscus caesius								23	2	
Chascanum pinnatifidum				1			1	22	8	
Abutilon fruticosum				2	1		1	20		
Seddera suffruticosa				4			1	18	2	
Indigofera charlieriana					1		1	18	4	
Chamaesyce inaequilatera							3	17	2	
Aristida rhiniochloa				6		1	6	16		
Eragrostis porosa							5	16		
Stipagrostis hirtigluma s. patula							1	15		
Helichrysum tomentosulum								15	2	
Pegolettia senegalensis			1	2			1	15	4	
Stipagrostis hirtigluma s. pearsonii								15		
Petalidium engleranum								14	8	
Monechma genistifolium								14	4	
Gossypium triphyllum								13		
Ruelliopsis setosa								13		
Eragrostis annulata							2	13		
Hirpicium gazanioides							1	12	2	
Acacia nebrownii								12		
Solanum species		1	1					12	2	
Aizoon virgatum								11		
Eragrostis glandulosipedata								11		
Triaspis hypericoides								11		
Ptycholobium biflorum								11		
Acalypha segetalis			1					11		
Lantana dinteri								10	2	
Cyperus fulgens							1	10	2	
Nidorella resedifolia								10		
Setaria verticillata			1		6	1	4	10		
Geigeria odontoptera								10		
Fockea angustifolia			1	2				10	2	
Species group P										
Acacia senegal				1	11		8	11	2	
Species group Q										
Cenchrus ciliaris		1	28	11	11	24	6	50		
Enneapogon scoparius			49	10	3	52	6	10		
Combretum imberbe	3	5	56	14	5	6	9	7		
Species group R										
Combretum apiculatum	4	44	27	64	85	84	9	33	6	

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Species group S										
Terminalia sericea			1	12		5	5	1	47	100
Tephrosia dregeana							2	3	25	40
Rhus tenuinervis							3	1	20	50
Bauhinia petersiana							0		19	20
Combretum collinum				6			1		10	60
Species group T										
Acacia fleckii							3	7	49	
Lonchocarpus nelsii								4	49	
Merremia tridentata				7				1	49	
Elephantorrhiza suffruticosa								6	45	
Acanthosicyos naudinianus							3		43	
Requienia sphaerosperma							1		41	
Neorautanenia species								5	36	
Acacia ataxacantha							3	1	31	
Commiphora angolensis							1	7	31	
Albizia anthelmintica	8			1			7	7	31	
Maerua juncea			3	1			1	8	29	
Indigofera colutea								2	23	
Merremia palmata				3			2	4	22	
Vernonia species	6	8					1	5	20	
Harpagophytum procumbens									18	
Ipomoea verbascoidea								1	18	
Hermannia species	3							4	18	
Kohautia caespitosa				1			1	1	17	
Clerodendrum dekindtii								1	16	
Commiphora species					1		2	5	14	
Petalidium coccineum								1	14	
Triraphis schinzii								4	14	
Vernonia poskeana				5			3	6	14	
Oxygonum dregeanum									12	
Dicoma species								1	12	
Eragrostis dinteri							1	4	12	
Melinis nerviglumis	3	5					1	5	12	
Blepharis species					1		4		10	
Species group U										
Catophractes alexandri						1	5	45	16	
Anthephora pubescens							3	34	57	
Acacia reficiens							3	26	44	
Montinia caryophyllacea							1	25	25	
Otoptera burchellii							1	25	57	
Helinus integrifolius								23	12	
Heliotropium ovalifolium							3	17	18	
Cephalocroton mollis				1				16	10	
Hermannia modesta				2			3	15	22	
Blepharis obmitrata								15	10	
Grewia retinervis							3	15	49	
Acacia mellifera							1	14	35	
Ehretia rigida			1	9			1	13	26	
Barleria lancifolia				3	18		1	13	20	

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Species group V										
Stipagrostis uniplumis			1	2	58	35	24	48	78	
Boscia albitrunca	1			5	67	3	22	30	61	
Grewia flava	3				77	6	5	19	49	
Monechma divaricatum				2	12	1	19	27	16	
Commiphora pyracanthoides				5	6	5	6	33	26	
Species group W										
Schmidtia pappophoroides				54	11	5	15	15	75	
Brachiaria deflexa			4	30	93	18	3	1	2	
Species group X										
Enneapogon cenchroides		6	30	52	97	71	40	61	31	
Terminalia prunioides	1		25	18	81	18	43	41	24	
Eragrostis lehmanniana			36	6	55	25	26	7	76	
Melinis repens			15	29	49	43	9	47	30	
Digitaria eriantha			12	62	10	21	1		6	
Ozoroa paniculosa			7	2	1	18	2	1	22	
Species group Y										
Panicum maximum	26	72	36	68	19	21	5		14	
Acacia tortilis	20	22	10	10	20	6	10	3	4	
Species group Z										
Asparagus nelsii							6			60
Dicoma schinzii							3		4	60
Ozoroa schinzii							1			50
Requienia pseudosphaerosperma							1			40
Talinum arnotii							3		2	40
Aristida stipoides							15		6	40
Stipagrostis uniplumis v. uniplumis							6			30
Ochna pulchra							0		4	30
Hyphaene petersiana							5		2	20
Peltophorum africanum			4	12			2		4	20
Harpagophytum zeyheri				1			3			20
Tragus racemosus							6			20
Dichapetalum cymosum										20
Cyperus margaritaceus							1			20
Cleome rubella							3	1		20
Acrotome inflata							3		2	20
Psydrax livida							1			20
Aristi stipitata s. graciliflora				6						10
Scilla nervosa							1			10
Salacia luebbertii										10
Basananthe pedata										10
Ophioglossum polyphyllum							1			10
Pentarrhinum insipidum							1			10
Tavaresia barklyi							3			10
Hermannia eenii										10
Lantana angolensis							0	1		10
Solanum delagoense							0	3		10
Combretum engleri									8	10

	Zimbabwe		Rivers	Lowv.	N.Soutp	Trans.	Semi-arid		Sandy	
Major vegetation type	**1.1**	**1.2**	**2**	**3**	**4**	**5**	**6.1**	**6.2**	**7.1**	**7.2**
Number of relevés	***71***	***131***	***92***	***1375***	***157***	***68***	***144***	***147***	***51***	***10***
Species group AA										
Rhigozum brevispinosum							4	19	73	10
Croton gratissimus				1	2		9	22	47	70
Urochloa brachyura				4			6	23	10	10
Species group BB										
Schmidtia kalihariensis							13	13	29	60
Pogonarthria fleckii							14	19	18	10
Pechuel-Loeschea leubnitziae							17	9	4	30
Acacia erioloba						1	6	1	51	30
Mundulea sericea				7			3	12	10	80
Species group CC										
Aristida adscensionis			32	24	80	35	16	74	12	10
Sclerocarya birrea		3	23	32	39	28	3	2		10
Eragrostis trichophora			1	2	62	35	43	13	6	90
Species group DD										
Colophospermum mopane	69	20	55	58	91	75	67	61	45	80
Dichrostachys cinerea	25	29	22	52	53	57	19	41	71	10
Tragus berteronianus	68	5	2	50	79	43	21	15	2	20
Grewia bicolor	40	11		59	84		23	40	39	30
Commiphora africana	9	4		22	9	13	7	6	29	10
Grewia flavescens	7	37	1	14		30	12	4	10	40
Evolvulus alsinoides	8	5		34	70		12	6	8	10