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A first formal classification of the Hardeveld vegetation in Namaqualand, South Africa

Jona Luther-Mosebach, Jürgen Dengler, Ute Schmiedel, Inga Ute Röwer, Timo Labitzky & Alexander Gröngröft

Keywords
Biodiversity; Desert; *Didelto carnosae-Cephalophylletea inaequalis*; Grazing intensity; *Hermannio trifurcae-Zygophylletea morgsanae*; *Heuweltjie*; Phytosociology; Quartz field; Relevé; Soil condition; Succulent Karoo; Syntaxonomy; Termitarium; TWINSPAN; Winter rainfall

Abbreviations
ANOVA = analysis of variance; DCA = Detrended Correspondence Analysis; ICPN = International Code of Phytosociological Nomenclature. 3rd ed. (Weber et al. 2000); SGD = sheep grazing days per year; TWINSPAN = Two-Way Indicator Species Analysis

Nomenclature
Germishuizen & Meyer (2003) for all taxa except Aizoaceae; Hartmann (2002a,b) for Aizoaceae .

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Luther-Mosebach, J. (corresponding author, jona.luther-mosebach@uni-hamburg.de), **Dengler, J.** (dengler@botanik.uni-hamburg.de), **Schmiedel, U.** (uschmiedel@botanik.uni-hamburg.de) & **Röwer, I.U.** (inga.roewer@uni-hamburg.de): Biodiversity, Evolution and Ecology of Plants, Biocentre Klein Flottbek and Botanical Garden, University of Hamburg, Ohnhorststr 18, 22609, Hamburg, Germany
Labitzky, T. (timo.labitzky@uni-hamburg.de) & **Gröngröft, A.** (a.groengroeft@ifb.uni-hamburg.de): Institute of Soil Science, University of Hamburg, Allende-Platz 2, 20146, Hamburg, Germany
Luther-Mosebach, J. & Röwer, I.U.: Current address: Institute of Soil Science, University of Hamburg, Allende-Platz 2, 20146, Hamburg, Germany

Abstract

Questions: The Succulent Karoo is a winter-rainfall desert in southern Africa with a highly diverse flora. Which environmental factors differentiate vegetation composition at the plot level: How can compositional pattern be best represented by a formal phytosociological classification.

Location: Soebatsfontein communal area and surroundings in the Namaqualand Hardeveld Bioregion of the Succulent Karoo Biome, Northern Cape Province, South Africa.

Methods: We recorded vascular plant species composition, together with a range of structural and soil parameters as well as grazing intensity, in 355 plots of 100 m² size. This sample covered all vegetation types of the study area except those of river beds and anthropogenic sites. Vegetation classification was carried out using modified TWINSPAN followed by manual re-arrangement of a subset of plots with the aim of increasing floristic distinctiveness of the vegetation units. For the final vegetation units, we determined diagnostic species and environmental parameters, according to phi-values and ANOVA, respectively, and translated these into a phytosociological classification.

Results: The major factor influencing species composition and richness was soil salinity. At a broad scale, the less saline sites could be differentiated into sandy plains and rocky hills, and the saline sites into quartz fields, the centres of *heuweltjies* (termitaria) and the matrix between. We translated these patterns into two phytosociological classes with four orders, six alliances and 16 associations. Most of the syntaxa are very well defined in floristic terms, and all except the *Othonnion cylindricae* are new to science. The *Hermannio trifurcae-Zygophylletea morgsanae* represents the zonal vegetation of marginally saline soils, the *Didelto carnosae-Cephalophylletea inaequalis* the vegetation of saline soils. The vegetation of the extremely saline quartz patches probably belongs to a third class not described here due to the scarcity of representative plots.

Conclusions: Our phytosociological approach allowed the various degrees of ecological and floristic similarity to be represented by syntaxa of different ranks. A comparison with previous classifications from the Succulent Karoo revealed a high spatial turnover, with only two of our alliances and none of our associations coinciding with those found in previously studied areas of the Succulent Karoo. Our formal classification has the potential to be a powerful tool for local land use, ecological comparison and conservation, and to contribute to a future national phytosociological classification of South Africa.

Introduction

The Succulent Karoo Biome is a subtropical winter-rainfall desert that covers ca. 111 000 km² in the western part of South Africa and the coastal regions of southern Namibia (Rutherford & Westfall 1994; Mucina et al. 2006b; Haarmeyer et al. 2010). It is bordered by the Fynbos Biome to the south, the Nama Karoo Biome to the east and the

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Namib Desert Biome to the north (Rutherford et al. 2006; Haarmeyer et al. 2010). Together with the Fynbos Biome, the Succulent Karoo was identified by Jürgens (1991) as being part of the Greater Cape Floristic Kingdom. It is widely acknowledged for its uniqueness at a global scale (Cowling et al. 1999; Mucina et al. 2006b). Myers et al. (2000) consider it as the only completely arid ecoregion among their 25 global biodiversity hotspots. It hosts nearly 5000 vascular plant species, of which ca. 40% are endemics (Cowling et al. 1999; Desmet 2007). Approximately 40% of the succulent plant species of the world occur in the Succulent Karoo (van Wyk & Smith 2001). Globally, four other subtropical winter-rainfall deserts exist, but none is similarly species-rich, and only the Succulent Karoo is dominated by leaf-succulent dwarf shrubs (Milton et al. 1997; Mucina et al. 2006b). Various explanations have been put forward for these exceptional features, including high rainfall predictability, moderate winter temperatures, and extreme small-scale soil heterogeneity (Cowling et al. 1998; Esler & Rundel 1999; Schmiedel & Jürgens 1999; Mucina et al. 2006b).

Studying and describing vegetation patterns has a long and broad tradition in South Africa, but in the country-wide classifications (Acocks 1953; Mucina & Rutherford 2006) the least-level units still comprise mosaics of different plant communities (Mucina et al. 2006a). There have also been attempts to classify vegetation at a much smaller spatial scale throughout the country, as reflected by the huge amount of vegetation plot data stored in electronic archives, with plot sizes in the range 1–1000 m² (Rutherford & Powrie submitted; see also Dengler et al. 2011). However, at community level these classifications have nearly always been restricted to relatively small areas, such as nature reserves (e.g. Rösch 2001; Janecke et al. 2003) or municipal areas (e.g. Cilliers & Bredenkamp 1999; van Wyk et al. 2000). Furthermore, much of this work remains in unpublished reports or theses (see Mucina & Rutherford 2006). An exception is the assessment by Jürgens (1986) of the broad vegetation patterns of arid southern Africa based on single, representative relevés.

While the majority of such vegetation studies claim to apply phytosociological or Braun-Blanquetian methods, formal classification following the International Code of Phytosociological Nomenclature (ICPN; Weber et al. 2000) is scarce. Thus, informal names are used for local units and there is a lack of comparison with previous studies. As a result, different names are sometimes used for similar communities (see Bredenkamp & Bezuidenhout 1995), or identical names for dissimilar communities. A well-prepared local classification is valuable in itself and a necessary starting point for any wider phytosociological study, but the true virtue of the Braun-Blanquetian approach is that it is capable of building, step-by-step, a comprehensive classification framework of vegetation patterns which are small-scale but at the same time applicable across very large areas (Westhoff & van der Maarel 1973; Dierschke 1994; Ewald 2003; Dengler et al. 2008). The need for a 'comprehensive formal hierarchical system for South African vegetation' has already been identified by Bredenkamp & Bezuidenhout (1995). However, only a few steps have been made in this direction. Notably, there have been studies on Afromontane forests (du Preez et al. 1991; du Preez & Bredenkamp 1991), Transvaal grasslands (Bezuidenhout et al. 1993), and communities on ultramafic substrates in Sekhukhuneland (Siebert et al. 2002) that have formally described a number of associations and sub-associations, as well as several alliances and orders and one class, according to the rules of ICPN. There are also some PhD theses dealing with formal syntaxonomic classifications (J.A.M. Janssen, pers. comm.), but it appears that the units described therein are not published effectively according to ICPN.

In the Succulent Karoo, vegetation classification studies are particularly rare. There are several informal classifications of the Goegap Nature Reserve near Springbok (van Rooyen et al. 1979a,b; Rösch 2001) and one of the Hantam-Tanqua-Roggeveld subregion (van der Merwe et al. 2008). Recently, Haarmeyer et al. (2010) provided a preliminary classification of the communities occurring at the nine BIOTA Observatories (each 1 km²) in the Succulent Karoo Biome. The only two formal phytosociological classifications for the Succulent Karoo known to us are from Jürgens (2004) for the Richtersveld (though neither with comprehensive relevé tables nor information on measured environmental conditions) and Schmiedel & Mucina (2006) for the quartz field vegetation of the Little Karoo and adjacent regions.

Apart from its scientific value, the description of syntaxa, followed by the assessment of their current state and spatial extent, can also provide management-relevant information and support the monitoring of future vegetation changes. In post-apartheid South Africa, the legacy of the 'tragedy of the commons' (Hardin 1968) has led to a widely held belief that transitions from freehold to communal land invariably result in vegetation degradation (Allsopp et al. 2007). As a result, some farmers on newly established commons request benchmark information in order to prove these expectations wrong. Such is the case in the settlement of Soebatsfontein, which experienced a change in land tenure of this nature in the year 2000 (Schmiedel et al. 2010). Until this current investigation, no community-level vegetation classification has existed for the Soebatsfontein commonage. Yet the study of plot-level vegetation patterns in this area, which belongs to the Hardeveld Bioregion (Mucina et al. 2006b) of central

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Namaqualand, is particularly interesting due to the presence of pronounced compositional shifts within a few metres distance, for example on so-called *heuweltjies* (Afrikaans: 'little hills'), on quartz fields or at the fringes of rocky outcrops.

In this study, we describe the variation in vegetation composition of the area and relate it to biotic and abiotic factors. In addition, we propose a syntaxonomical classification for the vegetation types encountered, both for use by land managers (farmers, conservationists) and scientists.

Study area

The study was conducted on the communal farmland of Soebatsfontein (30° 7′ S, 17° 35′ E), with a total area of 15 069 ha (for further details, see Schmiedel et al. 2010). It is located in the Northern Cape Province of South Africa at the transition from the Sandveld coastal plain to the foothills of the Kamiesberg escarpment (Fig. 1). The altitude ranges from 150 m a.s.l. in the valleys to 550 m a.s.l. on the hilltops.

The precipitation is highly predictable, in being concentrated between May and August, when 80% of the annual rainfall of about 131 mm can be expected (Haarmeyer et al. 2010). The mean annual temperature is 17.8 °C, with extremes ranging from 3.5 °C in winter to 42.4 °C in summer (Haarmeyer et al. 2010).

Soils are mainly Durisols, Cambisols and Leptosols derived from a parent material of gneisses (Petersen 2008; Haarmeyer et al. 2010), and Arenosols on dune sands (Labitzky 2009). Characteristic large earth mounds occur in regular patterns on plains and in valleys. These *heuweltjies*, which are considered to be fossil termitaria but whose age and exact origin are still under debate (see Midgley et al. 2002; Picker et al. 2007), are a common feature in Namaqualand (Desmet 2007; Francis et al. 2007). They are known to have very specific soil properties, strongly deviating from the surrounding matrix (Midgley & Musil 1990; Petersen et al. 2003; Veste & Jürgens 2004; Herpel 2008; Röwer 2009).

According to Mucina et al. (2006b), the area is part of the Namaqualand Heuweltjieveld vegetation unit (SKn 4) within the Hardeveld Bioregion of the Succulent Karoo Biome. This unit is dominated by succulent dwarf shrubs, mostly from the families Aizoaceae and Crassulaceae. Mass flowering of annuals (mainly Asteraceae) occurs during the winter rainfall season.

As recently as the year 2000, as part of the post-apartheid land and agrarian reform, the farmland of Soebatsfontein was transformed from private ownership by the De Beers mining company to a communal farm managed by the rural community of Soebatsfontein, which previously did not have access to farmland. In contrast to traditional communal farms, the Soebatsfontein farmland is subdivided by fences into camps (Fig. 1), which are allocated to individual farmers from the community (for further details on the historic and current land management in Soebatsfontein, see Schmiedel et al. 2010).

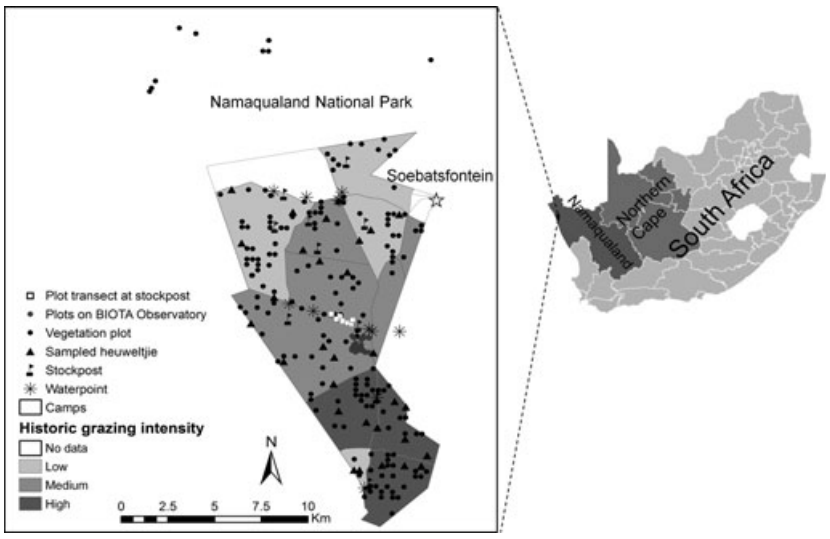

Fig. 1. Location of the Soebatsfontein communal area in the Namaqualand district of the Northern Cape Province, South Africa. The communal area is shown in detail to the left, with the different camps shaded according to their grazing intensity during 1986–1999. The vegetation plots from different sources (see Methods) are indicated by different symbols. Note that due to the spatial proximity of some of the plots, less than the overall number of 355 are visible in the map, e.g. each symbol for a sampled *heuweltjie* typically represents three to four plots arranged according to the *heuweltjie* zonation.

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Methods

Grazing intensity

Data on stock movement and stocking rates for the years 1986–1999 were available and considered to be reliable (Floors Brand, pers. comm.). The 16 camps were grouped into four categories of grazing intensity (Fig. 1). During the subsequent period 2000–2008, the overall grazing intensity was mostly lower, as the herds of the new communal farmers were still needed being built up. For this reason and because vegetation changes in the Succulent Karoo are known to be particularly slow (Rahlao et al. 2008), we assumed that these 'historic' grazing intensities still influenced the vegetation composition in 2008. The stocking rates were calculated as the sum of all known stock movements (the number of sheep multiplied by the number of days they stayed on the camp) over the period of 1 yr (sheep grazing days per year: SGD). An assumed carrying capacity of 9 ha·SSU^{-1} (SSU = small stock unit = one sheep or goat) was used by the former farm manager (Floors Brand, pers. comm.) to calculate 'potential sheep grazing days' (SGD_{pot} = (Camp area/Carrying capacity of the camp) × 365 d). Grazing intensity was then expressed as the ratio of actual SGD to SGD_{pot} (in%), and averaged over the recorded years. The grazing intensities of the camps were classified into the categories: 3 = high (>120%); 2 = intermediate (80–120%); and 1 = low (<80%). The grazing intensity for camps where actual SGD could not be determined was classified as 'unknown'.

Vegetation sampling

Our aim was to achieve an adequate cover of all major vegetation types in our data set. To this end, we used a geographic information system (GIS) to apply a 300-m vector grid to a high-resolution satellite image of the study area from the year 2003 (Digital Globe, provided by Google Earth), and assigned each of the 5700 grid intersections to a visually identifiable habitat type. We could distinguish eight habitat types in the satellite image, but combined the three types of *heuweltjie veld* into one category, as we could not identify any major environmental difference between them. The five final habitat categories were: (i) *heuweltjie veld*; (ii) quartz field (surface covered with quartz gravel); (iii) rocky outcrops and slopes; (iv) areas of grey appearance without *heuweltjies* (mostly with stony shallow soils); and (v) areas of red appearance without *heuweltjies* (mostly with deep red sands). The linear structures of ephemeral rivers as well as anthropogenic sites (i.e. villages, gravel roads) were excluded from the study.

Vegetation plot recording (relevés) was carried out in August and September 2008 (for details, see Luther-Mosebach 2009) on ten randomly selected plots per stratum; the strata being the different combinations of the three grazing intensities and four habitat types (excluding quartz fields – see below). This resulted in a total of 122 relevés (10 × 3 × 4 plus two additional relevés). Quartz fields were not sampled in 2008 – owing to their rarity in the study region, they had already been well covered by the 2007 sampling (see below). Additionally, we selected 15 plots (five plots per grazing intensity) at the fringes of large rock outcrops. This is another rare habitat type that was not represented in the stratified–random selection, but whose high biomass makes it important in the landscape for its biodiversity and grazing resources. To achieve a more comprehensive coverage of the vegetation variability, we added to the data set relevés from five other sources that had been sampled recently with the same methodology. These were: (i) 91 additional relevés sampled in 2008 and specifically placed in the three different zones occurring in a *heuweltje veld* (*heuweltjie* centre = C, *heuweltjie* fringe = F, matrix = M) close to the 30 chosen grid points in this habitat type (Röwer 2009); (ii) 20 relevés sampled in 2008 from the monitoring plots of the Soebatsfontein BIOTA Biodiversity Observatory, also situated within the commonage, and assessed in 2008 (Haarmeyer et al. 2010; Jürgens et al. 2012); (iii) 77 relevés sampled in 2007 and 2008 from the Soebatsfontein commonage, including some plots in quartz fields (U. Schmiedel, A. Gröngröft, J. Luther-Mosebach and I.U. Röwer, unpublished data); (iv) 16 relevés sampled in 2007 from the adjacent Namaqua National Park to the north (U. Schmiedel and A. Gröngröft, unpublished data); and (v) 14 relevés sampled in 2008 from a transect towards a stock post (U. Schmiedel, unpublished data). The different sources resulted in a combined total of 355 relevés.

All study plots were 10 m × 10 m in size. We recorded all vascular plant taxa present and estimated their percentage cover. The identification of critical specimens was facilitated by the use of the herbarium of the Succulent Karoo Knowledge Centre in Kamieskroon. As the taxonomic evaluation of the regional flora in general, and that of the Aizoaceae in particular, is still in progress, no valid names were available for a significant proportion of the plants occurring in our plots, even though we could clearly recognize and distinguish them. In our tables and species lists, these taxa are recorded as '*Genus* sp.' together with a unique ID. A six-digit ID (e.g. 124805) refers to the collection number of the Biodiversity of Plants working group at the University of Hamburg. Live plants are stored in the live plant collection and herbarium specimens at the Herbarium Hamburgense (HBG). IDs with the prefix 'US' (e.g. US07_2679) refer to a year (here 2007) followed by the number of the digital photograph of the species taken by U.S. four-digit IDs (e.g. 2485) refer to photographs taken

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by I.U.R. and J.L.-M. in 2008; both photograph databases are stored at the Data Facility Centre of the same working group. A five-digit ID (e.g. 20271) refers to the plot ID where the taxon had first been recorded. Samples with known genus but uncertain species identity are reported with 'cf.' in front of the epithet.

We assigned all taxa to two categories of life history (i.e. annual, perennial) and five categories of life form (i.e. therophyte, geophyte, hemicryptophyte, chamaephyte, phanerophyte). The two most important life forms of the area were further subdivided into nano-, micro- and meso-chamaephytes and nano- and micro-phanerophytes (Haarmeyer et al. 2010, p. 33). To assign palatability values for the most common plant species, we asked three farmers to rate them according to their palatability for sheep and goats and, where applicable, the season of highest grazing value. These data were complemented by information taken from literature (van Breda & Barnard 1991; Le Roux 2005) and additional interviews that had been conducted with farmers in Soebatsfontein (Linke 2009). In this way, we classified all taxa with available information into one of three palatability classes (see vegetation tables): eaten frequently (3), eaten (2), rarely eaten or poisonous (1). This classification was then used to assess the grazing value of the different vegetation types. In addition, we identified 'problem plants' (sensu Wells et al. 1986) as being species that are unpalatable and poisonous as well as invasive (both native and exotic).

All relevés (with species composition and environmental data) from this investigation are stored in, and available from, the BIOTA Southern Africa Vegetation Database (N. Jürgens et al., unpublished data), with the ID AF-00-003 in the Global Index of Vegetation-Plot Databases (Dengler et al. 2011) (see Supporting Information Appendix S1 for a translation for taxon names deviating between this publication and the database).

Environmental and biodiversity data

For each plot, several environmental parameters relating to topographic position, soil surface and soil properties were determined (Table 1). The estimated areas of plant cover, mineral soil surface and other structural elements were allowed to overlap, so the combined values could theoretically add up to more than 100%. For the determination of soil properties, we took mixed samples of the uppermost 10 cm of the soil from nine regularly distributed points within the plot. Sample preparation and laboratory methods followed BIOTA standard procedures (Herpel 2008; Haarmeyer et al. 2010, pp. 23 et seq.; see Table 1).

Table 1. Overview of environmental parameters available for the vegetation plots, and the methods used for their determination.

Parameter	Definition and method	Reference
Relief and soil surface		
	Measured with an inclinometer from the highest to the lowest point of the plot outline.	
Inclination (°)		
Slope position	Assignment to one of the six categories: Plain (including valleys); Toeslope; Midslope (often with rock outcrops); Upper Slope (normally with rock outcrops); Shoulder; Summit (hilltops and crests, rocky).	
Cover of mineral soil surface (%)	Estimated for each of the following seven categories: Fine material (<0.2 cm); Fine + medium gravel (0.2–2 cm); Coarse gravel (2–6 cm); Stones (6–20 cm); Boulders (20–60 cm); Large boulders (>60 cm); Rock outcrops.	FAO (2006)
Cover of other structural elements (%)	Estimated for each of the following four categories: Dead wood; Soft litter; Dung; Bioturbation (i.e. area affected by digging mammals).	
Soil properties		
pH	Preparation of soil suspensions by addition of 0.01 M $CaCl_2$ in a 1:2.5 ratio; measurement with a pH electrode after 1 h of repeated stirring.	DIN (2005)
EC ($\mu S \cdot cm^{-1}$)	Electrical conductivity: Measurement in an aquademin solution (1:2.5 ratio) with a conductivity sensor.	DIN (1997)
TC (%)	Total carbon: A fine-ground sample (about 0.7 g) was combusted at high temperatures (900 °C) with oxygen. The released gases were separated and cleaned from water, and the CO was oxidized to CO_2. The CO_2 was measured by thermal conductivity (Vario MAX, Elementar Analysensysteme).	DIN (1995)
IC (%)	Inorganic carbon: A fine-ground sample (0.1–2.0 g) was dried at 105 °C overnight and thereafter treated with 5 ml phosphoric acid (43%) in a closed system. The released CO_2 was measured by gas chromatography using a Shimadzu GC 14B device.	DIN (1995)
OC (%)	Organic carbon = TC − IC	DIN (1995)
N (%)	Total nitrogen: A fine-ground sample (about 0.7 g) was combusted at high temperatures (900 °C) with oxygen. The released gases were separated and cleaned from water, and the NO_x was reduced to N_2. The N_2 was measured by thermal conductivity (Vario MAX, Elementar Analysensysteme).	DIN (1998)
C:N ratio	= OC/N	

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Soil types were classified following the World Reference Base for Soil Resources (IUSS Working Group WRB 2006) and Labitzky (2009).

We determined the total vegetation cover per plot as the sum of the cover values of the species present. This is possible here because the vegetation is generally so sparse that individuals of different species rarely overlap. In terms of biodiversity indices, we calculated species richness per plot as well as the cover-based Shannon index (H'), Shannon evenness (J') and Simpson index (as $1 - D$) (Magurran 2004).

Vegetation classification

For the vegetation classification, we used the modified version of TWINSPAN (two-way indicator species analysis; Hill 1979) proposed by Roleček et al. (2009) and implemented in JUICE (Tichý 2002). Unlike the original version, modified TWINSPAN does not enforce a dichotomy of classification but instead, at each step, divides only the most heterogeneous cluster of the previous hierarchical level. Thus, the application of modified TWINSPAN results in vegetation units of similar internal heterogeneity. The pseudospecies cut levels were set to 0%, 1%, 2%, 5%, 10% and 20%. For translation into phytosociological associations, we chose the highest division that still yielded floristically well-characterized terminal clusters, i.e. either with their own character species (see below) or as the central unit within a superior cluster (Dengler 2003; Dengler et al. 2005; Michl et al. 2010). These terminal clusters were considered as associations.

Indicator species were identified using the phi-coefficient of association (Chytrý et al. 2002). Following the suggestion of Tichý & Chytrý (2006), we calculated the phi-values for the standardized rather than actual plot numbers in order to avoid unreasonable diagnostic values due to unequal plot numbers per column (also see Dengler 2003, p. 66). We standardized the number of relevés in the associations so that they were equal (see Michl et al. 2010). Following Chytrý (2007), species with phi $\geq$ 0.50 were considered as highly diagnostic, and species with phi $\geq$ 0.25 as diagnostic; species whose concentration according to Fisher's exact test was not significant at $\alpha = 0.05$ were disregarded. As in Michl et al. (2010), we also calculated phi-values for the higher syntaxonomic ranks. A diagnostic species of a syntaxon was considered as a character species when it had at a phi-value at least 0.10 higher than any other syntaxon of the same rank. In this way, one taxon could be a character species of several syntaxa that are subordinate to each other. In such cases, the taxon is displayed in the tables at the lowest syntaxonomic rank, and marked as a 'transgressive character species' at the higher syntaxonomic levels. Note, however, that a species was considered a character species at the higher level only when it had positive phi-values for more than half of the subordinate lower-rank units.

As we wanted to achieve syntaxa that were clearly distinguishable floristically, a final step was to adjust the TWINSPAN clusters by hand. For this purpose, we first determined the character species for the original TWINSPAN clusters. We then re-assigned those relevés in which character species of a cluster other than their own prevailed, nearly always leading to an increase of the phi-values of the character species of both syntaxa.

Those vegetation types for which no valid syntaxon names were available are formally described as new to science according to the regulations of the ICPN (Weber et al. 2000). For each syntaxon, we chose double names, based on two frequent species, with the first one normally being highly diagnostic and the second one particularly dominant. The formal requirements for the description of new syntaxa are fulfilled in Appendix 1. In the text, we have omitted the epitheta of the syntaxon names to increase readability.

Statistical analyses

We visualized the compositional patterns of the plots and their relationships to biotic and abiotic factors with a detrended correspondence analysis (DCA), applied in CANOCO 4.53 (ter Braak & Šmilauer 2002). We down-weighted rare species and used detrending-by-segments (Hill & Gauch 1980).

We determined the differences in biodiversity, structural and abiotic parameters between the stands of the separate vegetation types with analyses of variance (ANOVAs). For this purpose, we used the vegetation units (both associations and alliances) as predictors. The parameters listed in Table 1 were used as independent variables. Following the suggestion of Quinn & Keough (2002), we visually checked the dependent variables for normality of distribution and homogeneity of variances, $\log_{10}$-transforming the data if they did not satisfy these tests. We determined homogeneous groups of vegetation units for each dependent variable using the HSD test for unequal N. In doing so, we normally applied $\alpha = 0.05$, but in cases where log-transformation either was not possible or did not result in a reasonable distribution of the values, $\alpha = 0.01$ was used instead to account for the underestimation of Type I error rates in such situations (see Quinn & Keough 2002).

For the verbal description of syntaxa, five important parameters were classified into ordinal classes: four classes of mean species richness [11–17 species (poor), 18–22 (moderately poor), 23–27 (moderately rich), >27 (rich)]; four classes of the number of exclusively diagnostic species [1–7 species (weakly defined), 8–15 (moderately defined),

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16–23 (well defined), >23 (very well defined)]; six classes of soil salinity [21–384 $\mu S \cdot cm^{-1}$ (very low), 385–747 (low), 748–1110 (moderate), 1111–1474 (high), 1475–1838 (very high), >1838 (extremely high)]; and five classes of soil organic carbon content [0.2–0.6% (very low), 0.7–1.0 (low), 1.1–1.4 (moderate), 1.5–1.8 (high), >1.8 (very high)].

Results

Classification of the vegetation units

Comparing the different cluster divisions, 17 clusters was the highest number for which each of the terminal clusters fulfilled our floristic criterion of an association. For the superior syntaxonomic ranks, we selected levels within the cluster tree that yielded floristically well-defined and ecologically interpretable units. In general, we interpreted the two-cluster level as classes, the five-cluster level as orders, and the six-cluster level as alliances. In this way, each syntaxonomic level corresponds to a horizontal plane in the dendrogram (Fig. 2). However, we raised cluster 2 to alliance level based on its floristically intermediate position between cluster 1 on the one hand, and clusters 3 and 4 on the other, so that in the end seven alliance-level units were distinguished.

The manual 'optimization' of the cluster division with regard to diagnostic species led to 42 relevés being moved between clusters. This increased the mean phi-value of the diagnostic species at association level by ca. 8%. These rearrangements are indicated in the relevé tables of the orders (Appendices S3–S7).

In the final result (Tables 2 and 3), we accepted two classes, four orders, six alliances, 16 associations and one unit, which was not formally described (see below). The *Cephalophyllo-Eberlanzietum* was the only syntaxon that was not positively characterized by association character species of its own level, and thus was considered as the central association within the *Mesembryanthemo-Eberlanzion*. The other 16 terminal units had 1–33 character species of their own (mean 11.6), among which 0–8 were highly diagnostic (mean: 1.8) (Tables 2 and 3).

We refrained from a formal description of cluster 12, but treat it as provisional 'unit 2.3' (at ordinal level). This decision was due to the internal heterogeneity of the cluster, the low number of available relevés (8), and the fact that despite its placement within the second class (*Didelto-Cephalophylletea*) by TWINSPAN, the floristic analysis revealed it to be substantially different to all the other associations of this class (Table 3).

Major patterns in the vegetation studied and underlying environmental factors

On average, there were 21.6 species per 100-m^2 plot, with a range of 4–51 species. The soils differed widely between plots and community types (for details, see Table 4, Appendices S3–S8). The actual grazing intensities of the camps varied four-fold, from 41% to 163% of the assumed carrying capacity of 9 $ha \cdot SSU^{-1}$ (mean: 96%).

The DCA revealed a strong floristic differentiation among the plots, with the length of the first axis being 6.6 SD and that of the second 5.5 SD (Fig. 3). No clear groupings of relevés are visible in the ordination diagram, although the relevés of unit 2.3 are rather separated from all other relevés. The first axis represents, from left to right, a gradient from relatively C- and N-rich, non-saline, skeletal soils on slopes, to stands on saline soils with low cover of rocks and stones in plains. In this same direction, all diversity parameters and the cover of the vegetation generally decreased. The second axis, from bottom to top,

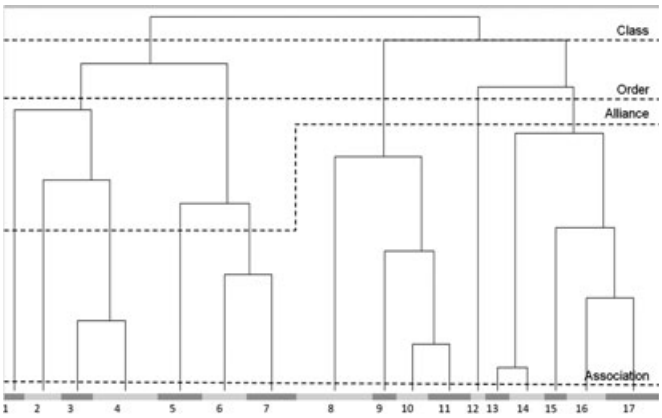

Fig. 2. Cluster tree of all 355 relevés according to the modified TWINSPAN analysis, with Whittaker's beta as distance measure. The figures at the bottom are the cluster numbers, while the width of the bars is proportional to the number of relevés originally assigned to the clusters. For the phytosociological classification, 12% of all relevés were manually re-arranged between the terminal clusters. The assignment of phytosociological ranks is indicated by horizontal lines. Note that cluster 12 is provisionally treated as informal unit 2.3 within the second class, while it most likely belongs to a class of its own.

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Table 2. Conspectus of the syntaxa found in the area of Soebatsfontein. Except for the *Othonnion sedifoliae* (author citation: "Jürgens 2004"), all of them are newly described in this paper (author citation: "Luther-Mosebach et al. 2012"; see Appendix 1).

Class 1: *Hermannio trifurcae-Zygophylletea morgsanae*
- Order 1.1: *Hermannio trifurcae-Othonnetalia sedifoliae*
  - Alliance 1.1.1: *Othonnion cylindricae*
    - Association: 1.1.1.1: *Oncosiphono grandiflori-Othonnetum cylindricae*
  - Alliance 1.1.2: *Stipagrostio obtusae-Othonnion sedifoliae*
    - Association: 1.1.2.1: *Stipagrostio obtusae-Othonnetum sedifoliae*
  - Alliance 1.1.3: *Grielo humifusi-Galenion sarcophyllae*
    - Association: 1.1.3.1: *Grielo humifusi-Othonnetum sedifoliae*
    - Association: 1.1.3.2: *Emico australis-Lebeckietum multiflorae*
- Order 1.2: *Berkheyo fruticosae-Rhoetalia undulatae*
  - Alliance 1.2.1: *Berkheyo fruticosae-Rhoion undulatae*
    - Association 1.2.1.1: *Ruschio goodiae-Lebeckietum sericeae*
    - Association 1.2.1.2: *Drosanthemo hispidi-Manochlamydetum albicantis*
    - Association 1.2.1.3: *Antizomato miersianae-Stoeberietum utilis*

Class 2: *Didelto carnosae-Cephalophylletea inaequalis*
- Order 2.1: *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis*
  - Alliance 2.1.1: *Mesembryanthemo guerichani-Eberlanzion cyathiformis*
    - Association 2.1.1.1: *Foveolino dichotomae-Eberlanzietum cyathiformis*
    - Association 2.1.1.2: *Antimimato komkansicae-Zygophylletum cordifolii*
    - Association 2.1.1.3: *Cheiridopsio robustae-Cephalophylletum inaequalis*
    - Association 2.1.1.4: *Mesembryanthemo guerichani-Eberlanzietum cyathiformis*
- Order 2.2: *Euphorbio hamatae-Cephalophylletalia inaequalis*
  - Alliance 2.2.1: *Euphorbio hamatae-Cephalophyllion inaequalis*
    - Association 2.2.1.1: *Halliantho plani-Ruschietum leucospermae*
    - Association 2.2.1.2: *Leipoldtio schultzei-Cephalophylletum inaequalis*
    - Association 2.2.1.3: *Pteronio glabratae-Cephalophylletum inaequalis*
    - Association 2.2.1.4: *Drosanthemo curtophylli-Meyerophytetum meyeri*
    - Association 2.2.1.5: *Ruschio versicoloris-Cephalophylletum inaequalis*
- Unit 2.3 (not named and not further analysed; probably belonging to a separate class)

corresponds to a gradient from *heuweltjie* centres (enriched in inorganic carbon and much affected by mammal bioturbation) to sites outside the *heuweltjies*, which generally had a higher C:N ratio and tended to be richer in species. While there was little overlap between the five orders in the ordination diagram, the three alliances of the order *Hermannio-Othonnetalia* (1.1) were hardly separated.

The proposed assignment to vegetation classes reflects a separation along the first axis of the DCA (Fig. 3), with the *Hermannio-Zygophylletea* representing the stands on soils with low salinity, and the *Didelto-Cephalophylletea* growing on particularly saline soils. Apart from salinity, no other measured abiotic or biotic parameters showed clear differences between the two classes. At alliance level (Table 4), only the *Berkheyo-Rhoion* (1.2.1) and unit 2.3 differed significantly from all the other equivalent units for some parameters. The *Berkheyo-Rhoion* occurred on steeper slopes and had a higher surface proportional area of outcrops than any other alliance. In addition, it showed the highest values for cover of boulders, cover of various types of organic litter (soft litter, dead wood, dung), species richness and the Simpson index, although the differences with other units were not always significant. By contrast, unit 2.3 (quartz fields) was distinct in terms of its high cover of gravel and stones, although the latter was non-significant. Further, the *Mesembryathemo-Eberlanzion* (2.1.1) was set apart from other alliances due to its high pH values and high levels of mammal bioturbation, though again the differences were not always significant. The three alliances of the *Hermannio-Othonnetalia* (1.1) did not strongly differ in any of the measured abiotic and biotic parameters. Grazing intensity was higher in the *Grielo-Galenion* (1.1.3) compared to the two other alliances (mean: 102% compared to ca. 75%), but this was not significant. In the *Grielo-Galenion*, the evenness was significantly lower than in the *Othonnion cylindricae* (1.1.1), while the *Stipagrostio-Othonnion* (1.1.2) had an intermediate evenness. Among the four non-monotypic alliances, only the *Berkheyo-Rhoion* (1.2.1) showed significant differences between associations for several of the measured parameters, while the associations of the other three (*Grielo-Galenion* – 1.1.3, *Mesembryanthemo-Eberlanzion* – 2.1.1, *Euphorbio-Cephalophyllion* – 2.2.1) hardly differed in this respect (Appendix S8; see also association description in the next sub-section).

Descriptions of the syntaxa

In this sub-section, we describe the vegetation units in conjunction with the conspectus of syntaxa (Table 2), the synoptic tables (Table 3, Appendix S2), and the five relevé tables (Appendices S3–S7). The characterization of the alliances based on the previous sub-section is summarized in Fig. 4, and a typical stand of each alliance is shown in Fig. 5. While the following text contains very brief descriptions of the 16 associations and the one informal unit, more detailed descriptions of all syntaxonomic levels, including photographs of all associations, can be found in Appendix S9. Finally, the formal publication of the new syntaxa according to the ICPN is provided in Appendix 1.

Othonnion cylindricae

1.1.1.1 Oncosiphono grandiflori-Othonnetum cylindricae

Characterization: This species-poor association forms sparse stands of dwarf shrubs that are seldom higher than

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1 m. It is dominated by the chamaephyte *Othonna cylindrica* and the tufty graminoid *Stipagrostis ciliata*. The association is very well defined by 32 exclusively diagnostic species. It has a low pasture value due to the high frequency of the unpalatable perennial grass *S. ciliata*, annuals (e.g. *Oncosiphon grandiflorum*) and shrubs (e.g. *O. cylindrica*).

Habitat: The *Oncosiphono-Othonnetum* occurs in plains without *heuweltjies* on deep red sandy soils (Arenosols). The soils are very slightly acidic, and both salinity and the organic carbon content are very low. Due to the high infiltration potential of the sandy substrate, water availability is higher than on adjacent sites with shallower, finely textured soils.

Stipagrostio obtusae-Othonnion sedifoliae

1.1.2.1 Stipagrostio obtusae-Othonnetum sedifoliae

Characterization: This moderately species-rich association is characterized by the nano-phanerophyte *Ruschia* subg. *Tumidula* sp. 3818 and a number of therophytic Scrophulariaceae. The *Ruschia* species and the tufty graminoid *Stipagrostis obtusa* are the dominant species. The association is well defined by 21 exclusively diagnostic species. It generally provides a better pasture than the *Oncosiphono-Othonnetum* (1.1.1.1) due to the higher abundance of palatable plants, such as the perennial grass *S. obtusa* and the shrub *Othonna sedifolia*, which is rated by the local farmers as being highly palatable.

Habitat: The *Stipagrostio-Othonnetum* occurs in plains and on gentle slopes without *heuweltjies*. The soils are deep Arenosols derived from red aeolian sands, with very slight acidity and very low salinity and organic carbon content. The sandy substrate is responsible for a fast infiltration of water after rain events and protects the sites from high evaporation. Therefore, water availability in this habitat is higher than on surrounding shallower, finely textured soils.

Grielo humifusi-Galenion sarcophyllae

1.1.3.1 Grielo humifusi-Othonnetum sediofoliae

Characterization: This species-poor association is seldom higher than 1 m and is characterized by sparse stands of the meso-chamaephyte *O. sedifolia*. Together with this species, the small therophytic graminoid *Karroochloa schismoides* can become dominant in winter and spring. This association is moderately defined by eight exclusively diagnostic species. Like the second association of the alliance, the *Grielo-Othonnetum* has a low grazing value due to the low cover of palatable plants and the high abundance of grasses with low to moderate palatability, such as *Stipa capensis* and *K. schismoides*.

Habitat: The *Grielo-Othonnetum* occurs in plains without *heuweltjies*, predominantly on deep red sandy Durisols and Arenosols on the transition to shallower soils. They range from slightly acidic to very slightly alkaline, the salinity and content of organic carbon being very low. Due to the high infiltration potential of the sandy substrate, soil water availability is higher than on shallower, more finely textured soils.

1.1.3.2 Emico australis-Lebeckietum multiflorae

Characterization: This moderately species-poor association consists of widely scattered shrubs with interspersed bare patches that are covered by annuals during winter and spring. The sites are often dominated by the therophytic graminoid *K. schismoides* and by sparse stands of the nano-phanerophyte *Lebeckia multiflora*. The species composition is affected by historic overgrazing, and the unpalatable annuals *Emex australis* and *Salsola kali* in particular are indicators of such degradation. It can thus be interpreted as a degraded form of the *Grielo-Othonnetum*. The association is weakly defined by just six exclusively diagnostic species. Like the *Grielo-Othonnetum* (1.1.3.1), it has a moderate grazing value.

Habitat: The *Emico-Lebeckietum* occurs on open midslopes without *heuweltjies* on shallow and deep sandy and silty Regosols and Arenosols. The soil properties are similar to the *Grielo-Othonnetum* (1.1.3.1) but with a tendency to a slightly higher enrichment of organic carbon in the topsoil (median 0.44%).

Berkheyo fruticosae-Rhoion undulatae

1.2.1.1 Ruschio goodiae-Lebeckietum sericeae

Characterization: This species-rich association is dominated by leaf-succulent, shrubby vegetation with some therophytic graminoids and herbs occurring in winter and spring. It is often dominated by the meso-chamaephytes *Ruschia versicolor* and *Leipoldtia schultzei*. It is moderately defined by 12 exclusively diagnostic species. Like all associations within the *Berkheyo-Rhoion*, this one is very valuable as pasture throughout the year due to the abundance of many highly palatable perennial plants, such as *Rhus incisa* and *Didelta spinosa*.

Habitat: The *Ruschio-Lebeckietum* occurs on midslopes and shoulders where rocky outcrops occur sporadically alongside shallow and stony Regosols and Leptosols free of calcium carbonate. However, it does not occur on *heuweltjies*. Although only moderately acidic, the soils of the association show the lowest pH values of the study area. The salinity is very low, and the content of organic carbon is low. Nevertheless, the amount of topsoil organic carbon is twice as high as in any other association of the *Hermannio-Zygophylletea*. The C:N ratio is also larger, indicating slower decomposition (see Appendix S8).

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Table 3. Abridged synoptic table of the proposed vegetation classes (Cl.), orders (O.), alliances (All.) and associations (A. or CA. = central association). The syntaxa. Each species is assigned to the lowest syntaxonomic rank where it is characteristic, and within each syntaxon the character species are arranged *; phi > 0: °). Character species are highlighted in dark grey at the lowest level where they are diagnostic and in light grey in the case of transgressive name, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems 15% constancy in the charcterized syntaxon and companion species with less than 7% overall constancy are not shown (a complete version of this table is

LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1
			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.
			Corresponding TWINSPAN cluster(s)		1–7	8–17	1–4	5–7	8–11	13–17	12	1	2	3–4	5–7	8–11
			Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4
			Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94
Class 1 – *Hermannio trifurcae-Zygophylletea morgsanae*																
T	1	*	*Oncosiphon suffruticosum*	28.7	48*	12	44°	52*	22	5	13	.	42°	68*	52*	22
Order 1.1 – *Hermannio trifurcae-Othonnetalia cylindricae*																
Cmes	3		*Hermannia trifurca*	16.1	34*	3	47*	18°	1	6	.	75*	63*	25°	18°	1
Alliance 1.1.1 – *Othonnion cylindricae*																
Cmes	1		*Othonna cylindrica*	3.1	11*	.	20*	.	.	.	.	58**	21°	.	.	.
H	1	*	*Stipagrostis ciliata*	7.0	20*	1	35**	.	2	1	.	75**	53*	6	.	2
Pnan			*Lebeckia* sp. 20271	1.1	5°	.	8*	.	.	.	.	33**	.	.	.	.
T			*Scrophulariaceae* sp. 124805	1.1	5°	.	8*	.	.	.	.	33**	.	.	.	.
T	1	*	*Oncosiphon grandiflorum*	2.5	7°	1	13*	.	1	1	.	42**	5°	2	.	1
H	1	*	*Stipagrostis zeyheri* subsp. *zeyheri*	4.5	13*	0	19*	5	.	1	.	50*	21°	2	5	.
Pnan	1		*Asparagus* sp. US07_2679	0.8	4°	.	6°	.	.	.	.	25*	.	.	.	.
Cnan			*Felicia* sp. 124816	0.8	4°	.	6°	.	.	.	.	25*	.	.	.	.
T			*Helichrysum* sp. 124804	0.8	4°	.	6°	.	.	.	.	25*	.	.	.	.
H	3		*Ehrharta melicoides*	2.0	6°	.	8°	4°	.	.	.	33*	.	.	4°	.
Cmes	1		*Ruschia* sp. US07_2384	1.1	4°	.	6°	2	.	.	.	25*	.	.	2	.
T			*Pelargonium* sp. 124815	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.
Cmes			*Brownanthus* sp. 124828	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.
H	1		*Cladoraphis spinosa*	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.
Cnan			*Conicosia* sp. 20270	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.
N.a.			*Gnidia* sp. US07_2782	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.
N.a.			*Pteronia* sp. 124818	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.
H			*Cymbopogon* cf. *marginatus*	2.0	6°	.	7°	4°	.	.	.	25*	.	2	4°	.
Cmes	1		*Euphorbia decussata*	3.4	7°	2	8°	5°	1	3	.	25*	5°	2	5°	1
T			*Pharnaceum* sp. 2259	6.5	15*	1	20*	9°	.	2	.	33*	16°	16°	9°	.
H			*Arctotis undulata*	3.9	10°	1	15*	3	1	1	.	25*	11°	11°	3	1
Alliance 1.1.2 – *Stipagrostio obtusae-Othonnion sedifoliae*																
Pnan	1		*Ruschia* subg. *Tumidula* sp. 3818	10.4	20*	3	27*	11°	3	3	.	8	84**	7	11°	3
T			*Scrophulariaceae* sp. 21905	1.4	4°	.	7°	.	.	.	.	.	26**	.	.	.
H	2		*Stipagrostis obtusa*	3.4	7°	0	9°	5°	.	1	.	.	37*	.	5°	.
T			*Scrophulariaceae* sp. 21906	2.8	7°	1	12*	.	2	.	.	8°	37*	2	.	2
T			*Rumex* sp. 21905	1.1	3°	.	5°	.	.	.	.	.	21*	.	.	.
T			*Felicia microsperma*	1.7	5°	.	9*	.	.	.	.	8°	26*	.	.	.
T			*Lyperia tristis*	3.1	7°	0	11*	1	.	1	.	.	32*	7°	1	.
T			*Silene clandestina*	1.7	4°	.	6°	1	.	.	.	.	21*	2	1	.
Cmes			*Lampranthus densipetalus*	1.4	3°	1	5°	.	.	2°	.	.	21*	.	.	.
Cmes	3		*Othonna sedifolia*	15.8	24°	13	38*	5	8	20°	.	17	68*	33°	5	8
G			*Lapeirousia arenicola*	2.0	5°	.	9*	.	.	.	.	8°	21*	3°	.	.
T			*Trichogyne lerouxiae*	2.3	5°	.	8°	2	.	.	.	.	21*	6°	2	.
T			*Lotononis parviflora*	2.5	4°	2	6°	1	.	4°	.	.	21*	2	1	.
T			*Pharnaceum croceum*	2.8	7°	.	8°	5°	.	.	.	8°	21*	2	5°	.
G			*Lachenalia* sp. 2763	2.8	5°	2	7°	1	1	4°	.	8°	21*	.	1	1
G			*Ornithoglossum vulgare*	3.9	7°	3	11°	1	1	7°	.	8°	26*	4	1	1
Alliance 1.1.3 – *Grielo humifusi-Galenion sarcophyllae*																
Cmes	3		*Galenia sarcophylla*	26.8	33°	17	39°	26°	32°	9	.	.	16	70*	26°	32°
Association 1.1.3.1 – *Grielo humifusi-Othonnetum sedifoliae*																
T			*Grielum humifusum*	10.1	21*	4	36*	.	5	3	.	17°	32°	48*	.	5
T			*Zaluzianskya affinis*	14.6	21°	9	34*	3	20°	2	.	8	11	59*	3	20°
T	1		*Helichrysum alsinoides*	13.8	27*	3	42*	7	3	4	.	.	53*	58*	7	3

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displayed values are percentage constancies in the plots belonging to a particular association and means of the association constancies in the case of higher according to decreasing phi-values. Phi-values (standardized for equal plot numbers per association) are indicated with superscript (phi > 0.5: **; phi > 0.25: character species at the highest level where they are diagnostic. This shading is also transferred to the subordinate units to the right. To the left of their (Pr.; * = problem plant; ** = problem and exotic plant; Wells et al. 1986). Note that in this abridged version of the table character species with less than available in Appendix S2).

2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
13–17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
5	.	42°	67°	69°	13	82*	61°	2	36°	5	44°	11	13	.	.	.
6	75*	63*	6	44°	42°	5	6	2	.	.	.	.	3	.	15	13
.	58**	21°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	75**	53*	.	13°	.	.	.	.	.	.	6	.	.	.	.	4
.	33**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	33**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	42**	5°	.	3	.	.	.	2	.	.	.	.	3	.	.	.
1	50*	21°	.	3	8°	.	6°	.	.	.	.	.	.	.	.	4
.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	33*	.	.	.	8°	.	3°	.	.	.	.	.	.	.	.	.
.	25*	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	25*	.	.	3°	.	5°	6°	.	.	.	.	.	.	.	.	.
3	25*	5°	.	3	.	5°	10°	.	.	5°	.	.	.	9°	5°	.
2	33*	16°	22°	9°	8°	9°	10°	.	.	.	.	.	.	.	.	8°
1	25*	11°	17°	6°	8°	.	.	2	.	.	.	.	.	.	.	4
3	8	84**	6	9	13°	9	13°	.	7	.	6	.	13°	.	.	4
.	.	26**	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	.	37*	.	.	4°	.	10°	.	.	.	.	.	3°	.	.	.
.	8°	37*	.	3	.	.	.	.	.	.	6°	.	.	.	.	.
.	.	21*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	8°	26*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	.	32*	11°	3	4°	.	.	.	.	.	.	.	.	.	.	4°
.	.	21*	.	3°	.	.	3°	.	.	.	.	.	.	.	.	.
2°	.	21*	.	.	.	.	.	.	.	.	.	11°	.	.	.	.
20°	17	68*	50°	16	13	.	3	5	14	.	13	33°	10	18°	15	25°
.	8°	21*	.	6°	.	.	.	.	.	.	.	.	.	.	.	.
.	.	21*	6°	6°	.	5°	.	.	.	.	.	.	.	.	.	.
4°	.	21*	.	3°	.	.	3°	.	.	.	.	11°	3°	.	.	4°
.	8°	21*	.	3°	4°	.	10°	.	.	.	.	.	.	.	.	.
4°	8°	21*	.	.	.	.	3°	2	.	.	.	11°	3°	.	5°	.
7°	8°	26*	6°	3	4	.	.	2	.	.	.	11°	3	18°	.	.
9	.	16	78*	63°	4	27°	45°	30°	43°	10	44°	.	10	18	10	8
3	17°	32°	78**	19°	.	.	.	2	.	5	13°	.	.	.	.	17°
2	8	11	83**	34°	4	5	.	23°	21°	5	31°	.	.	.	.	8
4	.	53*	78*	38°	4	5	13	.	7	.	6	.	6	.	.	13

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Table 3. Continued

LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1
			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.
			Corresponding TWINSPAN cluster(s)		1–7	8–17	1–4	5–7	8–11	13–17	12	1	2	3–4	5–7	8–11
			Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4
			Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94
T			*Gazania tenuifolia*	8.2	16*	2	26*	3	5	.	.	8°	26°	35*	3	5
T	1		*Karroochloa schismoides*	45.4	67*	24	74*	56°	39	14	13	42°	74°	91*	56°	39
T	2		*Stipa capensis*	3.4	7°	0	9°	4°	1	.	.	.	.	17*	4°	1
Association 1.1.3.2 – *Emico australis-Lebeckietum multiflorae*																
T		*	*Emex australis*	1.4	2°	.	4°	.	.	.	.	.	.	8*	.	.
T			*Arctotis fastuosa*	1.7	3°	.	5°	.	.	.	.	.	.	11*	.	.
Pnan	2		*Lebeckia multiflora*	26.2	41*	14	57*	19	25	8	.	42°	53°	67*	19	25
Order 1.2 – *Berkheyo fruticosae-Rhoetalia undulatae*																
T	1		*Heliophila variabilis*	22.0	30°	12	9	57*	16	10	.	.	.	18	57*	16
Cmes	3		*Berkheya fruticosa*	11.3	18°	4	3	39*	.	8	.	.	11°	.	39*	.
T	1		*Bromus pectinatus*	12.4	20°	5	4	40*	12°	.	.	.	.	8	40*	12°
Cmes			*Crassula expansa* subsp. *expansa*	5.4	10*	.	1	23*	.	.	.	.	.	2	23*	.
Pmic	2		*Rhus incisa*	4.8	9°	.	.	22*	.	.	.	.	.	.	22*	.
Cmes	3		*Microloma sagittatum*	9.6	16°	3	3	34*	2	4	.	.	5	3	34*	2
Pnan	2	*	*Zygophyllum morgsana*	14.4	30*	1	20°	44*	1	1	.	58*	5	8	44*	1
Pnan	3		*Didelta spinosa*	5.6	11*	.	2	23*	.	.	.	.	.	3	23*	.
T	1		*Aizoon canariense*	16.1	26*	5	12	43*	6	4	.	.	11	20°	43*	6
Cmes	1		*Crassula muscosa* var. *obtusifolia*	3.4	6°	.	.	15*	.	.	.	.	.	.	15*	.
Pnan			*Solanum giftbergense*	3.1	6°	.	.	14*	.	.	.	.	.	.	14*	.
Pnan	3		*Thesium lineatum*	3.4	7°	.	1	14*	.	.	.	.	5°	.	14*	.
T			*Hebenstretia parviflora*	8.5	13°	3	6	23*	2	4	.	.	11°	6	23*	2
Pnan	1	*	*Euphorbia mauritanica*	8.5	13°	4	6	22*	4	5	.	8°	.	7	22*	4
T			*Helichrysum leontonyx*	15.2	19°	10	7	33*	5	14°	13	.	.	15°	33*	5
T			*Leysera tenella*	18.6	28°	9	21°	37*	3	15	.	.	26°	29°	37*	3
Association 1.2.1.1 – *Ruschio goodiae-Lebeckietum sericeae*																
Cmes	1		*Ruschia goodiae*	5.9	10°	3	.	22*	4	3	.	.	.	.	22*	4
T			*Helichrysum* sp. 124788	1.1	2°	.	.	6°	.	.	.	.	.	.	6°	.
Pnan	1		*Lebeckia sericea*	4.2	9°	.	3	17*	.	.	.	8°	.	2	17*	.
T			*Ehrharta pusilla*	25.6	34°	17	23	48*	11	25°	.	8	53°	15	48*	11
T			*Tribolium utriculosum*	14.6	20°	9	6	39*	7	13	.	.	5	9	39*	7
Cmes	3		*Hirpicium alienatum*	5.1	5°	4	1	11°	.	9°	.	.	5°	.	11°	.
Cmes	1	*	*Sarcostemma viminale*	2.0	3°	1	.	8°	2	.	.	.	.	.	8°	2
Association 1.2.1.2 – *Drosanthemo hispidi-Manochlamydetum albicantis*																
Cmes	3		*Manochlamys albicans*	9.6	15°	3	7	26*	2	5	.	.	.	14°	26*	2
T	3	**	*Atriplex semibaccata*	6.8	12°	2	5	20*	.	4	.	.	.	10°	20*	.
Cmic	2		*Drosanthemum hispidum*	37.2	43°	27	30	59*	43°	19	.	.	11	55°	59*	43°
T			*Lepidium desertorum*	6.2	13*	0	9°	19*	1	.	.	8°	5	11°	19*	1
Pnan	2		*Lycium ferocissimum*	15.5	28*	4	21°	38*	2	5	.	25°	26°	16°	38*	2
Pnan	1	*	*Galenia africana*	5.6	10°	1	6°	16°	2	1	.	.	11°	6°	16°	2
Association 1.2.1.3 – *Antizomato miersianae-Stoeberietum utilis*																
Pnan	2		*Antizoma miersiana*	5.4	9°	.	.	21*	.	.	.	.	.	.	21*	.
Pnan	1		*Asparagus burchelli*	8.7	15*	1	5	29*	2	1	.	.	5	8°	29*	2
Pnan	2		*Stoeberia utilis*	8.2	14*	1	3	29*	1	1	.	8°	.	2	29*	1
Pnan	2		*Montinia caryophyllacea*	4.5	8°	.	.	18*	.	.	.	.	.	.	18*	.
Pmic	3		*Rhus undulata*	10.7	19*	1	1	43**	1	1	.	.	.	2	43**	1
T	1		*Ehrharta longiflora*	11.8	18°	3	3	37*	4	3	.	.	.	6	37*	4
T			*Senecio sisymbriifolius*	2.5	4°	.	.	10*	.	.	.	.	.	.	10*	.
T			*Jamesbrittenia racemosa*	5.4	7°	1	1	15*	1	1	.	.	.	3	15*	1
T			*Felicia tenera*	3.4	5°	0	.	12*	.	1	.	.	.	.	12*	.
Cmes	1	*	*Ballota africana*	3.1	5°	.	.	13*	.	.	.	.	.	.	13*	.
Cmes	1		*Thesium* sp. 20250	2.5	4°	.	.	10*	.	.	.	.	.	.	10*	.
Cmes			*Lotononis digitata*	2.8	5°	.	.	12*	.	.	.	.	.	.	12*	.
T			*Tripteris amplectens*	10.4	16°	3	4	33*	5	2	.	.	.	8	33*	5

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2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
13–17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
.	8°	26°	44*	25°	.	5	3	7	.	.	13°	.	.	.	.	.
14	42°	74°	100*	81°	46°	59°	65°	34	29	30	63°	.	26	.	20	25
.	.	.	22*	13°	13°	.	.	2	.	.	.	.	.	.	.	.
.	.	.	.	16*	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	6°	16*	.	.	.	.	.	.	.	.	.	.	.	.
8	42°	53°	56°	78*	29°	14	13	20	36°	5	38°	.	3	18	.	21
10	.	.	11	25°	67*	59*	45°	7	29°	5	25°	.	19°	.	10	21°
8	.	11°	.	.	21°	50*	45*	.	.	.	.	.	.	9	20°	13°
.	.	.	.	16°	17°	59*	45*	5	36°	.	6	.	.	.	.	.
.	.	.	.	3	17°	27*	26*	.	.	.	.	.	.	.	.	.
.	.	.	.	.	29*	14°	23°	.	.	.	.	.	.	.	.	.
4	.	5	.	6	46*	36*	19°	.	7	.	.	.	10°	.	10°	.
1	58*	5	.	16°	25°	36°	71*	2	.	.	.	.	.	.	.	4
.	.	.	.	6°	25*	18°	26*	.	.	.	.	.	.	.	.	.
4	.	11	11	28°	42°	36°	52*	.	7	.	19°	.	16°	.	5	.
.	.	.	.	.	13°	14°	19*	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	18*	23*	.	.	.	.	.	.	.	.	.
.	.	5°	.	.	13°	14°	16°	.	.	.	.	.	.	.	.	.
4	.	11°	.	13°	29°	27°	13°	2	.	.	6	.	10°	.	5	4
5	8°	.	11°	3	25°	23°	19°	2	7	.	6	.	3	.	.	21°
14°	.	.	11	19°	33°	41°	26°	2	7	.	13	11	23°	.	20°	17°
15	.	26°	17°	41°	54*	27°	29°	.	.	.	13	22°	13	.	20°	21°
3	.	.	.	.	58**	9°	.	.	14°	.	.	.	6°	9°	.	.
.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.
.	8°	.	.	3	33*	9°	10°	.	.	.	.	.	.	.	.	.
25°	8	53°	6	25°	88*	27°	29°	2	29°	5	6	.	23	9	60°	33°
13	.	5	11	6	54*	36°	26°	.	14°	.	13	11	19°	.	25°	8
9°	.	5°	.	.	29*	.	3	.	.	.	.	.	6°	9°	20°	8°
.	.	.	.	.	17*	5°	3°	.	7°	.	.	.	.	.	.	.
5	.	.	.	28°	13°	55*	10°	.	7	.	.	.	10°	9°	.	8°
4	.	.	11°	9°	8°	45*	6°	.	.	.	.	.	6°	.	5	8°
19	.	11	44°	66°	33	100*	45°	27	79°	5	63°	11	42°	.	25	17
.	8°	5	17°	6°	.	36*	19°	2	.	.	.	.	.	.	.	.
5	25°	26°	.	31°	17°	59*	39°	5	.	5	.	.	3	9	5	8
1	.	11°	.	13°	8°	27*	13°	.	7°	.	.	.	3	.	.	.
.	.	.	.	.	13°	.	52**	.	.	.	.	.	.	.	.	.
1	.	5	17°	.	.	18°	68**	.	7°	.	.	.	.	.	5	.
1	8°	.	.	3	4	23°	61**	.	.	5	.	.	.	.	.	4
.	.	.	.	.	8°	5°	42**	.	.	.	.	.	.	.	.	.
1	.	.	.	3	25°	36*	68**	.	.	5	.	.	3	.	.	.
3	.	.	.	13°	.	41*	71**	2	7	.	6	.	6	.	5	4
.	.	.	.	.	.	.	29**	.	.	.	.	.	.	.	.	.
1	.	.	6°	.	.	5°	42**	5°	.	.	.	.	6°	.	.	.
1	.	.	.	.	.	5°	32*	.	.	.	.	.	3°	.	.	.
.	.	.	.	.	4°	5°	29*	.	.	.	.	.	.	.	.	.
.	.	.	.	.	8°	.	23*	.	.	.	.	.	.	.	.	.
.	.	.	.	.	8°	5°	23*	.	.	.	.	.	.	.	.	.
2	.	.	.	16°	21°	32°	45*	2	7	.	13°	.	3	.	5	.

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Table 3. Continued

LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1
			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.
			Corresponding TWINSPAN cluster(s)		1–7	8–17	1–4	5–7	8–11	13–17	12	1	2	3–4	5–7	8–11
			Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4
			Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94
Cmes	1		*Hermannia amoena*	5.1	8°	1	2	17*	.	2	.	.	5°	2	17*	.
T			*Felicia merxmuelleri*	8.7	11°	6	8	15°	3	9°	.	.	16°	7	15°	3
H	3	*	*Ehrharta calycina*	4.2	5°	2	.	11°	2	3°	.	.	.	.	11°	2
Pnan	3		*Tripteris oppositifolia*	7.0	9°	5	.	21*	.	6	25°	.	.	.	21*	.
G			*Wachendorfia multiflora*	3.7	6°	1	4°	9°	2	.	.	.	11°	3	9°	2
Class 2 – *Didelto carnosae-Cephalophylletea inaequalis*																
T	3		*Didelta carnosa*	51.3	25	73*	22	30	73°	73*	75°	8	37	20	30	73°
Cmic	2		*Zygophyllum cordifolium*	30.4	14	41*	11	19	42°	45°	13	.	21	11	19	42°
Order 2.1 – *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis*																
T	1		*Mesembryanthemum guerichianum*	47.6	49°	37	42	59°	79*	10	.	17	5	72°	59°	79*
Cmes	1		*Psilocaulon dinteri*	31.8	23	36°	21	26	65*	18	13	.	11	36°	26	65*
Cmes	3		*Salsola* sp. US07_2312	41.4	25	55*	38	7	78*	41	38	17	42	47°	7	78*
Cmes	3		*Eberlanzia cyathiformis*	31.3	11	36*	13	9	55*	29°	.	.	5	22	9	55*
Association 2.1.1.1 – *Foveolino dichotomae-Eberlanzietum cyathiformis*																
T	2		*Foveolina dichotoma*	30.7	15	36°	19	9	63*	23	.	8	21	23	9	63*
Association 2.1.1.2 – *Antimimato komkansicae-Zygophylletum cordifoliae*																
Cmes	2		*Antimima komkansica*	13.8	7	18°	2	13	26°	16°	.	.	5	2	13	26°
G	3		*Oxalis pes-caprae*	33.2	30	31°	26	35°	48°	24	.	.	16	45°	35°	48°
Cmes	3		*Hermannia cuneifolia* var. *glabrescens*	6.8	6	8°	2	12°	13°	5	.	.	5	2	12°	13°
T	3		*Nemesia anisocarpa*	5.9	3	6°	1	6°	10°	5	.	.	.	3	6°	10°
Association 2.1.1.3 – *Cheiridopsio robustae-Cephalophylletum inaequalis*																
Cnan	2		*Cheiridopsis robusta*	13.2	2	23*	3	.	29°	22°	.	.	5	3	.	29°
Cmes	2		*Lampranthus otzenianus*	1.1	.	2°	.	.	4°	.	.	.	.	.	.	4°
Cmic	2		*Eberlanzia dichotoma*	1.4	.	3°	.	.	5°	2°	.	.	.	.	.	5°
Order 2.2 – *Euphorbio hamatae-Cephalophylletalia inaequalis*																
Cnan	1		*Cephalophyllum inaequale*	40.6	6	74**	5	8	56°	93**	50°	.	16	2	8	56°
Cmes	3		*Euphorbia hamata*	13.0	4	23*	.	10	5	41*	.	.	.	.	10	5
H	3		*Gazania krebsiana* subsp. *krebsiana*	8.7	1	20*	.	2	.	35*	25°	.	.	.	2	.
Cnan	1		*Phyllobolus prasinus*	10.4	1	20*	.	3	11	31*	.	.	.	.	3	11
Cmes	2		*Ruschia viridifolia*	12.7	9	17°	.	20°	1	33*	.	.	.	.	20°	1
Cmes	3		*Tetragonia fruticosa*	38.9	41	42°	44°	36	16	69*	13	83°	58°	18	36	16
Cmes	2		*Leipoldtia* cf. *crassulifera*	4.8	.	11°	.	.	3	20*	.	.	.	.	.	3
Cmes	3		*Tetragonia verrucosa*	20.8	16	27°	2	34°	8	43*	25°	.	5	2	34°	8
T	2		*Gorteria diffusa* subsp. *diffusa*	35.8	26	42°	9	48°	34	56*	.	.	11	14	48°	34
Association 2.2.1.1 – *Halliantho plani-Ruschietum leucospermae*																
Cnan	1		*Hallianthus planus*	2.0	.	6°	.	.	1	12*	.	.	.	.	.	1
Cmes	1		*Ruschia leucosperma*	11.8	1	23*	.	3	14°	35*	.	.	.	.	3	14°
G			*Lachenalia framesii*	0.6	.	2°	.	.	.	4°	.	.	.	.	.	.
Cmes			*Vanzijlia annulata*	2.3	1	4°	.	2	.	9°	.	.	.	.	2	.
G			*Eriospermum* sp. 1817	0.8	0	2°	.	1	.	4°	.	.	.	.	1	.
Cmes	1		Sarcocaulon l'heritieri	9.0	1	20*	1	1	10	28*	13°	.	5	.	1	10
G			*Bulbine torta*	1.1	.	3°	.	.	.	6°	.	.	.	.	.	.
Cmes	1		*Octopoma connatum*	3.1	1	6°	.	2	1	10°	.	.	.	.	2	1
Association 2.2.1.2 – *Leipoldtio schultzei-Cephalophylletum inaequalis*																
Cmes			*Antimima* sp. 2386	2.8	0	4°	.	1	.	7°	.	.	.	.	1	.
Cmes	1		*Leipoldtia schultzei*	32.4	27	35°	27	26	35°	42°	.	17	37°	28	26	35°
Association 2.2.1.3 – *Pteronio glabratae-Cephalophylletum inaequalis*																
Cnan			*Ruschia* sp. 124796	6.8	.	20*	.	.	5	25*	50*	.	.	.	.	5
Cmes			*Antimima* sp. US07_2582	5.6	1	13°	.	1	2	19*	25°	.	.	.	1	2
Cmes	3		*Tripteris sinuata* var. *sinuata*	1.4	1	3°	.	1	.	6°	.	.	.	.	1	.
Cmes	3		*Pteronia glabrata*	9.9	2	17°	2	2	18°	15°	25°	.	5	2	2	18°
Association 2.2.1.4 – *Drosanthemo curtophylli-Meyerophytetum meyeri*																
Cmes	2		*Drosanthemum curtophyllum*	10.4	3	17°	1	4	7	29*	.	.	5	.	4	7

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2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
13–17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
2	.	5°	.	3	13°	9°	29*	.	.	.	.	.	.	.	5°	4°
9°	.	16°	6	9°	.	5	42*	.	.	5	6	11°	6	9°	10°	8°
3°	.	.	.	.	8°	.	26*	.	.	.	6°	.	3	.	10°	4°
6	.	.	.	.	13°	14°	35*	.	.	.	.	.	6	9°	5	8°
.	.	11°	6°	.	4°	.	23*	2	.	.	6°	.	.	.	.	.
73*	8	37	22	19	42	41	6	64°	86°	75°	69°	56°	74°	82°	70°	83°
45°	.	21	6	16	8	36°	13	43°	86*	15	25	11	26	55°	60°	75°
10	17	5	94*	50°	25	82°	71°	84°	93*	40	100*	.	26	9	5	13
18	.	11	28	44°	13	59°	6	57°	71°	70°	63°	11	6	45°	.	25
41	17	42	78°	16	4	14	3	80°	57°	95*	81°	33	19	73°	20	58°
29°	.	5	17	28°	.	18	10	84*	7	40°	88*	11	45°	27°	30°	29°
23	8	21	28°	19	4	14	10	84*	50°	60°	56°	22	32°	36°	5	17
16°	.	5	.	3	4	27°	6	20°	57*	25°	.	.	13	27°	15°	25°
24	.	16	61°	28	8	55°	42°	34°	86*	15	56°	.	32°	.	45°	42°
5	.	5	.	3	4	23°	10°	2	36*	.	13°	.	3	9°	10°	4
5	.	.	6°	.	.	9°	10°	11°	29*	.	.	.	6°	.	10°	8°
22°	.	5	.	6	.	.	.	23°	14°	80*	.	44°	19°	36°	5	4
.	.	.	.	.	.	.	.	2°	.	15*	.	.	.	.	.	.
2°	.	.	.	.	.	.	.	.	.	20*	.	11°	.	.	.	.
93**	.	16	.	3	25	.	.	16	50°	65°	94°	100*	90°	82°	95°	96*
41*	.	.	.	.	25°	5	.	2	7	5	6	67*	10	18°	65*	46°
35*	.	.	.	.	.	5	.	.	.	.	.	44°	10	45*	55*	21°
31*	.	.	.	.	8	.	.	14°	14°	15°	.	56*	13°	27°	50*	8
33*	.	.	.	.	21°	5	35°	2	.	.	.	67*	13	9	55*	21°
69*	83°	58°	11	25	50°	18	39	2	29	15	19	78°	74°	45°	85°	63°
20*	.	.	.	.	.	.	.	.	.	.	13°	33*	10°	27°	25°	4
43*	.	5	.	3	50°	36°	16	5	7	15	6	33°	16	55°	65*	46°
56*	.	11	6	22	92*	32	19	11	29	35	63°	78°	61°	9	70°	63°
12*	.	.	.	.	.	.	.	.	.	5°	.	56**	3	.	.	.
35*	.	.	.	.	8	.	.	.	7	25°	25°	89**	52*	9	20°	4
4°	.	.	.	.	.	.	.	.	.	.	.	22*	.	.	.	.
9°	.	.	.	.	4°	.	3°	.	.	.	.	33*	6°	.	.	4°
4°	.	.	.	.	.	.	3°	.	.	.	.	22*	.	.	.	.
28*	.	5	.	.	4	.	.	5	.	30°	6	67*	6	27°	25°	17°
6°	.	.	.	.	.	.	.	.	.	.	.	22*	6°	.	.	.
10°	.	.	.	.	4°	.	3	.	.	5°	.	33*	6°	.	.	13°
7°	.	.	.	.	.	.	3°	.	.	.	.	.	23*	9°	.	4°
42°	17	37°	33°	22	42°	14	23	9	21	40°	69°	56°	90*	9	15	42°
25*	.	.	.	.	.	.	.	5	.	15°	.	11	.	100**	15°	.
19*	.	.	.	.	4	.	.	2	.	5	.	.	3	55*	25°	13°
6°	.	.	.	.	4°	.	.	.	.	.	.	.	.	18*	10°	.
15°	.	5	.	3	.	5	.	23°	21°	15°	13°	.	3	45*	5	21°
29*	.	5	.	.	8	5	.	.	29°	.	.	11	6	9	75**	42°

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Table 3. Continued

LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1
			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.
			Corresponding TWINSPAN cluster(s)		1–7	8–17	1–4	5–7	8–11	13–17	12	1	2	3–4	5–7	8–11
			Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4
			Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94
Cmes	2		*Thesium elatius*	3.7	1	6°	1	1	.	12*	.	.	5°	.	1	.
Cmes	3		*Pteronia ciliata*	6.5	2	12°	.	4	.	23*	.	.	.	.	4	.
H			*Cyphia longiflora*	1.4	.	2°	.	.	.	5°	.	.	.	.	.	.
Cmes	2		*Meyerophytum meyeri*	12.7	4	22*	.	9	9	37*	.	.	.	.	9	9
G	1		*Bulbine sedifolia*	1.4	.	3°	.	.	1	5°	.	.	.	.	.	1
Cmes			*Ruschia* sp. 21952	2.8	.	5°	.	.	1	9°	.	.	.	.	.	1
Association 2.2.1.5 – *Ruschio versicoloris-Cephalophylletum inaequalis*																
Cmes	1		*Ruschia versicolor*	20.6	19	21°	16	22°	11	33°	.	17	32°	7	22°	11
Unit 2.3																
Cmes	3		*Salsola* sp. 20223	2.0	.	9°	.	.	.	.	88**	.	.	.	.	.
Cmic	1		*Jacobsenia vaginata*	2.8	.	10°	.	.	1	4	75**	.	.	.	.	1
Cmic	1		*Dicrocaulon ramulosum*	2.5	.	8°	.	.	.	4	63**	.	.	.	.	.
Cmic	1		*Dicrocaulon spissum*	1.1	.	4°	.	.	.	1	38**	.	.	.	.	.
Cnan	1		*Adromischus filicaulis* subsp. *filicaulis*	0.6	.	3°	.	.	.	.	25*	.	.	.	.	.
Cnan			*Spergularia* sp. 20244	0.6	.	3°	.	.	.	.	25*	.	.	.	.	.
T	1		*Mesembryanthemum nodiflorum*	1.1	.	3°	.	.	1	1	25*	.	.	.	.	1
Cmes			*Drosanthemum ramosissimum*	1.1	.	4°	.	.	3°	.	25*	.	.	.	.	3°
Cmic			*Hirpicium* sp. US07_2511	1.4	.	5°	.	.	.	5°	25*	.	.	.	.	.
Cnan			*Senecio aloides*	1.4	.	5°	.	.	.	5°	25*	.	.	.	.	.
Cmes			*Aspazoma amplectens*	1.7	.	6°	.	.	.	6°	25*	.	.	.	.	.
T	1	*	*Mesembryanthemum hypertrophicum*	2.8	1	5°	2	.	5°	2	25*	.	.	4°	.	5°
Differential species (one-sided)																
Cnan			*Pharnaceum confertum* var. *brachyphyllum*	12.1	11°	11	3	21°	1	20°	.	.	5	3	21°	1
Cmes			*Othonna arbuscula*	7.3	2	18°	1	3	5	22°	50*	.	5	.	3	5
Companion species																
Cmes	3		*Galenia fruticosa*	66.2	56	70°	44	72°	74°	80°	.	33	63	39	72°	74°
G			*Trachyandra revoluta*	51.3	47	52°	48	45	54°	58°	13	25	53°	57°	45	54°
T	3		*Dimorphotheca sinuata*	39.2	42°	29	39°	46°	45°	22	.	.	37°	60°	46°	45°
T			*Tetragonia microptera*	38.0	42°	26	30	57°	49°	12	.	.	11	55°	57°	49°
T	2	**	*Atriplex lindleyi* subsp. *inflata*	29.6	23	28°	18	28°	43°	17	25	8	.	33°	28°	43°
Pnan	2		*Aridaria noctiflora* subsp. *noctiflora*	21.7	15	28°	8	25°	30°	32°	.	.	11	11	25°	30°
Cnan	3		*Hypertelis salsoloides* var. *salsoloides*	18.6	16	18°	14	17	10	29°	.	.	21°	18°	17	10
Cmes	1		*Asparagus capensis*	16.1	19°	16	15	24°	6	27°	.	42°	16	2	24°	6
T			*Amellus microglossus*	14.9	10	15°	8	14°	23°	7	25°	.	5	13°	14°	23°
G			*Trachyandra falcata*	14.6	16°	13	22°	9	22°	8	.	25°	37°	13	9	22°
G			*Chlorophytum crassinerve*	13.8	17°	10	8	30°	8	13	.	.	26°	3	30°	8
G			*Oxalis obtusa*	13.8	11	12°	3	23°	18°	10	.	.	11	.	23°	18°
Pnan	2		*Lycium oxycarpum*	13.2	14°	12	7	25°	16°	11	.	.	5	11	25°	16°
Pnan	1		*Stoeberia frutescens*	12.1	11°	11	6	18°	8	15°	.	8	11	3	18°	8
Cnan	2		*Phyllobolus trichotomus*	11.8	3	20°	1	5	18°	25°	.	.	5	.	5	18°
G			*Phyllobolus sinuosus*	9.9	7	11°	1	15°	9	16°	.	.	5	.	15°	9
G			*Albuca cooperi*	8.7	13°	6	14°	12°	6	7	.	.	11°	23°	12°	6
T			*Chenopodium album*	8.2	10°	3	6	15°	7°	1	.	.	.	12°	15°	7°
2.1.1.4 = *Mesembryanthemo guerichani-Eberlanzietum cyathiformis* (central assocation without association character species of its own)																

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2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
13–17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
12*	.	5°	.	.	4°	.	.	.	.	.	.	11°	.	.	40*	8°
23*	.	.	.	.	8°	5	.	.	.	.	.	22°	.	18°	60*	17°
5°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	20*	.
37*	.	.	.	.	17°	9	.	.	29°	.	6	11	23°	55*	70*	25°
5°	.	.	.	.	.	.	.	.	.	5°	.	.	.	9°	15*	.
9°	.	.	.	.	.	.	.	.	.	5°	.	11°	10°	.	20*	4°
33°	17	32°	6	9	50°	14	3	5	21°	5	13	.	13	18	35°	100**
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	2	.	.	.	.	.	18°	.	4
4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20°	.
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	.	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	4°
.	.	.	.	.	.	.	.	.	.	5°	6°	.	.	.	.	.
5°	.	.	.	.	.	.	.	.	.	.	.	.	.	18°	5°	.
5°	.	.	.	.	.	.	.	.	.	.	.	.	.	18°	5°	.
6°	.	.	.	.	.	.	.	.	.	.	.	22*	.	.	10°	.
2	.	.	6°	3	.	.	.	5°	.	10°	6°	.	.	9°	.	.
20°	.	5	.	6	42*	9	13°	.	.	5	.	.	10	.	50*	42*
22°	.	5	.	.	8	.	.	2	7	5	6	33°	3	45*	20°	8
80°	33	63	22	56	71°	86°	58	70°	79°	70°	75°	78°	65°	82°	95°	83°
58°	25	53°	67°	47	54°	45	35	45	43	70°	56°	67°	58°	27	60°	79°
22	.	37°	44°	75°	50°	64°	26	32	64°	15	69°	11	65°	.	5	29
12	.	11	67°	44°	29	73°	68°	64°	50°	15	69°	.	19	9	15	17
17	8	.	.	66°	17	59°	10	52°	64°	25	31°	.	19	18	15	33°
32°	.	11	.	22	25°	41°	10	9	50°	35°	25°	11	13	55°	50°	29°
29°	.	21°	6	31°	29°	9	13	5	7	10	19°	33°	52°	18°	20°	21°
27°	42°	16	.	3	21°	36°	16	5	7	5	6	.	19°	55°	40°	21°
7	.	5	11	16°	.	32°	10	34°	14°	25°	19°	.	16°	9	5	4
8	25°	37°	.	25°	13	14	.	25°	43°	.	19°	.	6	9	15°	8
13	.	26°	.	6	38°	32°	19°	2	7	10	13	.	13°	9	25°	17°
10	.	11	.	.	8	23°	39°	25°	14°	20°	13°	.	6	27°	5	13°
11	.	5	6	16°	13	36°	26°	9	43°	.	13	.	10	36°	5	4
15°	8	11	.	6	4	18°	32°	5	29°	.	.	11	19°	.	25°	21°
25°	.	5	.	.	8	5	3	9	36°	15°	13	33°	19°	9	45°	17°
16°	.	5	.	.	29°	9	6	2	14°	.	19°	11°	26°	9	20°	13°
7	.	11°	33°	13°	25°	.	10°	2	14°	.	6	11°	6	9°	5	4
1	.	.	11°	13°	4	23°	19°	18°	.	5	6°	.	.	.	5	.

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Table 4. Differences between the seven phytosociological alliances regarding landscape, surface cover, soil and vegetation parameters. Only parameters with significant differences are shown. Note that some of the landscape and soil parameters were not available for a minority of plots; therefore, the number of replicates (*N*) differs between parameters. Differences among the alliances were tested with ANOVAs, applying a nominal α of 0.05 or, in cases of severe violation of assumptions, a nominal α of 0.01 (see Methods). The latter is indicated by † in the last column. Superscript letters in the columns indicate homogenous groups according to an HSD *post-hoc* test for unequal *N*. Note that in some cases the overall pattern deviated significantly from random while the *post-hoc* test did not find a single significant contrast.

Parameter	Alliance 1.1.1		Alliance 1.1.2		Alliance 1.1.3		Alliance 1.2.1		Alliance 2.1.1		Alliance 2.2.1		Unit 2.3		*P*
	N	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	
Landscape parameters															
Inclination (°)	11	0.6 ± 1.0^{a}	18	3.3 ± 2.6^{a}	47	4.1 ± 3.0^{a}	76	11.8 ± 9.4^{b}	92	4.1 ± 3.6^{a}	91	4.6 ± 3.5^{a}	8	2.5 ± 2.1^{a}	<0.001†
Grazing intensity (%)	4	74.4 ± 17.5	19	78.7 ± 29.9	43	101.8 ± 34.0	77	104.7 ± 37.1	93	89.5 ± 39.9	95	94.7 ± 37.9	8	86.2 ± 33.9	0.032
Surface cover parameters															
Cover fine material (%)	12	100.0 ± 0.0^{a}	19	96.8 ± 8.3^{a}	50	96.8 ± 7.9^{a}	76	70.5 ± 28.3^{b}	94	97.7 ± 8.5^{a}	95	92.2 ± 14.3^{a}	8	50.1 ± 41.0^{b}	<0.001†
Cover fine+medium gravel (%)	12	0.0 ± 0.0^{a}	19	2.8 ± 7.2^{a}	50	2.0 ± 7.2^{a}	76	1.7 ± 4.0^{a}	94	1.0 ± 2.8^{a}	95	3.6 ± 7.3^{a}	8	27.8 ± 27.0^{b}	<0.001†
Cover coarse gravel (%)	12	0.0 ± 0.0^{a}	19	0.3 ± 1.1^{a}	50	0.1 ± 0.2^{a}	76	0.7 ± 1.4^{a}	94	1.1 ± 7.5^{a}	95	1.9 ± 5.3^{a}	8	18.9 ± 18.6^{b}	<0.001†
Cover stones (%)	12	0.0 ± 0.0	19	0.0 ± 0.0	50	0.0 ± 0.2	76	0.8 ± 2.1	94	0.1 ± 0.5	95	0.7 ± 2.3	8	3.3 ± 8.8	0.001†
Cover boulders (%)	12	0.0 ± 0.0^{ab}	19	0.0 ± 0.0^{ab}	50	0.0 ± 0.0^{a}	76	1.5 ± 4.3^{b}	94	0.0 ± 0.0^{a}	95	0.2 ± 1.0^{a}	8	0.0 ± 0.0^{ab}	<0.001†
Cover large boulders (%)	12	0.0 ± 0.0^{ab}	19	0.0 ± 0.0^{ab}	50	0.0 ± 0.0^{ab}	76	2.0 ± 6.2^{b}	94	0.0 ± 0.0^{a}	95	0.1 ± 1.0^{a}	8	0.0 ± 0.0^{ab}	<0.001†
Cover rock outcrops (%)	12	0.0 ± 0.0^{a}	19	0.0 ± 0.0^{a}	50	1.1 ± 3.4^{a}	76	22.9 ± 24.8^{b}	94	0.1 ± 0.5^{a}	95	1.3 ± 4.4^{a}	8	0.0 ± 0.0^{a}	<0.001†
Cover dead wood (%)	12	4.2 ± 3.9^{ab}	19	3.8 ± 1.3^{ab}	50	2.5 ± 2.5^{ab}	77	4.0 ± 4.0^{b}	94	2.6 ± 2.8^{ab}	95	1.9 ± 1.9^{a}	8	0.4 ± 0.4^{ab}	<0.001
Cover soft litter (%)	12	5.1 ± 2.7^{ab}	19	3.5 ± 3.6^{ab}	50	6.0 ± 13.1^{ab}	77	7.3 ± 9.1^{b}	94	2.6 ± 4.2^{a}	95	3.2 ± 4.2^{a}	8	0.2 ± 0.3^{ab}	0.002†
Cover dung (%)	12	0.0 ± 0.0^{ab}	19	0.1 ± 0.1^{ab}	50	0.1 ± 0.2^{ab}	77	0.1 ± 0.3^{b}	94	0.0 ± 0.1^{a}	95	0.0 ± 0.1^{a}	8	0.0 ± 0.0^{ab}	<0.001
Cover bioturbation (%)	12	0.0 ± 0.1^{ab}	19	1.4 ± 2.6^{ab}	50	1.4 ± 3.6^{ab}	77	0.0 ± 0.2^{a}	94	5.2 ± 16.3^{b}	95	0.2 ± 0.6^{a}	8	0.0 ± 0.0^{ab}	0.001†
Soil parameters															
pH ($CaCl_2$)	4	6.68 ± 0.85^{abc}	19	6.66 ± 0.88^{ab}	34	6.82 ± 0.85^{b}	73	6.04 ± 0.97^{a}	89	7.54 ± 0.81^{c}	95	6.18 ± 0.88^{a}	8	6.06 ± 1.21^{ab}	<0.001
EC ($\mu S \cdot cm^{-1}$)	4	21 ± 11^{ab}	19	154 ± 207^{ab}	34	249 ± 274^{ab}	73	376 ± 347^{a}	89	931 ± 1375^{ab}	95	1119 ± 1242^{b}	8	3173 ± 1742^{c}	<0.001†
IC (%)	2	0.004 ± 0.003^{ab}	19	0.004 ± 0.006^{a}	29	0.009 ± 0.011^{a}	51	0.014 ± 0.041^{a}	82	0.185 ± 0.240^{b}	75	0.007 ± 0.013^{a}	3	0.012 ± 0.012^{ab}	<0.001†
OC (%)	4	0.188 ± 0.057^{ab}	19	0.353 ± 0.233^{a}	33	0.532 ± 0.334^{a}	72	1.480 ± 1.250^{a}	90	0.835 ± 0.474^{a}	95	0.834 ± 0.338^{b}	8	0.765 ± 0.538^{ab}	<0.001†
N (%)	4	0.022 ± 0.004^{ab}	19	0.032 ± 0.015^{a}	33	0.051 ± 0.026^{a}	72	0.110 ± 0.088^{b}	90	0.076 ± 0.033^{a}	95	0.061 ± 0.020^{a}	8	0.050 ± 0.026^{ab}	<0.001†
C:N ratio	4	8.3 ± 1.7^{acd}	19	10.5 ± 2.1^{ab}	33	10.3 ± 1.7^{ab}	72	13.2 ± 2.2^{cdef}	90	12.0 ± 2.7^{abce}	95	13.9 ± 5.4^{bef}	8	13.5 ± 2.5^{df}	<0.001
Vegetation parameters															
Vegetation cover (%)	12	27.2 ± 8.1^{bc}	19	17.8 ± 8.2^{abc}	50	23.1 ± 12.8^{abc}	77	27.6 ± 15.4^{c}	94	21.8 ± 10.6^{ab}	95	27.8 ± 11.8^{c}	8	8.4 ± 3.0^{ab}	<0.001
Species richness ($100m^2$)	12	16.6 ± 5.7^{ab}	19	24.2 ± 8.2^{bc}	50	19.6 ± 6.9^{ab}	77	30.0 ± 8.3^{c}	94	16.7 ± 6.1^{a}	95	21.7 ± 5.5^{b}	8	11.8 ± 4.7^{a}	<0.001
Shannon index	12	1.96 ± 0.40^{cde}	19	1.84 ± 0.44^{cde}	50	1.53 ± 0.54^{abcd}	77	2.16 ± 0.42^{e}	94	1.43 ± 0.44^{ac}	95	1.63 ± 0.52^{bd}	8	1.08 ± 0.39^{ab}	<0.001
Shannon evenness	12	0.71 ± 0.11^{c}	19	0.59 ± 0.11^{abc}	50	0.52 ± 0.16^{a}	77	0.64 ± 0.11^{bc}	94	0.52 ± 0.14^{a}	95	0.53 ± 0.15^{a}	8	0.45 ± 0.14^{ab}	<0.001
Simpson index	12	0.80 ± 0.09^{bc}	19	0.74 ± 0.12^{abc}	50	0.65 ± 0.19^{ab}	77	0.81 ± 0.11^{c}	94	0.64 ± 0.17^{ab}	95	0.66 ± 0.18^{ab}	8	0.51 ± 0.17^{a}	<0.001

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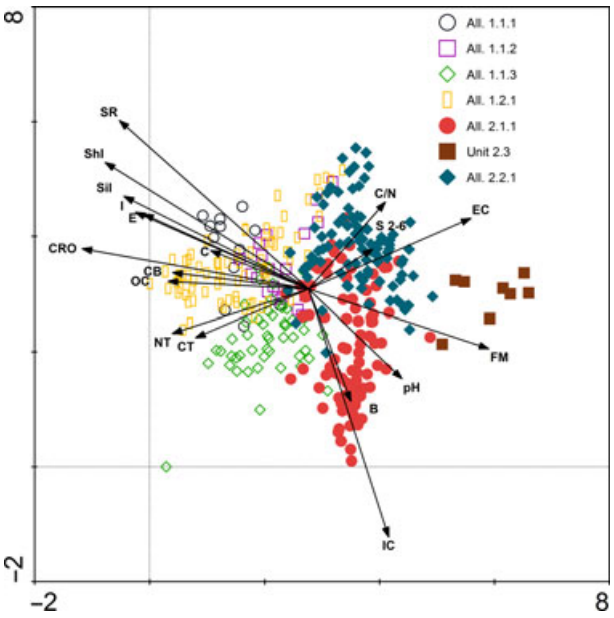

Fig. 3. Detrended correspondence analysis (DCA) of the species composition of all relevés with assignment to the phytosociological alliances. Important abiotic and vegetation parameters that were correlated with the first two axes are shown (see Table 1, for definitions): B = cover of biotubation, C = vegetation cover, CB = cover of large boulders (>60 cm), CRO = cover of rock outcrops, CT = total carbon, IC = inorganic carbon, OC = organic carbon, C:N = C:N ratio, E = Shannon evenness, EC = electrical conductivity, FM = cover of fine material, I = inclination, NT = total nitrogen, S 2–6 = cover of coarse gravel (2–6 cm), Shl = Shannon index, Sil = Simpson index, SR = species richness (100 m²). Sum of all eigenvalues = 18.4; eigenvalue of first axis = 0.72; eigenvalue of second axis = 0.63; length of first axis = 6.6 SD; length of second axis = 5.5 SD.

1.2.1.2 Drosanthemo hispidi-Manochlamydetum albicantis

Characterization: This species-rich association forms stands of dwarf shrubs and shrubs on the edges of rocky outcrops. It is often dominated by the nano-phanerophyte *Aridaria noctiflora* and the therophytic graminoid *Bromus pectinatus*. The association is weakly defined by seven exclusively diagnostic species. It is highly valuable as pasture due to the abundance of several palatable to highly palatable plants, including *Manochlamys albicans* and *Stoeberia utilis*. However, due to the often low accessiblity, the sites are subject to a lower grazing intensity than the vegetation could support.

Habitat: The *Drosanthemo-Manochlamydetum* occurs on midslopes and shoulders where rocky outcrops arise intermittently from shallow and stony Regosols, Leptosols and Durisols. Its soil properties are similar to those of the *Ruschio-Lebeckietum* (1.2.1.1) but with a higher accumulation of topsoil organic carbon (median 0.90%).

1.2.1.3 Antizomato miersianae-Stoeberietum utilis

Characterization: This species-rich association often forms thickets of up to 2 m in height. The vegetation is frequently dominated by the nano-phanerophyte *S. utilis* and the micro-phanerophyte *Rhus undulata*, which are among the largest plant species in the study area. The association is well defined by 18 exclusively diagnostic species. It is highly valuable as pasture due to the abundance of many palatable to highly palatable plants, such as *R. undulata*, *S. utilis* and *Montinia caryophyllacea*. However, the sites can be rather inaccessible and therefore subject to lower grazing intensity than the grazing value would suggest.

Habitat: The *Antizomato-Stoeberietum* occurs on midslopes, shoulders and summits where rocky outcrops occur alongside shallow and stony Regosols. The soils are slightly acidic to very slightly alkaline; in some places small amounts of calcium carbonate have been found. These soils receive additional run-off from rock faces, with the water probably enriched with nitrogen by the nitrogen-

Class 1: *Hermannio trifurcae-Zygophylletea morgsanae*				**Class 2:** *Didelto carnosae-Cephalophylletea inaequalis*		
Order 1.1: *Hermannio trifurcae-Othonnetalia sedifoliae*			**Order 1.2:** *Berkheyo fruticosae-Rhoetalia undulatae*	**Order 2.1:** *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis*	**Order 2.2:** *Euphorbio hamatae-Cephalophylletalia inaequalis*	**Unit 2.3:** not named
Alliance 1.1.1: *Othonnion cylindricae*	**Alliance 1.1.2:** *Stipagrostio obtusae-Othonnion sedifoliae*	**Alliance 1.1.3:** *Grielo humifusi-Galenion sarcophyllae*	**Alliance 1.2.1:** *Berkheyo fruticosae-Rhoion undulatae*	**Alliance 2.1.1:** *Mesembryanthemo guerichani-Eberlanzion cyathiformis*	**Alliance 2.2.1:** *Euphorbio hamatae-Cephalophyllion inaequalis*	
Deep, red sand; marginally saline, neutral	Sandy dunes; marginally saline, neutral	Sandy, shallow soils; marginally saline, neutral; disturbed places	Rocky slopes and summits; slightly acidic	*Heuweltjie* centres and similar vegetation; highly saline, slightly alkaline	*Heuweltjie* matrix; highly saline, slightly acidic	Quartz patches; extremely saline, slightly acidic
12 relevés 1 association	19 relevés 1 association	50 relevés 2 associations	77 relevés 3 associations	94 relevés 4 associations	95 relevés 5 associations	8 relevés no associations described

Fig. 4. Overview of the classification scheme proposed in this paper, together with the main ecological features of the alliances.

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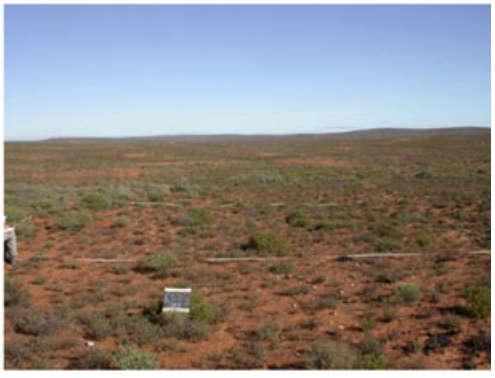
Othonnion cylindricae: assoc. 1.1.1.1

Stipagrostio-Othonnion: assoc. 1.1.2.1

Grielo-Galenion: assoc. 1.1.3.2

Berkheyo-Rhoion: assoc. 1.2.1.3

Mesembryanthemo-Eberlanzion: assoc. 2.1.1.1



Euphorbio-Cephalophyllion: assoc. 2.2.1.1

Quartz field communities: informal unit 2.3

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fixing cyanobacteria that cover them. As a result, the organic carbon (median 1.68%) and nitrogen contents are the highest in the study area. Also as a result of the run-on, the concentration of soluble salts (median EC 419 $\mu S \cdot cm^{-1}$) is higher than in any other association of the *Hermannio-Zygophylletea* (see Appendix S8).

Mesembryanthemo guerichiani-Eberlanzion cyathiformis

2.1.1.1 Foveolino dichotomae-Eberlanzietum cyathiformis

Characterization: This species-poor association consists of nearly circular stands of dwarf shrubs and many therophytes. It is dominated by the meso-chamaephyte *Eberlanzia cyathiformis* and, during winter and spring, the therophyte *Foveolina dichotoma*. The association is weakly defined by just one exclusively diagnostic species. It is valuable as a summer pasture due to the dominance of *E. cyathiformis* and indigenous woody *Salsola* species, which are particularly browsed during the dry season.

Habitat: The *Foveolino-Eberlanzietum* occurs in plains on the centres of *heuweltjies*, preferentially on Calcisols and Durisols with calcium carbonate in the topsoil. The range of soil acidity is very narrow, all sites being neutral to slightly alkaline. The salinity and organic carbon content of the topsoil is low.

2.1.1.2 Antimimato komkansicae-Zygophylletum cordifolii

Characterization: This moderately species-rich association consists of dwarf shrubs of up to 1 m in height. It is dominated by the micro-chamaephyte *Zygophyllum cordifolium* and is moderately defined by 12 exclusively diagnostic species. The association occurs in direct vicinity of the *Foveolio-Eberlanzietum* (2.1.1.1). It provides good grazing resources due to the dominance of moderately to highly palatable species, including *Hermannia cuneifolia* subsp. *glabrescens*, *Antimima komkansica* and *Galenia fruticosa*.

Habitat: The *Antimimato-Zygophylletum* occurs in plains around the centres and fringes of *heuweltjies* on Cambisols. Here, the topsoils present a broad range of pH values (median 6.87) and only small concentrations of calcium carbonate occur, if at all. The salinity in most sites is substantially higher than in the *Foveolino-Eberlanzietum* (2.1.1.1), while the content of organic carbon is very low (see Appendix S8).

2.1.1.3 Cheiridopsio robustae-Cephalophylletum inaequalis

Characterization: This species-poor association is dominated by dwarf shrubs, namely the creeping nano-chamaephyte *Cephalophyllum inaequale*. It is weakly defined by only three exclusively diagnostic species. The association typically occurs in the direct vicinity of the *Foveolino-Eberlanzietum*, but contributes only little to the grazing value of the vegetation due to the dominance of less palatable species, such as *C. inaequale* and *Cheiridopsis robusta*.

Habitat: The *Cheiridopsio-Cephalophylletum* occurs in plains on the fringes of *heuweltjies* on a wide variety of soil types, including Durisols, Solonchaks, Calcisols and Leptosols. Soils are slightly alkaline; small amounts of carbonates are typical, and in most cases the salinity is extremely high. The content of organic carbon is very low.

2.1.1.4 Mesembryanthemo guerichani-Eberlanzietum cyathiformis

Characterization: This moderately species-poor association is dominated by dwarf shrubs, in particular by the creeping nano-chamaephyte *C. inaequale*. It is the central association of the alliance *Mesembryanthemo-Eberlanzion* and has no exclusively diagnostic species. The association occurs in the direct vicinity of the *Foveolio-Eberlanzietum* (2.1.1.1). It provides good grazing value due to dominance of the palatable *E. cyathiformis*, which is well grazed during the dry season.

Habitat: Like the *Cheiridopsio-Cephalophylletum* (2.1.1.3), this community occurs in plains on the fringes of *heuweltjies* on a wide variety of soil types. The topsoil properties are also very similar to this other association, but with a tendency to lower amounts of inorganic carbon. The salinity is lowest within the *Didelto-Cephalophylletea* (see Appendix S8).

Euphorbio hamatae-Cephalophyllion inaequalis

2.2.1.1 Halliantho plani-Ruschietum leucospermae

Characterization: This moderately species-poor association consists of dwarf shrubs, which are mostly not higher than 50 cm. It is dominated by the nano- and micro-chamaephytes *C. inaequale* and *Ruschia leucosperma*. The association is moderately defined by 14 exclusively diagnostic species. It is moderately valuable as pasture due to the joint dominance of poorly palatable Aizoaceae (e.g. *R. leucosperma* and *C. inaequale*) and highly palatable species (e.g. *Euphorbia hamata* and *Tetragonia fruticosa*).

Habitat: The *Halliantho-Ruschietum* occurs in plains around the centres and fringes of *heuweltjies*, preferentially on Solonchaks without carbonates. The topsoil pH values vary from strongly acidic to very slightly alkaline, and the salinity ranges from moderate to high. The content of organic carbon and nitrogen is very low.

Fig. 5. Photographs showing typical examples of stands from the six alliances and the informal quartz-field unit 2.3. Further details on the photographs can be found in Appendix S9.

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2.2.1.2 Leipoldtio schultzei-Cephalophylletum inaequalis

Characterization: This moderately species-poor association is dominated by dwarf shrubs, namely the nano- to microchamaephytes *C. inaequale* and *L. schultzei*. The association is weakly defined by two exclusively diagnostic species. It is marginally valuable as pasture due to the dominance of the unpalatable *L. schultzei* and *R. leucosperma*, and the poorly palatable *C. inaequale*.

Habitat: The *Leipoldtio-Cephalophylletum* occurs in plains and on gentle slopes around the centres and fringes of *heuweltjies* on Durisols and Leptosols without carbonates. The soils are slightly acidic, the salinity is low to moderate, and the organic carbon content is low.

2.2.1.3 Pteronio glabratae-Cephalophylletum inaequalis

Characterization: This moderately species-poor association is dominated by the dwarf shrubs *C. inaequale* and *Ruschia* sp. 124796. The association is moderately defined by 15 exclusively diagnostic species. It is marginally valuable as pasture due to the dominance of the moderately palatable *C. inaequale*, which is frequently accompanied by highly palatable shrubs, such as *Hermannia cuneifolia* subsp. *cuneifolia, Pteronia glabrata, T. fruticosa* and *Tripteris sinuata* subsp. *sinuata*.

Habitat: The *Pteronio-Cephalophylletum* occurs in plains and on moderate slopes around the centres and fringes of *heuweltjies* on shallow soils, mostly Leptosols without carbonates in the topsoil. The topsoil acidity varies from slightly acidic to very slightly alkaline. At most sites the salinity is extremely high, and the content of organic carbon is low.

2.2.1.4 Drosanthemo curtophylli-Meyerophytetum meyeri

Characterization: This moderately species-rich association is dominated by dwarf shrubs, namely *C. inaequale* and *Meyerophytum meyeri*. The association is weakly defined by seven exclusively diagnostic species. The association has the highest grazing value within the *Euphorbio-Cephalophyllion*. Besides the dominant, moderately palatable *M. meyeri*, relatively high cover values exist for the highly palatable shrubs *Pteronia ciliata, E. hamata* and *T. fruticosa*, as well as the moderately palatable *Drosanthemum curtophyllum*.

Habitat: The *Drosanthemo-Meyerophytetum* occurs in plains and on gentle slopes around the centres and fringes of *heuweltjies* on shallow soils, mainly Leptosols and Durisols without carbonates. The soils are slightly acidic, and salinity is moderate. The content of organic carbon is low.

2.2.1.5 Ruschio versicoloris-Cephalophylletum inaequalis

Characterization: This moderately species-poor association is dominated by the dwarf shrubs *C. inaequale* and *R. versicolor*. The association is weakly defined by one exclusively diagnostic species. It is marginally valuable as pasture due to the dominance of the poorly palatable *R. versicolor* and *C. inaequale*.

Habitat: The *Ruschio-Cephalophylletum* occurs in plains and on moderate slopes around the centres and fringes of *heuweltjies* on shallow soils, preferentially Leptosols and Durisols without carbonates. The soils are very slightly acidic and the salinity is predominantly moderate. The content of organic carbon is low.

Unit 2.3

Characterization: Unit 2.3 represents a group of several distinct plant communities that typically occur on the quartz fields of the study area. The number of relevés of this habitat type was insufficient to reflect the spectrum of the associations adequately. The unit is well defined by 20 exclusively diagnostic species. It has low grazing value because of sparse vegetation cover and very few palatable species.

Habitat: The quartz field communities occur on soils that are covered by white angular quartz gravel. The salinity and acidity of these soil types are highly variable, ranging from very saline to extremely saline, and from strongly acidic to very slightly alkaline. The organic carbon content is low.

Discussion

Vegetation–environment relationships

The main environmental gradient in our study area (i.e. the first axis of the DCA ordination) was characterized by a decrease of rock cover at soil surface, inclination and nutrient supply (C, N), as well as an increase in salinity. This gradient can be summarized as a gradient of water availability in the root zone of the plants, which is controlled by a combination of habitat heterogeneity and physical soil factors. The highest water availability along the gradient can be assumed for the *Berkheyo-Rhoion* (1.2.1), where increased run-off takes place from the high coverage of blocks and outcrops at the upper slopes and results in down-slope patches of increased soil water content, which is available for longer time periods. These stands were also associated with relatively high nutrient supply, possibly due to the higher production of organic material in the wetter conditions, and the provision of nitrogen enriched run-off from the rock faces (Dojani et al. 2007). A relatively high water availability can also be assumed for the Arenosols of the *Othonnion cylindricae* (1.1.1) and *Stipagrostio-Othonnion* (1.1.2), where deeply infiltrated water reduces evaporation (inverse texture hypothesis; see Noy-Meir 1973). At the other extreme of

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the main environmental gradient, very to extremely high soil salinity, as found in the *Euphorbio-Cephalophyllion* (2.2.1) and in particular on the quartz fields (unit 2.3), results in high osmotic pressure and thus reduced water availability for plants.

Besides plant species turnover (i.e. separation of plant communities), this main environmental gradient was also related to species richness at community level. The highest species density among our alliances was found in the slope habitats of the *Berkheyo-Rhoion* (1.2.1) on the wetter end of the gradient (mean 30.0 on 100 m^2), whereas the lowest values were found on the extremely saline quartz fields (unit 2.3; mean 11.8 on 100 m^2). Higher species richness in communities on slopes compared to plains is corroborated by other studies from the Succulent Karoo, and has been explained by a high level of small-scale habitat heterogeneity in terms of soil depth, moisture and nutrient supply on rocky habitats compared to the more homogeneous plains (Jürgens 1986; Cowling et al. 1994; Desmet & Cowling 1999). The higher species richness of the *Berkheyo-Rhoion* could also be explained by the higher productivity of the relatively wetter and more nutrient-rich habitats – in a generally poorly productive desert – which might translate into higher densities of individuals, and therefore species, co-occurring in the same patch.

In contrast, quartz fields supported the most species-poor stands. Previous studies have characterized quartz fields as habitats with very plant-adverse growing conditions. They are edaphically arid due to shallow soils, high stone content and high salinity (partly > 2000 $\mu S \cdot cm^{-1}$). They also often have a very low soil pH (partly < 4; Schmiedel & Jürgens 1999), which causes the mobilization of plant-toxic aluminium. Clearly, only a limited number of taxa have developed adaptations that allow them to cope with such adverse conditions, thus limiting the available species pool (Schmiedel 2004). On the wider geographic scale of southern Africa, quartz fields are typically inhabited by species-poor communities dominated by very few specialized species (Schmiedel 2002; Schmiedel & Mucina 2006; Schmiedel et al. in press).

The second important gradient in our study area (reflected by the second axis of the DCA ordination) can be interpreted as a gradient of increasing disturbance. The highest disturbance can be assumed for the communities that either occur on *heuweltjie* centres with high bioturbation (*Mesembranthemo-Eberlanzion*, 2.1.1), or in intensively grazed places (*Grielo-Galenion*, 1.1.3). Disturbance decreases towards the matrix between the *heuweltjies* (*Euphorbio-Cephalophyllion*, 2.2.1) and the vegetation between the rocky outcrops (*Berkheyo-Rhoion*, 1.2.1). Rocky upland habitats are believed to be less targeted by grazing animals due to their inaccessible nature compared to equivalent lowland areas (Cowling et al. 1994; Todd & Hoffman 1999; Riginos & Hoffman 2003; Anderson & Hoffman 2007).

Heuweltjies are subject to continuous disturbance by burrowing mammals due to the softer, stone-free soils (Milton et al. 1992), as well as by domestic livestock, which prefers *heuweltjies* for foraging due to the higher nutrient content of their vegetation (Armstrong & Siegfried 1990). The vegetation on the *heuweltjie* centres (i.e. basically the *Foveolino-Eberlanzietum* 2.1.1.1) was characterized and dominated by annuals (e.g. *Foveolina dichotoma* and *Mesembryanthemum guerichianum*) and opportunistic perennials (e.g. *Psilocaulon dinteri* and *E. cyathiformis*). The dominance of opportunistic species (i.e. annuals and deciduous or short-lived perennials compared to evergreen and/or long-lived shrubs) on *heuweltjies* was also reported in Esler & Cowling (1995), who interpreted the traits of the plants as adaptations to frequently disturbed habitats (compare Knight et al. 1989; Midgley & Musil 1990; Röwer 2009). *Heuweltjies* thus seem to provide suitable habitats for a limited number of relatively fast-growing plant species that benefit from the increased nutrient provision (Francis et al. 2007; Röwer 2009) and are able to cope with regular disturbance.

Despite the distinct differences in grazing intensity between the camps (Röwer 2009), only three associations differed significantly from the rest in this respect (Appendix S8). The highest mean grazing intensity was found for the *Antimimato-Zygophylletum* (2.1.1.2), while the lowest values were found for two associations from the plains and *heuweltjie* fringes, namely the *Cheridopsio-Cephalophylletum* (2.1.1.3) and the *Mesembryanthemo-Eberlanzietum* (2.1.1.4). None of these three syntaxa was characterized by typical indicators of either high grazing intensity or fallow. The reason for this could be that our grazing intensity values represent means for the respective camps whereas livestock utilizes rangeland very heterogeneously (Stokes et al. 2009). Stockposts, water points and topography influence the patterns of rangeland utilization, resulting in grazing gradients and site-specific grazing intensities (see also Landsberg et al. 2003; Riginos & Hoffman 2003; Anderson & Hoffman 2007). In our study area, it was mainly the stands of the *Grielo-Galenion* (1.1.3) that were characterized by indicators of overgrazing (i.e. high abundance of annuals, geophytes or non-palatable/poisonous shrubs; see Todd & Hoffman 1999), and this was possibly related to previous uses as stockposts or even arable fields. Appendix S10 provides a more detailled overview of how the information on the syntaxa could be used by farmers and conservation managers.

Validity and relevance of the described syntaxa

In Appendix S11, we compare the syntaxa of this study in detail with those vegetation units that have previously

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been described in other regions of the Succulent Karoo (Knapp 1968; Rösch 2001; Schmiedel 2002; Jürgens 2004; Schmiedel & Mucina 2006; van der Merwe et al. 2008; Haarmeyer et al. 2010). Accordingly, much of the zonal vegetation of this biome probably belongs to the two classes described here, but frequently to other alliances or even orders than those present around Soebatsfontein, most of them so far undescribed.

Most of the vegetation types distinguished were very well differentiated from each other by numerous diagnostic species. With an average of ten character species, our associations were clearly more distinct than associations in typical European classifications (e.g. Schaminée et al. 1995; Berg et al. 2001; Chytrý 2007). Certainly, some of the species that qualified as association or alliance character species in the regional context of the present study cannot be maintained as such in a larger geographical context because they regularly occur in various other vegetation types outside the study area. This is likely true for some very widespread native species (e.g. *Berkheya fruticosa*, *Euphorbia mauritanica*, *Hirpicium alienatum* and *Tripteris sinuata*) as well as some exotic species. We are, however, optimistic that the majority of the associations we describe will also prove to have association status in a wider geographical context, both according to the association criterion used here (Dengler 2003; see Berg et al. 2004; Dengler et al. 2005) and other modern approaches (e.g. Chytrý 2007).

Moreover, we found that at least the higher syntaxa described (alliances upwards) were clearly defined and separated in terms of the measured environmental parameters. Only among some associations placed in the same alliance could we not always link the significant differences in species composition to equally significant differences in environmental conditions. Rather than invalidating our classification, this presently unexplained differentiation asks for further studies to reveal the underlying drivers.

In the context of the whole Succulent Karoo, it is interesting that the majority of associations seem to have rather narrow distribution ranges. Our comparisons with other studies indicate that even in places that are only 70 or 150 km apart and share similar ecological conditions, there are almost no common associations found. This high spatial turnover of communities is certainly driven by the high β-diversity and the many local endemics in the vascular plant flora (Desmet & Cowling 1999). At a higher syntaxonomic level (alliance, order, class), we found more coincidence with other regions in the Succulent Karoo. It seems that the two classes described here, the *Hermannio-Zygophylletea* of barely saline soils with better water availability and the *Didelto-Cephalophylletea* of saline and edaphically dry soils, are widely distributed throughout the Succulent Karoo. Stands of these two classes with basically similar species composition account for much of the zonal vegetation of the biome, as is nicely demonstrated by synoptic tables of the nine BIOTA Observatories that are located along a representative transect throught the whole Succulent Karoo (Haarmeyer et al. 2010).

The eight relevés of quartz fields (unit 2.3) would have been placed within the class *Didelto-Cephalophylletea* according to the TWINSPAN analysis. However, this is likely an artifact of the small number of available relevés, as our knowledge of the quartz field vegetation in South Africa (Schmiedel & Jürgens 1999; Schmiedel 2002, 2004; Schmiedel & Mucina 2006; Haarmeyer et al. 2010) suggests that quartz fields should be treated as a separate class due to their very distinct species combination and site conditions, as already proposed by Knapp (1968): *Lithopso-Conophytetea* nom. inval.

In conclusion, the described vegetation units are both statistically well separated in floristic terms and ecologically meaningful, while the appropriateness of the delimitation and naming of the higher-rank units is further corroborated by previous vegetation studies throughout the biome (see above and Appendix S11). Therefore, we consider the formal publication of the vegetation units as syntaxa a logical consequence. Only in the case of the quartz fields, we refrained from such a step, as our sample of eight heterogeneous plots was clearly not sufficient. Since there were only two previous publications with formal syntaxon names (Knapp 1968; Jürgens 2004), of which the names in the first source were all invalid, we had to describe almost all syntaxa anew. Only for our alliance 1.1.1 could we apply a previously described name: *Othonnion cylindricae* Jürgens 2004.

Towards a consistent phytosociological classification of South Africa

Our results show that it is possible and appropriate to classify near-natural vegetation in Africa with a Braun-Blanquetian approach (Braun-Blanquet 1964; Dierschke 1994; Dengler et al. 2008), despite repeated suggestions that this methodology only makes sense, if at all, in European landscapes that are dominated by anthropogenic vegetation types mostly separated by sharp borders. The associations described in the Succulent Karoo were even better differentiated in floristic terms than most associations of the cultural landscapes in Europe (see above).

Despite being based on regional data alone, our study could be a first but decisive step towards a comprehensive and consistent classification of the plant communities in the Succulent Karoo. Such a bottom-up approach is typi-

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cal for Braun-Blanquetian phytosociology (Dierschke 1994; Ewald 2003; Dengler et al. 2008). The advantage is that one does not have to wait for a comprehensive vegetation database of the whole Succulent Karoo before a sound classification can be accomplished. The establishment of a hierarchical system of meaningful vegetation units can start with a regional study and then successively be extended to larger areas. While the classification will certainly change somewhat when more data become available, the principles of the ICPN guarantee that not every new classification generates a completely new set of syntaxon names. Instead, the syntaxa described here will retain their names even if their delimitation or their lists of diagnostic species will slightly change in the future.

We are convinced that using similar approaches in other parts of southern Africa could help to overcome the past tendency of each new study generating a different list of local vegetation units. Instead, local studies can contribute to a biome- or nationwide synthesis of plant communities. Whilst the outstanding work of Mucina & Rutherford (2006) provides South Africa with a consistent overview of its vegetation complexes at a landscape scale, a typology of similar quality for plant communities (i.e. at the plot scale) would be at least as valuable. It is only small-scale descriptions of formal syntaxa, such as provided in the current study, which can differentiate between near-natural and overgrazed patches, between small quartz fields and the surrounding zonal vegetation, or among the different zones typically associated with *heuweltjies*. Evidently, a sound methodology for delimiting, naming and determining such plant communities is necessary for more detailed ecological studies and comparisons between them (see Dengler 2003; Ewald 2003; Dengler et al. 2008). As shown in Appendix S10, the associations and alliances described here could also provide valuable information for farmers and other land users. The examples of Red Lists of plant communities from Germany (Rennwald 2002; Berg et al. 2004) and the fact that the Habitats Directive of the European Union (the most powerful conservation regulation in Europe) is largely based on phytosociological units (European Commission 2007), demonstrate that a well-developed syntaxonomic scheme could also be a powerful tool for conservationists. Aiming at a country-wide consistent phytosociological classification (e.g. Schaminée et al. 1995; Chytrý 2007), in South Africa would be greatly assisted by the existence of the National Vegetation Database (Mucina et al. 2000; code AF-ZA-001 according to Dengler et al. 2011; Rutherford & Powrie in press). Already, this database is among the biggest worldwide (Dengler et al. 2011), notwithstanding that there are certainly regions in the country that require additional field sampling.

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Appendix

Formal description of the new syntaxa according to the ICPN, including the designation of nomenclatural types. For diagnostic species of syntaxa above association rank, see Table 3 and Appendix S2. Environmental parameters for the type relevés of associations can be found in the relevé tables (Appendices S3–S6).

Typification of classes

Didelto carnosae-Cephalophylletea inaequalis cl. nova hoc loco

Euphorbio hamatae-Cephalophylletalia inaequalis ordo novus (see below) [holotypus hoc loco]

Hermannio trifurcae-Zygophylletea morgsanae cl. nova hoc loco

Berkheyo fruticosae-Rhoetalia undulatae ordo novus (see below) [holotypus hoc loco]

Typification of orders

Berkheyo fruticosae-Rhoetalia undulatae ordo novus hoc loco

Berkheyo fruticosae-Rhoion undulatae all. nov. (see below) [holotypus hoc loco]

Euphorbio hamatae-Cephalophylletalia leucospermae ordo novus hoc loco

Euphorbio hamatae-Cephalophyllion leucospermae all. nov. (see below) [holotypus hoc loco]

Hermannio trifurcae-Othonnetalia sedifoliae ordo novus hoc loco

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Stipagrostio obtusae-Othonnion sedifoliae all. nov. (see below) [holotypus hoc loco]

Mesembryanthemo guerichiani-Eberlanzietalia cyathiformis ordo novus hoc loco

Mesembryanthemo guerichiani-Eberlanzion cyathiformis all. nov. (see below) [holotypus hoc loco]

Typification of alliances

Berkheyo fruticosae-Rhoion undulatae all. nova hoc loco

Drosanthemo hispidi-Manochlamydetum albicantis ass. nova (see below) [holotypus hoc loco]

Euphorbio hamatae-Cephalophyllion inaequalis all. nova hoc loco

Halliantho plani-Ruschietum leucospermae ass. nova (see below) [holotypus hoc loco]

Grielo humifusi-Galenion sarcophyllae all. nova hoc loco

Grielo humifusi-Othonnetum sediofoliae ass. nova (see below) [holotypus hoc loco]

Mesembryanthemo guerichani-Eberlanzion cyathiformis all. nova hoc loco

Mesembryanthemo guerichani-Eberlanzietum cyathiformis ass. nova (see below) [holotypus hoc loco]

Stipagrostio obtusae-Othonnion sedifoliae all. nova hoc loco

Stipagrostio obtusae-Othonnetum sedifoliae ass. nova (see below) [holotypus hoc loco]

Typification of associations

Antimimato komkansicae-Zygophylletum cordifolii ass. nova hoc loco

Holotypus hoc loco: Plot ID: 14786; Date: 01.08.2008; Coordinates: -30.194145/17.543908; *Drosanthemum curtophyllum* 6; *Zygophyllum cordifolium* 5; *Meyerophytum meyeri* 4; *Salsola* sp. US07_2312 2.5; *Antimima komkansica* 2; *Aridaria noctiflora* supsp. *noctiflora* 1; *Atriplex lindleyi* supsp. *inflata* 1; *Bromus pectinatus* 1; *Lycium oxycarpum* 1; *Tribolium utriculosum* 1; *Pelargonium grandicalcaratum* 0.5; *Trachyandra involucrata* 0.5; *Dimorphotheca sinuata* 0.25; *Manochlamys albicans* 0.25; *Didelta carnosa* 0.1; *Drosanthemum hispidum* 0.1; *Ehrharta longiflora* 0.1; *Galenia sarcophylla* 0.1; *Karroochloa schismoides* 0.1; *Mesembryanthemum guerichianum* 0.1; *Oxalis pes-caprae* 0.1; *Psilocaulon dinteri* 0.1; *Tetragonia fruticosa* 0.1; *Tetragonia microptera* 0.1; *Trachyandra revoluta* 0.1; *Tylecodon wallichii* 0.1; *Crassula pyramidalis* 0.05; *Crassula rudolfii* 0.05; *Heliophila variabilis* 0.05; *Crassula tomentosa* 0.01; *Crassula vaillantii* 0.01; *Monocotyledonic geophyte* 14786 0.01; *Oncosiphon suffruticosum* 0.01.

Antizomato miersianae-Stoeberietum utilis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22066; Date: 13.09.2008; Coordinates: -30.257520/17.568438; *Antizoma miersiana* 8; *Rhus undulata* 6.5; *Stoeberia utilis* 5.5; *Hermannia amoena* 3.5; *Zygophyllum morgsana* 3; *Galenia fruticosa* 2.5; *Thesium lineatum* 1.5; *Tripteris oppositifolia* 1.1; *Leipoldtia schultzei* 0.75; *Asparagus burchelli* 0.25; *Didelta spinosa* 0.25; *Drosanthemum hispidum* 0.25; *Ehrharta calycina* 0.25; *Galenia sarcophylla* 0.25; *Hermannia* sp. 124822 0.25; *Mesembryanthemum guerichianum* 0.25; *Berkheya fruticosa* 0.1; *Asparagus capensis* 0.05; *Lotononis digitata* 0.05; *Tetragonia microptera* 0.05; *Tripteris amplectens* 0.05; *Aizoon canariense* 0.02; *Heliophila variabilis* 0.02; *Atriplex lindleyi* supsp. *inflata* 0.01; *Atriplex semibaccata* 0.01; *Dimorphotheca sinuata* 0.01; *Ehrharta longiflora* 0.01; *Helichrysum leontonyx* 0.01; *Jamesbrittenia racemosa* 0.01; *Karroochloa schismoides* 0.01; *Microloma sagittatum* 0.01; *Nemesia anisocarpa* 0.01; *Oxalis pes-caprae* 0.01; *Pharnaceum croceum* 0.01; *Trachyandra revoluta* 0.01; *Tripteris clandestina* 0.01.

Cheiridopsio robustae-Cephalophylletum inaequalis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22093; Date: 04.09.2008; Coordinates: -30.113966/17.475109; *Phyllobolus trichotomus* 5; *Cheiridopsis robusta* 2; *Salsola* sp. US07_2312 1.75; *Antimima komkansica* 1; *Lampranthus otzenianus* 1; *Cephalophyllum inaequale* 0.5; *Eberlanzia dichotoma* 0.5; *Galenia fruticosa* 0.5; *Sarcocaulon l'heritieri* 0.25; *Trachyandra revoluta* 0.15; *Psilocaulon dinteri* 0.1; *Chlorophytum crassinerve* 0.01; *Didelta carnosa* 0.01; *Foveolina dichotoma* 0.01; *Gorteria diffusa* supsp. *diffusa* 0.01; *Oxalis obtusa* 0.01.

Drosanthemo curtophylli-Meyerophytetum meyeri ass. nova hoc loco

Holotypus hoc loco: Plot ID: 21937; Date: 22.08.2008; Coordinates: -30.219600/17.568438; *Meyerophytum meyeri* 7; *Aridaria noctiflora* supsp. *noctiflora* 5; *Ehrharta pusilla* 2.5; *Drosanthemum curtophyllum* 2; *Berkheya fruticosa* 1.5; *Pharnaceum confertum* var. *brachyphyllum* 1.5; *Tetragonia fruticosa* 1.25; *Cephalophyllum inaequale* 1; *Galenia fruticosa* 1; *Gazania krebsiana* supsp. *krebsiana* 1; *Ruschia viridifolia* 1; *Euphorbia hamata* 0.75; *Stoeberia frutescens* 0.5; *Tetragonia verrucosa* 0.5; *Thesium elatius* 0.25; *Aloe krapohliana* 0.1; *Asparagus capensis* 0.1; *Phyllobolus prasinus* 0.1; *Chlorophytum crassinerve* 0.05; *Microloma sagittatum* 0.05; *Phyllobolus sinuosus* 0.05; *Crassula muscosa* var. *muscosa* 0.01; *Gethyllis* sp. 21914 0.01; *Gorteria diffusa* supsp. *diffusa* 0.01; *Nemesia anisocarpa* 0.01; *Oxalis* sp. 2345 0.01; *Pteronia ciliata* 0.01.

Drosanthemo hispidi-Manochlamydetum albicantis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22071; Date: 11.09.2008; Coordinates: -30.227539/17.552120; *Rhus undulata* 9; *Manochlamys albicans* 5.5; *Ehrharta longiflora* 4; *Lycium ferocissimum* 3; *Cineraria canescens* 0.5; *Galenia fruticosa* 0.5; *Galenia sarcophylla* 0.5; *Lycium oxycarpum* 0.25; *Mesembryanthemum guerichianum* 0.25; *Drosanthemum hispidum* 0.1; *Amellus microglossus* 0.05; *Chenopodium album* 0.05; *Tetragonia fruticosa* 0.05; *Tetragonia microptera* 0.05; *Lepidium desertorum* 0.02; *Tripteris amplectens* 0.02; *Atriplex semibaccata* 0.01; *Dorotheanthus bellidiformis* supsp. *hestermalensis* 0.01; *Oncosiphon suffruticosum* 0.01; *Oxalis pes-caprae* 0.01.

Emico australis-Lebeckietum multiflorae ass. nova hoc loco

Holotypus hoc loco: Plot ID: 21916; Date: 02.09.2008; Coordinates: -30.262937/17.555994; *Amsinckia retrorsa* 9; *Galenia africana* 3.5; *Dimorphotheca sinuata* 2.5; *Mesembryanthemum guerichianum* 2; *Lebeckia multiflora* 1.25; *Raphanus raphanistrum* 1; *Atriplex lindleyi* supsp. *inflata* 0.75; *Karroochloa schismoides* 0.75; *Psilocaulon dinteri* 0.75; *Oncosiphon suffruticosum* 0.5; *Arctotis fastuosa* 0.25; *Tetragonia microptera* 0.1; *Tripteris amplectens* 0.1; *Chenopodium album* 0.05; *Emex australis* 0.05; *Gazania tenuifolia* 0.05; *Malva parviflora* var. *parviflora* 0.05; *Pharnaceum croceum* 0.05; *Stipagrostis ciliata* 0.05; *Aizoon canariense* 0.01; *Amellus microglossus* 0.01; *Bromus pectinatus* 0.01; *Ehrharta longiflora* 0.01; *Lotononis parviflora* 0.01; *Lycium ferocissimum* 0.01; *Oxalis pes-caprae* 0.01; *Salsola kali* 0.01; *Trichogyne lerouxiae* 0.01.

Foveolino dichotomae-Eberlanzietum cyathiformis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 20222; Date: 01.10.2007; Coordinates: -30.225017/17.524885; *Eberlanzia cyathiformis* 25; *Phyllobolus prasinus* 6; *Foveolina dichotoma* 5; *Salsola* sp. US07_2312 3; *Zygophyllum cordifolium* 2; *Pteronia glabrata* 1.5; *Cephalophyllum inaequale* 0.5; *Galenia fruticosa* 0.5; *Psilocaulon foliosum* 0.5; *Mesembryanthemum guerichianum* 0.25; *Didelta carnosa* 0.1; *Psilocaulon dinteri* 0.1; *Trachyandra falcata* 0.01.

Grielo humifusi-Othonnetum sedifoliae ass. nova hoc loco

Holotypus hoc loco: Plot ID: 14187; Date: 15.08.2008; Coordinates: -30.176000/17.532231; *Othonna sedifolia* 13; *Karroochloa schismoides* 4; *Salsola* sp. US07_2312 1.5; *Leipoldtia schultzei* 1; *Hermannia trifurca* 0.3; *Helichrysum alsinoides* 0.25; *Mesembryanthemum guerichianum* 0.25; *Trachyandra revoluta* 0.25; *Grielum humifusum* 0.05; *Arctotis undulata* 0.02; *Oxalis* sp. US08_6222 0.02; *Foveolina dichotoma* 0.01; *Galenia sarcophylla* 0.01; *Gazania tenuifolia* 0.01; *Oxalis pes-caprae* 0.01; *Zaluzianskya affinis* 0.01.

Halliantho plani-Ruschietum leucospermae ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22122; Date: 23.08.2008; Coordinates: -30.141051/17.481331; *Ruschia leucosperma* 8; *Ruschia* sp. 124796 3; *Ruschia* sp. 22122 3; *Othonna arbuscula* 2.5; *Sarcocaulon l'heritieri* 1.85; *Tetragonia fruticosa* 1.25; *Cephalophyllum inaequale* 0.75; *Octopoma connatum* 0.5; *Othonna sedifolia* 0.5; *Ruschia viridifolia* 0.5; *Pteronia ciliata* 0.2; *Galenia fruticosa* 0.1; *Hallianthus planus* 0.1; *Leipoldtia schultzei* 0.1; *Trachyandra revoluta* 0.1; *Cheiridopsis robusta* 0.05; *Chlorophytum undulatum* 0.05; *Euphorbia hamata* 0.05; *Lapeirousia* sp. 21958 0.05; *Lachenalia framesii* 0.02; *Phyllobolus sinuosus* 0.02; *Cotula leptalea* 0.01; *Crassula subaphylla* var. *subaphylla* 0.01; *Eriospermum* sp. 1817 0.01; *Lotononis parviflora* 0.01.

Leipoldtio schultzei-Cephalophylletum inaequalis ass. nova hoc loco

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Holotypus hoc loco: Plot ID: 21950; Date: 21.08.2008; Coordinates: -30.124800/17.568438; *Leipoldtia schultzei* 19; *Stoeberia frutescens* 5; *Lebeckia multiflora* 1.5; *Tetragonia fruticosa* 1.5; *Eberlanzia cyathiformis* 1.25; *Cephalophyllum inaequale* 0.75; *Antimima* sp. 2386 0.5; *Lycium oxycarpum* 0.5; *Galenia fruticosa* 0.25; *Salsola* sp. US07_2312 0.25; *Asparagus fasciculatus* 0.1; *Helichrysum dregeanum* 0.1; *Tripteris hyoseroides* 0.1; *Trachyandra revoluta* 0.05; *Didelta carnosa* 0.02; *Oxalis pes-caprae* 0.02; *Cheiridopsis robusta* 0.01; *Foveolina dichotoma* 0.01; *Karroochloa schismoides* 0.01; *Oxalis* cf. *gracilis* 0.01.

Mesembryanthemo guerichani-Eberlanzietum cyathiformis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22105; Date: 06.09.2008; Coordinates: -30.200640/17.506219; *Cephalophyllum inaequale* 3.5; *Trachyandra falcata* 3.25; *Psilocaulon dinteri* 2.5; *Eberlanzia cyathiformis* 1.5; *Galenia fruticosa* 1.25; *Salsola* sp. US07_2312 1.25; *Lycium oxycarpum* 0.75; *Hermannia cuneifolia* var. *glabrescens* 0.1; *Pteronia glabrata* 0.1; *Zygophyllum cordifolium* 0.1; *Amellus microglossus* 0.01; *Chlorophytum crassinerve* 0.01; *Didelta carnosa* 0.01; *Karroochloa schismoides* 0.01; *Leysera tenella* 0.01; *Mesembryanthemum guerichianum* 0.01; *Oncosiphon suffruticosum* 0.01; *Oxalis obtusa* 0.01; *Pelargonium minimum* 0.01; *Scrophulariaceae* sp. 21906 0.01; *Tetragonia microptera* 0.01; *Zaluzianskya benthamiana* 0.01.

Oncosiphono grandiflori-Othonnetum cylindricae ass. nova hoc loco

Holotypus hoc loco: Plot ID: 20273; Date: 09.10.2007; Coordinates: -30.05/17.05; *Ruschia* sp. US07_2384 5; *Lebeckia* sp. 20271 4; *Ehrharta melicoides* 3; *Stipagrostis zeyheri* supsp. *zeyheri* 3; *Hermannia trifurca* 2; *Othonna cylindrica* 2; *Ruschia versicolor* 2; *Tetragonia fruticosa* 1; *Zygophyllum morgsana* 1; *Asparagus* sp. US07_2679 0.25; *Pteronia* sp. 124818 0.25; Scrophulariaceae sp. 124805 0.05; *Felicia* sp. 124816 0.02; *Lachenalia* sp. 2763 0.02; *Ruscus* sp. 124827 0.02; *Trachyandra falcata* 0.02; *Helichrysum* sp. 124804 0.01; *Heliophila coronopifolia* 0.01; *Oncosiphon grandiflorum* 0.01.

Pteronio glabratae-Cephalophylletum inaequalis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22011; Date: 16.08.2008; Coordinates: -30.225017/17.537328; *Cephalophyllum inaequale* 15; *Ruschia* sp. 124796 11; *Pteronia glabrata* 5; *Salsola* sp. US07_2312 4.5; *Phyllobolus prasinus* 2.5; *Galenia fruticosa* 1.5; *Zygophyllum cordifolium* 0.75; *Zygophyllum sessilifolium* 0.75; *Eberlanzia cyathiformis* 0.5; *Hermannia cuneifolia* var. *cuneifolia* 0.5; *Lycium oxycarpum* 0.5; *Othonna arbuscula* 0.5; *Psilocaulon dinteri* 0.5; *Ruschia versicolor* 0.25; *Asparagus capensis* 0.2; *Tetragonia verrucosa* 0.2; *Didelta carnosa* 0.1; *Lebeckia multiflora* 0.1; *Meyerophytum meyeri* 0.1; *Antimima* sp. US07_2582 0.05; *Cheiridopsis robusta* 0.05; *Galenia sarcophylla* 0.05; *Oxalis obtusa* 0.05; *Pelargonium leipoldtii* 0.02; *Trachyandra falcata* 0.02; *Aridaria noctiflora* supsp. *noctiflora* 0.01; *Ornithoglossum vulgare* 0.01.

Ruschio goodiae-Lebeckietum sericeae ass. nova hoc loco

Holotypus hoc loco: Plot ID: 21904; Date: 02.09.2008; Coordinates: -30.276480/17.568438; *Ruschia* subg. *Tumidulae* sp. 3818 4; *Amphiglossa tomentosa* 3.5; *Ruschia goodiae* 3; *Didelta spinosa* 2.5; *Lebeckia sericea* 2; *Rhus incisa* 1.5; *Thesium spinosum* 1; *Acanthopsis* cf. *carduifolia* 0.75; *Berkheya fruticosa* 0.5; *Tribolium utriculosum* 0.5; *Zygophyllum morgsana* 0.25; *Zygophyllum sessilifolium* 0.25; *Ehrharta pusilla* 0.1; *Helichrysum* sp. 124788 0.1; *Hirpicium alienatum* 0.1; *Microloma sagittatum* 0.1; *Trachyandra involucrata* 0.1; *Arctotis acaulis* 0.05; *Asparagus capensis* 0.05; *Gorteria diffusa* supsp. *diffusa* 0.05; *Hermannia trifurca* 0.05; *Lycium cinereum* 0.05; *Tetragonia fruticosa* 0.05; *Ursinia chrysanthemoides* 0.05; *Trachyandra revoluta* 0.02; *Aizoon canariense* 0.01; *Albuca cooperi* 0.01; *Chrysocoma cernua* 0.01; *Drosanthemum hispidum* 0.01; *Hebenstretia parviflora* 0.01; *Heliophila variabilis* 0.01; *Indigofera heterophylla* 0.01; *Leysera tenella* 0.01; *Mesembryanthemum guerichianum* 0.01; *Oxalis ambigua* 0.01; *Oxalis clavifolia* 0.01.

Ruschio versicoloris-Cephalophylletum inaequalis ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22036; Date: 12.08.2008; Coordinates: -30.192514/17.527996; *Ruschia versicolor* 20; *Cephalophyllum inaequale* 10; *Salsola* sp. US07_2312 3; *Galenia fruticosa* 2; *Othonna sedifolia* 1.5; *Zygophyllum cordifolium* 0.125; *Lebeckia multiflora* 0.1; *Hypertelis salsoloides* var. *salsoloides* 0.05; *Didelta carnosa* 0.02; *Grielum humifusum* 0.02; *Tetragonia fruticosa* 0.02; *Trachyandra* sp. 1670 0.02; *Amellus microglossus* 0.01.

Stipagrostio obtusae-Othonnetum sedifoliae ass. nova hoc loco

Holotypus hoc loco: Plot ID: 22052; Date: 18.09.2008; Coordinates: -30.268354/17.552883; *Ruschia* subg. *Tumidulae* sp. 3818 7; *Lebeckia multiflora* 3; *Stipagrostis obtusa* 3; *Othonna sedifolia* 1; *Helichrysum alsinoides* 0.5; *Ehrharta pusilla* 0.1; *Galenia africana* 0.1; *Grielum humifusum* 0.1; *Stipagrostis ciliata* 0.1; *Dimorphotheca sinuata* 0.05; *Gorteria diffusa* supsp. *diffusa* 0.02; *Lapeirousia arenicola* 0.02; *Hermannia* sp. 124822 0.01; *Karroochloa schismoides* 0.01; *Lyperia tristis* 0.01; *Oxalis* sp. 2233 0.01; Scrophulariaceae sp. 21906 0.01; *Silene clandestina* 0.01; *Wahlenbergia sessiliflora* 0.01.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Appendix S1. Translation table for deviating taxon names between this publication and the BIOTA database.

Appendix S2. Complete synoptic table of all syntaxa from association to class level.

Appendix S3. Relevé table of the order *Hermannio trifurcae-Othonnetalia sedifoliae* (1.1).

Appendix S4. Relevé table of the order *Berkheyo fruticosae-Rhoetalia undulatae* (1.2).

Appendix S5. Relevé table of the order *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis* (2.1).

Appendix S6. Relevé table of the order *Euphorbio hamatae-Cephalophylletalia inaequalis* (2.2).

Appendix S7. Relevé table of unit 2.3.

Appendix S8. Differences between the 16 phytosociological associations and the one equivalent unit regarding landscape, surface cover, soil and vegetation parameters.

Appendix S9. Detailed description of the syntaxa in the study area (including photographs of all associations).

Appendix S10. Relevance of the syntaxa for practitioners.

Appendix S11. Comparison of our syntaxa with previously described units.

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Appendix S1. Translation table for deviating taxon names between this publication and the BIOTA database.

Species name in this publication	Species name in the BIOTA database
Adromischus filicaulis subsp. filicaulis	Adromischus filicaulis ssp. filicaulis
Albuca sp. 1636	Albuca Breitblatt behaarter Blattrand
Amaranthaceae sp. 4003	Amaranthaceae weed
Anacampseros filamentosa subsp. namaquensis	Anacampseros filamentosa ssp. namaquensis
Anthospermum dregei subsp. dregei	Anthospermum dregei ssp. dregei
Antimima sp. 124808	Antimima fein Strauch Spitzbl.
Antimima sp. 124810	Antimima Rotrand watermeyeri-ähnl. fishy
Antimima sp. 14549	Antimima kompakt
Antimima sp. 21985	Antimima kriechend
Antimima sp. 2386	Antimima große rote Früchte
Antimima sp. 2496	Antimima kleines Polster Spitzblatt
Antimima sp. US07_2582	Antimima glatte Blä.
Antimima subg. Clavipes sp. 20212	Antimima subg. Clavipes Soeb
Arctotis sp. 3034	Arctotis silbrig
Arenifera sp. 132030	Arenifera stylosa nicht dornig
Aridaria noctiflora subsp. noctiflora	Aridaria noctiflora ssp. noctiflora
Asparagus sp. 22034	Asparagus Bäumchen
Asparagus sp. 3827	Asparagus verzweigte Kurztriebe
Asparagus sp. US07_2679	Asparagus cf. bayeri
Asteraceae sp. 124786	Strauch Asteraceae längl. Blä., behaart
Asteraceae sp. 2077	Asteraceae liegend
Atriplex lindleyi subsp. inflata	Atriplex lindleyi ssp. inflata
Babiana sp. 1765	Babiana sp.
Babiana sp. 21901	Babiana zebra BS, zigzag Stängel
Babiana sp. 21954	Babiana haarig curly
Babiana sp. 2210	Babiana curly ends
Babiana sp. US07_2643	Babiana lang und gross
Boscia sp. 22053	Boscia ähnlich
Bromus sp. 22033	Bromus fein
Brownanthus sp. 124828	Brownanthus sp.
Bulbine sp. 1820	Bulbine sp.
Campanulaceae sp. 21925	Campanulaceae
Chaetobromus involucratus subsp. dregeanus	Chaetobromus involucratus ssp. dregeanus
Cheilanthes deltoidea	Farn
Chenopodium sp. 14555	Chenopodium löffelblatt fishy
Chlorophytum sp. 1887	Chlorophytum haariger Rand
Conicosia sp. 20270	Conicosia sp.
Conophytum minutum subsp. minutum	Conophytum minutum ssp. minutum
Conophytum sp. US06_2214	Conophytum breve o. pagae
Cotula sp. 22024	Cotula sp.
Crassula columnaris subsp. prolifera	Crassula columnaris ssp. prolifera
Crassula expansa subsp. expansa	Crassula expansa ssp. expansa
Crassula expansa subsp. pyrifolia	Crassula expansa ssp. pyrifolia
Crassula tetragona subsp. rudis	Crassula tetragona ssp. rudis
Cyphia sp. 2010	Cyphia sp.
Dicotyledoic therophyte 124825	Kl. lila Blume
Dicotyledoneae sp. 21901	Klein 3-Blatt
Dipogon sp. 2054	Fabaceae windend
Dorotheanthus bellidiformis subsp. hestermalensis	Dorotheanthus bellidiformis ssp. hestermalensis
Drimia sp. 21898	Drimia sp.
Drosanthemum sp. 21969	Drosanthemum groß grün verzweigt
Eriospermum sp. 1817	Eriospermum sp.
Felicia sp. 124816	Felicia drüsig borstig
Ferraria sp. 2742	cf. Ferraria sp.
Ferraria sp. US07_2858	Ferraria groß
Ferraria uncinata subsp. macrochlamys	Ferraria uncinata ssp. macrochlamys
Freesia sp. 2776	Freesia sp.
Gazania krebsiana subsp. krebsiana	Gazania krebsiana ssp. krebsiana
Gethyllis sp. 21914	Gethyllis sp.
Gladiolus sp. 3777	cf. Gladiolus Grasblatt
Gnidia sp. US07_2782	Gnidia Strauch Spatelbl. runde Frü.
Gorteria diffusa subsp. diffusa	Gorteria diffusa ssp. diffusa
Hebenstretia sp. 2737	Hebenstretia artig gelb weiß
Helichrysum sp. 124788	Helichrysum Spatelblatt dicht
Helichrysum sp. 124804	Helichrysum gelbes Zentr.
Hemimeris sp. 4283	Hemimeris sp.
Hermannia sp. 124822	Hermannia fein
Hirpicium sp. 124820	Hirpicium annuell
Hirpicium sp. US07_2511	Hirpicium Gorteria Strauch
Indigofera sp. 3765	Indigofera non achselständige Blü dreiblatt
Lachenalia sp. 1644	Lachenalia gewellter Rand
Lachenalia sp. 22106	Lachenalia unduliert 1 Blatt Haarig
Lachenalia sp. 2763	Lachenalia sp.
Lachenalia sp. 3715	Lachenalia lang behaart, undul. Blatt
Lapeirousia sp. 21958	Lapeirousia sp.
Lebeckia sp. 20271	Lebeckia sericea dornig
Lessertia sp. 20203	Lessertia lange gedrehte Frü.
Lessertia sp. 21897	Lessertia sp.
Lessertia sp. 2825	Lessertia strauchig
Lessertia sp. 3061	Fabaceae Strauch Lessertia
Monilaria scutata subsp. scutata	Monilaria scutata ssp. scutata
Monocotyledonic geophyte 14786	Geophyt gr. Petersilienblatt, glatt

Species name in this publication	Species name in the BIOTA database
Monocotyledonic geophyte 1678	Geophyt spiralig aufgewickelt
Monocotyledonic geophyte 21901	Geophyt Zebra
Monocotyledonic geophyte 21958	Geophyt groß
Monocotyledonic geophyte 21982	Geophyt haarige Blattränder
Monocotyledonic geophyte 22106	Geophyt 2 -Blatt Haarig
Monocotyledonic geophyte 2761	Geophyt broad undulated leaves
Monocotyledonic geophyte 3441	Geophyt curly dicht
Monocotyledonic geophyte US08_6108	Geophyt breitband blau wenige Blä curly
Moraea sp. 20204	Moraea sp.
Ornithogalum sp. 2017	Ornithogalum hoch geschlossene Blattscheide
Ornithogalum sp. 20210	Ornithogalum sp.
Ornithogalum sp. 22007	Ornithogalum sukkulent aufrecht
Ornithogalum sp. 2759	Ornithogalum Rinnenblatt
Osteospermum sp. 20236	Osteospermum Othonna cylindrica Flachblatt
Othonna sp. 124806	Othonna blaugrüne Stiefblätter
Othonna sp. 2023	Othonna stengelumfassend kletternd
Oxalis sp. 1800	Oxalis succ Blätter senkrecht
Oxalis sp. 20205	Oxalis Fabaceae
Oxalis sp. 20235	Oxalis 5-Blatt
Oxalis sp. 21934	Oxalis succ Blasenzellen 3-Blatt
Oxalis sp. 22012	Oxalis lang gestielt
Oxalis sp. 22029	Oxalis aufrecht kleinbl.
Oxalis sp. 2233	Oxalis Bäumchen
Oxalis sp. 2345	Oxalis senkr. Blä.
Oxalis sp. 2445	Oxalis senkr. Blä. behaart
Oxalis sp. 2717	Oxalis mini
Oxalis sp. 3423	Oxalis gestielt Schirm
Oxalis sp. US08_6222	Oxalis kleine Blätter
Pelargonium sp. 124815	Pelargonium krautig, aufrecht, annuell
Pelargonium sp. 20224	Pelargonium Geophyt, breites Petersilienblatt
Pelargonium sp. 21-23	Pelargonium sp.
Pelargonium sp. 21908	Pelargonium Geophytisch
Pharnaceum sp. 2259	Pharnaceum croceum mini
Phyllobolus sp. 20257	Phyllobolus non-nitidus
Poaceae sp. 124829	Dun gras borstig
Poaceae sp. 22069	Gras verzweigt, behaarter Rand
Prismatocarpus sp. 3052	Prismatocarpus sp.
Pteronia sp. 124818	Pteronia haarig annuell
Pteronia sp. 2895	Pteronia Lanzenspitze
Rumex sp. 21905	Rumex Spatelblatt
Ruschia sp. 124796	Ruschia knu. Fensterrand 6 loc
Ruschia sp. 124809	Ruschia last. - ähnlich
Ruschia sp. 132028	Ruschia Lampranthus kleine Blätter 6-Fach
Ruschia sp. 20228	Ruschia seidig
Ruschia sp. 21952	Ruschia viridifolia subvital
Ruschia sp. 22026	Ruschia sp.
Ruschia sp. 22122	Ruschia non-robusta
Ruschia sp. 4025	Ruschia cf. stricta kleine Blätter 7-8 Fach
Ruschia sp. US07_2384	Ruschia Polster unordentlich
Ruschia sp. US07_2473	Ruschia 15cm Hereroa-Blä
Ruschia sp. US07_2659	Ruschia A. solida-ähnlich
Ruschia subg. Tumidula sp. 2485	Ruschia subg. Tumidulae verdornte Infloreszenz
Ruschia subg. Tumidula sp. 3818	Ruschia subg. Tumidulae ohne Dornen
Ruschia subg. Tumidula sp. 4078	Ruschia subg. Tumidulae locker
Ruscus sp. 124827	Ruscus crypt. Blä.
Salsola sp. 20223	Salsola seidig
Salsola sp. 20239	Salsola blattlos grün
Salsola sp. US07_2312	Salsola grau
Scrophulariaceae sp. 124805	Scrophulariaceae langer Stiel gekn. Blü
Scrophulariaceae sp. 21905	Scrophulariaceae gelb-weiß
Scrophulariaceae sp. 21906	Scrophulariaceae weiße Miniblütenbüschel
Scrophulariaceae sp. 21918	Scrophulariaceae haarig weiß gelbe miniblüten
Scrophulariaceae sp. 21924	Scrophulariaceae strauch gelbe Blüten
Scrophulariaceae sp. US08_6109	Scrophulariaceae einz. kl. Blü.
Selago sp. 2582	Selago sp.
Senecio sp. 2594	Senecio sp.
Spergularia sp. 20244	Spergularia media
Stipagrostis zeyheri subsp. zeyheri	Stipagrostis zeyheri ssp. Zeyheri
Thesium sp. 20250	Thesium wirtelig
Thesium sp. US07_2398	cf. Thesium sp.
Trachyandra sp. 1670	Trachyandra thin leaves
Trachyandra sp. 3013	Trachyandra groß succ Rinnenblätter
Tripteris sp. 22029	Tripteris glatte Blätter
Tripteris sp. 2928	Tripteris non-oppositifolia
Tylecodon reticulatus subsp. reticulatus	Tylecodon reticulatus ssp. reticulatus
Wahlenbergia sp. 124789	Wahlenbergia Strauch
Wahlenbergia sp. 124821	Wahlenbergia verzweigt blau
Wahlenbergia sp. 2470	Wahlenbergia androsacea gewellter Blattrand
Zaluzianskya sp. 21994	Zaluzianskya sp.
Zygophyllum sp. US07_2788	Zygophyllum feines Bl.

Appendix S2. Complete synoptic table of the proposed vegetation classes (Cl.), orders (O.), alliances (All.), and associations (A. or CA. = central association). The displayed values are percentage constancies in the plots belonging to a particular association and means of the association constancies in the case of higher syntaxa. Each species is assigned to the lowest syntaxonomic rank were it is characteristic, and within a certain syntaxon, the character species are arranged according to decreasing phi-values. Phi-values (standardised for equal plot numbers per association) are indicated with superscript (phi > 0.5: **; phi > 0.25: *; phi > 0: °). Character species are highlighted in dark grey at the lowest level where they are diagnostic and in light grey in case of transgressive character species at the highest level where they are diagnostic. This shading is also transferred to the subordinate units to the right. To the left of its name, each species is classified whether it can be considered as regional character species of one or of several syntaxa. Further, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems (Pr.; * = problem plant; ** problem and exotic plant; Wells et al. 1986).

Character taxon				LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl.	O.	All.	A.				Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.
							Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
							Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
							Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
							Class 1 - Hermannio trifurcae Zygophylletea morgsanae																																
1				T	1	*	Oncosiphon suffruticosum	28.7	48*	12	44°	52*	22	5	13	.	42°	68*	52*	22	5	.	42°	67°	69°	13	82*	61°	2	36°	5	44°	11	13	.	.	.
							Order 1.1 - Hermannio trifurcae-Othonnetalia cylindricae																																
1	1.1			Cmes	3		Hermannia trifurca	16.1	34*	3	47*	18°	1	6	.	75*	63*	25°	18°	1	6	75*	63*	6	44°	42°	5	6	2	.	.	.	.	3	.	15	13
							Alliance 1.1.1 - Othonnion cylindricae																																
	1.1	1.1.1	1.1.1.1	Cmes	1		Othonna cylindrica	3.1	11*	.	20*	.	.	.	.	58**	21°	.	.	.	.	58**	21°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1.1	1.1.1	1.1.1.1	H	1	*	Stipagrostis ciliata	7.0	20*	1	35**	.	2	1	.	75**	53*	6	.	2	1	75**	53*	.	13°	.	.	.	.	.	.	6	.	.	.	.	4
		1.1.1	1.1.1.1	Pnan			Lebeckia sp. 20271	1.1	5°	.	8*	.	.	.	.	33**	.	.	.	.	.	33**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Scrophulariaceae sp. 124805	1.1	5°	.	8*	.	.	.	.	33**	.	.	.	.	.	33**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1.1	1.1.1	1.1.1.1	T	1	*	Oncosiphon grandiflorum	2.5	7°	1	13*	.	1	1	.	42**	5°	2	.	1	1	42**	5°	.	3	.	.	.	2	.	.	.	.	3	.	.	.
	1.1	1.1.1	1.1.1.1	H	1	*	Stipagrostis zeyheri subsp. zeyheri	4.5	13*	0	19*	5	.	1	.	50*	21°	2	5	.	1	50*	21°	.	3	8°	.	6°	.	.	.	.	.	.	.	.	4
		1.1.1	1.1.1.1	Pnan	1		Asparagus sp. US07_2679	0.8	4°	.	6°	.	.	.	.	25*	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cnan			Felicia sp. 124816	0.8	4°	.	6°	.	.	.	.	25*	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Helichrysum sp. 124804	0.8	4°	.	6°	.	.	.	.	25*	.	.	.	.	.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	H	3		Ehrharta melicoides	2.0	6°	.	8°	4°	.	.	.	33*	.	.	4°	.	.	33*	.	.	3°	8°	.	3°	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cmes	1		Ruschia sp. US07_2384	1.1	4°	.	6°	2	.	.	.	25*	.	.	2	.	.	25*	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Pelargonium sp. 124815	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cmes			Brownanthus sp. 124828	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	H	1		Cladoraphis spinosa	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cnan			Conicosia sp. 20270	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	n.a.			Gnidia sp. US07_2782	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	n.a.			Pteronia sp. 124818	0.6	2°	.	4°	.	.	.	.	17*	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	H			Cymbopogon cf. marginatus	2.0	6°	.	7°	4°	.	.	.	25*	.	2	4°	.	.	25*	.	.	3°	.	5°	6°	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Pnan			Asparagus crispus	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	G			Ferraria sp. US07_2858	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Heliophila coronopifolia	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Hirpicium sp. 124820	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Dicotyledonic therophyte 124825	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	G			Lachenalia anguinea	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cmes			Pelargonium sp. 21-23	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cmes			Monocotyledoneae sp. 124827	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	G			Trachyandra sp. 3013	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Ursinia speciosa	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	T			Wahlenbergia sp. 124821	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cmes			Zygophyllum sp. US07_2788	0.3	1°	.	2°	.	.	.	.	8*	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.1	1.1.1.1	Cmes	1		Euphorbia decussata	3.4	7°	2	8°	5°	1	3	.	25*	5°	2	5°	1	3	25*	5°	.	3	.	5°	10°	.	.	5°	.	.	.	9°	5°	.
1	1.1	1.1.1	1.1.1.1	T			Pharnaceum sp. 2259	6.5	15*	1	20*	9°	.	2	.	33*	16°	16°	9°	.	2	33*	16°	22°	9°	8°	9°	10°	.	.	.	.	.	.	.	.	8°
	1.1	1.1.1	1.1.1.1	H			Arctotis undulata	3.9	10°	1	15*	3	1	1	.	25*	11°	11°	3	1	1	25*	11°	17°	6°	8°	.	.	2	.	.	.	.	.	.	.	4
							Alliance 1.1.2 - Stipagrostio obtusae-Othonnion sedifoliae																																
1		1.1.2	1.1.2.1	Pnan	1		Ruschia subg. Tumidula sp. 3818	10.4	20*	3	27*	11°	3	3	.	8	84**	7	11°	3	3	8	84**	6	9	13°	9	13°	.	7	.	6	.	13°	.	.	4
		1.1.2	1.1.2.1	T			Scrophulariaceae sp. 21905	1.4	4°	.	7°	.	.	.	.	.	26**	.	.	.	.	.	26**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	H	2		Stipagrostis obtusa	3.4	7°	0	9°	5°	.	1	.	.	37*	.	5°	.	1	.	37*	.	.	4°	.	10°	.	.	.	.	.	3°	.	.	.
	1.1	1.1.2	1.1.2.1	T			Scrophulariaceae sp. 21906	2.8	7°	1	12*	.	2	.	.	8°	37*	2	.	2	.	8°	37*	.	3	.	.	.	.	.	.	6°	.	.	.	.	.
		1.1.2	1.1.2.1	T			Rumex sp. 21905	1.1	3°	.	5°	.	.	.	.	.	21*	.	.	.	.	.	21*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1.1	1.1.2	1.1.2.1	T			Felicia microsperma	1.7	5°	.	9*	.	.	.	.	8°	26*	.	.	.	.	8°	26*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1.1	1.1.2	1.1.2.1	T			Lyperia tristis	3.1	7°	0	11*	1	.	1	.	.	32*	7°	1	.	1	.	32*	11°	3	4°	.	.	.	.	.	.	.	.	.	.	4°
		1.1.2	1.1.2.1	T			Silene clandestina	1.7	4°	.	6°	1	.	.	.	.	21*	2	1	.	.	.	21*	.	3°	.	.	3°	.	.	.	.	.	.	.	.	.	.

Character taxon			LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl.	O.	All.	A.			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
						Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
						Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
						Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
		1.1.2	1.1.2.1	Cmes		Lampranthus densipetalus	1.4	3°	1	5°	.	.	2°	.	.	21*	.	.	.	2°	.	21*	.	.	.	.	.	.	.	.	.	11°	.	.	.	.
	1.1	1.1.2	1.1.2.1	Cmes	3	Othonna sedifolia	15.8	24°	13	38*	5	8	20°	.	17	68*	33°	5	8	20°	17	68*	50°	16	13	.	3	5	14	.	13	33°	10	18°	15	25°
	1.1	1.1.2	1.1.2.1	G		Lapeirousia arenicola	2.0	5°	.	9*	.	.	.	.	8°	21*	3°	.	.	.	8°	21*	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Trichogyne lerouxiae	2.3	5°	.	8°	2	.	.	.	.	21*	6°	2	.	.	.	21*	6°	6°	.	5°	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Phyllopodium cf. phyllopodioides	0.6	2°	.	3°	.	.	.	.	.	11*	.	.	.	.	.	11*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Prismatocarpus sp. 3052	0.6	2°	.	3°	.	.	.	.	.	11*	.	.	.	.	.	11*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Wahlenbergia sessiliflora	0.6	2°	.	3°	.	.	.	.	.	11*	.	.	.	.	.	11*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Lotononis parviflora	2.5	4°	2	6°	1	.	4°	.	.	21*	2	1	.	4°	.	21*	.	3°	.	.	3°	.	.	.	.	11°	3°	.	.	4°
		1.1.2	1.1.2.1	T		Pharnaceum croceum	2.8	7°	.	8°	5°	.	.	.	8°	21*	2	5°	.	.	8°	21*	.	3°	4°	.	10°	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Arctotheca calendula	0.8	2°	.	3°	.	.	.	.	.	11*	2°	.	.	.	.	11*	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	T		Arctotis auriculata	0.8	2°	.	3°	2°	.	.	.	.	11*	.	2°	.	.	.	11*	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.2	1.1.2.1	G		Lachenalia sp. 2763	2.8	5°	2	7°	1	1	4°	.	8°	21*	.	1	1	4°	8°	21*	.	.	.	.	3°	2	.	.	.	11°	3°	.	5°	.
		1.1.2		G		Ornithoglossum vulgare	3.9	7°	3	11°	1	1	7°	.	8°	26*	4	1	1	7°	8°	26*	6°	3	4	.	.	2	.	.	.	11°	3	18°	.	.
						Alliance 1.1.3 - Grielo humifusi-Galenion sarcophyllae																																
		1.1.3		Cmes	3	Galenia sarcophylla	26.8	33°	17	39°	26°	32°	9	.	.	16	70*	26°	32°	9	.	16	78*	63*	4	27°	45°	30°	43°	10	44°	.	10	18	10	8
						Association 1.1.3.1 - Grielo humifusi-Othonnetum sedifoliae																																
	1.1	1.1.3	1.1.3.1	T		Grielum humifusum	10.1	21*	4	36*	.	5	3	.	17°	32°	48*	.	5	3	17°	32°	78**	19°	.	.	.	2	.	5	13°	.	.	.	.	17°
		1.1.3	1.1.3.1	T		Zaluzianskya affinis	14.6	21°	9	34*	3	20°	2	.	8	11	59*	3	20°	2	8	11	83**	34°	4	5	.	23°	21°	5	31°	.	.	.	.	8
	1.1	1.1.3	1.1.3.1	T	1	Helichrysum alsinoides	13.8	27*	3	42*	7	3	4	.	.	53*	58*	7	3	4	.	53*	78*	38°	4	5	13	.	7	.	6	.	6	.	.	13
	1.1	1.1.3	1.1.3.1	T		Gazania tenuifolia	8.2	16*	2	26*	3	5	.	.	8°	26°	35*	3	5	.	8°	26°	44*	25°	.	5	3	7	.	.	13°	.	.	.	.	.
			1.1.3.1	G		Oxalis sp. US08_6222	0.6	2°	.	3°	.	.	.	.	.	.	6°	.	.	.	.	.	11*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
			1.1.3.1	T		Scrophulariaceae sp. US08_6109	0.6	2°	.	3°	.	.	.	.	.	.	6°	.	.	.	.	.	11*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	1.1	1.1.3	1.1.3.1	T	1	Karroochloa schismoides	45.4	67*	24	74*	56°	39	14	13	42°	74°	91*	56°	39	14	42°	74°	100*	81°	46°	59°	65°	34	29	30	63°	.	26	.	20	25
		1.1.3	1.1.3.1	T	2	Stipa capensis	3.4	7°	0	9°	4°	1	.	.	.	.	17*	4°	1	.	.	.	22*	13°	13°	.	.	2	.	.	.	.	.	.	.	.
		1.1.3	1.1.3.1	H		Lotononis falcata	0.8	2°	.	4°	.	.	.	.	.	.	7*	.	.	.	.	.	11*	3°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
						Association 1.1.3.2 - Emico australis-Lebeckietum multiflorae																																
			1.1.3.2	T	*	Emex australis	1.4	2°	.	4°	.	.	.	.	.	.	8*	.	.	.	.	.	.	16*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
			1.1.3.2	T		Poaceae sp. 124829	1.1	2°	.	3°	.	.	.	.	.	.	6°	.	.	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		1.1.3	1.1.3.2	T		Arctotis fastuosa	1.7	3°	.	5°	.	.	.	.	.	.	11*	.	.	.	.	.	6°	16*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	1.1	1.1.3	1.1.3.2	Pnan	2	Lebeckia multiflora	26.2	41*	14	57*	19	25	8	.	42°	53°	67*	19	25	8	42°	53°	56°	78*	29°	14	13	20	36°	5	38°	.	3	18	.	21
		1.1.3	1.1.3.2	T	1	** Salsola kali	1.4	3°	.	5°	.	.	.	.	.	.	9*	.	.	.	.	.	6°	13*	.	.	.	.	.	.	.	.	.	.	.	.
			1.1.3.2	T		Malva parviflora var. parviflora	1.1	2°	.	2°	1°	.	.	.	.	.	5°	1°	.	.	.	.	.	9*	.	.	3°	.	.	.	.	.	.	.	.	.	.	.
						Order 1.2 - Berkheyo fruticosae-Rhoetalia undulatae																																
	1.2	1.2.1		T	1	Heliophila variabilis	22.0	30°	12	9	57*	16	10	.	.	.	18	57*	16	10	.	.	11	25°	67*	59*	45°	7	29°	5	25°	.	19°	.	10	21°
	1.2	1.2.1		Cmes	3	Berkheya fruticosa	11.3	18°	4	3	39*	.	8	.	.	11°	.	39*	.	8	.	11°	.	.	21°	50*	45*	.	.	.	.	.	9	20°	13°
	1.2	1.2.1		T	1	Bromus pectinatus	12.4	20°	5	4	40*	12°	.	.	.	.	8	40*	12°	.	.	.	.	16°	17°	59*	45*	5	36°	.	6	.	.	.	.	.
	1.2	1.2.1		Cmes		Crassula expansa subsp. expansa	5.4	10*	.	1	23*	.	.	.	.	.	2	23*	.	.	.	.	.	3	17°	27*	26*	.	.	.	.	.	.	.	.	.	.
	1.2	1.2.1		Pmic	2	Rhus incisa	4.8	9°	.	.	22*	.	.	.	.	.	.	22*	.	.	.	.	.	.	29*	14°	23°	.	.	.	.	.	.	.	.	.
	1.2	1.2.1		Cmes	3	Microloma sagittatum	9.6	16°	3	3	34*	2	4	.	.	5	3	34*	2	4	.	5	.	6	46*	36*	19°	.	7	.	.	.	10°	.	10°	.
1	1.2			Pnan	2	* Zygophyllum morgsana	14.4	30*	1	20°	44*	1	1	.	58*	5	8	44*	1	1	58*	5	.	16°	25°	36°	71*	2	.	.	.	.	.	.	.	4
	1.2	1.2.1		Pnan	3	Didelta spinosa	5.6	11*	.	2	23*	.	.	.	.	.	3	23*	.	.	.	.	.	6°	25*	18°	26*	.	.	.	.	.	.	.	.	.
	1.2	1.2.1		T	1	Aizoon canariense	16.1	26*	5	12	43*	6	4	.	.	11	20°	43*	6	4	.	11	11	28°	42°	36°	52*	.	7	.	19°	.	16°	.	5	.
	1.2	1.2.1		Cmes	1	Crassula muscosa var. obtusifolia	3.4	6°	.	.	15*	.	.	.	.	.	.	15*	.	.	.	.	.	.	13°	14°	19*	.	.	.	.	.	.	.	.	.
	1.2	1.2.1		Pnan		Solanum giftbergense	3.1	6°	.	.	14*	.	.	.	.	.	.	14*	.	.	.	.	.	.	.	18*	23*	.	.	.	.	.	.	.	.	.	.
	1.2	1.2.1		Pnan	3	Thesium lineatum	3.4	7°	.	1	14*	.	.	.	.	5°	.	14*	.	.	.	5°	.	.	13°	14°	16°	.	.	.	.	.	.	.	.	.
	1.2	1.2.1		T		Hebenstretia parviflora	8.5	13°	3	6	23*	2	4	.	.	11°	6	23*	2	4	.	11°	.	13°	29°	27°	13°	2	.	.	6	.	10°	.	5	4
	1.2	1.2.1		Pnan	1	* Euphorbia mauritanica	8.5	13°	4	6	22*	4	5	.	8°	.	7	22*	4	5	8°	.	11°	3	25°	23°	19°	2	7	.	6	.	3	.	.	21°
	1.2	1.2.1		T		Helichrysum leontonyx	15.2	19°	10	7	33*	5	14°	13	.	.	15°	33*	5	14°	.	.	11	19°	33°	41°	26°	2	7	.	13	11	23°	.	20°	17°
	1.2	1.2.1		T		Leysera tenella	18.6	28°	9	21°	37*	3	15	.	.	26°	29°	37*	3	15	.	26°	17°	41°	54*	27°	29°	.	.	.	13	22°	13	.	20°	21°
						Association 1.2.1.1 - Ruschio goodiae-Lebeckietum sericeae																																
	1.2	1.2.1	1.2.1.1	Cmes	1	Ruschia goodiae	5.9	10°	3	.	22*	4	3	.	.	.	.	22*	4	3	.	.	.	.	58**	9°	.	.	14°	.	.	.	6°	9°	.	.
			1.2.1.1	T		Helichrysum sp. 124788	1.1	2°	.	.	6°	.	.	.	.	.	.	6°	.	.	.	.	.	.	17*	.	.	.	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.1	Pnan	1	Lebeckia sericea	4.2	9°	.	3	17*	.	.	.	8°	.	2	17*	.	.	8°	.	.	3	33*	9°	10°	.	.	.	.	.	.	.	.	.
	1.2		1.2.1.1	T		Ehrharta pusilla	25.6	34°	17	23	48*	11	25°	.	8	53°	15	48*	11	25°	8	53°	6	25°	88*	27°	29°	2	29°	5	6	.	23	9	60°	33°

Character taxon			LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl.	O.	All.	A.			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.
						Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
						Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
						Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
	1.2	1.2.1	1.2.1.1	T			Tribolium utriculosum	14.6	20°	9	6	39*	7	13	.	.	5	9	39*	7	13	.	5	11	6	54*	36°	26°	.	14°	.	13	11	19°	.	25°	8
			1.2.1.1	Cmes	3		Hirpicium alienatum	5.1	5°	4	1	11°	.	9°	.	.	5°	.	11°	.	9°	.	5°	.	.	29*	.	3	.	.	.	.	.	6°	9°	20°	8°
			1.2.1.1	T			Arctotis acaulis	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.
			1.2.1.1	Cmes			Chrysocoma ciliata	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.
			1.2.1.1	Pnan			Nylandtia spinosa	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.
			1.2.1.1	Cmes			Asteraceae sp. 124786	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	8*	.	.	.	.	.	.	.	.	.	.	.
			1.2.1.1	Cmes	1	*	Sarcostemma viminale	2.0	3°	1	.	8°	2	.	.	.	.	.	8°	2	.	.	.	.	.	17*	5°	3°	.	7°	.	.	.	.	.	.	.
			1.2.1.1	Cmes	3		Wiborgia monoptera	1.4	2°	1	.	4°	.	2°	.	.	.	.	4°	.	2°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	5°	4°
						Association 1.2.1.2 - Drosanthemo hispidi-Manochlamydetum albicantis																																	
	1.2	1.2.1	1.2.1.2	Cmes	3		Manochlamys albicans	9.6	15°	3	7	26*	2	5	.	.	.	14°	26*	2	5	.	.	.	28°	13°	55*	10°	.	7	.	.	.	10°	9°	.	8°
	1.2	1.2.1	1.2.1.2	T	3	**	Atriplex semibaccata	6.8	12°	2	5	20*	.	4	.	.	.	10°	20*	.	4	.	.	11°	9°	8°	45*	6°	.	.	.	.	.	6°	.	5	8°
	1.2		1.2.1.2	Cmic	2		Drosanthemum hispidum	37.2	43°	27	30	59*	43°	19	.	.	11	55°	59*	43°	19	.	11	44°	66°	33	100*	45°	27	79°	5	63°	11	42°	.	25	17
1	1.2	1.2.1	1.2.1.2	T			Lepidium desertorum	6.2	13*	0	9°	19*	1	.	.	8°	5	11°	19*	1	.	8°	5	17°	6°	.	36*	19°	2	.	.	.	.	.	.	.	.
1	1.2	1.2.1	1.2.1.2	Pnan	2		Lycium ferocissimum	15.5	28*	4	21°	38*	2	5	.	25°	26°	16°	38*	2	5	25°	26°	.	31°	17°	59*	39°	5	.	5	.	.	3	9	5	8
			1.2.1.2	T			Crassula strigosa	1.4	3°	.	.	7°	.	.	.	.	.	.	7°	.	.	.	.	.	.	.	14*	6°	.	.	.	.	.	.	.	.	.	.
			1.2.1.2	Pnan	1	*	Galenia africana	5.6	10°	1	6°	16°	2	1	.	.	11°	6°	16°	2	1	.	11°	.	13°	8°	27*	13°	.	7°	.	.	.	3	.	.	.
						Association 1.2.1.3 - Antizomato miersianae-Stoeberietum utilis																																	
	1.2	1.2.1	1.2.1.3	Pnan	2		Antizoma miersiana	5.4	9°	.	.	21*	.	.	.	.	.	.	21*	.	.	.	.	.	.	13°	.	52**	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.3	Pnan	1		Asparagus burchelli	8.7	15*	1	5	29*	2	1	.	.	5	8°	29*	2	1	.	5	17°	.	.	18°	68**	.	7°	.	.	.	.	.	5	.
	1.2	1.2.1	1.2.1.3	Pnan	2		Stoeberia utilis	8.2	14*	1	3	29*	1	1	.	8°	.	2	29*	1	1	8°	.	.	3	4	23°	61**	.	.	5	.	.	.	.	.	4
	1.2	1.2.1	1.2.1.3	Pnan	2		Montinia caryophyllacea	4.5	8°	.	.	18*	.	.	.	.	.	.	18*	.	.	.	.	.	.	8°	5°	42**	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.3	Pmic	3		Rhus undulata	10.7	19*	1	1	43**	1	1	.	.	.	2	43**	1	1	.	.	.	3	25°	36*	68**	.	.	5	.	.	3	.	.	.
	1.2	1.2.1	1.2.1.3	T	1		Ehrharta longiflora	11.8	18°	3	3	37*	4	3	.	.	.	6	37*	4	3	.	.	.	13°	.	41*	71**	2	7	.	6	.	6	.	5	4
			1.2.1.3	T			Senecio sisymbriifolius	2.5	4°	.	.	10*	.	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	29**	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.3	T			Jamesbrittenia racemosa	5.4	7°	1	1	15*	1	1	.	.	.	3	15*	1	1	.	.	6°	.	.	5°	42**	5°	.	.	.	.	6°	.	.	.
	1.2	1.2.1	1.2.1.3	T			Felicia tenera	3.4	5°	0	.	12*	.	1	.	.	.	.	12*	.	1	.	.	.	.	.	5°	32*	.	.	.	.	.	3°	.	.	.
	1.2	1.2.1	1.2.1.3	Cmes	1	*	Ballota africana	3.1	5°	.	.	13*	.	.	.	.	.	.	13*	.	.	.	.	.	.	4°	5°	29*	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.3	Cmes	1		Thesium sp. 20250	2.5	4°	.	.	10*	.	.	.	.	.	.	10*	.	.	.	.	.	.	8°	.	23*	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.3	Cmes			Lotononis digitata	2.8	5°	.	.	12*	.	.	.	.	.	.	12*	.	.	.	.	.	.	8°	5°	23*	.	.	.	.	.	.	.	.	.
	1.2	1.2.1	1.2.1.3	T			Tripteris amplectens	10.4	16°	3	4	33*	5	2	.	.	.	8	33*	5	2	.	.	.	16°	21°	32°	45*	2	7	.	13°	.	3	.	5	.
	1.2	1.2.1	1.2.1.3	Cmes	1		Hermannia amoena	5.1	8°	1	2	17*	.	2	.	.	5°	2	17*	.	2	.	5°	.	3	13°	9°	29*	.	.	.	.	.	.	.	5°	4°
			1.2.1.3	T			Felicia merxmuelleri	8.7	11°	6	8	15°	3	9°	.	.	16°	7	15°	3	9°	.	16°	6	9°	.	5	42*	.	.	5	6	11°	6	9°	10°	8°
			1.2.1.3	H	3	*	Ehrharta calycina	4.2	5°	2	.	11°	2	3°	.	.	.	.	11°	2	3°	.	.	.	.	8°	.	26*	.	.	.	6°	.	3	.	10°	4°
			1.2.1.3	H			Dianthus namaensis	0.8	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.
			1.2.1.3	H			Dipogon sp. 2054	1.4	2°	.	.	6°	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	5°	13*	.	.	.	.	.	.	.	.	.
	1.2		1.2.1.3	Pnan	3		Tripteris oppositifolia	7.0	9°	5	.	21*	.	6	25°	.	.	.	21*	.	6	.	.	.	.	13°	14°	35*	.	.	.	.	.	6	9°	5	8°
			1.2.1.3	G			Wachendorfia multiflora	3.7	6°	1	4°	9°	2	.	.	.	11°	3	9°	2	.	.	11°	6°	.	4°	.	23*	2	.	.	6°	.	.	.	.	.
						Class 2 - Didelto carnosae-Cephalophylletea inaequalis																																	
2				T	3		Didelta carnosa	51.3	25	73*	22	30	73°	73*	75°	8	37	20	30	73°	73*	8	37	22	19	42	41	6	64°	86°	75°	69°	56°	74°	82°	70°	83°
2				Cmic	2		Zygophyllum cordifolium	30.4	14	41*	11	19	42°	45°	13	.	21	11	19	42°	45°	.	21	6	16	8	36°	13	43°	86*	15	25	11	26	55°	60°	75°
						Order 2.1 - Mesembryanthemo guerichani-Eberlanzietalia cyathiformis																																	
	2.1	2.1.1		T	1		Mesembryanthemum guerichianum	47.6	49°	37	42	59°	79*	10	.	17	5	72°	59°	79*	10	17	5	94*	50°	25	82°	71°	84°	93*	40	100*	.	26	9	5	13
	2.1	2.1.1		Cmes	1		Psilocaulon dinteri	31.8	23	36°	21	26	65*	18	13	.	11	36°	26	65*	18	.	11	28	44°	13	59°	6	57°	71°	70°	63°	11	6	45°	.	25
	2.1	2.1.1		Cmes	3		Salsola sp. US07_2312	41.4	25	55*	38	7	78*	41	38	17	42	47°	7	78*	41	17	42	78°	16	4	14	3	80°	57°	95*	81°	33	19	73°	20	58°
2	2.1	2.1.1		Cmes	3		Eberlanzia cyathiformis	31.3	11	36*	13	9	55*	29°	.	.	5	22	9	55*	29°	.	5	17	28°	.	18	10	84*	7	40°	88*	11	45°	27°	30°	29°
						Association 2.1.1.1 - Foveolino dichotomae-Eberlanzietum cyathiformis																																	
	2.1	2.1.1	2.1.1.1	T	2		Foveolina dichotoma	30.7	15	36°	19	9	63*	23	.	8	21	23	9	63*	23	8	21	28°	19	4	14	10	84*	50°	60°	56°	22	32°	36°	5	17
						Association 2.1.1.2 - Antimimato komkansicae-Zygophylletum cordifoliae																																	
			2.1.1.2	Cmes	2		Antimima komkansica	13.8	7	18°	2	13	26°	16°	.	.	5	2	13	26°	16°	.	5	.	3	4	27°	6	20°	57*	25°	.	.	13	27°	15°	25°
			2.1.1.2	G	3		Oxalis pes-caprae	33.2	30	31°	26	35°	48°	24	.	.	16	45°	35°	48°	24	.	16	61°	28	8	55°	42°	34°	86*	15	56°	.	32°	.	45°	42°
			2.1.1.2	Cmes	3		Hermannia cuneifolia var. glabrescens	6.8	6	8°	2	12°	13°	5	.	.	5	2	12°	13°	5	.	5	.	3	4	23°	10°	2	36*	.	13°	.	3	9°	10°	4
			2.1.1.2	H			Cyphia sp. 2010	1.1	1	2°	1	.	4°	1	.	.	.	3°	.	4°	1	.	.	6°	.	.	.	.	.	14*	.	.	.	.	.	5°	.
			2.1.1.2	T	3		Nemesia anisocarpa	5.9	3	6°	1	6°	10°	5	.	.	.	3	6°	10°	5	.	.	6°	.	.	9°	10°	11°	29*	.	.	.	6°	.	10°	8°
			2.1.1.2	Cmes	1		Crassula pyramidalis	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.

Character taxon				LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl.	O.	All.	A.				Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
							Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
							Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
							Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
			2.1.1.2	Cmes	1		Crassula rudolfii	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.
			2.1.1.2	G			Freesia sp. 2776	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.
			2.1.1.2	G			Monocotyledonic geophyte 14786	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.
			2.1.1.2	G			Pelargonium sp. 21908	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.
			2.1.1.2	Cmes			Pelargonium grandicalcaratum	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.
			2.1.1.2	G			Trachyandra tortilis	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	7*	.	.	.	.	.	.	.
							Association 2.1.1.3 - Cheiridopsio robustae-Cephalophylletum inaequalis																																	
2			2.1.1.3	Cnan	2		Cheiridopsis robusta	13.2	2	23*	3	.	29°	22°	.	.	5	3	.	29°	22°	.	5	.	6	.	.	.	23°	14°	80*	.	44°	19°	36°	5	4
			2.1.1.3	Cmes	2		Lampranthus otzenianus	1.1	.	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	2°	.	15*	.	.	.	.	.	.
			2.1.1.3	Cmic	2		Eberlanzia dichotoma	1.4	.	3°	.	.	5°	2°	.	.	.	.	.	5°	2°	.	.	.	.	.	.	.	.	.	20*	.	11°	.	.	.	.
							Order 2.2 - Euphorbio hamatae-Cephalophylletalia inaequalis																																	
2	2.2	2.2.1		Cnan	1		Cephalophyllum inaequale	40.6	6	74**	5	8	56°	93**	50°	.	16	2	8	56°	93**	.	16	.	3	25	.	.	16	50°	65°	94°	100*	90°	82°	95°	96*
	2.2	2.2.1		Cmes	3		Euphorbia hamata	13.0	4	23*	.	10	5	41*	.	.	.	.	10	5	41*	.	.	.	.	25°	5	.	2	7	5	6	67*	10	18°	65*	46°
2	2.2	2.2.1		H	3		Gazania krebsiana subsp. krebsiana	8.7	1	20*	.	2	.	35*	25°	.	.	.	2	.	35*	.	.	.	.	.	5	.	.	.	.	.	44°	10	45*	55*	21°
	2.2	2.2.1		Cnan	1		Phyllobolus prasinus	10.4	1	20*	.	3	11	31*	.	.	.	.	3	11	31*	.	.	.	.	8	.	.	14°	14°	15°	.	56*	13°	27°	50*	8
	2.2	2.2.1		Cmes	2		Ruschia viridifolia	12.7	9	17°	.	20°	1	33*	.	.	.	.	20°	1	33*	.	.	.	.	21°	5	35°	2	.	.	.	67*	13	9	55*	21°
	2.2	2.2.1		Cmes	3		Tetragonia fruticosa	38.9	41	42°	44°	36	16	69*	13	83°	58°	18	36	16	69*	83°	58°	11	25	50°	18	39	2	29	15	19	78°	74°	45°	85°	63°
	2.2	2.2.1		Cmes	2		Leipoldtia cf. crassulifera	4.8	.	11°	.	.	3	20*	.	.	.	.	.	3	20*	.	.	.	.	.	.	.	.	.	.	.	13°	33*	10°	27°	25°	4
	2.2	2.2.1		Cmes	3		Tetragonia verrucosa	20.8	16	27°	2	34°	8	43*	25°	.	5	2	34°	8	43*	.	5	.	3	50°	36°	16	5	7	15	6	33°	16	55°	65*	46°
	2.2	2.2.1		T	2		Gorteria diffusa subsp. diffusa	35.8	26	42°	9	48°	34	56*	.	.	11	14	48°	34	56*	.	11	6	22	92*	32	19	11	29	35	63°	78°	61°	9	70°	63°
	2.2	2.2.1		G			Oxalis sp. 2345	3.1	.	5°	.	.	.	10*	.	.	.	.	.	.	10*	.	.	.	.	.	.	.	.	.	.	.	.	11°	19°	.	20*	.
							Association 2.2.1.1 - Halliantho plani-Ruschietum leucospermae																																	
			2.2.1.1	Cnan	1		Hallianthus planus	2.0	.	6°	.	.	1	12*	.	.	.	.	.	1	12*	.	.	.	.	.	.	.	.	5°	.	56**	3	.	.	.
2	2.2	2.2.1	2.2.1.1	Cmes	1		Ruschia leucosperma	11.8	1	23*	.	3	14°	35*	.	.	.	.	3	14°	35*	.	.	.	.	8	.	.	.	7	25°	25°	89**	52*	9	20°	4
			2.2.1.1	G			Lachenalia framesii	0.6	.	2°	.	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.	22*	.	.	.	.
			2.2.1.1	Cmes			Vanzijlia annulata	2.3	1	4°	.	2	.	9°	.	.	.	.	2	.	9°	.	.	.	.	4°	.	3°	.	.	.	.	33*	6°	.	.	4°
			2.2.1.1	G			Eriospermum sp. 1817	0.8	0	2°	.	1	.	4°	.	.	.	.	1	.	4°	.	.	.	.	.	.	3°	.	.	.	.	22*	.	.	.	.
2	2.2	2.2.1	2.2.1.1	Cmes	1		Sarcocaulon l´heritieri	9.0	1	20*	1	1	10	28*	13°	.	5	.	1	10	28*	.	5	.	.	4	.	.	5	.	30°	6	67*	6	27°	25°	17°
			2.2.1.1	G			Bulbine torta	1.1	.	3°	.	.	.	6°	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	22*	6°	.	.	.
			2.2.1.1	Cmes	1		Octopoma connatum	3.1	1	6°	.	2	1	10°	.	.	.	.	2	1	10°	.	.	.	.	4°	.	3	.	.	5°	.	33*	6°	.	.	13°
			2.2.1.1	T			Cotula leptalea	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.
			2.2.1.1	Cmes			Crassula expansa subsp. pyrifolia	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.
			2.2.1.1	Cmic	1		Ruschia sp. US07_2473	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.
			2.2.1.1	Cmes	1		Ruschia sp. 22122	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.
			2.2.1.1	Cmes	1		Salsola sp. 20239	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.
			2.2.1.1	Cmes	1	*	Tylecodon reticulatus subsp. reticulatus	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.
							Association 2.2.1.2 - Leipoldtio schultzei-Cephalophylletum inaequalis																																	
			2.2.1.2	Cmes			Antimima sp. 2386	2.8	0	4°	.	1	.	7°	.	.	.	.	1	.	7°	.	.	.	.	.	.	3°	.	.	.	.	.	23*	9°	.	4°
			2.2.1.2	Cmes	1		Leipoldtia schultzei	32.4	27	35°	27	26	35°	42°	.	17	37°	28	26	35°	42°	17	37°	33°	22	42°	14	23	9	21	40°	69°	56°	90*	9	15	42°
							Association 2.2.1.3 - Pteronio glabratae-Cephalophylletum inaequalis																																	
2			2.2.1.3	Cnan			Ruschia sp. 124796	6.8	.	20*	.	.	5	25*	50*	.	.	.	.	5	25*	.	.	.	.	.	.	.	5	.	15°	.	11	.	100**	15°	.
	2.2	2.2.1	2.2.1.3	Cmes			Antimima sp. US07_2582	5.6	1	13°	.	1	2	19*	25°	.	.	.	1	2	19*	.	.	.	.	4	.	.	2	.	5	.	.	3	55*	25°	13°
			2.2.1.3	Cmes	3		Tripteris sinuata var. sinuata	1.4	1	3°	.	1	.	6°	.	.	.	.	1	.	6°	.	.	.	.	4°	.	.	.	.	.	.	.	18*	10°	.
			2.2.1.3	G			Albuca sp. 1636	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	Cmes			Antimima sp. 21985	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	G			Chlorophytum sp. 1887	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	Cmic			Euphorbia caput-medusae	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	Cmes	3		Hermannia cuneifolia var. cuneifolia	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	G			Lachenalia sp. 1644	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	G			Lapeirousia spinosa	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	Cmes	1		Monilaria chrysoleuca	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	n.a.			Othonna sp. 124806	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	G			Oxalis sp. 22012	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
			2.2.1.3	Cmes			Pelargonium ceratophyllum	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	9*	.	.

Character taxon			LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl.	O.	All.	A.			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
						Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
						Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
						Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
		2.2.1.3	Cmic			Ruschia sp. 20228	0.3	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	.	.	9*	.	.
		2.2.1.3	Cmes	3		Pteronia glabrata	9.9	2	17°	2	2	18°	15°	25°	.	5	2	2	18°	15°	.	5	.	3	.	5	.	23°	21°	15°	13°	.	3	45*	5	21°
						Association 2.2.1.4 - Drosanthemo curtophylli-Meyerophytetum meyeri																																
		2.2.1.4	Cmes	2		Drosanthemum curtophyllum	10.4	3	17°	1	4	7	29*	.	.	5	.	4	7	29*	.	5	.	.	8	5	.	.	29°	.	.	11	6	9	75**	42°
2.2	2.2.1	2.2.1.4	Cmes	2		Thesium elatius	3.7	1	6°	1	1	.	12*	.	.	5°	.	1	.	12*	.	5°	.	.	4°	.	.	.	.	.	.	11°	.	.	40*	8°
2.2	2.2.1	2.2.1.4	Cmes	3		Pteronia ciliata	6.5	2	12°	.	4	.	23*	.	.	.	.	4	.	23*	.	.	.	.	8°	5	.	.	.	.	.	22°	.	18°	60*	17°
		2.2.1.4	H			Cyphia longiflora	1.4	.	2°	.	.	.	5°	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	20*	.
		2.2.1.4	Cmes	2		Meyerophytum meyeri	12.7	4	22*	.	9	9	37*	.	.	.	.	9	9	37*	.	.	.	.	17°	9	.	.	29°	.	6	11	23°	55*	70*	25°
		2.2.1.4	Cmes	1		Aloe krapohliana	0.6	.	1°	.	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10*	.
		2.2.1.4	G	1		Bulbine sedifolia	1.4	.	3°	.	.	1	5°	.	.	.	.	.	1	5°	.	.	.	.	.	.	.	.	.	5°	.	.	.	9°	15*	.
		2.2.1.4	Cmes			Ruschia sp. 21952	2.8	.	5°	.	.	1	9°	.	.	.	.	.	1	9°	.	.	.	.	.	.	.	.	.	5°	.	11°	10°	.	20*	4°
						Association 2.2.1.5 - Ruschio versicoloris-Cephalophylletum inaequalis																																
		2.2.1.5	Cmes	1		Ruschia versicolor	20.6	19	21°	16	22°	11	33°	.	17	32°	7	22°	11	33°	17	32°	6	9	50°	14	3	5	21°	5	13	.	13	18	35°	100**
						Unit 2.3																														
2.3	2.3.x	2.3.x.x	Cmes	3		Salsola sp. 20223	2.0	.	9°	.	.	.	.	88**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cmic	1		Jacobsenia vaginata	2.8	.	10°	.	.	1	4	75**	.	.	.	.	1	4	.	.	.	.	.	.	.	.	2	.	.	.	.	18°	.	4
2.3	2.3.x	2.3.x.x	Cmic	1		Dicrocaulon ramulosum	2.5	.	8°	.	.	.	4	63**	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	20°	.
2.3	2.3.x	2.3.x.x	Cmic	1		Dicrocaulon spissum	1.1	.	4°	.	.	.	1	38**	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
2.3	2.3.x	2.3.x.x	Cnan	1		Adromischus filicaulis subsp. filicaulis	0.6	.	3°	.	.	.	.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan			Spergularia sp. 20244	0.6	.	3°	.	.	.	.	25*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	T	1		Mesembryanthemum nodiflorum	1.1	.	3°	.	.	1	1	25*	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	4°
2.3	2.3.x	2.3.x.x	Cmes			Drosanthemum ramosissimum	1.1	.	4°	.	.	3°	.	25*	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	5°	6°	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cmic			Afrolimon namaquanum	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cmes			Antimima sp. 124808	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan	1		Conophytum concavum	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan	1		Crassula susannae	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan	1		Euphorbia celata	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	T			Gazania lichtensteinii	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	G			Othonna cuneata	0.3	.	1°	.	.	.	.	13*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cmic			Hirpicium sp. US07_2511	1.4	.	5°	.	.	.	5°	25*	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	18°	5°	.
2.3	2.3.x	2.3.x.x	Cnan			Senecio aloides	1.4	.	5°	.	.	.	5°	25*	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	18°	5°	.
2.3	2.3.x		Cmes			Aspazoma amplectens	1.7	.	6°	.	.	.	6°	25*	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	22*	.	.	10°	.
2.3	2.3.x	2.3.x.x	G			Othonna incisa	0.6	.	2°	.	.	.	1	13*	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
2.3	2.3.x	2.3.x.x	H			Lessertia sp. 20203	0.6	.	2°	.	.	1°	.	13*	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	T	1	*	Mesembryanthemum hypertrophicum	2.8	1	5°	2	.	5°	2	25*	.	.	4°	.	5°	2	.	.	6°	3	.	.	.	5°	.	10°	6°	.	.	9°	.	.
						Differential species (one-sided)																														
			Cnan			Pharnaceum confertum var. brachyphyllum	12.1	11°	11	3	21°	1	20°	.	.	5	3	21°	1	20°	.	5	.	6	42*	9	13°	.	.	5	.	.	10	.	50*	42*
			Cmes			Othonna arbuscula	7.3	2	18°	1	3	5	22°	50*	.	5	.	3	5	22°	.	5	.	.	8	.	.	2	7	5	6	33°	3	45*	20°	8
			Cmic	3		Limeum africanum	5.6	12°	1	16°	7°	2	1	.	25°	32*	5	7°	2	1	25°	32*	.	9°	21°	.	.	.	7°	.	.	.	3	.	.	4
			Cmic	1		Galenia meziana	3.9	11°	1	15*	6°	.	1	.	33*	26°	.	6°	.	1	33*	26°	.	.	4	14°	.	.	.	.	.	.	.	.	5°	.
			Cnan	3		Peliostomum virgatum	2.5	4°	.	4°	5°	.	.	.	.	.	8°	5°	.	.	.	.	.	16*	13°	.	3°	.	.	.	.	.	.	.	.	.
			T			Heliophila lactea	2.0	5°	1	9°	.	2	.	.	17°	21*	.	.	2	.	17°	21*	.	.	.	.	.	.	.	.	.	6°	.	.	.	.	.
			Cmic	1		Othonna rechingeri	1.4	.	5°	.	.	.	8°	13°	.	.	.	.	.	8°	.	.	.	.	.	.	.	.	.	.	.	22*	.	18°	.	.
						Companion species																														
			Cmes	3		Galenia fruticosa	66.2	56	70°	44	72°	74°	80°	.	33	63	39	72°	74°	80°	33	63	22	56	71°	86°	58	70°	79°	70°	75°	78°	65°	82°	95°	83°
			G			Trachyandra revoluta	51.3	47	52°	48	45	54°	58°	13	25	53°	57°	45	54°	58°	25	53°	67°	47	54°	45	35	45	43	70°	56°	67°	58°	27	60°	79°
			T	3		Dimorphotheca sinuata	39.2	42°	29	39°	46°	45°	22	.	.	37°	60°	46°	45°	22	.	37°	44°	75°	50°	64°	26	32	64°	15	69°	11	65°	.	5	29
			T			Tetragonia microptera	38.0	42°	26	30	57°	49°	12	.	.	11	55°	57°	49°	12	.	11	67°	44°	29	73°	68°	64°	50°	15	69°	.	19	9	15	17
			T	2	**	Atriplex lindleyi subsp. inflata	29.6	23	28°	18	28°	43°	17	25	8	.	33°	28°	43°	17	8	.	.	66°	17	59°	10	52°	64°	25	31°	.	19	18	15	33°
			Pnan	2		Aridaria noctiflora subsp. noctiflora	21.7	15	28°	8	25°	30°	32°	.	.	11	11	25°	30°	32°	.	11	.	22	25°	41°	10	9	50°	35°	25°	11	13	55°	50°	29°
			Cnan	3		Hypertelis salsoloides var. salsoloides	18.6	16	18°	14	17	10	29°	.	.	21°	18°	17	10	29°	.	21°	6	31°	29°	9	13	5	7	10	19°	33°	52°	18°	20°	21°
			Cmes	1		Asparagus capensis	16.1	19°	16	15	24°	6	27°	.	42°	16	2	24°	6	27°	42°	16	.	3	21°	36°	16	5	7	5	6	.	19°	55°	40°	21°
			T			Amellus microglossus	14.9	10	15°	8	14°	23°	7	25°	.	5	13°	14°	23°	7	.	5	11	16°	.	32°	10	34°	14°	25°	19°	.	16°	9	5	4
			G			Trachyandra falcata	14.6	16°	13	22°	9	22°	8	.	25°	37°	13	9	22°	8	25°	37°	.	25°	13	14	.	25°	43°	.	19°	.	6	9	15°	8

Character taxon			LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl.	O.	All.	A.			Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
						Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
						Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
						Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
			G			Chlorophytum crassinerve	13.8	17°	10	8	30°	8	13	.	.	26°	3	30°	8	13	.	26°	.	6	38°	32°	19°	2	7	10	13	.	13°	9	25°	17°
			G			Oxalis obtusa	13.8	11	12°	3	23°	18°	10	.	.	11	.	23°	18°	10	.	11	.	.	8	23°	39°	25°	14°	20°	13°	.	6	27°	5	13°
			Pnan	2		Lycium oxycarpum	13.2	14°	12	7	25°	16°	11	.	.	5	11	25°	16°	11	.	5	6	16°	13	36°	26°	9	43°	.	13	.	10	36°	5	4
			Pnan	1		Stoeberia frutescens	12.1	11°	11	6	18°	8	15°	.	8	11	3	18°	8	15°	8	11	.	6	4	18°	32°	5	29°	.	.	11	19°	.	25°	21°
			Cnan	2		Phyllobolus trichotomus	11.8	3	20°	1	5	18°	25°	.	.	5	.	5	18°	25°	.	5	.	.	8	5	3	9	36°	15°	13	33°	19°	9	45°	17°
			G			Phyllobolus sinuosus	9.9	7	11°	1	15°	9	16°	.	.	5	.	15°	9	16°	.	5	.	.	29°	9	6	2	14°	.	19°	11°	26°	9	20°	13°
			G			Albuca cooperi	8.7	13°	6	14°	12°	6	7	.	.	11°	23°	12°	6	7	.	11°	33°	13°	25°	.	10°	2	14°	.	6	11°	6	9°	5	4
			T			Chenopodium album	8.2	10°	3	6	15°	7°	1	.	.	.	12°	15°	7°	1	.	.	11°	13°	4	23°	19°	18°	.	5	6°	.	.	.	5	.
			T	1	*	Tripteris clandestina	6.8	7°	5	3	11°	8°	4	.	.	.	6°	11°	8°	4	.	.	6	6°	13°	9°	13°	7°	7°	10°	6°	.	6°	.	10°	4
			Pnan	2		Zygophyllum retrofractum	6.5	9°	4	5	14°	1	7°	.	.	.	9°	14°	1	7°	.	.	.	19°	4	18°	19°	.	.	5	.	11°	3	9°	5	4
			Cmes	2		Trachyandra involucrata	6.2	8°	5	1	17°	7°	3	.	.	5	.	17°	7°	3	.	5	.	.	17°	23°	13°	.	29°	.	.	.	3	.	5	8°
			T			Dorotheanthus bellidiformis subsp. hestermalens	5.9	12°	1	10°	15°	.	2	.	8°	21°	4	15°	.	2	8°	21°	6	3	13°	23°	10°	.	.	.	.	3	.	.	8°
			T			Wahlenbergia androsacea	5.9	12°	1	10°	14°	2	.	.	8°	.	16°	14°	2	.	8°	.	17°	16°	17°	9°	16°	.	7°	.	.	.	.	.	.	.
			Cmes			Antimima sp. 124810	5.6	3	9°	.	8°	3	15°	.	.	.	.	8°	3	15°	.	.	.	.	13°	5	6	.	7°	5	.	22°	6	18°	15°	13°
			T			Manulea corymbosa	5.6	4	6°	5	2	3	10°	.	.	11°	4	2	3	10°	.	11°	6°	3	4	.	3	.	.	5	6°	.	13°	.	15°	21°
			Cmic			Helichrysum dregeanum	5.1	5	6°	1	9°	.	6°	25°	.	5°	.	9°	.	6°	.	5°	.	.	13°	5	10°	.	.	.	.	.	10°	.	10°	13°
			T			Pentaschistis airoides	5.1	6°	5	4	9°	2	10°	.	17°	.	.	9°	2	10°	17°	.	.	.	17°	5	6°	.	.	.	6°	22°	6°	.	20°	.
			Pnan	2		Ruschia subg. Tumidula sp. 2485	5.1	10°	3	9°	10°	7°	.	.	8°	26°	2	10°	7°	.	8°	26°	.	3	17°	14°	.	.	21°	.	6°	.	.	.	.	.
			Cmes			Phyllobolus spinuliferus	4.8	1	7°	.	3	7°	8°	.	.	.	.	3	7°	8°	.	.	.	.	.	9°	.	11°	7°	10°	.	11°	3	9°	10°	8°
			Cmes			Crassula muscosa var. muscosa	4.5	2	5°	.	6°	2	9°	.	.	.	.	6°	2	9°	.	.	.	.	13°	5°	.	.	7°	.	.	.	10°	.	20°	17°
			G			Babiana sp. 2210	4.2	4°	4	3	5°	5°	4	.	.	11°	2	5°	5°	4	.	11°	.	3	8°	5°	3	.	21°	.	.	.	6°	.	5°	8°
			Cnan	2		Cephalophyllum pillansii	4.2	6°	2	3	10°	2	3	.	.	11°	2	10°	2	3	.	11°	.	3	17°	9°	3	.	7°	.	.	.	10°	.	.	4°
			Cmes	3		Asparagus fasciculatus	3.9	3	4°	1	5°	4°	4°	.	.	.	2	5°	4°	4°	.	.	.	3	4°	5°	6°	5°	.	5°	6°	.	6°	.	10°	4°
			Cmes	3		Hermannia sp. 124822	3.9	8°	1	9°	8°	.	2	.	17°	5°	6°	8°	.	2	17°	5°	.	13°	.	14°	10°	.	.	.	.	11°	.	.	.	.
			Cmes	2		Pelargonium karooicum	3.9	3	5°	.	7°	5°	6°	.	.	.	.	7°	5°	6°	.	.	.	.	8°	9°	3	.	7°	5°	6°	.	.	.	20°	8°
			G			Oxalis sp. 2233	3.7	5°	3	6°	4°	.	5°	.	.	16°	4°	4°	.	5°	.	16°	6°	3	13°	.	.	.	.	.	11°	6°	.	5°	4°
			G			Chlorophytum undulatum	3.4	4	4°	3	5°	5°	4°	.	.	11°	.	5°	5°	4°	.	11°	.	.	4°	5°	6°	5°	14°	.	.	22°	.	.	.	.
			Pnan	3		Lycium cinereum	3.4	5°	1	1	11°	2	1	.	.	.	2	11°	2	1	.	.	.	3°	8°	9°	16°	.	.	.	6°	.	.	.	.	4°
			T			Plantago cafra	3.4	6°	1	5°	7°	2	1	.	.	.	10°	7°	2	1	.	.	11°	9°	.	18°	3°	.	7°	.	.	.	3°	.	.	.
			G			Asparagus multituberosus	3.1	4°	2	.	10°	4°	.	.	.	.	.	10°	4°	.	.	.	.	.	4°	9°	16°	2	14°	.	.	.	.	.	.	.
			T			Manulea cheiranthus	3.1	4°	1	3°	5°	1	2	.	.	5°	4°	5°	1	2	.	5°	6°	3°	4°	.	10°	2	.	.	.	.	6°	.	.	4°
			T			Zaluzianskya benthamiana	3.1	6°	1	6°	6°	2	.	.	8°	.	7°	6°	2	.	8°	.	11°	3°	4°	5°	10°	2	.	.	6°	.	.	.	.	.
			H			Cyphia crenata	2.8	2	4°	1	3	3°	5°	.	.	.	3	3	3°	5°	.	.	6°	.	.	9°	.	.	7°	.	6°	.	3°	9°	5°	8°
			G			Oxalis clavifolia	2.8	4°	2	4°	4°	.	4°	.	.	.	7°	4°	.	4°	.	.	11°	3°	4°	.	6°	.	.	.	.	.	.	.	10°	8°
			G			Oxalis sp. 20205	2.8	4°	1	.	10°	.	2	.	.	.	.	10°	.	2	.	.	.	.	17°	14°	.	.	.	.	.	.	3°	.	5°	4°
			Cmes			Zygophyllum spinosum	2.8	4°	2	4°	4°	.	4°	.	.	16°	.	4°	.	4°	.	16°	.	.	13°	.	.	.	.	.	.	.	.	.	10°	8°
			Pnan	3		Asparagus bayeri	2.5	3°	1	.	7°	2°	.	.	.	.	.	7°	2°	.	.	.	.	.	4°	5°	13°	7°	.	.	.	.	.	.	.	.
			G			Oxalis ambigua	2.5	4°	1	5°	3°	3°	.	.	.	11°	5°	3°	3°	.	.	11°	.	9°	4°	5°	.	.	.	5°	6°	.	.	.	.	.
			G			Oxalis cf. gracilis	2.5	1	3°	2	.	4°	3°	.	.	.	3°	.	4°	3°	.	.	.	6°	.	.	.	2°	7°	.	6°	.	3°	.	5°	8°
			G			Pelargonium leipoldtii	2.5	2	4°	3	1	5°	4°	.	.	5°	3	1	5°	4°	.	5°	6°	.	4°	.	.	2	14°	5°	.	.	.	18°	.	.
			Pnan	1		Pteronia divaricata	2.5	5°	1	6°	4°	2	.	.	.	16°	3°	4°	2	.	.	16°	.	6°	4°	5°	3°	.	7°	.	.	.	.	.	.	.
			Cmes	2		Ruschia stricta	2.5	3°	1	.	7°	.	3°	.	.	.	.	7°	.	3°	.	.	.	.	13°	5°	3°	.	.	.	.	.	6°	.	.	8°
			T			Tripteris hyoseroides	2.5	4°	0	1	9°	.	1	.	.	.	2	9°	.	1	.	.	.	3°	13°	5°	10°	.	.	.	.	.	3°	.	.	.
			Cnan	1		Antimima sp. 2496	2.3	2	2°	2°	1	5°	.	.	.	.	4°	1	5°	.	.	.	6°	3°	4°	.	.	7°	7°	5°	.	.	.	.	.	.
			H	3		Ehrharta barbinodis	2.3	4°	1	2°	6°	.	2	.	.	5°	2	6°	.	2	.	5°	.	3°	.	14°	3°	.	.	.	.	.	.	.	5°	4°
			Pnan	2		Euphorbia burmannii	2.3	6°	.	8°	4°	.	.	.	17°	16°	.	4°	.	.	17°	16°	.	.	8°	5°	.	.	.	.	.	.	.	.	.	.
			G			Ferraria uncinata subsp. macrochlamys	2.3	1	3°	.	1	4°	2°	.	.	.	.	1	4°	2°	.	.	.	.	4°	.	.	5°	7°	.	6°	.	3°	.	5°	4°
			H	2		Fingerhuthia africana	2.3	4°	.	4°	3°	.	.	.	.	5°	6°	3°	.	.	.	5°	.	13°	.	.	10°	.	.	.	.	.	.	.	.	.
			T			Manulea decipiens	2.3	4°	0	2°	7°	.	1	.	.	.	4°	7°	.	1	.	.	6°	3°	4°	9°	6°	.	.	.	.	.	.	.	.	4°
			Cmic			Zygophyllum sessilifolium	2.3	3°	2	1	6°	.	4°	.	.	5°	.	6°	.	4°	.	5°	.	.	13°	5°	.	.	.	.	.	.	.	9°	5°	4°
			G			Albuca maxima	2.0	3°	1	1	6°	2°	.	.	.	.	2	6°	2°	.	.	.	6°	3°	.	5°	13°	.	7°	.	.	.	.	.	.	.	.
			G			Babiana sinuata	2.0	2°	2	1	3°	.	4°	.	.	5°	.	3°	.	4°	.	5°	.	3°	8°	.	.	.	.	.	.	.	.	.	15°	4°
			G			Monocotyledonic geophyte 2761	2.0	0	3°	1	.	5°	2	.	.	.	2	.	5°	2	.	.	.	3°	.	.	.	5°	14°	.	.	.	.	.	.	.	8°
			H			Kedrostis psammophylla	2.0	4°	1	6°	.	2	1	.	.	11°	7°	.	2	1	.	11°	11°	3°	.	.	.	.	.	.	6°	.	.	.	.	.	4°
			G			Trachyandra bulbinifolia	2.0	1	2°	.	1	2°	3°	.	.	.	.	1	2°	3°	.	.	.	.	4°	.	.	2°	.	5°	.	.	10°	.	5°	.
			Cnan			Amphiglossa tomentosa	1.7	1	2°	.	3°	.	4°	.	.	.	.	3°	.	4°	.	.	.	.	8°	.	.	.	.	.	.	.	.	.	.	10°	8°
			G			Androcymbium scabromarginatum	1.7	1	3°	.	2	5°	2	.	.	.	.	2	5°	2	.	.	.	.	.	5°	.	2°	.	10°	6°	.	.	9°	.	.

Character taxon	LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl. O. All. A.				Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
				Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
				Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
				Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
	Cmes			Anthospermum dregei subsp. dregei	1.7	2°	1	.	5°	.	2°	.	.	.	.	5°	.	2°	.	.	.	.	8°	5°	3°	.	.	.	.	.	.	.	10°	.
	Cmes	2		Crassula subaphylla var. subaphylla	1.7	0	3°	.	1	.	5°	.	.	.	.	1	.	5°	.	.	.	.	.	.	3°	.	.	.	.	11°	6°	.	.	8°
	G			Ornithogalum sp. 2759	1.7	1	2°	1	.	3°	2°	.	.	.	3°	.	3°	2°	.	.	6°	.	.	.	.	5°	7°	.	.	.	.	.	10°	.
	T	3		Osteospermum pinnatum var. pinnatum	1.7	1	2°	.	2°	3°	1	.	.	.	.	2°	3°	1	.	.	.	.	.	5°	.	7°	.	5°	.	.	.	.	5°	.
	G			Oxalis sp. 1800	1.7	.	3°	.	.	.	6°	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	6°	9°	10°	4°
	T			Pelargonium minimum	1.7	2°	1	3°	1	3°	.	.	.	5°	4°	1	3°	.	.	5°	6°	3°	.	.	3°	.	.	.	13°	.	.	.	.	.
	Cnan			Quaqua mammillaris	1.7	0	2°	1	.	3°	2°	.	.	.	2°	.	3°	2°	.	.	.	3°	.	.	.	.	.	10°	.	.	3°	.	.	8°
	T			Senecio abruptus	1.7	1	2°	1	2	5°	.	.	.	.	3°	2	5°	.	.	.	6°	.	.	5°	.	5°	14°	.	.	.	.	.	.	.
	T			Senecio arenarius	1.7	2°	1	1	3°	.	2°	.	.	.	2°	3°	.	2°	.	.	.	3°	8°	.	.	.	.	.	.	.	10°	.	.	.
	G			Trachyandra sp. 1670	1.7	2°	1	1	3°	2	2°	.	.	5°	.	3°	2	2°	.	5°	.	.	.	5°	3°	.	.	.	6°	.	.	.	.	8°
	G			Babiana sp. 1765	1.4	1	2°	1	2	2	3°	.	.	5°	.	2	2	3°	.	5°	.	.	.	5°	.	.	.	.	6°	11°	.	.	5°	.
	Cnan	1		Conophytum bilobum	1.4	1	3°	.	2	.	6°	.	.	.	.	2	.	6°	.	.	.	.	.	5°	.	.	.	.	.	11°	.	9°	5°	4°
	Cmes	2		Crassula subaphylla var. virgata	1.4	.	3°	.	.	2°	3°	.	.	.	.	.	2°	3°	.	.	.	.	.	.	.	5°	.	5°	.	11°	.	.	5°	.
	H	3		Ehrharta capensis	1.4	4°	.	2°	6°	.	.	.	8°	.	.	6°	.	.	8°	.	.	.	8°	9°	.	.	.	.	.	.	.	.	.	.
	Cmes	3		Indigofera heterophylla	1.4	2°	0	.	5°	.	1	.	.	.	.	5°	.	1	.	.	.	.	4°	5°	6°	.	.	.	.	.	3°	.	.	.
	Cmes	1	*	Tylecodon wallichii	1.4	2°	2	.	4°	2°	2°	.	.	.	.	4°	2°	2°	.	.	.	.	.	9°	3°	.	7°	.	.	.	.	9°	.	.
	H			Acanthopsis cf. carduifolia	1.1	2°	1	1	3°	.	1°	.	.	.	2°	3°	.	1°	.	.	.	3°	8°	.	.	.	.	.	.	.	.	.	5°	.
	Cnan	1		Crassula elegans	1.1	2°	1	.	4°	1°	.	.	.	.	.	4°	1°	.	.	.	.	.	4°	5°	3°	.	.	5°	.	.	.	.	.	.
	T			Crassula vaillantii	1.1	2°	1	.	4°	2°	.	.	.	.	.	4°	2°	.	.	.	.	.	.	9°	3°	.	7°	.	.	.	.	.	.	.
	Cmes	2		Drosanthemum sp. 21969	1.1	.	2°	.	.	3°	1°	.	.	.	.	.	3°	1°	.	.	.	.	.	.	.	5°	7°	.	.	.	.	.	5°	.
	Cmes	2		Eriocephalus microphyllus var. pubescens	1.1	1°	1	.	2°	2°	1	.	.	.	.	2°	2°	1	.	.	.	.	4°	.	3°	.	.	.	6°	.	.	.	.	4°
	Cmes			Euphorbia ephedroides	1.1	1°	1	1°	2°	.	2°	.	.	5°	.	2°	.	2°	.	5°	.	.	.	5°	.	.	.	.	.	.	3°	9°	.	.
	G			Monocotyledonic geophyte 3441	1.1	1°	1	1°	1°	1	1	.	.	.	2°	1°	1	1	.	.	.	3°	4°	.	.	2°	.	.	.	.	3°	.	.	.
	Cmes	3		Helichrysum hebelepis	1.1	2°	.	.	5°	.	.	.	.	.	.	5°	.	.	.	.	.	.	4°	.	10°	.	.	.	.	.	.	.	.	.
	Cmes			Kleinia longiflora	1.1	2°	.	.	5°	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	5°	10°	.	.	.	.	.	.	.	.	.
	G			Lapeirousia sp. 21958	1.1	1	1°	1	2°	.	3°	.	.	5°	.	2°	.	3°	.	5°	.	.	.	5°	.	.	.	.	.	11°	3°	.	.	.
	G			Ornithogalum sp. 2017	1.1	1°	1	.	3°	2°	1	.	.	.	.	3°	2°	1	.	.	.	.	.	5°	3°	.	.	.	6°	.	3°	.	.	.
	G			Othonna amplexifolia	1.1	2°	0	.	4°	.	1	.	.	.	.	4°	.	1	.	.	.	.	8°	.	3°	.	.	.	.	.	.	.	.	4°
	Cmes	3		Pelargonium crithmifolium	1.1	1	2°	.	2°	2°	.	13°	.	.	.	2°	2°	.	.	.	.	.	.	.	6°	.	7°	.	.	.	.	.	.	.
	T			Ursinia cakilefolia	1.1	2°	1	1°	3°	.	1	.	.	5°	.	3°	.	1	.	5°	.	.	8°	.	.	.	.	.	.	.	.	.	5°	.
	G			Albuca viscosa	0.8	.	2°	.	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.	11°	3°	.	5°	.
	T			Arctotis scullyi	0.8	1	1°	1°	.	.	2°	.	.	5°	.	.	.	2°	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	8°
	Cmes			Arenifera stylosa	0.8	1°	0	.	3°	.	1	.	.	.	.	3°	.	1	.	.	.	.	8°	.	.	.	.	.	.	3°	.	.	.
	Cmes			Asparagus sp. 22034	0.8	2°	0	3°	.	1	.	.	8°	5°	.	.	1	.	8°	5°	.	.	.	.	.	2°	.	.	.	.	.	.	.	.
	G			Babiana sp. 21954	0.8	3°	.	5°	.	.	.	.	8°	11°	.	.	.	.	8°	11°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Bulbine sp. 1820	0.8	1	1°	.	1°	.	3°	.	.	.	.	1°	.	3°	.	.	.	.	4°	.	.	.	.	.	.	11°	3°	.	.	.
	Cmes			Chrysocoma cernua	0.8	1°	0	.	2°	.	1°	.	.	.	.	2°	.	1°	.	.	.	.	4°	.	3°	.	.	.	.	.	.	.	.	4°
	Cmes			Cineraria canescens	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	9°	3°	.	.	.	.	.	.	.	.	.
	T			Cotula coronopifolia	0.8	1	1°	.	2°	2°	1	.	.	.	.	2°	2°	1	.	.	.	.	.	5°	.	.	.	.	6°	.	3°	.	.	.
	Cnan			Crassula tomentosa	0.8	1°	1	.	2°	2°	.	.	.	.	.	2°	2°	.	.	.	.	.	.	.	6°	.	7°	.	.	.	3°	.	.	.
	G			Cyanella hyacinthoides	0.8	1°	0	.	2°	.	1°	.	.	.	.	2°	.	1°	.	.	.	.	4°	.	3°	.	.	.	.	.	3°	.	.	.
	Cmes			Delosperma crassum	0.8	1°	1	.	3°	.	2°	.	.	.	.	3°	.	2°	.	.	.	.	.	5°	3°	.	.	.	.	.	.	9°	.	.
	T			Diascia namaquensis	0.8	2°	.	1°	2°	.	.	.	.	.	3°	2°	.	.	.	.	6°	.	.	.	6°	.	.	.	.	.	.	.	.	.	.
	Cmes			Euryops dregeanus	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	5°	6°	.	.	.	.	.	.	.	.	.	.
	G			Gethyllis sp. 21914	0.8	1°	1	2°	.	.	1°	.	.	.	4°	.	.	1°	.	.	6°	3°	.	.	.	.	.	.	.	.	.	.	5°	.
	G			Haemanthus coccineus	0.8	2°	.	2°	3°	.	.	.	8°	.	.	3°	.	.	8°	.	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.	.
	Cmes			Jacobsenia kolbei	0.8	1°	0	.	3°	.	1	.	.	.	.	3°	.	1	.	.	.	.	.	5°	3°	.	.	.	.	.	3°	.	.	.
	Cmes			Melolobium humile	0.8	2°	.	1°	3°	.	.	.	.	5°	.	3°	.	.	.	5°	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.	.
	Cmic			Meyerophytum globosum	0.8	.	3°	.	.	.	3°	13°	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.	9°	.	4°
	G			Moraea fugax	0.8	2°	.	1°	3°	.	.	.	.	5°	.	3°	.	.	.	5°	.	.	8°	.	.	.	.	.	.	.	.	.	.	.	.
	G			Ornithogalum suaveolens	0.8	.	2°	.	.	2°	2°	.	.	.	.	.	2°	2°	.	.	.	.	.	.	.	2°	.	5°	.	.	.	9°	.	.	.
	Cmes	1		Osteospermum sp. 20236	0.8	2°	1	3°	.	.	1	.	8°	5°	.	.	.	.	8°	5°	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	Cmes			Othonna sp. 2023	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	9°	3°	.	.	.	.	.	.	.	.	.	.
	G			Oxalis sonderiana	0.8	0	1°	.	1°	.	3°	.	.	.	.	1°	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	9°	.	4°
	G			Oxalis sp. 2445	0.8	1	1°	1	1°	.	2°	.	.	.	2°	1°	.	2°	.	.	.	3°	4°	.	.	.	.	.	.	11°	.	.	.	.
	Cmes			Phyllobolus oculatus	0.8	2°	0	2°	1°	.	1	.	8°	.	.	1°	.	1	8°	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	4°
	Pnan	3		Putterlickia pyracantha	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	4°	5°	3°	.	.	.	.	.	.	.	.	.	.

Character taxon Cl. O. All. A.	LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
				Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
				Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
				Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
				Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
	Cmes			Senecio laticipes	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	4°	5°	3°	.	.	.	.	.	.	.	.	.
	Cmes			Senecio sarcoides	0.8	1°	0	.	2°	.	1°	.	.	.	.	2°	.	1°	.	.	.	.	.	.	6°	.	.	.	.	.	3°	.	.	.
	T		*	Ursinia chrysanthemoides	0.8	2°	.	1°	3°	.	.	.	.	5°	.	3°	.	.	.	5°	.	.	8°	.	.	.	.	.	.	.	.	.	.	.
	Cnan			Wahlenbergia oxyphylla	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	8°	5°	.	.	.	.	.	.	.	.	.	.
	Pnan	1		Zygophyllum foetidum	0.8	2°	.	.	4°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	5°	6°	.	.	.	.	.	.	.	.	.
	T	1		Amsinckia retrorsa	0.6	1°	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.
	Cnan			Anacampseros filamentosa subsp. namaquensis	0.6	0°	0	.	1°	.	1°	.	.	.	.	1°	.	1°	.	.	.	.	.	.	3°	.	.	.	.	.	3°	.	.	.
	T			Arctotis cf. hirsuta	0.6	1°	.	1°	1°	.	.	.	.	5°	.	1°	.	.	.	5°	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes			Asparagus alopecurus	0.6	1°	1	.	2°	2°	.	.	.	.	.	2°	2°	.	.	.	.	.	.	5°	.	.	.	.	6°	.	.	.	.	.
	Pnan	1		Asparagus retrofractus	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.
	Pnan	1		Berkheya spinosissima	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.
	G			Bulbine praemorsa	0.6	1°	0	.	2°	.	1°	.	.	.	.	2°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	3°	.	.	.	.
	H	3		Chaetobromus involucratus subsp. dregeanus	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.
	Cnan			Conophytum sp. US06_2214	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	4°	.	3°	.	.	.	.	.	.	.	.	.	.
	Cmes	1		Cotyledon orbiculata var. orbiculata	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	4°	.	3°	.	.	.	.	.	.	.	.	.	.
	T			Cysticapnos vesicaria	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.
	T			Dischisma spicatum	0.6	2°	.	3°	.	.	.	.	8°	.	2°	.	.	.	8°	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Drimia sp. 21898	0.6	0°	0	1°	.	.	1°	.	.	.	2°	.	.	1°	.	.	.	3°	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Pnan			Erythrophysa alata	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.
	Pnan			Euryops tenuissimus	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	4°	.	3°	.	.	.	.	.	.	.	.	.	.
	T			Hebenstretia dentata	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.
	Cmes			Helichrysum cylindriflorum	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	4°	5°	.	.	.	.	.	.	.	.	.	.	.
	T			Heliophila leptophylla	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.	.
	H			Indigofera sp. 3765	0.6	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	6°	.	.	.
	Pnan			Kleinia cephalophora	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	4°	.	3°	.	.	.	.	.	.	.	.	.	.
	Cmes			Lampranthus watermeyeri	0.6	1	1°	.	1°	2°	.	.	.	.	.	1°	2°	.	.	.	.	.	4°	.	.	.	7°	.	.	.	.	.	.	.	.
	G			Lapeirousia cf. silenoides	0.6	.	2°	.	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	11*	.	.	.	.	4°
	T	3		Lessertia diffusa	0.6	1	1°	.	1°	.	2°	.	.	.	.	1°	.	2°	.	.	.	.	4°	.	.	.	.	.	.	.	9°	.	.	.
	Cnan			Lotononis longiflora	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.	.
	G			Massonia depressa	0.6	1°	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Monocotyledonic geophyte 1678	0.6	.	1°	.	.	.	3°	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	7°	5°	.	.	.	.	.	.	.	.
	G			Ornithogalum polyphyllum	0.6	1	1°	.	2°	.	2°	.	.	.	.	2°	.	2°	.	.	.	.	.	5°	.	.	.	.	.	.	9°	.	.	.
	G			Ornithogalum xanthochlorum	0.6	0	1°	1°	.	.	1°	.	.	.	2°	.	.	1°	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	5°	.	.
	G			Othonna oleracea	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.	.
	Cmic			Othonna protecta	0.6	1	1°	.	1°	.	2°	.	.	.	.	1°	.	2°	.	.	.	.	4°	.	.	.	.	.	.	11*	.	.	.	.	.
	G			Pelargonium sp. 20224	0.6	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	2°	.	5°	.	.	.	.	.	.	.
	Cmes			Polymita steenbokensis	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	4°	5°	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Psilocaulon foliosum	0.6	.	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.
	H			Rumex lativalvis	0.6	2°	.	3°	.	.	.	.	8°	5°	.	.	.	.	8°	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes	2		Thesium spinosum	0.6	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	4°	.	3°	.	.	.	.	.	.	.	.	.	.
	G			Trachyandra muricata	0.6	1°	.	1°	2°	.	.	.	.	5°	.	2°	.	.	.	5°	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.
	Pnan	1	*	Tylecodon paniculatus	0.6	0°	0	.	1°	.	1°	.	.	.	.	1°	.	1°	.	.	.	.	.	.	3°	.	.	.	.	.	3°	.	.	.
	Cmes			Tylecodon pearsonii	0.6	1°	.	.	3°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	5°	3°	.	.	.	.	.	.	.	.	.	.
	Pnan			Zygophyllum leptopetalum	0.6	1°	0	.	2°	.	1°	.	.	.	.	2°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	3°	.	.	.	.	.
	Cnan			Adromischus alstonii	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	Cnan			Adromischus marianiae	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	G			Albuca spiralis	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Aloe melanacantha	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	T			Amaranthaceae sp. 4003	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	Cnan			Antimima sp. 14549	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Antimima subg. Clavipes sp. 20212	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	T			Arctotis sp. 3034	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Arenifera sp. 132030	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	Cmes			Asparagus sp. 3827	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	T			Asteraceae sp. 2077	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.
	G			Babiana sp. 21901	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	G			Babiana sp. US07_2643	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.

Character taxon	LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.2.1.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl. O. All. A.				Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
				Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
				Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
				Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
	Pnan			Boscia sp. 22053	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T			Bromus sp. 22033	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	G			Bulbine succulenta	0.3	.	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	.
	T			Campanulaceae sp. 21925	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	H			Cheilanthes deltoidea	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T			Chenopodium murale var. murale	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	T			Chenopodium sp. 14555	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	Cnan			Conophytum minutum subsp. minutum	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	T			Cotula sp. 22024	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cnan			Crassula columnaris subsp. prolifera	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cnan			Crassula cotyledonis	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.
	Cnan			Crassula deceptor	0.3	.	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	.
	Cnan			Crassula pseudohemisphaerica	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes			Crassula pubescens	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmic			Crassula tetragona subsp. rudis	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	Cmes			Crassula umbella	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T			Crotalaria humilis	0.3	.	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	5°	.	.	.	.	.	.
	T			Dimorphotheca pluvialis	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Dimorphotheca tragus	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	T			Ehrharta delicatula	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Pnan	2		Eriocephalus africanus var. paniculatus	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes	2		Eriocephalus namaquensis	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	G			Eriospermum paradoxum	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	T		**	Erodium cicutarium	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	6°	.	.	.	.	.
	Pnan			Euclea tomentosa	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	G			Ferraria sp. 2742	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Pmic			Ficus ilicina	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T			Forsskaolea candida	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	.	6°	.	.	.	.	.
	G			Monocotyledonic geophyte 22106	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	.	6°	.	.	.	.	.
	G			Monocotyledonic geophyte US08_6108	0.3	1°	.	1°	.	.	.	.	.	.	3°	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Monocotyledonic geophyte 21958	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Monocotyledonic geophyte 21982	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	G			Monocotyledonic geophyte 21901	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	G			Gladiolus saccatus	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Gladiolus sp. 3777	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	T			Hebenstretia sp. 2737	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	T			Hemimeris sp. 4283	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	n.a.			Dicotyledonic sp. 21901	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.
	G			Lachenalia sp. 22106	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	.	6°	.	.	.	.	.
	G			Lachenalia sp. 3715	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4°
	G			Lachenalia violacea	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.
	T			Lasiospermum brachyglossum	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Lessertia sp. 21897	0.3	.	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.
	n.a.			Lessertia sp. 2825	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.	.
	n.a.			Lessertia sp. 3061	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Melolobium adenodes	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Monilaria scutata subsp. scutata	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	G			Moraea bifida	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	G			Moraea sp. 20204	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	Cnan			Orbea namaquensis	0.3	.	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.	.	.	.	.	6°	.	.	.	.	.
	G			Ornithogalum sp. 20210	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Ornithogalum sp. 22007	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.	.
	G			Oxalis dregei	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.
	G			Oxalis sp. 20235	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4°
	G			Oxalis sp. 21934	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.	.
	G			Oxalis sp. 22029	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	G			Oxalis sp. 2717	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.

Character taxon	LF	Pal.	Pr.	Species	All	1	2	1.1	1.2	2.1	2.2	2.3	1.1.1	1.1.2	1.1.3	1.2.1	2.1.1	2.2.1	1.1.1.1	1.1.2.1	1.1.3.1	1.1.3.2	1.2.1.1	1.2.1.2	1.1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
Cl. O. All. A.				Rank		Cl.	Cl.	O.	O.	O.	O.	O.	All.	All.	All.	All.	All.	All.	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	CA.	A.	A.	A.	A.	A.
				Corresponding TWINSPAN cluster(s)		1-7	8-17	1-4	5-7	8-11	13-17	12	1	2	3-4	5-7	8-11	13-17	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17
				Number of associations	17	7	10	4	3	4	5	(1)	1	1	2	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
				Number of plots	355	158	197	81	77	94	95	8	12	19	50	77	94	95	12	19	18	32	24	22	31	44	14	20	16	9	31	11	20	24
	G			Oxalis sp. 3423	0.3	1°	.	1°	.	.	.	.	.	.	3°	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	.
	Pmic			Ozoroa dispar	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmic			Pelargonium dasyphyllum	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmic	3		Pelargonium fulgidum	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes			Pelargonium praemorsum	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Phyllobolus sp. 20257	0.3	.	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.
	n.a.			Poaceae sp. 22069	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	n.a.			Pteronia sp. 2895	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Pnan	3		Pteronia undulata	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T			Raphanus raphanistrum	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes			Ruschia sp. 124809	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	Cmes			Ruschia sp. 132028	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	Cmes			Ruschia sp. 22026	0.3	.	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	.
	Cmes			Ruschia sp. 4025	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	Cmic			Ruschia sp. US07_2659	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	Pnan			Ruschia subg. Tumidula sp. 4078	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes			Salsola zeyheri	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.
	Cmes	1		Salvia dentata	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T	1		Schmidtia kalahariensis	0.3	1°	.	1°	.	.	.	.	.	.	3°	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	.
	T			Scrophulariaceae sp. 21918	0.3	1°	.	1°	.	.	.	.	.	.	3°	.	.	.	.	.	6°	.	.	.	.	.	.	.	.	.	.	.	.	.
	n.a.			Scrophulariaceae sp. 21924	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmic			Selago albida	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	n.a.			Selago cf. glabrata	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Pnan			Selago divaricata	0.3	1°	.	1°	.	.	.	.	.	5°	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	n.a.			Selago sp. 2582	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4°
	Cnan			Senecio sp. 2594	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes			Solanum cf. guineense	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	Cmes	1	*	Stipagrostis brevifolia	0.3	.	1°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5°	.
	Cmes			Teedia lucida	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	n.a.			Thesium sp. US07_2398	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.
	T			Trifolium cf. arvense	0.3	1°	.	.	2°	.	.	.	.	.	.	2°	.	.	.	.	.	.	.	5°	.	.	.	.	.	.	.	.	.	.
	n.a.			Tripteris sp. 22029	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	Cmes			Tripteris sp. 2928	0.3	0°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.
	T			Wahlenbergia sp. 124789	0.3	1°	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	4°	.	.	.	.	.	.	.	.	.	.	.
	T			Wahlenbergia sp. 2470	0.3	.	0°	.	.	.	1°	.	.	.	.	.	.	1°	.	.	.	.	.	.	.	.	.	.	.	.	3°	.	.	.
	T			Zaluzianskya sp. 21994	0.3	0°	.	1°	.	.	.	.	.	.	2°	.	.	.	.	.	.	3°	.	.	.	.	.	.	.	.	.	.	.	.

Appendix S3. Relevé table of the order *Hermannio trifurcae-Othonnetalia sedifoliae* (1.1).

Complete table of the relevés assigned to the *Hermannio-Othonnetalia*. To the left of its name, each species is classified whether it can be considered as regional character species of one or of several syntaxa. Further, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems (Pr.; * = problem plant; ** problem and exotic plant; Wells et al. 1986). Between species names and individual relevés, information at association level is provided, namely constancy, phi-value (calculated on the basis of all 17 units at association level), and mean cover (including those plots without occurrences). Colours are used to indicate species with particularly high constancy, fidelity (phi > 0.5: red; phi > 0.25: blue, phi > 0: green), or cover. On the top of the table, it is indicated to which syntaxa of different rank a certain relevé belongs, with the number in brackets after the association name showing the corresponding TWINSPAN cluster (Fig. 2). Further, the nomenclatural types of the associations and the sources of the individual relevés (0 = Luther-Mosebach (2009); 1 = additional relevés from Röwer (2009)/*heuweltjies*; 2 = BIOTA Observatory; 3 = additional relevés from the commonage 2007 and 2008; 4 = Namaqua National Park; 5 = stock post transect) are indicated.

Order 1.1: *Hermannio trifurcae-Othonnetalia sedifoliae*

Alliance	Association	Sequential No.	Plot No. in database
Alliance 1.1.1: *Othonnion cylindricae*	Association 1.1.1.1: *Oncosiphono grandiflori-Othonnetum cylindricae* (1)	1–12	20236 20254 20268 20269 20270 20271 20272 20273 20274 21957 21987 20267
Alliance 1.1.2: *Stipagrostio obtusae-Othonnion sedifoliae*	Association 1.1.2.1: *Stipagrostio obtusae-Othonnetum sedifoliae* (2)	13–31	20234 20245 21905 21906 21907 21925 21954 21955 21956 21958 21977 21986 22003 22008 22041 22052 22065 22110 22115
Alliance 1.1.3: *Grielo humifusi-Galenion sarcophyllae*	Association 1.1.3.1: *Grielo humifusi-Othonnetum sedifoliae* (3)	32–49	14187 14188 14189 14192 14193 14194 14195 14197 14198 14762 21917 22124 22125 22127 22129 22130 21914 21918
Alliance 1.1.3: *Grielo humifusi-Galenion sarcophyllae*	Association 1.1.3.2: *Emico australis-Lebeckietum multiflorae* (4)	50–81	20202 14789 20210 20211 20255 20276 20277 20278 20279 20280 20281 20282 21891 21910 21911 21912 21915 21916 21919 21920 21933 21979 21980 21994 21995 21999 22007 22018 22019 22068 22072 22111

Header row	Values (relevés 1–81)
Cluster No. (TWINSPAN)	1 (×12), 2 (×19), 3 (×18), 4 (×32)
Nomenclatural type relevé of the association	x (8), x (28), x (32), x (67)
Source	3 3 4 4 4 4 4 4 4 0 0 4 3 3 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 5 5 5 5 5 5 5 5 5 2 0 0 0 0 0 0 3 0 3 2 3 3 3 4 4 4 4 4 4 4 3 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0
Grazing intensity category	1 2 . . . . 2 1 . 1 2 1 1 1 2 1 2 1 2 2 1 1 1 3 3 3 1 1 2 2 2 2 2 2 2 2 2 2 3 2 2 2 2 2 3 3 2 2 3 3 2 . . . . 1 1 1 2 3 3 3 3 2 2 2 3 3 3 1 3 3 3 3 1
Heuweltjie zone	M (22), M (23), F (25), F (27), F (71), F (72), F (73), C (74)

Diagnostic values	LF	Pal.	Pr.	Taxon or field name	All [%]	Const. 1.1.1.1	Const. 1.1.2.1	Const. 1.1.3.1	Const. 1.1.3.2	phi 1.1.1.1	phi 1.1.2.1	phi 1.1.3.1	phi 1.1.3.2	Mean 1.1.1.1	Mean 1.1.2.1	Mean 1.1.3.1	Mean 1.1.3.2	Relevé values (in order)
Alliance 1.1.1 - Othonnion cylindricae																		
1.1 1.1.1 1.1.1.1	Cmes	1		Othonna cylindrica	14	58	21	.	.	64	19	-6	-6	3.5	0.4	.	.	5 15 1.5 6 2 5 7 0.5 0.5 5.5 1
1.1 1.1.1 1.1.1.1	H	1	*	Stipagrostis ciliata	28	75	53	.	13	58	39	-8	3	2.8	0.3	.	0.1	3 0.25 3 5 10 6.1 1.5 0.25 5 0.5 0.1 0.5 4 0.25 0.01 0.1 0.01 0.1 0.5 1.5 0.1 0.1 0.05
1.1.1 1.1.1.1	Pnan			Lebeckia sp. 20271	5	33	.	.	.	57	-4	-4	-4	0.7	.	.	.	1.25 0.5 4 3
1.1.1 1.1.1.1	T			Scrophulariaceae sp. 124805	5	33	.	.	.	57	-4	-4	-4	0.1	.	.	.	0.01 0.05 0.5 0.05
1.1 1.1.1 1.1.1.1	T	1	*	Oncosiphon grandiflorum	9	42	5	.	3	54	3	-5	0	0.6	0.0	.	0.0	0.01 5 1.5 0.01 1 0.02 0.75
1.1 1.1.1 1.1.1.1	H	1	*	Stipagrostis zeyheri subsp. zeyheri	14	50	21	.	3	49	17	-6	-3	1.5	0.1	.	0.0	2.5 3 6 3 1 2 0.25 0.25 0.5 0.5 0.1
1.1.1 1.1.1.1	Pnan	1		Asparagus sp. US07_2679	4	25	.	.	.	49	-3	-3	-3	0.1	.	.	.	1.25 0.1 0.25
1.1.1 1.1.1.1	Cnan			Felicia sp. 124816	4	25	.	.	.	49	-3	-3	-3	0.0	.	.	.	0.02 0.25 0.02
1.1.1 1.1.1.1	T			Helichrysum sp. 124804	4	25	.	.	.	49	-3	-3	-3	0.1	.	.	.	0.02 0.01 1
1.1.1 1.1.1.1	H	3		Ehrharta melicoides	5	33	.	.	.	48	-4	-4	-4	1.4	.	.	.	10 1 3 3
1.1.1 1.1.1.1	Cmes	1		Ruschia sp. US07_2384	4	25	.	.	.	45	-3	-3	-3	1.0	.	.	.	4 5 3
1.1.1 1.1.1.1	T			Pelargonium sp. 124815	2	17	.	.	.	40	-2	-2	-2	0.0	.	.	.	0.05 0.01
1.1.1 1.1.1.1	Cmes			Brownanthus sp. 124828	2	17	.	.	.	40	-2	-2	-2	1.5	.	.	.	15 3
1.1.1 1.1.1.1	H	1		Cladoraphis spinosa	2	17	.	.	.	40	-2	-2	-2	1.3	.	.	.	10 6
1.1.1 1.1.1.1	Cnan			Conicosia sp. 20270	2	17	.	.	.	40	-2	-2	-2	0.0	.	.	.	0.1 0.1
1.1.1 1.1.1.1	n.a.			Gnidia sp. US07_2782	2	17	.	.	.	40	-2	-2	-2	0.2	.	.	.	2 0.01
1.1.1 1.1.1.1	n.a.			Pteronia sp. 124818	2	17	.	.	.	40	-2	-2	-2	0.0	.	.	.	0.25 0.25
1.1.1 1.1.1.1	H			Cymbopogon cf. marginatus	5	25	.	.	3	38	-4	-4	1	0.2	.	.	0.0	1.5 0.5 0.25
1.1.1 1.1.1.1	Pnan			Asparagus crispus	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.25
1.1.1 1.1.1.1	G			Ferraria sp. US07_2858	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.25
1.1.1 1.1.1.1	T			Heliophila coronopifolia	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.01
1.1.1 1.1.1.1	T			Hirpicium sp. 124820	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.5
1.1.1 1.1.1.1	T			Dicotyledonic therophyte 124825	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.01
1.1.1 1.1.1.1	G			Lachenalia anguinea	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.05
1.1.1 1.1.1.1	Cmes			Pelargonium sp. 21-23	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.1
1.1.1 1.1.1.1	Cmes			Monocotyledoneae sp. 124827	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.02
1.1.1 1.1.1.1	G			Trachyandra sp. 3013	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.05
1.1.1 1.1.1.1	T			Ursinia speciosa	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.05
1.1.1 1.1.1.1	T			Wahlenbergia sp. 124821	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.05
1.1.1 1.1.1.1	Cmes			Zygophyllum sp. US07_2788	1	8	.	.	.	28	-2	-2	-2	0.0	.	.	.	0.5
1.1.1 1.1.1.1	Cmes	1		Euphorbia decussata	6	25	5	.	3	27	2	-5	-1	1.0	0.0	.	0.0	2.5 7.5 2.5 0.01 0.05 1.25
1 1.1 1.1.1 1.1.1.1	T			Pharnaceum sp. 2259	17	33	16	22	9	26	9	15	3	0.0	0.0	0.0	0.0	0.1 0.02 0.01 0.01 0.1 0.05 0.05 0.01 0.01 0.01 0.01 0.01 0.05 0.02 0.01 0.02 0.25 0.01
1.1 1.1.1 1.1.1.1	H			Arctotis undulata	12	25	11	17	6	25	8	15	2	0.1	0.0	0.0	0.0	0.25 1 0.25 0.1 0.1 0.1 0.02 0.02 0.02 0.01 0.02 0.01
Alliance 1.1.2 - Stipagrostio obtusae-Othonnion sedifoliae																		
1 1.1.2 1.1.2.1	Pnan	1		Ruschia subg. Tumidula sp. 3818	26	8	84	6	9	-1	61	-4	-1	0.0	3.1	0.1	0.5	0.25 7 3 3 0.05 3.5 6 4.5 5 6 1 1 1.5 3 7 6 0.75 1.5 0.25 12 4
1.1.2 1.1.2.1	T			Scrophulariaceae sp. 21905	6	.	26	.	.	-3	50	-3	-3	.	0.0	.	.	0.01 0.02 0.01 0.01 0.01
1.1.2 1.1.2.1	H	2		Stipagrostis obtusa	9	.	37	.	.	-5	48	-5	-5	.	0.3	.	.	0.1 0.1 0.02 1 0.01 3 1.5
1.1 1.1.2 1.1.2.1	T			Scrophulariaceae sp. 21906	11	8	37	.	3	7	48	-5	0	0.0	0.0	.	0.0	0.01 0.05 0.01 0.01 0.01 0.01 0.01 0.02 0.01
1.1.2 1.1.2.1	T			Rumex sp. 21905	5	.	21	.	.	-3	45	-3	-3	.	0.0	.	.	0.01 0.01 0.01 0.01
1.1 1.1.2 1.1.2.1	T			Felicia microsperma	7	8	26	.	.	11	43	-4	-4	0.0	0.0	.	.	0.01 0.02 0.05 0.02 0.01 0.01
1.1 1.1.2 1.1.2.1	T			Lyperia tristis	11	.	32	11	3	-5	40	11	0	.	0.0	0.0	0.0	0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
1.1.2 1.1.2.1	T			Silene clandestina	6	.	21	.	3	-3	39	-3	3	.	0.0	.	0.0	0.01 0.05 0.01 0.01 0.01
1.1.2 1.1.2.1	Cmes			Lampranthus densipetalus	5	.	21	.	.	-3	35	-3	-3	.	0.1	.	.	1 0.25 1 0.5
1.1 1.1.2 1.1.2.1	Cmes	3		Othonna sedifolia	36	17	68	50	16	-1	33	21	-1	0.1	1.7	5.6	0.3	0.25 1 1 4 0.1 0.01 7 8 1.5 0.1 1.5 1.5 1 1 1.5 6 13 12 0.25 0.3 26 15 10 21 3 2 0.5 4.25 3 0.75
1.1 1.1.2 1.1.2.1	G			Lapeirousia arenicola	9	8	21	6	.	11	33	-4	7	0.0	0.0	.	0.0	0.1 0.01 0.01 0.02 0.01 0.01 0.01
1.1.2 1.1.2.1	T			Trichogyne lerouxiae	9	.	21	6	6	-4	32	6	7	.	0.0	0.1	0.0	0.1 0.01 0.1 0.1 0.01 2 0.05 0.01
1.1.2 1.1.2.1	T			Phyllopodium cf. phyllopodioides	2	.	11	.	.	-2	32	-2	-2	.	0.0	.	.	0.01
1.1.2 1.1.2.1	T			Prismatocarpus sp. 3052	2	.	11	.	.	-2	32	-2	-2	.	0.0	.	.	0.01 0.1
1.1.2 1.1.2.1	T			Wahlenbergia sessiliflora	2	.	11	.	.	-2	32	-2	-2	.	0.0	.	.	0.01 0.01
1.1.2 1.1.2.1	T			Lotononis parviflora	6	.	21	.	3	-4	28	-4	1	.	0.0	.	0.0	0.01 0.01 0.01 0.01 0.02
1.1.2 1.1.2.1	T			Pharnaceum croceum	7	8	21	.	3	9	28	-4	1	0.0	0.0	.	0.0	0.01 0.01 0.05 0.01 0.01 0.05
1.1.2 1.1.2.1	T			Arctotheca calendula	4	.	11	.	3	-2	27	-2	7	.	0.0	.	0.0	0.1 0.05 0.1
1.1.2 1.1.2.1	T			Arctotis auriculata	2	.	11	.	.	-2	26	-2	-2	.	0.0	.	.	0.02 0.01
1.1.2 1.1.2.1	G			Lachenalia sp. 2763	6	8	21	.	.	7	25	-5	-5	0.0	0.0	.	.	0.02 0.01 0.01 0.01 0.01
1.1.2	G			Ornithoglossum vulgare	10	8	26	6	3	4	25	1	-2	0.0	0.0	0.0	0.0	0.01 0.01 0.01 0.02 0.01 0.02 0.01 0.05
Alliance 1.1.3 - Grielo humifusi-Galenion sarcophyllae																		
1.1.3	Cmes	3		Galenia sarcophylla	46	.	16	78	63	-14	-5	32	23	.	0.0	0.2	0.2	0.05 0.02 0.25 0.25 0.01 0.05 0.25 0.5 0.25 0.02 0.05 0.05 0.5 1.5 0.02 0.1 0.25 0.75 0.5 0.5 0.1 0.2 0.2 0.1 0.5 0.1 0.02 0.1 0.25 0.25 0.25 0.1 0.5 0.1 0.5 1.5 0.5 0.5
Association 1.1.3.1 - Grielo humifusi-Othonnetum sedifoliae																		
1.1 1.1.3 1.1.3.1	T			Grielum humifusum	35	17	32	78	19	5	17	54	7	0.1	0.0	0.1	0.2	0.25 0.5 0.01 0.01 0.05 0.25 0.25 0.1 0.01 0.05 0.05 0.25 0.5 0.25 0.1 0.01 0.1 0.01 0.1 0.02 0.01 0.05 0.01 0.01 2 0.5 0.25 0.25 2 0.01
1.1.3 1.1.3.1	T			Zaluzianskya affinis	36	8	11	83	34	-4	-2	50	15	0.0	0.0	0.1	0.0	0.02 0.01 0.02 0.01 0.01 0.02 0.25 0.03 0.1 0.02 0.01 0.01 0.1 0.01 0.01 0.1 0.01 0.01 0.25 0.05 0.02 0.01 0.25 0.01 0.0
1.1 1.1.3 1.1.3.1	T	1		Helichrysum alsinoides	44	.	53	78	38	-10	29	48	18	.	0.2	0.1	0.4	2 1 0.01 0.01 0.01 0.5 0.05 0.5 0.1 0.01 0.25 0.02 0.5 0.01 0.05 0.1 0.01 0.02 0.01 0.01 0.75 0.1 0.25 5 1 3 1.5 0.02 0.2 0.05 0.01 0.01 2 0.1 0.1
1.1 1.1.3 1.1.3.1	T			Gazania tenuifolia	27	8	26	44	25	1	17	34	16	0.0	0.1	0.0	0.1	0.01 0.02 0.02 0.02 0.01 1 0.01 0.05 0.05 0.03 0.02 0.01 0.01 0.02 0.02 0.5 0.1 0.05 0.02 0.1 0.75 0.5
1.1.3.1	G			Oxalis sp. US08_6222	2	.	.	11	.	-2	-2	32	-2	.	.	0.0	.	0.01 0.01
1.1.3.1	T			Scrophulariaceae sp. US08_6109	2	.	.	11	.	-2	-2	32	-2	.	.	0.0	.	0.02 0.01
1 1.1 1.1.3 1.1.3.1	T			Karroochloa schismoides	78	42	74	100	81	0	16	30	20	1.0	0.3	3.7	4.5	1 7 3 1 0.25 0.05 3 0.01 0.02 0.25 0.01 0.5 0.01 0.01 1 0.01 1 0.01 0.01 0.05 0.01 4 5 5 1 7 15 5 10 0.05 2 5 3 3 0.75 0.01 0.01 0.02 0.01 0.25 0.1 60 10 15 0.5 0.1 0.05 0.25 1 0.25 5 20 4 0.02 0.75 0.1 0.05 0.01 1.5 1 0.1 0.05 5 20 0.5
1.1.3 1.1.3.1	T	2		Stipa capensis	10	.	.	22	13	-4	-4	29	14	.	.	2.0	0.5	0.01 0.01 30 6 0.2 1.5 15 1 0.02
1.1.3 1.1.3.1	H			Lotononis falcata	4	.	.	11	3	-2	-2	28	6	.	.	0.0	0.0	0.01 0.01
Association 1.1.3.2 - Emico australis-Lebeckietum multiflorae																		
1.1.3.2	T		*	Emex australis	6	.	.	.	16	-2	-2	-2	39	.	.	.	0.0	0.02 0.05 0.02 0.01 0.05
1.1.3.2	T			Poaceae sp. 124829	5	.	.	.	13	-2	-2	-2	34	.	.	.	0.1	0.5 1 0.5 0.1
1.1.3 1.1.3.2	T			Arctotis fastuosa	7	.	.	6	16	-3	-3	10	32	.	.	0.0	0.0	0.25 0.05 0.25 0.01 1 0.05
1.1 1.1.3 1.1.3.2	Pnan	2		Lebeckia multiflora	62	42	53	56	78	10	16	18	31	1.0	1.1	1.3	1.6	3 1 0.75 3 4 2 0.02 5 0.25 3 1.5 5 3 1.5 5 3 0.05 0.5 4.5 0.1 2 0.05 0.2 4 2 6 4 1.25 3.5 2 2 1.7 2.5 0.25 0.5 0.5 0.5 8 0.75 3 1 3 0.1 1.25 3 7 0.75 1 2 2 0.5 4.5 0.1
1.1.3 1.1.3.2	T	1	**	Salsola kali	6	.	.	6	13	-3	-3	11	28	.	.	0.0	0.0	0.01 0.02 0.01 0.02 0.1
1.1.3.2	T			Malva parviflora var. parviflora	4	.	.	.	9	-2	-2	-2	25	.	.	.	0.0	0.01 0.05 0.05
Order 1.1 - Hermannio trifurcae-Othonnetalia sedifoliae																		
1 1.1	Cmes	3		Hermannia trifurca	44	75	63	6	44	40	32	-7	19	0.8	0.4	0.0	0.3	1.5 0.5 3.5 0.01 2 0.25 0.75 0.25 1 0.25 1 0.02 0.25 0.75 0.02 0.5 1 3 0.1 3 0.1 0.25 0.01 0.3 0.5 0.5 0.01 0.5 0.5 0.01 0.25 0.05 0.1 0.1 2 3 0.1 0.5
Class 1 - Hermannio trifurcae-Zygophylletea morgsanae																		
1	T	1	*	Oncosiphon suffruticosum	52	.	42	67	69	-15	9	22	24	.	0.0	0.1	0.3	0.02 0.01 0.25 0.01 0.01 0.01 0.1 0.01 0.01 0.1 0.5 0.1 0.05 0.05 0.02 0.01 0.05 0.1 0.1 1.5 0.05 0.05 0.01 0.25 0.25 1 0.02 0.02 0.1 0.5 0.5 0.5 0.5 0.1 0.5 0.01 2.5 0.25 1 0.01 0.05 1 0.75 0.1 0.3
1	Pnan	2		Lycium ferocissimum	22	25	26	.	31	8	9	-10	13	0.7	0.1	.	0.6	4 0.5 4.25 0.5 0.1 0.75 0.5 0.75 3.25 0.25 3.5 2 2 0.75 1.5 1 0.5 1.5 0.1 0.75 4.0
1	Pnan	2	*	Zygophyllum morgsana	16	58	5	.	16	34	-6	-10	2	1.2	0.0	.	0.1	1.5 4.5 1 4 1 1 1.5 0.75 1 0.25 1.5 0.5
1	T			Lepidium desertorum	9	8	5	17	6	3	0	12	1	0.0	0.0	0.0	0.0	0.01 0.01 0.01 0.01 0.02 0.01 0.01
Differential species (one-sided)																		
	T			Mesembryanthemum guerichianum	44	17	5	94	50	-13	-19	27	4	0.0	0.0	0.7	0.2	0.01 0.05 0.01 0.25 1 0.02 2 0.05 0.01 0.01 1 5 3 0.1 0.1 0.1 0.01 0.1 0.01 2 0.05 0.25 0.01 0.5 0.1 0.01 1 0.05 0.5 2.5
	Cmic	3		Limeum africanum	15	25	32	.	.	20	27	-6	4	0.0	0.1	.	0.0	0.02 0.02 0.01 0.02 0.01 0.01 0.1 0.02 1 1 0.05 0.25 0.01
	Cmic	1		Galenia meziana	11	33	26	.	.	33	25	-6	-6	0.1	0.1	.	.	0.5 0.01 0.1 0.05 0.05 0.25 0.5 0.25 0.25
	T			Heliophila lactea	7	17	21	.	.	22	29	-4	-4	0.0	0.0	.	.	0.01 0.01 0.01 0.01 0.01 0.01
	Cnan	3		Peliostomum virgatum	6	.	.	.	16	-3	-3	-3	26	.	.	.	0.0	0.01 0.05 0.1 0.02 0.1
Companion species																		
	G			Trachyandra revoluta	49	25	53	67	47	-12	1	8	-1	0.0	0.0	0.0	0.0	
	T	3		Dimorphotheca sinuata	48	.	37	44	75	-18	1	5	21	.	0.0	0.1	1.4	
	Cmes	3		Galenia fruticosa	47	33	63	22	56	-16	0	-22	-4	0.4	0.9	0.4	1.4	
	Cmic	2		Drosanthemum hispidum	38	.	11	44	66	-18	-12	6	17	.	0.0	1.0	2.4	
	Cmes	3		Tetragonia fruticosa	38	83	58	11	25	21	8	-15	-8	1.2	0.7	0.0	0.1	
	Cmes	3		Salsola sp. US07_2312	36	17	42	78	16	-13	0	18	-14	0.5	1.2	2.4	0.4	
	T			Tetragonia microptera	35	.	11	67	44	-17	-12	18	6	.	0.0	0.8	0.0	
	G	3		Oxalis pes-caprae	28	.	16	61	28	-17	-8	17	-1	.	0.0	0.0	0.0	
	T	2	**	Atriplex lindleyi subsp. inflata	27	8	.	.	66	-10	-15	-15	23	0.0	.	.	0.4	
	Cmes	1		Leipoldtia schultzei	27	17	37	33	22	-8	6	3	-5	0.1	0.3	0.7	0.7	
	T			Leysera tenella	26	.	26	17	41	-11	7	0	16	.	0.0	0.0	2.6	
	Cmes	1		Psilocaulon dinteri	26	.	11	28	44	-17	-11	-2	7	.	0.0	0.0	0.0	
	T			Ehrharta pusilla	25	8	53	6	25	-9	17	-11	1	0.0	0.2	0.0	0.1	
	T	3		Didelta carnosa	22	8	37	22	19	-23	-8	-16	-17	0.0	0.1	0.0	0.0	
	G			Trachyandra falcata	22	25	37	.	25	8	16	-10	8	0.0	0.0	.	0.0	
	T	2		Foveolina dichotoma	20	8	21	28	19	-11	-4	0	-5	0.0	0.0	0.1	0.0	
	Cnan	3		Hypertelis salsoloides var. salsoloides	19	.	21	6	31	-11	3	-8	9	.	0.0	0.0	0.1	
	T	1		Aizoon canariense	16	.	11	11	28	-10	-2	-2	11	.	0.1	0.0	0.0	
	Cmes	3		Eberlanzia cyathiformis	16	.	5	17	28	-15	-12	-5	1	.	0.0	0.2	1.0	
	G			Albuca cooperi	15	.	11	33	13	-8	2	22	3	.	0.0	0.0	0.0	
	Cmes	1		Ruschia versicolor	15	17	32	6	9	-2	7	-9	-7	0.3	2.3	0.0	0.1	
	T	2		Gorteria diffusa subsp. diffusa	12	.	11	6	22	-18	-13	-16	-7	.	0.0	0.0	0.0	
	T	1		Heliophila variabilis	12	.	.	11	25	-12	-12	-5	4	.	.	0.0	0.0	
	Cmic	2		Zygophyllum cordifolium	12	.	21	6	16	-16	-5	-13	-8	.	0.1	0.1	0.0	
	Pnan	2		Aridaria noctiflora subsp. noctiflora	11	.	11	.	22	-14	-7	-14	0	.	0.2	.	0.4	
	Cmes	1		Asparagus capensis	11	42	16	.	3	16	-1	-11	-9	0.4	0.0	.	0.0	
	Cmes	3		Manochlamys albicans	11	.	.	.	28	-7	-7	-7	18	.	.	.	0.2	
	T			Wahlenbergia androsacea	11	8	.	17	16	3	-6	13	12	0.0	.	0.0	0.0	
	T			Amellus microglossus	10	.	5	11	16	-10	-6	-2	2	.	0.0	0.0	0.0	
	T			Helichrysum leontonyx	10	.	.	11	19	-10	-10	-2	4	.	.	0.0	0.0	
	G			Chlorophytum crassinerve	9	.	26	.	6	-10	10	-10	-5	.	0.0	.	0.0	
	T			Dorotheanthus bellidiformis subsp. hestermalensis	9	8	21	6	3	3	17	0	-3	0.0	0.0	0.0	0.0	
	T			Felicia merxmuelleri	9	.	16	6	9	-7	7	-2	1	.	0.0	0.0	0.0	
	Cmes	3		Hermannia sp. 124822	9	17	5	.	13	16	2	-5	11	0.1	0.0	.	0.0	
	Pnan	2		Lycium oxycarpum	9	.	5	6	16	-10	-6	-6	2	.	0.1	0.0	0.1	
	Pnan	2		Ruschia subg. Tumidula sp. 2485	9	8	26	.	3	3	22	-6	-3	0.3	0.5	.	0.0	
	T			Chenopodium album	7	.	.	11	13	-6	-6	5	7	.	.	0.4	0.0	
	Pnan	1	*	Galenia africana	7	.	11	.	13	-6	7	-6	9	.	0.1	.	0.3	
	T			Hebenstretia parviflora	7	.	11	.	13	-7	3	-7	5	.	0.0	.	0.0	
	Pnan	2		Zygophyllum retrofractum	7	.	.	.	19	-6	-6	-6	14	.	.	.	0.2	
	T	3	**	Atriplex semibaccata	6	.	.	11	9	-6	-6	6	4	.	.	0.0	0.1	
	T	1		Bromus pectinatus	6	.	.	.	16	-9	-9	-9	4	.	.	.	0.1	
	Pnan	2		Euphorbia burmannii	6	17	16	.	.	22	20	-4	-4	0.6	0.2	.	.	
	H	2		Fingerhuthia africana	6	.	5	.	13	-3	7	-3	22	.	0.0	.	0.0	
	H			Kedrostis psammophylla	6	.	11	11	3	-4	15	16	2	.	0.0	0.0	0.0	
	G			Oxalis ambigua	6	.	11	.	9	-4	14	-4	12	.	0.0	.	0.0	
	G			Oxalis sp. 2233	6	.	16	6	3	-5	16	2	-1	.	0.0	0.0	0.0	
	T			Plantago cafra	6	.	.	11	9	-4	-4	12	9	.	.	0.0	0.0	
	Pnan	1		Pteronia divaricata	6	.	16	.	6	-4	22	-4	6	.	0.2	.	0.0	
	Pnan	1		Stoeberia frutescens	6	8	11	.	6	-2	0	-9	-4	0.0	1.1	.	0.7	
	T			Tribolium utriculosum	6	.	5	11	6	-10	-6	-2	-5	.	0.0	0.3	0.0	
	T			Tripteris amplectens	6	.	.	.	16	-8	-8	-8	6	.	.	.	0.0	
	Pnan	1		Asparagus burchellii	5	.	5	17	.	-7	-2	9	-7	.	0.0	0.1	.	
	Cnan	1		Cephalophyllum inaequale	5	.	16	.	3	-23	-15	-23	-21	.	0.1	.	0.0	
	T	1		Ehrharta longiflora	5	.	.	.	13	-8	-8	-8	3	.	.	.	0.0	
	Pnan	1	*	Euphorbia mauritanica	5	8	.	11	3	1	-7	3	-4	1.0	.	0.0	0.0	
	T			Manulea corymbosa	5	.	11	6	3	-6	6	1	-2	.	0.0	0.0	0.0	
	T			Zaluzianskya benthamiana	5	8	.	11	3	8	-4	12	0	0.0	.	0.0	0.0	
	G			Babiana sp. 21954	4	8	11	.	.	17	22	-3	-3	0.0	0.0	.	.	
	G			Babiana sp. 2210	4	.	11	.	3	-5	8	-5	-1	.	0.0	.	0.0	
	Cnan	2		Cephalophyllum pillansii	4	.	11	.	3	-5	9	-5	-1	.	0.2	.	0.0	
	Cnan	2		Cheiridopsis robusta	4	.	5	.	6	-10	-6	-10	-6	.	0.0	.	0.0	
	T			Manulea cheiranthus	4	.	5	6	3	-4	5	5	1	.	0.0	0.0	0.0	
	Cmes	3		Microloma sagittatum	4	.	5	.	6	-7	-3	-7	-2	.	0.0	.	0.0	
	G			Oxalis clavifolia	4	.	.	11	3	-4	-4	14	1	.	.	0.0	0.0	
	T			Pelargonium minimum	4	.	5	6	3	-3	7	7	3	.	0.0	0.0	0.0	
	Cnan			Pharnaceum confertum var. brachyphyllum	4	.	5	.	6	-9	-4	-9	-4	.	0.0	.	0.0	
	T	1	*	Tripteris clandestina	4	.	.	6	6	-6	-6	0	1	.	.	0.0	0.0	
	G			Wachendorfia multiflora	4	.	11	6	.	-4	11	4	-4	.	0.0	0.0	.	
	Cmes			Zygophyllum spinosum	4	.	16	.	.	-4	20	-4	-4	.	0.0	.	.	
	T	1		Amsinckia retrorsa	2	.	.	.	6	-2	-2	-2	24	.	.	.	0.3	
	Cmes	2		Antimima komkansica	2	.	5	.	3	-10	-6	-10	-8	.	0.0	.	0.0	
	Cnan	1		Antimima sp. 2496	2	.	.	6	3	-3	-3	7	2	.	.	0.0	0.0	
	Cmes			Asparagus sp. 22034	2	8	5	.	.	19	11	-2	-2	0.0	0.0	.	.	
	Cmes	3		Berkheya fruticosa	2	.	11	.	.	-8	1	-8	-8	.	0.1	.	.	
	G			Chlorophytum undulatum	2	.	11	.	.	-5	8	-5	-5	.	0.0	.	.	
	Pnan	3		Didelta spinosa	2	.	.	.	6	-5	-5	-5	2	.	.	.	0.0	
	T			Dischisma spicatum	2	8	.	.	3	23	-2	-2	7	0.0	.	.	0.0	
	H	3		Ehrharta barbinodis	2	.	5	.	3	-4	6	-4	2	.	0.0	.	0.0	
	G			Gethyllis sp. 21914	2	.	.	6	3	-2	-2	13	6	.	.	0.0	0.0	
	Cmes	1		Hermannia amoena	2	.	5	.	3	-5	2	-5	-1	.	0.0	.	0.0	
	Cmes	3		Hermannia cuneifolia var. glabrescens	2	.	5	.	3	-7	-2	-7	-4	.	0.0	.	0.0	
	Pnan	1		Lebeckia sericea	2	8	.	.	3	6	-5	-5	-1	0.4	.	.	0.1	
	T			Manulea decipiens	2	.	.	6	3	-3	-3	7	2	.	.	0.0	0.0	
	G			Massonia depressa	2	.	.	.	6	-2	-2	-2	24	.	.	.	0.0	
	T	1	*	Mesembryanthemum hypertrophicum	2	.	.	6	3	-5	-5	2	-1	.	.	0.0	0.0	
	Cmes	1		Osteospermum sp. 20236	2	8	5	.	.	17	10	-3	-3	0.0	0.0	.	.	
	G			Oxalis cf. gracilis	2	.	.	.	6	-4	-4	-4	7	.	.	.	0.0	
	G			Oxalis obtusa	2	.	11	.	.	-9	-1	-9	-9	.	0.0	.	.	
	G			Pelargonium leipoldtii	2	.	5	6	.	-5	3	3	-5	.	0.0	0.0	.	
	T			Pentaschistis airoides	2	17	.	.	.	12	-6	-6	-6	0.1	.	.	.	
	Cmes	3		Pteronia glabrata	2	.	5	.	3	-9	-4	-9	-6	.	0.0	.	0.1	
	H			Rumex lativalvis	2	8	5	.	.	21	13	-2	-2	0.0	0.0	.	.	
	Pnan	2		Stoeberia utilis	2	8	.	.	3	2	-7	-7	-3	0.2	.	.	0.1	
	Pnan	2		Tetragonia verrucosa	2	.	5	.	3	-13	-10	-13	-12	.	0.1	.	0.0	
	H			Acanthopsis cf. carduifolia	1	.	.	.	3	-2	-2	-2	6	.	.	.	0.0	
	G			Albuca maxima	1	.	.	.	3	-3	-3	-3	3	.	.	.	0.0	
	G			Albuca spiralis	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	T			Arctotis cf. hirsuta	1	.	5	.	.	-2	17	-2	-2	.	0.0	.	.	
	T			Arctotis scullyi	1	.	5	.	.	-2	13	-2	-2	.	0.0	.	.	
	T			Arctotis sp. 3034	1	.	5	.	.	-1	22	-1	-1	.	0.1	.	.	
	Cmes	3		Asparagus fasciculatus	1	.	.	.	3	-5	-5	-5	0	.	.	.	0.0	
	G			Babiana sinuata	1	.	5	.	.	-4	6	-4	-4	.	0.0	.	.	
	G			Babiana sp. 1765	1	.	5	.	.	-3	6	-3	-3	.	0.0	.	.	
	T			Campanulaceae sp. 21925	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	Cmes			Crassula expansa subsp. expansa	1	.	.	.	3	-5	-5	-5	-1	.	.	.	0.0	
	H			Cyphia crenata	1	.	.	6	.	-5	-5	3	-5	.	.	0.0	.	
	H			Cyphia sp. 2010	1	.	.	6	.	-3	-3	9	-3	.	.	0.0	.	
	T			Diascia namaquensis	1	.	.	6	.	-2	-2	14	-2	.	.	0.0	.	
	T			Dimorphotheca pluvialis	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	G			Drimia sp. 21898	1	.	.	.	3	-2	-2	-2	11	.	.	.	0.0	
	Cmes	2		Drosanthemum curtophyllum	1	.	5	.	.	-9	-5	-9	-9	.	0.1	.	.	
	H	3		Ehrharta capensis	1	8	.	.	.	14	-3	-3	-3	0.0	.	.	.	
	Cmes			Euphorbia ephedroides	1	.	5	.	.	-3	9	-3	-3	.	0.1	.	.	
	G			Ferraria sp. 2742	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	G			Monocotyledonic geophyte US08_6108	1	.	.	6	.	-1	-1	23	-1	.	.	0.0	.	
	G			Monocotyledonic geophyte 2761	1	.	.	.	3	-3	-3	-3	3	.	.	.	0.0	
	G			Monocotyledonic geophyte 3441	1	.	.	.	3	-2	-2	-2	7	.	.	.	0.0	
	G			Monocotyledonic geophyte 21958	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	G			Gladiolus saccatus	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	G			Haemanthus coccineus	1	8	.	.	.	19	-2	-2	-2	0.0	.	.	.	
	T			Hebenstretia sp. 2737	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	Cmic			Helichrysum dregeanum	1	.	5	.	.	-6	0	-6	-6	.	0.0	.	.	
	Cmes	3		Hirpicium alienatum	1	.	5	.	.	-6	1	-6	-6	.	0.0	.	.	
	T			Jamesbrittenia racemosa	1	.	.	6	.	-5	-5	2	-5	.	.	0.0	.	
	G			Lapeirousia sp. 21958	1	.	5	.	.	-3	8	-3	-3	.	0.0	.	.	
	T			Lasiospermum brachyglossum	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	n.a.			Lessertia sp. 3061	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	Pnan	3		Lycium cinereum	1	.	.	.	3	-4	-4	-4	1	.	.	.	0.0	
	Cmes			Melolobium adenodes	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	Cmes			Melolobium humile	1	.	5	.	.	-2	13	-2	-2	.	0.0	.	.	
	G			Moraea fugax	1	.	5	.	.	-2	13	-2	-2	.	0.0	.	.	
	T	3		Nemesia anisocarpa	1	.	.	6	.	-6	-6	0	-6	.	.	0.0	.	
	G			Ornithogalum sp. 20210	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	G			Ornithogalum sp. 22007	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	G			Ornithogalum sp. 2759	1	.	.	6	.	-3	-3	8	-3	.	.	0.0	.	
	G			Ornithogalum xanthochlorum	1	.	.	.	3	-2	-2	-2	10	.	.	.	0.0	
	Cmes			Othonna arbuscula	1	.	5	.	.	-9	-5	-9	-9	.	0.1	.	.	
	G			Oxalis sp. 2445	1	.	.	.	3	-3	-3	-3	5	.	.	.	0.0	
	G			Oxalis sp. 3423	1	.	.	6	.	-1	-1	23	-1	.	.	0.0	.	
	Cmes			Phyllobolus oculatus	1	8	.	.	.	19	-2	-2	-2	0.1	.	.	.	
	G			Phyllobolus sinuosus	1	.	5	.	.	-8	-4	-8	-8	.	0.0	.	.	
	Cnan	2		Phyllobolus trichotomus	1	.	5	.	.	-10	-6	-10	-10	.	0.0	.	.	
	Cnan			Quaqua mammillaris	1	.	.	.	3	-3	-3	-3	3	.	.	.	0.0	
	T			Raphanus raphanistrum	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	Pmic	3		Rhus undulata	1	.	.	.	3	-8	-8	-8	-5	.	.	.	0.0	
	Cmes			Salsola zeyheri	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	Cmes	1		Sarcocaulon l´heritieri	1	.	5	.	.	-9	-5	-9	-9	.	0.0	.	.	
	T	1		Schmidtia kalahariensis	1	.	.	6	.	-1	-1	23	-1	.	.	0.0	.	
	T			Scrophulariaceae sp. 21918	1	.	.	6	.	-1	-1	23	-1	.	.	0.0	.	
	n.a.			Selago cf. glabrata	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	Pnan			Selago divaricata	1	.	5	.	.	-1	22	-1	-1	.	0.0	.	.	
	T			Senecio abruptus	1	.	.	6	.	-3	-3	7	-3	.	.	0.0	.	
	T			Senecio arenarius	1	.	.	.	3	-3	-3	-3	4	.	.	.	0.0	
	Cmes	2		Thesium elatius	1	.	5	.	.	-5	2	-5	-5	.	0.0	.	.	
	Pnan	3		Thesium lineatum	1	.	5	.	.	-4	4	-4	-4	.	0.0	.	.	
	Cmes	2		Trachyandra involucrata	1	.	5	.	.	-6	-1	-6	-6	.	0.0	.	.	
	G			Trachyandra muricata	1	.	5	.	.	-2	15	-2	-2	.	0.0	.	.	
	G			Trachyandra sp. 1670	1	.	5	.	.	-3	7	-3	-3	.	0.0	.	.	
	T			Tripteris hyoseroides	1	.	.	.	3	-4	-4	-4	2	.	.	.	0.0	
	T			Ursinia cakilefolia	1	.	5	.	.	-3	10	-3	-3	.	0.0	.	.	
	T		*	Ursinia chrysanthemoides	1	.	5	.	.	-2	13	-2	-2	.	0.0	.	.	
	T			Zaluzianskya sp. 21994	1	.	.	.	3	-1	-1	-1	17	.	.	.	0.0	
	Cmic			Zygophyllum sessilifolium	1	.	5	.	.	-4	5	-4	-4	.	0.0	.	.	

Appendix S4. Relevé table of the order *Berkheyo fruticosae-Rhoetalia undulatae* (1.2).

Complete table of the relevés assigned to the *Berkheyo-Rhoetalia*. To the left of its name, each species is classified whether it can be considered as regional character species of one or of several syntaxa. Further, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems (Pr.; * = problem plant; ** problem and exotic plant; Wells et al. 1986). Between species names and individual relevés, information at association level is provided, namely constancy, phi-value (calculated on the basis of all 17 units at association level), and mean cover (including those plots without occurrences). Colours are used to indicate species with particularly high constancy, fidelity (phi > 0.5: red; phi > 0.25: blue, phi > 0: green), or cover. On the top of the table, it is indicated to which syntaxa of different rank a certain relevé belongs, with the number in brackets after the association name showing the corresponding TWINSPAN cluster (Fig. 2). Further, the nomenclatural types of the associations and the sources of the individual relevés (0 = Luther-Mosebach (2009); 1 = additional relevés from Röwer (2009)/heuweltjies; 2 = BIOTA Observatory; 3 = additional relevés from the commonage 2007 and 2008; 4 = Namaqua National Park; 5 = stock post transect) are indicated.

Order 1.2: *Berkheyo fruticosae-Rhoetalia undulatae*
Alliance 1.2.1: *Berkheyo fruticosae-Rhoion undulatae*
Association 1.2.1.1: *Ruschio goodiae-Lebeckietum sericeae* (5) · Association 1.2.1.2: *Drosanthemo hispidi-Manochlamydetum albicantis* (6) · Association 1.2.1.3: *Antizomato miersianae-Stoeberietum utilis* (7)

Site variable	Mean 1.2.1.1 (n = 24)	Mean 1.2.1.2 (n = 22)	Mean 1.2.1.3 (n = 31)
Inclination [°]	8.2	11.0	15.1
Grazing intensity [%]	116	115	89
Fine material [%]	77	82	58
Fine + medium gravel [%]	2.9	1.0	1.1
Coarse gravel (2-6 cm) [%]	0.4	0.4	1.1
Stones (6-20 cm) [%]	0.1	0.8	1.4
Boulders (20-60 cm) [%]	1.3	0.4	2.4
Larger boulders (> 60 cm) [%]	0.3	1.1	3.9
Rock outcrops [%]	18.1	14.5	32.2
Dead wood [%]	2.2	3.2	5.8
Soft litter [%]	7.6	5.9	8.0
Dung [%]	0.0	0.1	0.2
Area disturbed by mammal activity [%]	0.0	0.0	0.1
pH ($CaCl_2$)	5.37	6.05	6.54
EC [$\mu S\ cm^{-1}$]	282	293	504
IC [%]	0.004	0.007	0.021
OC [%]	0.781	1.305	2.156
N [%]	0.060	0.094	0.161
C/N ratio	12.8	13.1	13.6
Species richness (100 m²)	28.5	30.6	30.8
Shannon index	2.09	2.24	2.16
Shannon evenness	0.63	0.66	0.64
Simpson index	0.78	0.83	0.82
Cover sum vegetation [%]	23.2	24.3	33.5

Diagnostic values	LF	Pal.	Pr.	Taxon or field name	All [%]	Const. 1.2.1.1	Const. 1.2.1.2	Const. 1.2.1.3	phi 1.2.1.1	phi 1.2.1.2	phi 1.2.1.3	Mean 1.2.1.1	Mean 1.2.1.2	Mean 1.2.1.3
Association 1.2.1.1 - Ruschio goodiae-Lebeckietum sericeae														
1.2 1.2.1 1.2.1.1	Cmes	1		Ruschia goodiae	21	58	9	.	57	4	-6	1.1	0.3	.
1.2.1.1	T			Helichrysum sp. 124788	5	17	.	.	40	-2	-2	0.1	.	.
1.2 1.2.1 1.2.1.1	Pnan	1		Lebeckia sericea	17	33	9	10	39	7	8	1.1	0.8	0.3
1.2 1.2.1.1	T			Ehrharta pusilla	47	88	27	29	38	2	3	1.1	0.0	0.0
1.2 1.2.1 1.2.1.1	T			Tribolium utriculosum	38	54	36	26	30	17	9	0.2	0.1	0.0
1.2.1.1	Cmes	3		Hirpicium alienatum	10	29	.	3	29	-6	-2	0.1	.	0.0
1.2.1.1	T			Arctotis acaulis	3	8	.	.	28	-2	-2	0.0	.	.
1.2.1.1	Cmes			Chrysocoma ciliata	3	8	.	.	28	-2	-2	0.0	.	.
1.2.1.1	Pnan			Nylandtia spinosa	3	8	.	.	28	-2	-2	0.1	.	.
1.2.1.1	Cmes			Asteraceae sp. 124786	3	8	.	.	28	-2	-2	0.0	.	.
1.2.1.1	Cmes	1	*	Sarcostemma viminale	8	17	5	3	27	5	3	0.0	0.0	0.0
1.2.1.1	Cmes	3		Wiborgia monoptera	4	13	.	.	25	-3	-3	0.1	.	.
Association 1.2.1.2 - Drosanthemo hispidi-Manochlamydetum albicantis														
1.2 1.2.1 1.2.1.2	Cmes	3		Manochlamys albicans	23	13	55	10	4	42	1	0.0	1.0	0.0
1.2 1.2.1 1.2.1.2	T	3	**	Atriplex semibaccata	18	8	45	6	3	42	1	0.0	0.0	0.0
1.2 1.2.1.2	Cmic	2		Drosanthemum hispidum	57	33	100	45	0	35	6	0.2	0.8	0.0
1 1.2 1.2.1 1.2.1.2	T			Lepidium desertorum	18	.	36	19	-6	34	15	0.0	0.0	0.0
1 1.2 1.2.1 1.2.1.2	Pnan	2		Lycium ferocissimum	38	17	59	39	2	33	18	0.1	1.3	1.6
1.2.1.2	T			Crassula strigosa	6	.	14	6	-3	29	12	.	0.0	0.0
1.2.1.2	Pnan	1	*	Galenia africana	16	8	27	13	4	26	9	0.1	1.0	0.3
Association 1.2.1.3 - Antizomato miersianae-Stoeberietum utilis														
1.2 1.2.1 1.2.1.3	Pnan	2		Antizoma miersiana	25	13	.	52	11	-5	63	0.1	.	1.1
1.2 1.2.1 1.2.1.3	Pnan	1		Asparagus burchelli	32	.	18	68	-7	11	59	.	0.0	0.3
1.2 1.2.1 1.2.1.3	Pnan	2		Stoeberia utilis	32	4	23	61	-2	17	56	0.0	0.9	4.6
1.2 1.2.1 1.2.1.3	Pnan	2		Montinia caryophyllacea	21	8	5	42	7	2	55	0.2	0.2	2.2
1.2 1.2.1 1.2.1.3	Pmic	3		Rhus undulata	45	25	36	68	15	26	54	0.6	1.1	5.7
1.2 1.2.1 1.2.1.3	T	1		Ehrharta longiflora	40	.	41	71	-8	28	54	.	0.8	0.2
1.2.1.3	T			Senecio sisymbriifolius	12	.	.	29	-3	-3	53	.	.	0.2
1.2 1.2.1 1.2.1.3	T			Jamesbrittenia racemosa	18	.	5	42	-5	1	51	.	0.0	0.0
1.2 1.2.1 1.2.1.3	T			Felicia tenera	14	.	5	32	-4	4	49	.	0.0	0.0
1.2 1.2.1 1.2.1.3	Cmes	1	*	Ballota africana	14	4	5	29	3	4	45	0.0	0.0	0.3
1.2 1.2.1 1.2.1.3	Cmes	1		Thesium sp. 20250	12	8	.	23	12	-3	39	0.0	.	0.0
1.2 1.2.1 1.2.1.3	Cmes			Lotononis digitata	13	8	5	23	11	4	36	0.0	0.0	0.1
1.2 1.2.1 1.2.1.3	T			Tripteris amplectens	34	21	32	45	11	21	33	0.0	0.0	0.0
1.2 1.2.1 1.2.1.3	Cmes	1		Hermannia amoena	18	13	9	29	11	6	32	0.1	0.1	0.5
1.2.1.3	T			Felicia merxmuelleri	18	.	5	42	-7	-3	32	.	0.0	0.0
1.2.1.3	H	3	*	Ehrharta calycina	13	8	.	26	7	-5	31	0.0	.	0.3
1.2.1.3	H			Dianthus namaensis	4	.	.	10	-2	-2	30	.	.	0.0
1.2.1.3	H			Dipogon sp. 2054	6	.	5	13	-3	9	29	.	0.0	0.1
1.2 1.2.1.3	Pnan	3		Tripteris oppositifolia	22	13	14	35	6	7	29	0.1	0.1	0.6
1.2.1.3	G			Wachendorfia multiflora	10	4	.	23	2	-4	29	0.0	.	0.0
Order 1.2 - Berkheyo fruticosae-Rhoetalia undulatae														
1.2 1.2.1	T	1		Heliophila variabilis	56	67	59	45	30	26	17	0.0	0.0	0.0
1.2 1.2.1	Cmes	3		Berkheya fruticosa	39	21	50	45	9	34	30	0	0	1
1.2 1.2.1	T	1		Bromus pectinatus	40	17	59	45	5	39	28	0	1	0
1.2 1.2.1	Cmes			Crassula expansa subsp. expansa	23	17	27	26	15	28	27	0.0	0.0	0.0
1.2 1.2.1	Pmic	2		Rhus incisa	22	29	14	23	33	13	24	0.3	0.1	0.4
1.2 1.2.1	Cmes	3		Microloma sagittatum	32	46	36	19	34	26	10	0.0	0.0	0.0
1 1.2	Pnan	2	*	Zygophyllum morgsana	47	25	36	71	9	18	43	0.1	0.4	2.2
1.2 1.2.1	Pnan	3		Didelta spinosa	23	25	18	26	25	17	26	0.3	0.3	0.2
1.2 1.2.1	T	1		Aizoon canariense	44	42	36	52	21	17	28	0	0	0
1.2 1.2.1	Cmes	1		Crassula muscosa var. obtusifolia	16	13	14	19	15	17	26	0	0	0
1.2 1.2.1	Pnan			Solanum giftbergense	14	.	18	23	-4	26	33	.	0.2	0.1
1.2 1.2.1	Pnan	3		Thesium lineatum	14	13	14	16	15	16	20	0.0	0.2	0.1
1.2 1.2.1	T			Hebenstretia parviflora	22	29	27	13	22	20	6	0.0	0.0	0.0
1.2 1.2.1	Pnan	1	*	Euphorbia mauritanica	22	25	23	19	16	14	11	0.5	0.6	0.3
1.2 1.2.1	T			Helichrysum leontonyx	32	33	41	26	14	20	9	0.0	0.3	0.0
1.2 1.2.1	T			Leysera tenella	36	54	27	29	25	7	8	0.1	0.1	0.0
Class 1 - Hermannio trifurcae Zygophylletea morgsanae														
1 1.1 1.1.3 1.1.3.1	T	1		Karroochloa schismoides	57	46	59	65	2	9	12	1.6	0.6	0.1
1	T	1	*	Oncosiphon suffruticosum	52	13	82	61	-8	31	19	0.0	0.3	0.1
1 1.1	Cmes	3		Hermannia trifurca	17	42	5	6	17	-8	-7	0.5	0.0	0.0
1 1.1.2 1.1.2.1	Pnan	1		Ruschia subg. Tumidula sp. 3818	12	13	9	13	2	-1	2	0.5	0.0	0.1
1 1.1 1.1.1 1.1.1.1	T			Pharnaceum sp. 2259	9	8	9	10	1	2	3	0.0	0.0	0.0
Differential species (one-sided)														
	T	2		Gorteria diffusa subsp. diffusa	45	92	32	19	30	-2	-8	0.3	0.0	0.0
	Cnan			Pharnaceum confertum var. brachyphyllum	21	42	9	13	25	-1	2	0.1	0.0	0.0
Companion species														
	Cmes	3		Galenia fruticosa	70	71	86	58	4	12	-3	0.8	1.4	0.6
	T	1		Mesembryanthemum guerichianum	60	25	82	71	-9	20	15	0.0	0.1	0.8
	T			Tetragonia microptera	57	29	73	68	-2	22	19	0.0	0.1	0.1
	T	3		Dimorphotheca sinuata	44	50	64	26	8	15	-5	0.1	0.2	0.0
	G			Trachyandra revoluta	44	54	45	35	2	-2	-7	0.0	0.0	0.0
	Cmes	3		Tetragonia fruticosa	36	50	18	39	4	-12	-1	0.2	0.1	0.5
	G	3		Oxalis pes-caprae	35	8	55	42	-12	13	6	0.0	0.0	0.0
	Cmes	3		Tetragonia verrucosa	32	50	36	16	16	8	-4	0.3	0.0	0.0
	G			Chlorophytum crassinerve	29	38	32	19	19	14	5	0.0	0.0	0.0
	T	3		Didelta carnosa	27	42	41	6	-6	-6	-24	0.3	0.0	0.0
	Cmes	3		Galenia sarcophylla	27	4	27	45	-12	2	13	0.0	0.2	0.1
	T	2	**	Atriplex lindleyi subsp. inflata	26	17	59	10	-5	19	-9	0.0	0.2	0.0
	Cmes	1		Leipoldtia schultzei	26	42	14	23	5	-10	-5	2.8	0.3	0.4
	G			Oxalis obtusa	25	8	23	39	-3	8	21	0.0	0.1	0.1
	Pnan	2		Lycium oxycarpum	25	13	36	26	0	17	10	0.1	0.2	0.1
	Pnan	2		Aridaria noctiflora subsp. noctiflora	23	25	41	10	1	11	-8	0.4	2.2	0.3
	Cmes	1		Asparagus capensis	23	21	36	16	2	13	-1	0.0	0.0	0.0
	Cmes	1		Psilocaulon dinteri	23	13	59	6	-10	15	-13	0.1	0.1	0.0
	Cmes	2		Ruschia viridifolia	22	21	5	35	5	-6	16	1.1	0.0	0.7
	Cmes	1		Ruschia versicolor	21	50	14	3	19	-4	-10	3.0	0.8	0.0
	Pnan	1		Stoeberia frutescens	19	4	18	32	-6	6	17	0.1	0.8	1.6
	Pnan	2		Lebeckia multiflora	18	29	14	13	2	-7	-7	0.2	0.2	0.2
	Cmic	2		Zygophyllum cordifolium	18	8	36	13	-12	4	-9	0.0	0.4	0.2
	Cnan	3		Hypertelis salsoloides var. salsoloides	17	29	9	13	8	-5	-3	0.2	0.0	0.0
	Cmes	2		Trachyandra involucrata	17	17	23	13	11	18	7	0.0	0.1	0.1
	T			Chenopodium album	16	4	23	19	-8	17	14	0.0	0.0	0.0
	T			Dorotheanthus bellidiformis subsp. hestermalensis	14	13	23	10	8	19	4	0.0	0.0	0.0
	G			Phyllobolus sinuosus	14	29	9	6	17	0	-3	0.0	0.0	0.0
	T			Wahlenbergia androsacea	14	17	9	16	13	4	12	0.0	0.0	0.0
	Pnan	2		Zygophyllum retrofractum	14	4	18	19	-2	13	15	0.0	0.3	0.4
	T			Amellus microglossus	13	.	32	10	-10	14	-3	.	0.0	0.0
	G			Albuca cooperi	12	25	.	10	14	-8	1	0.0	.	0.0
	Cmes	2		Antimima komkansica	12	4	27	6	-7	10	-5	0.0	0.4	0.1
	Cmes	3		Hermannia cuneifolia var. glabrescens	12	4	23	10	-3	15	2	0.0	0.1	0.1
	Pnan	3		Lycium cinereum	12	8	9	16	8	10	20	0.0	0.0	0.3
	T	1	*	Tripteris clandestina	12	13	9	13	7	4	8	0.0	0.0	0.0
	G			Asparagus multituberosus	10	4	9	16	2	10	21	0.0	0.0	0.0
	Cnan	2		Cephalophyllum pillansii	9	17	9	3	17	7	-1	0.1	0.0	0.0
	Cmes	3		Eberlanzia cyathiformis	9	.	18	10	-15	-4	-9	.	0.1	0.1
	Cmes	3		Euphorbia hamata	9	25	5	.	7	-7	-11	0.2	0.0	.
	T	2		Foveolina dichotoma	9	4	14	10	-13	-8	-10	0.0	0.0	0.0
	Cmic			Helichrysum dregeanum	9	13	5	10	8	-1	5	0.0	0.0	0.0
	G			Oxalis sp. 20205	9	17	14	.	23	18	-4	0.0	0.0	.
	T			Pentaschistis airoides	9	17	5	6	12	-1	1	0.0	0.0	0.0
	Pnan	2		Ruschia subg. Tumidula sp. 2485	9	17	14	.	12	9	-6	0.2	0.1	.
	T			Tripteris hyoseroides	9	13	5	10	19	5	14	0.0	0.0	0.0
	Cmes			Antimima sp. 124810	8	13	5	6	6	-2	0	0.0	0.0	0.0
	Pnan	3		Asparagus bayeri	8	4	5	13	5	6	22	0.0	0.0	0.2
	Cnan	1		Cephalophyllum inaequale	8	25	.	.	-11	-23	-23	0.3	.	.
	T	1		Helichrysum alsinoides	8	4	5	13	-7	-6	0	0.0	0.0	0.0
	Cmes	3		Hermannia sp. 124822	8	.	14	10	-5	12	7	.	0.0	0.0
	Cmes	2		Meyerophytum meyeri	8	17	9	.	2	-4	-10	0.3	0.1	.
	G			Trachyandra falcata	8	13	14	.	-1	0	-10	0.0	0.0	.
	G			Albuca maxima	6	.	5	13	-3	6	22	.	0.0	0.0
	Cmic	3		Limeum africanum	6	21	.	.	16	-6	-6	0.0	.	.
	T			Manulea decipiens	6	4	9	6	4	13	8	0.0	0.0	0.0
	T	3		Nemesia anisocarpa	6	.	9	10	-6	4	5	.	0.0	0.0
	Cmes	2		Pelargonium karooicum	6	8	9	3	6	7	-1	0.0	0.0	0.0
	T			Plantago cafra	6	.	18	3	-4	22	0	.	0.0	0.0
	Cmes	2		Ruschia stricta	6	13	5	3	18	4	2	0.0	0.0	0.3
	Cmes	3		Salsola sp. US07_2312	6	4	14	3	-20	-15	-20	0.0	0.1	0.0
	T			Zaluzianskya benthamiana	6	4	5	10	2	2	10	0.0	0.0	0.0
	Cmes			Anthospermum dregei subsp. dregei	5	8	5	3	14	6	3	0.1	0.0	0.0
	Cmes	3		Asparagus fasciculatus	5	4	5	6	1	2	5	0.0	0.0	0.0
	G			Babiana sp. 2210	5	8	5	3	5	0	-1	0.0	0.0	0.0
	G			Chlorophytum undulatum	5	4	5	6	0	1	3	0.0	0.0	0.0
	Cmes			Crassula muscosa var. muscosa	5	13	5	.	10	0	-5	0.0	0.0	.
	H	3		Ehrharta barbinodis	5	.	14	3	-4	21	2	.	0.0	0.0
	H	3		Ehrharta capensis	5	8	9	.	14	16	-3	0.0	0.1	.
	Cmes	1		Euphorbia decussata	5	.	5	10	-5	1	7	.	0.0	0.1
	Cmic	1		Galenia meziana	5	4	14	.	-1	10	-6	0.0	0.1	.
	Cmes	3		Helichrysum hebelepis	5	4	.	10	9	-2	25	0.0	.	0.2
	Cmes	3		Indigofera heterophylla	5	4	5	6	7	8	13	0.0	0.0	0.0
	Cmes			Kleinia longiflora	5	.	5	10	-2	10	24	.	0.0	0.0
	T			Manulea cheiranthus	5	4	.	10	3	-4	12	0.0	.	0.0
	Cmes	3		Othonna sedifolia	5	13	.	3	-3	-12	-9	0.0	.	0.0
	Cnan	3		Peliostomum virgatum	5	13	.	3	20	-3	3	0.0	.	0.0
	T			Pharnaceum croceum	5	4	.	10	2	-4	11	0.0	.	0.0
	Cnan	2		Phyllobolus trichotomus	5	8	5	3	-3	-6	-7	0.0	0.0	0.0
	H	2		Stipagrostis obtusa	5	4	.	10	1	-5	9	0.0	.	0.2
	H	1	*	Stipagrostis zeyheri subsp. zeyheri	5	8	.	6	3	-6	1	0.0	.	0.1
	Cmic			Zygophyllum sessilifolium	5	13	5	.	17	4	-4	0.1	0.0	.
	Cmes			Cineraria canescens	4	.	9	3	-2	25	7	.	0.0	0.0
	Cnan	1		Crassula elegans	4	4	5	3	8	9	6	0.0	0.0	0.0
	T			Crassula vaillantii	4	.	9	3	-3	19	5	.	0.0	0.0
	H			Cymbopogon cf. marginatus	4	.	5	6	-4	4	7	.	0.0	0.1
	Cmes	2		Drosanthemum curtophyllum	4	8	5	.	-2	-5	-9	0.1	0.1	.
	H	3		Ehrharta melicoides	4	8	.	3	9	-4	1	0.0	.	0.0
	Pnan	2		Euphorbia burmannii	4	8	5	.	9	3	-4	0.0	0.0	.
	Cmes			Euryops dregeanus	4	.	5	6	-2	12	18	.	0.0	0.0
	H	2		Fingerhuthia africana	4	.	.	10	-3	-3	16	.	.	0.0
	G			Othonna amplexifolia	4	8	.	3	19	-2	6	0.0	.	0.0
	Cmes			Othonna sp. 2023	4	.	9	3	-2	25	7	.	0.0	0.0
	G			Oxalis clavifolia	4	4	.	6	3	-4	6	0.0	.	0.0
	G			Oxalis sp. 2233	4	13	.	.	12	-5	-5	0.0	.	.
	Cmes	3		Pteronia ciliata	4	8	5	.	1	-3	-7	0.0	0.0	.
	Pnan	1		Pteronia divaricata	4	4	5	3	3	3	1	0.0	0.0	0.1
	Pnan	3		Putterlickia pyracantha	4	4	5	3	10	12	8	0.0	0.0	0.0
	Cmes			Senecio laticipes	4	4	5	3	10	12	8	0.0	0.0	0.0
	T	2		Stipa capensis	4	13	.	.	14	-4	-4	0.0	.	.
	Cmes	1	*	Tylecodon wallichii	4	.	9	3	-3	14	3	.	0.0	0.0
	Cnan			Wahlenbergia oxyphylla	4	8	5	.	22	11	-2	0.0	0.0	.
	Pnan	1		Zygophyllum foetidum	4	.	5	6	-2	12	18	.	0.0	0.1
	Cmes			Zygophyllum spinosum	4	13	.	.	15	-4	-4	0.0	.	.
	H			Acanthopsis cf. carduifolia	3	8	.	.	19	-2	-2	0.0	.	.
	Cnan			Amphiglossa tomentosa	3	8	.	.	14	-3	-3	0.2	.	.
	H			Arctotis undulata	3	8	.	.	5	-5	-5	0.0	.	.
	Cmes			Arenifera stylosa	3	8	.	.	23	-2	-2	0.1	.	.
	Pnan	1		Asparagus retrofractus	3	.	.	6	-2	-2	25	.	.	0.0
	G			Babiana sinuata	3	8	.	.	12	-4	-4	0.0	.	.
	Pnan	1		Berkheya spinosissima	3	.	.	6	-2	-2	25	.	.	0.0
	H	3		Chaetobromus involucratus subsp. dregeanus	3	.	5	3	-2	15	10	.	0.0	0.0
	Cmes			Chrysocoma cernua	3	4	.	3	11	-2	8	0.0	.	0.0
	Cnan			Conophytum sp. US06_2214	3	4	.	3	14	-2	11	0.0	.	0.0
	Cmes	1		Cotyledon orbiculata var. orbiculata	3	4	.	3	14	-2	11	0.0	.	0.0
	Cnan			Crassula tomentosa	3	.	.	6	-2	-2	16	.	.	0.0
	G			Cyanella hyacinthoides	3	4	.	3	11	-2	8	0.0	.	0.0
	H			Cyphia crenata	3	.	9	.	-5	8	-5	.	0.0	.
	T			Cysticapnos vesicaria	3	.	.	6	-2	-2	25	.	.	0.0
	Cmes			Delosperma crassum	3	.	5	3	-3	9	6	.	0.6	0.0
	T			Diascia namaquensis	3	.	.	6	-2	-2	17	.	.	0.0
	Cmes	2		Eriocephalus microphyllus var. pubescens	3	4	.	3	8	-3	5	0.0	.	0.0
	Pnan			Erythrophysa alata	3	.	.	6	-2	-2	25	.	.	0.3
	Pnan			Euryops tenuissimus	3	4	.	3	14	-2	11	0.0	.	0.0
	T			Gazania tenuifolia	3	.	5	3	-7	-3	-4	.	0.0	0.0
	G			Haemanthus coccineus	3	.	5	3	-2	9	6	.	0.0	0.0
	T			Hebenstretia dentata	3	.	.	6	-2	-2	25	.	.	0.0
	Cmes			Helichrysum cylindriflorum	3	4	5	.	13	14	-2	0.0	0.0	.
	T			Heliophila leptophylla	3	.	5	3	-2	15	10	.	0.0	0.0
	Cmes			Jacobsenia kolbei	3	.	5	3	-2	12	8	.	0.0	0.0
	Pnan			Kleinia cephalophora	3	4	.	3	14	-2	11	0.0	.	0.0
	Cnan			Lotononis longiflora	3	.	5	3	-2	15	10	.	0.0	0.0
	T			Manulea corymbosa	3	4	.	3	-1	-6	-2	0.0	.	0.0
	Cmes			Melolobium humile	3	.	5	3	-2	11	7	.	0.0	0.0
	G			Moraea fugax	3	8	.	.	21	-2	-2	0.0	.	.
	Cmes	1		Octopoma connatum	3	4	.	3	0	-5	-1	0.1	.	0.0
	G			Ornithogalum sp. 2017	3	.	5	3	-3	9	6	.	0.0	0.0
	Cmes			Othonna arbuscula	3	8	.	.	-2	-9	-9	0.0	.	.
	G			Othonna oleracea	3	.	5	3	-2	15	10	.	0.1	0.1
	G			Oxalis ambigua	3	4	5	.	3	4	-4	0.0	0.0	.
	Cmes	3		Pelargonium crithmifolium	3	.	.	6	-3	-3	10	.	.	0.0
	Cnan	1		Phyllobolus prasinus	3	8	.	.	-3	-9	-9	0.0	.	.
	Cmes			Phyllobolus spinuliferus	3	.	9	.	-6	5	-6	.	0.0	.
	Cmes			Polymita steenbokensis	3	4	5	.	13	14	-2	0.0	0.0	.
	Cmes	1		Ruschia leucosperma	3	8	.	.	-4	-10	-10	0.0	.	.
	T			Senecio arenarius	3	8	.	.	16	-3	-3	0.0	.	.
	Cmes			Senecio sarcoides	3	.	.	6	-2	-2	20	.	.	0.0
	Cmes	2		Thesium spinosum	3	4	.	3	14	-2	11	0.0	.	0.0
	G			Trachyandra sp. 1670	3	.	5	3	-3	6	3	.	0.0	0.0
	Cmes			Tylecodon pearsonii	3	.	5	3	-2	15	10	.	0.0	0.0
	T			Ursinia cakilefolia	3	8	.	.	17	-3	-3	0.1	.	.
	T		*	Ursinia chrysanthemoides	3	8	.	.	21	-2	-2	0.0	.	.
	Cmes			Vanzijlia annulata	3	4	.	3	2	-4	0	0.0	.	0.0
	T			Zaluzianskya affinis	3	4	5	.	-7	-7	-10	0.0	0.0	.
	Cnan			Adromischus alstonii	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes			Aloe melanacantha	1	.	.	3	-1	-1	17	.	.	0.0
	T			Amaranthaceae sp. 4003	1	.	.	3	-1	-1	17	.	.	0.1
	Cnan			Anacampseros filamentosa subsp. namaquensis	1	.	.	3	-2	-2	12	.	.	0.0
	G			Androcymbium scabromarginatum	1	.	5	.	-3	5	-3	.	0.0	.
	Cnan			Antimima sp. 14549	1	4	.	.	20	-1	-1	0.0	.	.
	Cmes			Antimima sp. 2386	1	.	.	3	-4	-4	2	.	.	0.0
	Cnan	1		Antimima sp. 2496	1	4	.	.	4	-3	-3	0.0	.	.
	Cmes			Antimima sp. US07_2582	1	4	.	.	-3	-7	-7	0.0	.	.
	T			Arctotis auriculata	1	.	5	.	-2	10	-2	.	0.0	.
	T			Arctotis cf. hirsuta	1	.	.	3	-2	-2	10	.	.	0.0
	Cmes			Asparagus alopecurus	1	.	5	.	-2	12	-2	.	0.0	.
	Cmes			Asparagus sp. 3827	1	.	.	3	-1	-1	17	.	.	0.0
	T			Asteraceae sp. 2077	1	.	5	.	-1	21	-1	.	0.0	.
	G			Babiana sp. 1765	1	.	5	.	-3	5	-3	.	0.0	.
	G			Babiana sp. 21901	1	.	.	3	-1	-1	17	.	.	0.0
	G			Babiana sp. US07_2643	1	.	.	3	-1	-1	17	.	.	0.0
	Pnan			Boscia sp. 22053	1	.	.	3	-1	-1	17	.	.	0.1
	T			Bromus sp. 22033	1	.	.	3	-1	-1	17	.	.	0.1
	G			Bulbine praemorsa	1	.	5	.	-2	15	-2	.	0.0	.
	G			Bulbine sp. 1820	1	4	.	.	7	-3	-3	0.0	.	.
	H			Cheilanthes deltoidea	1	.	.	3	-1	-1	17	.	.	0.0
	T			Chenopodium murale var. murale	1	.	5	.	-1	21	-1	.	0.0	.
	T			Chenopodium sp. 14555	1	.	5	.	-1	21	-1	.	0.0	.
	Cnan	1		Conophytum bilobum	1	.	5	.	-4	5	-4	.	0.0	.
	T			Cotula coronopifolia	1	.	5	.	-2	10	-2	.	0.0	.
	T			Cotula sp. 22024	1	.	.	3	-1	-1	17	.	.	0.0
	Cnan			Crassula columnaris subsp. prolifera	1	.	.	3	-1	-1	17	.	.	0.0
	Cnan			Crassula cotyledonis	1	4	.	.	20	-1	-1	0.0	.	.
	Cnan			Crassula pseudohemisphaerica	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes			Crassula pubescens	1	.	.	3	-1	-1	17	.	.	0.1
	Cmes	2		Crassula subaphylla var. subaphylla	1	.	.	3	-3	-3	3	.	.	0.0
	Cmic			Crassula tetragona subsp. rudis	1	.	5	.	-1	21	-1	.	0.0	.
	Cmes			Crassula umbella	1	.	.	3	-1	-1	17	.	.	0.0
	n.a.			Dicotyledonic sp. 21901	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes			Dimorphotheca tragus	1	.	5	.	-1	21	-1	.	0.0	.
	T			Ehrharta delicatula	1	.	.	3	-1	-1	17	.	.	0.0
	Pnan	2		Eriocephalus africanus var. paniculatus	1	.	.	3	-1	-1	17	.	.	0.0
	G			Eriospermum paradoxum	1	.	5	.	-1	21	-1	.	0.0	.
	G			Eriospermum sp. 1817	1	.	.	3	-3	-3	4	.	.	0.0
	Pnan			Euclea tomentosa	1	.	.	3	-1	-1	17	.	.	0.1
	Cmes			Euphorbia ephedroides	1	.	5	.	-3	7	-3	.	0.2	.
	G			Ferraria uncinata subsp. macrochlamys	1	4	.	.	4	-4	-4	0.0	.	.
	Pmic			Ficus ilicina	1	.	.	3	-1	-1	17	.	.	0.1
	H	3		Gazania krebsiana subsp. krebsiana	1	.	5	.	-9	-6	-9	.	0.0	.
	T			Hemimeris sp. 4283	1	.	.	3	-1	-1	17	.	.	0.0
	G			Lachenalia sp. 2763	1	.	.	3	-5	-5	0	.	.	0.0
	G			Lachenalia violacea	1	.	5	.	-1	21	-1	.	0.0	.
	Cmes			Lampranthus watermeyeri	1	4	.	.	11	-2	-2	0.0	.	.
	G			Lapeirousia sp. 21958	1	.	5	.	-3	7	-3	.	0.0	.
	T	3		Lessertia diffusa	1	4	.	.	10	-2	-2	0.0	.	.
	n.a.			Lessertia sp. 2825	1	4	.	.	20	-1	-1	0.0	.	.
	T			Lotononis parviflora	1	.	.	3	-4	-4	1	.	.	0.0
	T			Lyperia tristis	1	4	.	.	1	-5	-5	0.0	.	.
	T			Malva parviflora var. parviflora	1	.	.	3	-2	-2	7	.	.	0.0
	G			Monocotyledonic geophyte 21901	1	.	.	3	-1	-1	17	.	.	0.0
	G			Monocotyledonic geophyte 3441	1	4	.	.	10	-2	-2	0.0	.	.
	G			Ornithogalum polyphyllum	1	.	5	.	-2	10	-2	.	0.0	.
	G			Ornithoglossum vulgare	1	4	.	.	-1	-6	-6	0.0	.	.
	T	3		Osteospermum pinnatum var. pinnatum	1	.	5	.	-3	7	-3	.	0.0	.
	Cmic			Othonna protecta	1	4	.	.	9	-2	-2	0.0	.	.
	G			Oxalis dregei	1	.	5	.	-1	21	-1	.	0.0	.
	G			Oxalis sonderiana	1	.	.	3	-2	-2	6	.	.	0.0
	G			Oxalis sp. 21934	1	4	.	.	20	-1	-1	0.0	.	.
	G			Oxalis sp. 2445	1	4	.	.	7	-3	-3	0.0	.	.
	G			Oxalis sp. 2717	1	.	.	3	-1	-1	17	.	.	0.0
	Pmic			Ozoroa dispar	1	.	.	3	-1	-1	17	.	.	0.0
	Cmic			Pelargonium dasyphyllum	1	.	.	3	-1	-1	17	.	.	0.0
	Cmic	3		Pelargonium fulgidum	1	.	.	3	-1	-1	17	.	.	0.0
	G			Pelargonium leipoldtii	1	4	.	.	1	-5	-5	0.0	.	.
	T			Pelargonium minimum	1	.	.	3	-3	-3	3	.	.	0.0
	Cmes			Pelargonium praemorsum	1	4	.	.	20	-1	-1	0.0	.	.
	Cmes			Phyllobolus oculatus	1	4	.	.	8	-2	-2	0.0	.	.
	n.a.			Poaceae sp. 22069	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes	3		Pteronia glabrata	1	.	5	.	-9	-5	-9	.	0.0	.
	n.a.			Pteronia sp. 2895	1	.	.	3	-1	-1	17	.	.	0.0
	Pnan	3		Pteronia undulata	1	.	.	3	-1	-1	17	.	.	0.1
	Cmes			Ruschia sp. 124809	1	.	5	.	-1	21	-1	.	0.2	.
	Cmes	1		Ruschia sp. US07_2384	1	.	5	.	-3	5	-3	.	0.0	.
	Pnan			Ruschia subg. Tumidula sp. 4078	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes	1		Salvia dentata	1	.	.	3	-1	-1	17	.	.	0.1
	Cmes	1		Sarcocaulon l'heritieri	1	4	.	.	-6	-9	-9	0.0	.	.
	n.a.			Scrophulariaceae sp. 21924	1	.	.	3	-1	-1	17	.	.	0.0
	Cmic			Selago albida	1	.	.	3	-1	-1	17	.	.	0.0
	T			Senecio abruptus	1	.	5	.	-3	5	-3	.	0.0	.
	Cnan			Senecio sp. 2594	1	.	.	3	-1	-1	17	.	.	0.0
	T			Silene clandestina	1	.	.	3	-3	-3	3	.	.	0.0
	Cmes			Solanum cf. guineense	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes			Teedia lucida	1	.	.	3	-1	-1	17	.	.	0.0
	Cmes	2		Thesium elatius	1	4	.	.	0	-5	-5	0.0	.	.
	n.a.			Thesium sp. US07_2398	1	4	.	.	20	-1	-1	0.0	.	.
	G			Trachyandra bulbinifolia	1	4	.	.	5	-3	-3	0.0	.	.
	G			Trachyandra muricata	1	.	5	.	-2	13	-2	.	0.0	.
	T			Trichogyne lerouxiae	1	.	5	.	-4	4	-4	.	0.0	.
	T			Trifolium cf. arvense	1	.	5	.	-1	21	-1	.	0.0	.
	Cmes	3		Tripteris sinuata var. sinuata	1	4	.	.	4	-3	-3	0.0	.	.
	Cmes			Tripteris sp. 2928	1	.	.	3	-1	-1	17	.	.	0.0
	Pnan	1	*	Tylecodon paniculatus	1	.	.	3	-2	-2	12	.	.	0.1
	T			Wahlenbergia sp. 124789	1	4	.	.	20	-1	-1	0.0	.	.
	Pnan			Zygophyllum leptopetalum	1	.	5	.	-2	15	-2	.	0.1	.

Appendix S5. Relevé table of the order *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis* (2.1).

Complete table of the relevés assigned to the *Mesembryanthemo-Eberlanzietalia*. To the left of its name, each species is classified whether it can be considered as regional character species of one or of several syntaxa. Further, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems (Pr.; * = problem plant; ** problem and exotic plant; Wells et al. 1986). Between species names and individual relevés, information at association level is provided, namely constancy, phi-value (calculated on the basis of all 17 units at association level), and mean cover (including those plots without occurrences). Colours are used to indicate species with particularly high constancy, fidelity (phi > 0.5: red; phi > 0.25: blue, phi > 0: green), or cover. On the top of the table, it is indicated to which syntaxa of different rank a certain relevé belongs, with the number in brackets after the association name showing the corresponding TWINSPAN cluster (Fig. 2). Further, the nomenclatural types of the associations and the sources of the individual relevés (0 = Luther-Mosebach (2009); 1 = additional relevés from Röwer (2009)/*heuweltjies*; 2 = BIOTA Observatory; 3 = additional relevés from the commonage 2007 and 2008; 4 = Namaqua National Park; 5 = stock post transect) are indicated.

Order 2.1: *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis*
Alliance 2.1.1: *Mesembryanthemo guerichani-Eberlanzion cyathiformis*
Association 2.1.1.1: *Foveolino dichotomae-Eberlanzietum cyathiformis* (8); Association 2.1.1.2: *Antimimato komkansicae-Zygophylletum cordifoliae* (9); Association 2.1.1.3: *Cheiridopsio robustae-Cephalophylletum inaequalis* (10); Association 2.1.1.4: *Mesembryanthemo guerichani-Eberlanzietum cyathiformis* (central association; 11)

Diagnostic values	LF	Pal.	Pr.	Taxon or field name	All [%]	Const. 2.1.1.1	Const. 2.1.1.2	Const. 2.1.1.3	Const. 2.1.1.4	phi 2.1.1.1	phi 2.1.1.2	phi 2.1.1.3	phi 2.1.1.4	Mean 2.1.1.1	Mean 2.1.1.2	Mean 2.1.1.3	Mean 2.1.1.4
						n = 44	n = 14	n = 20	n = 16	n = 44	n = 14	n = 20	n = 16	n = 44	n = 14	n = 20	n = 16
				Inclination [°]										2.8	7.7	3.5	5.3
				Grazing intensity [%]										94	123	66	76
				Fine material [%]										99	99	94	98
				Fine + medium gravel [%]										1.1	0.4	1.1	1.5
				Coarse gravel (2-6 cm) [%]										0.1	0.1	4.8	0.2
				Stones (6-20 cm) [%]										0.0	0.0	0.3	0.0
				Boulders (20-60 cm) [%]										0.0	0.0	0.0	0.0
				Larger boulders (> 60 cm) [%]										0.0	0.0	0.0	0.0
				Rock outcrops [%]										0.0	0.1	0.3	0.1
				Dead wood [%]										3.4	3.5	0.9	2.2
				Soft litter [%]										2.3	5.1	2.0	1.9
				Dung [%]										0.1	0.0	0.0	0.0
				Area disturbed by mammal activity [%]										7.1	0.4	3.7	5.9
				pH ($CaCl_2$)										7.81	6.79	7.72	7.21
				EC [$\mu S\ cm^{-1}$]										773	1015	1603	409
				IC [%]										0.328	0.018	0.082	0.034
				OC [%]										0.975	0.995	0.517	0.667
				N [%]										0.090	0.082	0.053	0.059
				C/N ratio										13.0	12.2	10.2	11.4
				Species richness (100 m²)										14.3	23.6	14.4	20.3
				Shannon index										1.26	1.91	1.42	1.53
				Shannon evenness										0.48	0.61	0.54	0.52
				Simpson index										0.58	0.78	0.64	0.66
				Cover sum vegetation [%]										23.5	27.7	16.3	18.9
Association 2.1.1.1 - Foveolino dichotomae-Eberlanzietum cyathiformis																	
2.1 2.1.1 2.1.1.1	T	2		Foveolina dichotoma	69	84	50	60	56	32	13	18	16	3.58	0.33	0.12	0.48
Association 2.1.1.2 - Antimimato komkansicae-Zygophylletum cordifoliae																	
2.1.1.2	Cmes	2		Antimima komkansica	23	20	57	25	.	5	32	8	-10	0.17	2.82	0.18	.
2.1.1.2	G	3		Oxalis pes-caprae	41	34	86	15	56	2	30	-8	14	0.01	0.04	0	0.01
2.1.1.2	Cmes	3		Hermannia cuneifolia var. glabrescens	9	2	36	.	13	-5	28	-7	5	0.01	0.02	.	0.01
2.1.1.2	H			Cyphia sp. 2010	2	.	14	.	.	-3	27	-3	-3	.	0	.	.
2.1.1.2	T	3		Nemesia anisocarpa	10	11	29	.	.	7	26	-6	-6	0	0	.	.
2.1.1.2	Cmes	1		Crassula pyramidalis	1	.	7	.	.	-2	26	-2	-2	.	0	.	.
2.1.1.2	Cmes	1		Crassula rudolfii	1	.	7	.	.	-2	26	-2	-2	.	0	.	.
2.1.1.2	G			Freesia sp. 2776	1	.	7	.	.	-2	26	-2	-2	.	0	.	.
2.1.1.2	G			Monocotyledonic geophyte 14786	1	.	7	.	.	-2	26	-2	-2	.	0	.	.
2.1.1.2	G			Pelargonium sp. 21908	1	.	7	.	.	-2	26	-2	-2	.	0	.	.
2.1.1.2	Cmes			Pelargonium grandicalcaratum	1	.	7	.	.	-2	26	-2	-2	.	0.04	.	.
2.1.1.2	G			Trachyandra tortilis	1	.	7	.	.	-2	26	-2	-2	.	0	.	.
Association 2.1.1.3 - Cheiridopsio robustae-Cephalophylletum inaequalis																	
2 2.1.1.3	Cnan	2		Cheiridopsis robusta	30	23	14	80	.	6	0	48	-10	0.19	0.01	2.04	.
2.1.1.3	Cmes	2		Lampranthus otzenianus	4	2	.	15	.	3	-3	35	-3	0.01	.	0.11	.
2.1.1.3	Cmic	2		Eberlanzia dichotoma	4	.	.	20	.	-3	-3	34	-3	.	.	0.13	.
Order 2.1 - Mesembryanthemo guerichani-Eberlanzietalia cyathiformis																	
2.1 2.1.1	Cmes	3		Salsola sp. US07_2312	80	80	57	95	81	19	7	26	19	2.6	1.64	2.14	1.48
2.1 2.1.1	T	1		Mesembryanthemum guerichianum	79	84	93	40	100	21	26	-1	29	0.57	0.06	0.12	0.02
2 2.1 2.1.1	Cmes	3		Eberlanzia cyathiformis	64	84	7	40	88	33	-11	8	35	10.6	0.11	0.82	2.64
2.1 2.1.1	Cmes	1		Psilocaulon dinteri	63	57	71	70	63	14	22	21	17	0.31	0.51	0.29	0.41
Class 2 - Didelto carnosae-Cephalophylletea inaequalis																	
2	T	3		Didelta carnosa	70	64	86	75	69	5	16	11	8	0.05	0.03	0.08	0.01
2 2.2 2.2.1	Cnan	1		Cephalophyllum inaequale	45	16	50	65	94	-15	2	10	24	0.82	3.5	4.18	3.86
2	Cmic	2		Zygophyllum cordifolium	40	43	86	15	25	7	31	-8	-3	0.59	2.64	0	0.09
2 2.2 2.2.1 2.2.1.1	Cmes	1		Ruschia leucosperma	11	.	7	25	25	-10	-5	8	8	.	0.07	1.11	0.32
2 2.2 2.2.1 2.2.1.1	Cmes	1		Sarcocaulon l'heritieri	10	5	.	30	6	-6	-9	14	-4	0.01	.	0.08	0.01
2 2.2.1.3	Cnan			Ruschia sp. 124796	5	.	.	15	.	-5	-9	3	-9	0.11	.	0.3	.
Companion species																	
	Cmes	3		Galenia fruticosa	72	70	79	70	75	3	8	3	6	0.67	3.71	1.37	1.29
	T			Tetragonia microptera	52	64	50	15	69	17	9	-9	20	0.2	0.04	0	0.02
	G			Trachyandra revoluta	52	45	43	70	56	-2	-3	10	3	0.01	0.01	0.02	0.01
	T	2	**	Atriplex lindleyi subsp. inflata	45	52	64	25	31	15	22	-1	3	0.13	0.62	0.02	0.27
	T	3		Dimorphotheca sinuata	39	32	64	15	69	-1	16	-10	18	0.01	0.04	0.01	0.07
	T	1		Karroochloa schismoides	37	34	29	30	63	-4	-7	-6	11	0.38	0.16	0	0.1
	Cmic	2		Drosanthemum hispidum	36	27	79	5	63	-3	24	-15	15	0.09	0.94	0	0.39
	Cmes	3		Galenia sarcophylla	30	30	43	10	44	3	11	-8	12	0.11	0.07	0.1	0.04
	T	2		Gorteria diffusa subsp. diffusa	28	11	29	35	63	-12	-3	0	14	0.01	0.01	0.01	0.04
	Cmes	1		Leipoldtia schultzei	28	9	21	40	69	-12	-5	5	20	0.14	0.55	0.51	2.75
	T			Amellus microglossus	27	34	14	25	19	15	1	9	4	0.06	0	0.01	0
	Pnan	2		Aridaria noctiflora subsp. noctiflora	23	9	50	35	25	-8	16	7	1	0.04	2.77	0.22	0.78
	Pnan	2		Lebeckia multiflora	22	20	36	5	38	-3	6	-12	7	0.38	0.09	0.01	0.12
	G			Trachyandra falcata	21	25	43	.	19	8	21	-10	3	0.02	0.01	.	0.33
	G			Oxalis obtusa	20	25	14	20	13	10	2	6	0	0	0	0	0
	T			Zaluzianskya affinis	20	23	21	5	31	7	6	-6	13	0	0	0	0.01
	Cmes	3		Pteronia glabrata	19	23	21	15	13	10	9	3	1	0.4	0.34	0.19	0.13
	T	1	*	Oncosiphon suffruticosum	15	2	36	5	44	-14	5	-12	10	0	0.04	0	0.03
	Cnan	2		Phyllobolus trichotomus	15	9	36	15	13	-3	17	2	0	0.11	0.55	1.15	0.17
	T	1		Heliophila variabilis	13	7	29	5	25	-8	6	-9	4	0	0.01	0	0
	Pnan	2		Lycium oxycarpum	13	9	43	.	13	-3	22	-10	0	0.07	0.24	.	0.06
	Cnan	1		Phyllobolus prasinus	12	14	14	15	.	1	2	2	-9	0.34	0.04	0.06	.
	Cmes	3		Tetragonia fruticosa	12	2	29	15	19	-20	-7	-13	-12	0.01	0.03	0.06	0.02
	T			Chenopodium album	11	18	.	5	6	13	-6	-1	0	0.05	.	0	0
	T	1		Bromus pectinatus	9	5	36	.	6	-5	20	-9	-4	0	0.73	.	0.01
	Cnan	3		Hypertelis salsoloides var. salsoloides	9	5	7	10	19	-8	-7	-5	1	0.01	0.01	0.02	0.01
	Cmes			Phyllobolus spinuliferus	9	11	7	10	.	8	3	6	-6	0.16	0.05	0.16	.
	Cmes	1		Ruschia versicolor	9	5	21	5	13	-10	1	-9	-5	0	0.17	0.01	2.06
	T			Ehrharta pusilla	7	2	29	5	6	-13	3	-11	-10	0	0.01	0.01	0
	Cmes	3		Tetragonia verrucosa	7	5	7	15	6	-11	-9	-5	-10	0	0	0	0
	T	1	*	Tripteris clandestina	7	7	7	10	6	1	2	5	1	0	0	0	0
	G			Chlorophytum crassinerve	6	2	7	10	13	-8	-4	-2	0	0	0	0	0
	Cmes	3		Othonna sedifolia	6	5	14	.	13	-9	-2	-12	-3	0.07	0.23	.	0.02
	G			Phyllobolus sinuosus	6	2	14	.	19	-6	4	-8	8	0	0.01	.	0.02
	Pnan	1		Stoeberia frutescens	6	5	29	.	.	-5	14	-9	-9	0.11	1.07	.	.
	Cnan	1		Antimima sp. 2496	5	7	7	5	.	9	10	6	-3	0.02	0.07	0.03	.
	Cmes	1		Asparagus capensis	5	5	7	5	6	-8	-7	-8	-7	0	0	0	0.01
	T			Gazania tenuifolia	5	7	.	.	13	-1	-7	-7	4	0	.	.	0
	T	1	*	Mesembryanthemum hypertrophicum	5	5	.	10	6	1	-5	8	3	0	.	0	0
	Cmes	2		Meyerophytum meyeri	5	.	29	.	6	-10	10	-10	-6	.	0.31	.	0.02
	T	1		Aizoon canariense	4	.	7	.	19	-10	-5	-10	4	.	0	.	0
	G			Albuca cooperi	4	2	14	.	6	-6	5	-8	-2	0	0	.	0
	G			Androcymbium scabromarginatum	4	2	.	10	6	1	-3	15	8	0	.	0	0
	Cmes	3		Asparagus fasciculatus	4	5	.	5	6	2	-5	3	4	0	.	0	0.01
	G			Chlorophytum undulatum	4	5	14	.	.	1	13	-5	-5	0	0	.	.
	Cmes	2		Drosanthemum curtophyllum	4	.	29	.	.	-9	14	-9	-9	.	0.72	.	.
	Cmes	3		Euphorbia hamata	4	2	7	5	6	-9	-6	-7	-6	0	0.02	0	0.02
	G			Ferraria uncinata subsp. macrochlamys	4	5	7	.	6	4	9	-4	7	0	0	.	0
	T			Grielum humifusum	4	2	.	5	13	-7	-9	-5	1	0	.	0.01	0.01
	T			Helichrysum leontonyx	4	2	7	.	13	-8	-5	-10	-1	0	0	.	0
	G			Monocotyledonic geophyte 2761	4	5	14	.	.	5	24	-3	-3	0	0	.	.
	T	3		Osteospermum pinnatum var. pinnatum	4	7	.	5	.	12	-3	8	-3	0	.	0	.
	Cmes			Othonna arbuscula	4	2	7	5	6	-7	-3	-5	-4	0	0.04	0	0.03
	G			Pelargonium leipoldtii	4	2	14	5	.	-1	16	3	-5	0	0.01	0	.
	Pnan	2		Ruschia subg. Tumidulae sp. 2485	4	.	21	.	6	-6	17	-6	1	.	1.57	.	0.06
	T			Senecio abruptus	4	5	14	.	.	5	24	-3	-3	0	0	.	.
	Cmes	2		Trachyandra involucrata	4	.	29	.	.	-6	24	-6	-6	.	0.1	.	.
	T			Tribolium utriculosum	4	.	14	.	13	-10	1	-10	-1	.	0.07	.	0.01
	T			Tripteris amplectens	4	2	7	.	13	-6	-1	-8	4	0	0	.	0.02
	Pnan	3		Asparagus bayeri	3	7	.	.	.	10	-3	-3	-3	0.01	.	.	.
	G			Asparagus multituberosus	3	2	14	.	.	-1	18	-4	-4	0	0.01	.	.
	G			Babiana sp. 2210	3	.	21	.	.	-5	22	-5	-5	.	0	.	.
	Cmes			Crassula subaphylla var. virgata	3	5	.	5	.	6	-3	7	-3	0	.	0	.
	Cmes	2		Drosanthemum sp. 21969	3	5	7	.	.	9	16	-2	-2	0	0.01	.	.
	T	1		Ehrharta longiflora	3	2	7	.	6	-6	-2	-8	-3	0	0.01	.	0
	Pnan	1	*	Euphorbia mauritanica	3	2	7	.	6	-5	0	-7	-1	0	0.14	.	0.02
	Pnan	2		Lycium ferocissimum	3	5	.	5	.	-7	-10	-6	-10	0.02	.	0.08	.
	G			Ornithogalum sp. 2759	3	5	7	.	.	6	11	-3	-3	0	0	.	.
	G			Oxalis cf. gracilis	3	2	7	.	6	0	8	-4	7	0	0	.	0
	Cmes	2		Pelargonium karooicum	3	.	7	5	6	-5	4	1	3	.	0	0	0
	Cmes			Antimima sp. 124810	2	.	7	5	.	-7	1	-1	-7	.	0	0.01	.
	Cmes			Antimima sp. US07_2582	2	2	.	5	.	-5	-7	-3	-7	0.01	.	0	.
	H			Cyphia crenata	2	.	7	.	6	-5	6	-5	4	.	0	.	0
	Cmes			Drosanthemum ramosissimum	2	.	.	5	6	-4	-4	5	7	.	.	0.13	0.06
	T			Felicia merxmuelleri	2	.	.	5	6	-7	-7	-3	-1	.	.	0	0
	T			Hebenstretia parviflora	2	2	.	.	6	-5	-7	-7	-1	0	.	.	0
	T	1		Helichrysum alsinoides	2	.	7	.	6	-10	-4	-10	-5	.	0	.	0.01
	T			Jamesbrittenia racemosa	2	5	.	.	.	1	-5	-5	-5	0	.	.	.
	Cmes	2		Leipoldtia cf. crassulifera	2	.	.	.	13	-7	-7	-7	6	.	.	.	0.06
	T			Leysera tenella	2	.	.	.	13	-11	-11	-11	-3	.	.	.	0
	T			Manulea corymbosa	2	.	.	5	6	-6	-6	0	1	.	.	0	0
	G			Monocotyledonic geophyte 1678	2	.	7	5	.	-2	19	13	-2	.	0	0	.
	G			Ornithogalum suaveolens	2	2	.	5	.	3	-2	10	-2	0	.	0	.
	G			Oxalis ambigua	2	.	.	5	6	-4	-4	4	6	.	.	0	0
	T			Pelargonium minimum	2	.	.	.	13	-3	-3	-3	21	.	.	.	0
	G			Pelargonium sp. 20224	2	2	.	5	.	7	-2	18	-2	0	.	0	.
	Cmes			Psilocaulon foliosum	2	5	.	.	.	21	-1	-1	-1	0.02	.	.	.
	Cnan			Quaqua mammillaris	2	.	.	10	.	-3	-3	18	-3	.	.	0.01	.
	Cmes	1		Ruschia goodiae	2	.	14	.	.	-6	9	-6	-6	.	0.05	.	.
	Pnan	1		Ruschia subg. Tumidulae sp. 3818	2	.	7	.	6	-8	-2	-8	-3	.	0.04	.	0.13
	G			Trachyandra bulbinifolia	2	2	.	5	.	1	-3	7	-3	0	.	0	.
	G			Wachendorfia multiflora	2	2	.	.	6	-1	-4	-4	5	0	.	.	0
	T			Zaluzianskya benthamiana	2	2	.	.	6	-1	-4	-4	5	0	.	.	0
	G			Albuca maxima	1	.	7	.	.	-3	11	-3	-3	.	0	.	.
	H			Arctotis undulata	1	2	.	.	.	-3	-5	-5	-5	0	.	.	.
	Cmes			Asparagus alopecurus	1	.	.	.	6	-2	-2	-2	18	.	.	.	0.02
	Pnan	1		Asparagus burchelli	1	.	7	.	.	-7	0	-7	-7	.	0	.	.
	Cmes			Asparagus sp. 22034	1	2	.	.	.	3	-2	-2	-2	0	.	.	.
	G			Babiana sp. 1765	1	.	.	.	6	-3	-3	-3	8	.	.	.	0
	G	1		Bulbine sedifolia	1	.	.	5	.	-3	-3	6	-3	.	.	0	.
	G			Bulbine succulenta	1	.	.	5	.	-1	-1	22	-1	.	.	0	.
	Cnan	2		Cephalophyllum pillansii	1	.	7	.	.	-5	4	-5	-5	.	0.02	.	.
	T			Cotula coronopifolia	1	.	.	.	6	-2	-2	-2	15	.	.	.	0
	Cnan			Crassula deceptor	1	.	.	5	.	-1	-1	22	-1	.	.	0	.
	Cnan	1		Crassula elegans	1	.	.	5	.	-3	-3	10	-3	.	.	0	.
	Cmes			Crassula muscosa var. muscosa	1	.	7	.	.	-5	4	-5	-5	.	0	.	.
	Cnan			Crassula tomentosa	1	.	7	.	.	-2	18	-2	-2	.	0	.	.
	T			Crassula vaillantii	1	.	7	.	.	-3	14	-3	-3	.	0	.	.
	T			Crotalaria humilis	1	.	.	5	.	-1	-1	22	-1	.	.	0	.
	H	3	*	Ehrharta calycina	1	.	.	.	6	-5	-5	-5	4	.	.	.	0.09
	Cmes	2		Eriocephalus microphyllus var. pubescens	1	.	.	.	6	-3	-3	-3	13	.	.	.	0
	T		**	Erodium cicutarium	1	.	.	.	6	-2	-2	-2	24	.	.	.	0
	Cmes	1		Euphorbia decussata	1	.	.	5	.	-5	-5	1	-5	.	.	0.01	.
	T			Forsskaolea candida	1	.	.	.	6	-2	-2	-2	24	.	.	.	0.13
	Pnan	1	*	Galenia africana	1	.	7	.	.	-6	3	-6	-6	.	0.01	.	.
	Cnan	1		Hallianthus planus	1	.	.	5	.	-5	-5	2	-5	.	.	0	.
	T			Heliophila lactea	1	.	.	.	6	-4	-4	-4	6	.	.	.	0
	Cmes	3		Hermannia trifurca	1	2	.	.	.	-9	-11	-11	-11	0.01	.	.	.
	Cmic	1		Jacobsenia vaginata	1	2	.	.	.	-4	-6	-6	-6	0.1	.	.	.
	H			Kedrostis psammophylla	1	.	.	.	6	-4	-4	-4	7	.	.	.	0.02
	G			Lachenalia sp. 22106	1	.	.	.	6	-2	-2	-2	24	.	.	.	0
	G			Lachenalia sp. 2763	1	2	.	.	.	-1	-5	-5	-5	0	.	.	.
	Cmes			Lampranthus watermeyeri	1	.	7	.	.	-2	20	-2	-2	.	0	.	.
	T			Lepidium desertorum	1	2	.	.	.	-4	-6	-6	-6	0.01	.	.	.
	H			Lessertia sp. 20203	1	.	.	5	.	-3	-3	10	-3	.	.	0	.
	Cmes			Lessertia sp. 21897	1	2	.	.	.	15	-1	-1	-1	0	.	.	.
	Cmic	3		Limeum africanum	1	.	7	.	.	-6	1	-6	-6	.	0	.	.
	Pnan	3		Lycium cinereum	1	.	.	.	6	-4	-4	-4	5	.	.	.	0.05
	Cmes	3		Manochlamys albicans	1	.	7	.	.	-7	-1	-7	-7	.	0.02	.	.
	T			Manulea cheiranthus	1	2	.	.	.	0	-4	-4	-4	0	.	.	.
	T	1		Mesembryanthemum nodiflorum	1	.	.	5	.	-4	-4	5	-4	.	.	0.03	.
	Cmes	3		Microloma sagittatum	1	.	7	.	.	-7	-1	-7	-7	.	0	.	.
	G			Monocotyledonic geophyte 22106	1	.	.	.	6	-2	-2	-2	24	.	.	.	0
	G			Monocotyledonic geophyte 3441	1	2	.	.	.	4	-2	-2	-2	0	.	.	.
	Cmes	1		Octopoma connatum	1	.	.	5	.	-5	-5	2	-5	.	.	0	.
	T	1	*	Oncosiphon grandiflorum	1	2	.	.	.	-1	-5	-5	-5	0	.	.	.
	Cnan			Orbea namaquensis	1	.	.	.	6	-2	-2	-2	24	.	.	.	0
	G			Ornithogalum sp. 2017	1	.	.	.	6	-3	-3	-3	13	.	.	.	0
	G			Ornithoglossum vulgare	1	2	.	.	.	-3	-6	-6	-6	0	.	.	.
	Cmes	3		Pelargonium crithmifolium	1	.	7	.	.	-3	11	-3	-3	.	0.02	.	.
	T			Pentaschistis airoides	1	.	.	.	6	-6	-6	-6	0	.	.	.	0
	Cnan			Pharnaceum confertum var. brachyphyllum	1	.	.	5	.	-9	-9	-5	-9	.	.	0	.
	Cmes			Phyllobolus sp. 20257	1	2	.	.	.	15	-1	-1	-1	0	.	.	.
	T			Plantago cafra	1	.	7	.	.	-4	6	-4	-4	.	0	.	.
	Pnan	1		Pteronia divaricata	1	.	7	.	.	-4	8	-4	-4	.	0.02	.	.
	Pmic	3		Rhus undulata	1	.	.	5	.	-8	-8	-3	-8	.	.	0.05	.
	Cmes			Ruschia sp. 21952	1	.	.	5	.	-4	-4	3	-4	.	.	0.06	.
	Cmes			Ruschia sp. 22026	1	2	.	.	.	15	-1	-1	-1	0	.	.	.
	Cmes	2		Ruschia viridifolia	1	2	.	.	.	-8	-10	-10	-10	0.02	.	.	.
	Cmes	1	*	Sarcostemma viminale	1	.	7	.	.	-3	10	-3	-3	.	0.04	.	.
	T			Scrophulariaceae sp. 21906	1	.	.	.	6	-5	-5	-5	4	.	.	.	0
	T	2		Stipa capensis	1	2	.	.	.	-1	-4	-4	-4	0	.	.	.
	H	1	*	Stipagrostis ciliata	1	.	.	.	6	-8	-8	-8	-2	.	.	.	0.01
	Pnan	2		Stoeberia utilis	1	.	.	5	.	-7	-7	-1	-7	.	.	0.23	.
	G			Trachyandra sp. 1670	1	.	.	.	6	-3	-3	-3	9	.	.	.	0
	Cmes	1	*	Tylecodon wallichii	1	.	7	.	.	-3	11	-3	-3	.	0.01	.	.
	T			Wahlenbergia androsacea	1	.	7	.	.	-6	2	-6	-6	.	0	.	.
	Pnan	2	*	Zygophyllum morgsana	1	2	.	.	.	-8	-10	-10	-10	0.01	.	.	.
	Pnan	2		Zygophyllum retrofractum	1	.	.	5	.	-6	-6	-1	-6	.	.	0.01	.

Appendix S6. Relevé table of the order *Euphorbio hamatae-Cephalophylletalia inaequalis* (2.2).

Complete table of the relevés assigned to the *Euphorbio-Cephalophylletalia*. To the left of its name, each species is classified whether it can be considered as regional character species of one or of several syntaxa. Further, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems (Pr.; * = problem plant; ** problem and exotic plant; Wells et al. 1986). Between species names and individual relevés, information at association level is provided, namely constancy, phi-value (calculated on the basis of all 17 units at association level), and mean cover (including those plots without occurrences). Colours are used to indicate species with particularly high constancy, fidelity (phi > 0.5: red; phi > 0.25: blue, phi > 0: green), or cover. On the top of the table, it is indicated to which syntaxa of different rank a certain relevé belongs, with the number in brackets after the association name showing the corresponding TWINSPAN cluster (Fig. 2). Further, the nomenclatural types of the associations and the sources of the individual relevés (0 = Luther-Mosebach (2009); 1 = additional relevés from Röwer (2009)/*heuweltjies*; 2 = BIOTA Observatory; 3 = additional relevés from the commonage 2007 and 2008; 4 = Namaqua National Park; 5 = stock post transect) are indicated.

Order 2.2: *Euphorbio hamatae-Cephalophylletalia inaequalis*
Alliance 2.2.1: *Euphorbio hamatae-Cephalophyllion inaequalis*
Association 2.2.1.1: *Hallianthо plani-Ruschietum leucospermae* (13) | Association 2.2.1.2: *Leipoldtio schultzei-Cephalophylletum inaequalis* (14) | Association 2.2.1.3: *Pteronio glabratae-Cephalophylletum inaequalis* (15) | Association 2.2.1.4: *Drosanthemo curtophylli-Meyerophytetum meyeri* (16) | Association 2.2.1.5: *Ruschio versicoloris-Cephalophylletum inaequalis* (17)

Diagnostic values	LF	Pal.	Pr.	Taxon or field name	All [%]	Constancy [%] 2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5	phi-value x 100 2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5	Mean values or mean cover [%] 2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5
				Plot No. in database		n = 9	n = 31	n = 11	n = 20	n = 24	n = 9	n = 31	n = 11	n = 20	n = 24	n = 9	n = 31	n = 11	n = 20	n = 24
				Inclination [°]												3.2	4.7	5.7	4.0	4.6
				Grazing intensity [%]												66	82	91	116	100
				Fine material [%]												88	92	90	91	95
				Fine + medium gravel [%]												4.1	3.9	3.7	4.4	2.4
				Coarse gravel (2-6 cm) [%]												4.4	1.5	3.9	3.4	0.3
				Stones (6-20 cm) [%]												2.2	0.7	2.0	0.8	0.2
				Boulders (20-60 cm) [%]												0.9	0.2	0.2	0.4	0.2
				Larger boulders (> 60 cm) [%]												0.0	0.0	0.0	0.0	0.4
				Rock outcrops [%]												0.2	2.1	0.3	0.4	1.2
				Dead wood [%]												0.9	2.0	0.9	2.7	1.5
				Soft litter [%]												0.6	3.9	3.0	2.4	2.7
				Dung [%]												0.0	0.0	0.0	0.1	0.0
				Area disturbed by mammal activity [%]												0.6	0.3	0.0	0.2	0.2
				pH ($CaCl_2$)												6.10	6.34	6.43	5.68	6.22
				EC [µS cm^{-1}]												1224	844	2626	1000	986
				IC [%]												0.005	0.005	0.009	0.006	0.010
				OC [%]												0.638	0.777	0.944	0.955	0.778
				N [%]												0.050	0.061	0.066	0.063	0.058
				C/N ratio												12.7	12.5	14.4	15.2	13.2
				Species richness (100 m²)												20.3	19.5	20.5	26.1	22.3
				Shannon index												1.54	1.42	1.61	1.93	1.73
				Shannon evenness												0.51	0.48	0.53	0.59	0.56
				Simpson index												0.61	0.60	0.67	0.73	0.71
				Cover sum vegetation [%]												23.4	28.0	28.0	26.7	28.2
Association 2.2.1.1 - Hallianthо plani-Ruschietum leucospermae																				
2.2.1.1	Cnan	1		Hallianthus planus	6	56	3	.	.	.	68	-1	-5	-5	-5	0.06	0	.	.	.
2 2.2 2.2.1 2.2.1.1	Cmes	1		Ruschia leucosperma	32	89	52	9	20	4	54	27	-4	4	-7	10.2	3.72	0.05	0.07	0
2.2.1.1	G			Lachenalia framesii	2	22	.	.	.	.	46	-3	-3	-3	-3	0	.	.	.	.
2.2.1.1	Cmes			Vanzijlia annulata	6	33	6	.	.	4	44	5	-4	-4	2	0.54	0.15	.	.	0.13
2.2.1.1	G			Eriospermum sp. 1817	2	22	.	.	.	.	43	-3	-3	-3	-3	0	.	.	.	.
2 2.2 2.2.1 2.2.1.1	Cmes	1		Sarcocaulon l'heritieri	21	67	6	27	25	17	42	-4	12	10	4	0.52	0.01	0.1	0.08	0.08
2.2.1.1	G			Bulbine torta	4	22	6	.	.	.	40	9	-3	-3	-3	0	0	.	.	.
2.2.1.1	Cmes	1		Octopoma connatum	8	33	6	.	.	13	39	3	-5	-5	11	0.09	0.02	.	.	0.05
2.2.1.1	T			Cotula leptalea	1	11	.	.	.	.	32	-2	-2	-2	-2	0	.	.	.	.
2.2.1.1	Cmes			Crassula expansa subsp. pyrifolia	1	11	.	.	.	.	32	-2	-2	-2	-2	0	.	.	.	.
2.2.1.1	Cmic	1		Ruschia sp. US07_2473	1	11	.	.	.	.	32	-2	-2	-2	-2	0.01	.	.	.	.
2.2.1.1	Cmes	1		Ruschia sp. 22122	1	11	.	.	.	.	32	-2	-2	-2	-2	0.33	.	.	.	.
2.2.1.1	Cmes	1		Salsola sp. 20239	1	11	.	.	.	.	32	-2	-2	-2	-2	0.03	.	.	.	.
2.2.1.1	Cmes	1	*	Tylecodon reticulatus subsp. reticulatus	1	11	.	.	.	.	32	-2	-2	-2	-2	0	.	.	.	.
Association 2.2.1.2 - Leipoldtio schultzei-Cephalophylletum inaequalis																				
2.2.1.2	Cmes			Antimima sp. 2386	9	.	23	9	.	4	-4	34	11	-4	3	.	0.19	0.02	.	0
2.2.1.2	Cmes	1		Leipoldtia schultzei	49	56	90	9	15	42	13	32	-12	-9	5	0.65	7.02	0.05	0.16	0.51
Association 2.2.1.3 - Pteronio glabratae-Cephalophylletum inaequalis																				
2 2.2.1.3	Cnan			Ruschia sp. 124796	16	11	.	100	15	.	0	-9	69	3	-9	0.33	.	7.43	0.05	.
2.2 2.2.1 2.2.1.3	Cmes			Antimima sp. US07_2582	16	.	3	55	25	13	-7	-4	44	16	4	.	0	0.04	0.01	0.05
2.2.1.3	Cmes	3		Tripteris sinuata var. sinuata	4	.	.	18	10	.	-3	-3	30	15	-3	.	.	0.05	0.09	.
2.2.1.3	G			Albuca sp. 1636	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	Cmes			Antimima sp. 21985	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0.14	.	.
2.2.1.3	G			Chlorophytum sp. 1887	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	Cmic			Euphorbia caput-medusae	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0.01	.	.
2.2.1.3	Cmes	3		Hermannia cuneifolia var. cuneifolia	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0.05	.	.
2.2.1.3	G			Lachenalia sp. 1644	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	G			Lapeirousia spinosa	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	Cmes	1		Monilaria chrysoleuca	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	n.a.			Othonna sp. 124806	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	G			Oxalis sp. 22012	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	Cmes			Pelargonium ceratophyllum	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0	.	.
2.2.1.3	Cmic			Ruschia sp. 20228	1	.	.	9	.	.	-2	-2	29	-2	-2	.	.	0.32	.	.
2.2.1.3	Cmes	3		Pteronia glabrata	13	.	3	45	5	21	-9	-6	28	-5	8	.	0.03	1.14	0.01	0.93
Association 2.2.1.4 - Drosanthemo curtophylli-Meyerophytetum meyeri																				
2.2.1.4	Cmes	2		Drosanthemum curtophyllum	31	11	6	9	75	42	0	-4	-2	51	24	0.03	0.05	0.18	2.71	0.49
2.2 2.2.1 2.2.1.4	Cmes	2		Thesium elatius	12	11	.	.	40	8	9	-5	-5	46	5	0.01	.	.	0.04	0
2.2 2.2.1 2.2.1.4	Cmes	3		Pteronia ciliata	21	22	.	18	60	17	14	-7	10	49	8	0.03	.	0.03	0.33	0.13
2.2.1.4	H			Cyphia longiflora	5	.	3	.	20	.	-3	4	-3	40	-3	.	0	.	0	.
2.2.1.4	Cmes	2		Meyerophytum meyeri	36	11	23	55	70	25	-2	6	29	40	8	0.03	0.54	0.55	7.78	0.67
2.2.1.4	Cmes	1		Aloe krapohliana	2	.	.	.	10	.	-2	-2	-2	31	-2	.	.	.	0.01	.
2.2.1.4	G	1		Bulbine sedifolia	4	.	.	9	15	.	-3	-3	14	26	-3	.	.	0	0	.
2.2.1.4	Cmes			Ruschia sp. 21952	9	11	10	.	20	4	12	10	-4	25	2	0.03	0.11	.	0.24	0.04
Association 2.2.1.5 - Ruschio versicoloris-Cephalophylletum inaequalis																				
2.2.1.5	Cmes	1		Ruschia versicolor	39	.	13	18	35	100	-12	-4	-1	9	50	.	0.35	0.05	0.89	6.45
Order 2.2 - Euphorbio hamatae-Cephalophylletalia inaequalis																				
2 2.2 2.2.1	Cnan	1		Cephalophyllum inaequale	93	100	90	82	95	96	27	22	18	25	25	4.31	8.6	5.45	3.8	9.21
2.2 2.2.1	Cmes	3		Tetragonia fruticosa	71	78	74	45	85	63	18	17	2	22	11	0.62	0.74	0.16	1	0.44
2.2 2.2.1	T	2		Gorteria diffusa subsp. diffusa	59	78	61	9	70	63	22	14	-14	18	14	0.07	0.03	0	0.09	0.01
2.2 2.2.1	Cmes	3		Tetragonia verrucosa	40	33	16	55	65	46	6	-4	19	25	14	0.02	0.02	0.11	0.17	0.06
2.2 2.2.1	Cmes	3		Euphorbia hamata	37	67	10	18	65	46	36	-4	2	35	22	0.16	0.06	0.02	0.54	0.17
2 2.2 2.2.1	H	3		Gazania krebsiana subsp. krebsiana	29	44	10	45	55	21	25	-2	26	33	7	0.07	0.01	0.01	0.13	0.01
2.2 2.2.1	Cmes	2		Ruschia viridifolia	28	67	13	9	55	21	39	0	-3	31	5	1.19	0.16	0.18	0.42	0.42
2.2 2.2.1	Cnan	1		Phyllobolus prasinus	25	56	13	27	50	8	33	1	12	29	-3	0.12	0.01	0.28	0.28	0.01
2.2 2.2.1	Cmes	2		Leipoldtia cf. crassulifera	16	33	10	27	25	4	27	3	21	19	-2	0.13	0.03	3.74	0.64	0
2.2 2.2.1	G			Oxalis sp. 2345	12	11	19	.	20	.	12	24	-4	25	-4	0	0	.	0	.
Class 2 - Didelto carnosae-Cephalophylletea inaequalis																				
2	T	3		Didelta carnosa	75	56	74	82	70	83	1	10	14	8	15	0.07	0.06	0.07	0.13	0.02
2	Cmic	2		Zygophyllum cordifolium	47	11	26	55	60	75	-10	-2	13	16	25	0.06	0.48	0.51	0.87	1.42
2 2.1 2.1.1	Cmes	3		Eberlanzia cyathiformis	33	11	45	27	30	29	-8	11	1	2	2	0.11	0.92	0.11	0.23	0.51
2 2.1.1.3	Cnan	2		Cheiridopsis robusta	17	44	19	36	5	4	22	4	16	-6	-7	0.54	0.02	0.19	0.1	0
Differential species (one-sided)																				
	Cnan			Pharnaceum confertum var. brachyphyllum	24	.	10	.	50	42	-9	-1	-9	32	25	.	0.03	.	0.13	0.05
	Cmes			Othonna arbuscula	16	33	3	45	20	8	17	-6	27	7	-2	0.61	0.02	0.28	0.24	0.05
2.3 2.3.x	Cmes			Aspazoma amplectens	4	22	.	.	10	.	26	-5	-5	9	-5	0.19	.	.	0.41	.
	Cmic	1		Othonna rechingeri	4	22	.	18	.	.	28	-4	22	-4	-4	0	.	0	.	.
	Cmic	3		Limeum africanum	2	.	3	.	.	4	-6	-3	-6	-6	-2	.	0	.	.	0
Companion species																				
	Cmes	3		Galenia fruticosa	79	78	65	82	95	83	7	0	9	16	10	0.52	0.99	0.69	0.79	1.37
	G			Trachyandra revoluta	61	67	58	27	60	79	8	4	-11	5	15	0.04	0.01	0	0.01	0.02
	Cmes	3		Salsola sp. US07_2312	37	33	19	73	20	58	-5	-12	15	-12	8	0.31	0.23	2.55	0.28	1.29
	Cnan	3		Hypertelis salsoloides var. salsoloides	32	33	52	18	20	21	11	23	1	2	2	0.06	0.31	0.01	0.04	0.05
	T	3		Dimorphotheca sinuata	31	11	65	.	5	29	-12	16	-18	-15	-3	0	0.02	.	0.01	0.01
	G	3		Oxalis pes-caprae	31	.	32	.	45	42	-17	1	-17	8	6	.	0.01	.	0.01	0.02
	Pnan	2		Aridaria noctiflora subsp. noctiflora	29	11	13	55	50	29	-7	-6	19	16	4	0.17	0.93	0.39	0.8	0.49
	T			Ehrharta pusilla	29	.	23	9	60	33	-14	-1	-9	21	6	.	0.03	0.01	0.46	0.12
	Cmes	1		Asparagus capensis	26	.	19	55	40	21	-11	1	25	15	2	.	0.02	0.12	0.03	0.03
	Cmic	2		Drosanthemum hispidum	24	11	42	.	25	17	-12	5	-18	-4	-9	0	0.47	.	0.05	0.03
	Cnan	2		Phyllobolus trichotomus	24	33	19	9	45	17	15	5	-3	24	3	0.05	0.14	0.01	0.22	0.07
	T	2		Foveolina dichotoma	22	22	32	36	5	17	-3	3	5	-13	-6	0	0.02	0.01	0	0
	T	2	**	Atriplex lindleyi subsp. inflata	20	.	19	18	15	33	-15	-4	-4	-6	4	.	0.01	0.01	0.16	0.09
	T	1		Karroochloa schismoides	19	.	26	.	20	25	-21	-8	-21	-11	-8	.	0.05	.	0.01	0
	Cmes	3		Othonna sedifolia	18	33	10	18	15	25	10	-5	0	-2	5	0.34	0.04	0.02	0.05	0.69
	G			Phyllobolus sinuosus	18	11	26	9	20	13	1	14	0	9	2	0	0.05	0	0.02	0.01
	Pnan	1		Stoeberia frutescens	18	11	19	.	25	21	0	7	-9	11	8	0.28	0.86	.	0.27	0.25
	Cmes	2		Antimima komkansica	17	.	13	27	15	25	-10	0	10	1	8	.	0.1	0.1	0.13	0.19
	T			Helichrysum leontonyx	17	11	23	.	20	17	-2	6	-10	4	2	0.01	0.01	.	0.01	0
	T			Leysera tenella	16	22	13	.	20	21	4	-2	-11	2	3	0.03	0	.	0.01	0
	G			Chlorophytum crassinerve	15	.	13	9	25	17	-10	0	-3	9	3	.	0	0	0.01	0
	Cmes	1		Psilocaulon dinteri	15	11	6	45	.	25	-11	-13	8	-17	-3	0	0	0.06	.	0.06
	T			Tetragonia microptera	15	.	19	9	15	17	-17	-7	-12	-9	-8	.	0.01	0	0	0
	T			Tribolium utriculosum	15	11	19	.	25	8	-2	4	-10	8	-4	0	0	.	0.01	0
	T	1		Heliophila variabilis	14	.	19	.	10	21	-12	0	-12	-6	1	.	0	.	0	0
	T	1		Mesembryanthemum guerichianum	14	.	26	9	5	13	-21	-8	-17	-19	-15	.	0	0.02	0.01	0
	Cmes			Antimima sp. 124810	13	22	6	18	15	13	16	0	12	9	6	0.02	0.01	0	0.14	0.07
	T			Manulea corymbosa	13	.	13	.	15	21	-6	9	-6	11	18	.	0	.	0	0
	Cmes			Crassula muscosa var. muscosa	12	.	10	.	20	17	-5	7	-5	20	16	.	0	.	0.01	0
	Cmes	3		Galenia sarcophylla	9	.	10	18	10	8	-14	-8	-3	-8	-9	.	0.09	0.01	0.01	0
	Cmes	3		Hirpicium alienatum	9	.	6	9	20	8	-6	2	5	18	4	.	0.01	0.01	0.13	0.1
	Pnan	2		Lycium oxycarpum	9	.	10	36	5	4	-10	-2	17	-6	-7	.	0.06	0.19	0.01	0
	G			Oxalis obtusa	9	.	6	27	5	13	-9	-4	12	-5	0	.	0	0.01	0	0
	T			Amellus microglossus	8	.	16	9	5	4	-10	2	-3	-6	-7	.	0	0.01	0	0
	Cmes	3		Berkheya fruticosa	8	.	.	9	20	13	-8	-8	-1	8	2	.	.	0.07	0.27	0.23
	T			Felicia merxmuelleri	8	11	6	9	10	8	3	-1	1	2	0	0	0	0	0.01	0
	Cmic			Helichrysum dregeanum	8	.	10	.	10	13	-6	5	-6	5	8	.	0.03	.	0.01	0.01
	Pnan	2		Lebeckia multiflora	8	.	3	18	.	21	-14	-13	-4	-14	-2	.	0.05	0.03	.	0.08
	T			Pentaschistis airoides	8	22	6	.	20	.	17	1	-6	15	-6	0.02	0	.	0.02	.
	G			Trachyandra falcata	8	.	6	9	15	8	-10	-5	-4	1	-4	.	0	0	0	0
	Cmes	3		Hermannia trifurca	7	.	3	.	15	13	-11	-9	-11	-1	-2	.	0.06	.	0.02	0.1
	Cmes			Phyllobolus spinuliferus	7	11	3	9	10	8	8	-2	5	6	4	0.22	0.01	0.02	0.08	0.01
	T	1		Aizoon canariense	6	.	16	.	5	.	-10	2	-10	-6	-10	.	0	.	0	.
	G			Albuca cooperi	6	11	6	9	5	4	2	-2	0	-3	-4	0	0	0	0	0
	Pnan	1	*	Euphorbia mauritanica	6	.	3	.	.	21	-7	-4	-7	-7	12	.	0	.	.	0.13
	Cmes	3		Manochlamys albicans	6	.	10	9	.	8	-7	1	1	-7	0	.	0.12	0.02	.	0.01
	T	3		Nemesia anisocarpa	6	.	6	.	10	8	-6	1	-6	5	3	.	0	.	0	0
	G			Oxalis sp. 1800	6	.	6	9	10	4	-3	9	14	16	5	.	0	0	0	0
	Cmes	2		Pelargonium karooicum	6	.	.	.	20	8	-5	-5	-5	21	6	.	.	.	0.03	0.05
	Pnan	3		Tripteris oppositifolia	6	.	6	9	5	8	-7	0	2	-2	2	.	0.02	0.36	0.01	0.06
	Cmes	3		Asparagus fasciculatus	5	.	6	.	10	4	-5	5	-5	10	1	.	0	.	0.01	0
	T	3	**	Atriplex semibaccata	5	.	6	.	5	8	-6	1	-6	-1	3	.	0	.	0.01	0
	G			Babiana sp. 2210	5	.	6	.	5	8	-5	3	-5	1	5	.	0	.	0	0
	Cmes	2		Crassula subaphylla var. subaphylla	5	11	6	.	.	8	18	9	-3	-3	13	0	0	.	.	0.01
	H			Cyphia crenata	5	.	3	9	5	8	-5	0	8	3	7	.	0	0	0	0
	T			Hebenstretia parviflora	5	.	10	.	5	4	-7	3	-7	-2	-3	.	0	.	0	0
	T	1		Helichrysum alsinoides	5	.	6	.	.	13	-10	-5	-10	-10	0	.	0	.	.	0
	Cmes	3		Hermannia cuneifolia var. glabrescens	5	.	3	9	10	4	-7	-4	2	3	-3	.	0.03	0.01	0.05	0.02
	Pnan	2		Lycium ferocissimum	5	.	3	9	5	8	-10	-8	-3	-6	-4	.	0.05	0	0.01	0.03
	Cmes	3		Microloma sagittatum	5	.	10	.	10	.	-7	1	-7	2	-7	.	0	.	0	.
	T	1	*	Oncosiphon suffruticosum	5	11	13	.	.	.	-9	-8	-15	-15	-15	0	0	.	.	.
	G			Oxalis sp. 2233	5	11	6	.	5	4	10	4	-5	2	1	0	0	.	0	0
	Pnan	1		Ruschia subg. Tumidulae sp. 3818	5	.	13	.	.	4	-8	2	-8	-8	-5	.	0.17	.	.	0.03
	T	1	*	Tripteris clandestina	5	.	6	.	10	4	-6	1	-6	5	-2	.	0	.	0	0
	Pnan	2		Zygophyllum retrofractum	5	11	3	9	5	4	6	-3	4	-1	-2	0.03	0.05	0.14	0.01	0.02
	Cnan			Amphiglossa tomentosa	4	.	.	.	10	8	-3	-3	-3	17	14	.	.	.	0.03	0.1
	G			Babiana sinuata	4	.	.	.	15	4	-4	-4	-4	24	4	.	.	.	0	0
	Cnan	2		Cephalophyllum pillansii	4	.	10	.	.	4	-5	8	-5	-5	1	.	0.01	.	.	0
	Cnan	1		Conophytum bilobum	4	11	.	9	5	4	16	-4	13	5	4	0	.	0	0	0
	Cmic	1		Dicrocaulon ramulosum	4	.	.	.	20	.	-6	-6	-6	18	-6	.	.	.	0.34	.
	H	3	*	Ehrharta calycina	4	.	3	.	10	4	-5	0	-5	9	1	.	0.03	.	0.01	0
	T	1		Ehrharta longiflora	4	.	6	.	5	4	-8	-2	-8	-4	-4	.	0	.	0	0
	T			Grielum humifusum	4	.	.	.	.	17	-9	-9	-9	-9	5	.	.	.	.	0.01
	G			Ornithoglossum vulgare	4	11	3	18	.	.	7	-2	16	-6	-6	0	0	0	.	.
	G			Oxalis cf. gracilis	4	.	3	.	5	8	-4	2	-4	5	10	.	0	.	0	0
	G			Oxalis clavifolia	4	.	.	.	10	8	-4	-4	-4	12	9	.	.	.	0	0
	Cmes	2		Ruschia stricta	4	.	6	.	.	8	-4	8	-4	-4	11	.	0.23	.	.	0.01
	G			Trachyandra bulbinifolia	4	.	10	.	5	.	-3	17	-3	7	-3	.	0	.	0	.
	Cmes	2		Trachyandra involucrata	4	.	3	.	5	8	-6	-3	-6	-1	2	.	0.01	.	0	0.01
	Cmes			Zygophyllum spinosum	4	.	.	.	10	8	-4	-4	-4	11	9	.	.	.	0.08	0.01
	G			Albuca viscosa	3	11	3	.	5	.	24	5	-3	9	-3	0	0	.	0	.
	T			Dorotheanthus bellidiformis subsp. hestermalensis	3	.	3	.	.	8	-6	-3	-6	-6	3	.	0	.	.	0
	G			Ferraria uncinata subsp. macrochlamys	3	.	3	.	5	4	-4	2	-4	5	4	.	0	.	0	0
	Cmic			Hirpicium sp. US07_2511	3	.	.	18	5	.	-4	-4	23	3	-4	.	.	0.66	0	.
	Cmic	1		Jacobsenia vaginata	3	.	.	18	.	4	-6	-6	13	-6	-2	.	.	0.32	.	0
	G			Lachenalia sp. 2763	3	11	3	.	5	.	11	0	-5	3	-5	0	0	.	0	.
	T			Lotononis parviflora	3	11	3	.	.	4	13	1	-4	-4	2	0	0	.	.	0
	T			Manulea cheiranthus	3	.	6	.	.	4	-4	7	-4	-4	3	.	0	.	.	0
	G			Oxalis sp. 20205	3	.	3	.	5	4	-4	1	-4	4	3	.	0	.	0	0
	Cnan			Quaqua mammillaris	3	.	3	.	.	8	-3	4	-3	-3	14	.	0	.	.	0
	Cmes	1		Ruschia goodiae	3	.	6	9	.	.	-6	1	4	-6	-6	.	0.1	0.05	.	.
	Cnan			Senecio aloides	3	.	.	18	5	.	-4	-4	23	3	-4	.	.	0.01	0	.
	T			Senecio arenarius	3	.	10	.	.	.	-3	19	-3	-3	-3	.	0	.	.	.
	Cmic			Zygophyllum sessilifolium	3	.	.	9	5	4	-4	-4	11	4	3	.	.	0.07	0.01	0.01
	Cmes			Anthospermum dregei subsp. dregei	2	.	.	.	10	.	-3	-3	-3	17	-3	.	.	.	0.02	.
	T			Arctotis scullyi	2	.	.	.	.	8	-2	-2	-2	-2	21	.	.	.	.	0.06
	G			Babiana sp. 1765	2	11	.	.	5	.	17	-3	-3	6	-3	0	.	.	0	.
	G			Bulbine sp. 1820	2	11	3	.	.	.	24	5	-3	-3	-3	0	0	.	.	.
	G			Chlorophytum undulatum	2	22	.	.	.	.	24	-5	-5	-5	-5	0.01	.	.	.	.
	Cmes	2		Crassula subaphylla var. virgata	2	11	.	.	5	.	20	-3	-3	7	-3	0	.	.	0	.
	H	3		Ehrharta barbinodis	2	.	.	.	5	4	-4	-4	-4	5	4	.	.	.	0.01	0
	Cmes	1		Euphorbia decussata	2	.	.	9	5	.	-5	-5	7	1	-5	.	.	0	0.05	.
	Cmes			Euphorbia ephedroides	2	.	3	9	.	.	-3	4	17	-3	-3	.	0.02	0.02	.	.
	Cmes	1		Hermannia amoena	2	.	.	.	5	4	-5	-5	-5	1	0	.	.	.	0	0
	H			Indigofera sp. 3765	2	.	6	.	.	.	-2	25	-2	-2	-2	.	0	.	.	.
	T			Jamesbrittenia racemosa	2	.	6	.	.	.	-5	4	-5	-5	-5	.	0	.	.	.
	G			Lapeirousia cf. silenoides	2	11	.	.	.	4	27	-2	-2	-2	9	0	.	.	.	0
	G			Lapeirousia sp. 21958	2	11	3	.	.	.	20	4	-3	-3	-3	0.01	0	.	.	.
	Cmic			Meyerophytum globosum	2	.	.	9	.	4	-3	-3	16	-3	5	.	.	0.45	.	0
	G			Monocotyledonic geophyte 2761	2	.	.	.	.	8	-3	-3	-3	-3	12	.	.	.	.	0
	G			Ornithogalum sp. 2759	2	.	.	.	10	.	-3	-3	-3	17	-3	.	.	.	0	.
	G			Oxalis sonderiana	2	.	.	9	.	4	-2	-2	21	-2	8	.	.	0	.	0
	G			Pelargonium leipoldtii	2	.	.	18	.	.	-5	-5	21	-5	-5	.	.	0	.	.
	T			Pharnaceum sp. 2259	2	.	.	.	.	8	-7	-7	-7	-7	1	.	.	.	.	0
	G			Trachyandra sp. 1670	2	.	.	.	.	8	-3	-3	-3	-3	13	.	.	.	.	0
	T			Tripteris amplectens	2	.	3	.	5	.	-8	-5	-8	-3	-8	.	0	.	0	.
	Cmes	3		Wiborgia monoptera	2	.	.	.	5	4	-3	-3	-3	8	6	.	.	.	0	0.08
	T			Zaluzianskya affinis	2	.	.	.	.	8	-10	-10	-10	-10	-4	.	.	.	.	0
	H			Acanthopsis cf. carduifolia	1	.	.	.	5	.	-2	-2	-2	10	-2	.	.	.	0.05	.
	Cnan			Adromischus marianiae	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0	.
	Cnan			Anacampseros filamentosa subsp. namaquensis	1	.	3	.	.	.	-2	12	-2	-2	-2	.	0	.	.	.
	G			Androcymbium scabromarginatum	1	.	.	9	.	.	-3	-3	13	-3	-3	.	.	0	.	.
	Cmes			Antimima subg. Clavipes sp. 20212	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0.01	.
	H			Arctotis undulata	1	.	.	.	.	4	-5	-5	-5	-5	0	.	.	.	.	0
	Cmes			Arenifera sp. 132030	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0.04	.	.	.
	Cmes			Arenifera stylosa	1	.	3	.	.	.	-2	8	-2	-2	-2	.	0	.	.	.
	Pnan	1		Asparagus burchelli	1	.	.	.	5	.	-7	-7	-7	-2	-7	.	.	.	0	.
	G			Bulbine praemorsa	1	.	3	.	.	.	-2	10	-2	-2	-2	.	0	.	.	.
	T			Chenopodium album	1	.	.	.	5	.	-6	-6	-6	-1	-6	.	.	.	0	.
	Cmes			Chrysocoma cernua	1	.	.	.	.	4	-2	-2	-2	-2	11	.	.	.	.	0.06
	Cnan			Conophytum minutum subsp. minutum	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0	.
	T			Cotula coronopifolia	1	.	3	.	.	.	-2	7	-2	-2	-2	.	0	.	.	.
	G			Cyanella hyacinthoides	1	.	3	.	.	.	-2	8	-2	-2	-2	.	0	.	.	.
	H			Cyphia sp. 2010	1	.	.	.	5	.	-3	-3	-3	7	-3	.	.	.	0	.
	Cmes			Delosperma crassum	1	.	.	9	.	.	-3	-3	20	-3	-3	.	.	0.14	.	.
	Cmic	1		Dicrocaulon spissum	1	.	.	.	5	.	-4	-4	-4	4	-4	.	.	.	0.03	.
	G			Drimia sp. 21898	1	.	3	.	.	.	-2	12	-2	-2	-2	.	0	.	.	.
	Cmes	2		Drosanthemum sp. 21969	1	.	.	.	5	.	-2	-2	-2	10	-2	.	.	.	0.01	.
	Cmic	2		Eberlanzia dichotoma	1	11	.	.	.	.	17	-3	-3	-3	-3	0.11	.	.	.	.
	Cmes	2		Eriocephalus microphyllus var. pubescens	1	.	.	.	.	4	-3	-3	-3	-3	8	.	.	.	.	0.01
	Cmes	2		Eriocephalus namaquensis	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0.01	.
	T			Felicia tenera	1	.	3	.	.	.	-4	1	-4	-4	-4	.	0	.	.	.
	Pnan	1	*	Galenia africana	1	.	3	.	.	.	-6	-2	-6	-6	-6	.	0.05	.	.	.
	Cmic	1		Galenia meziana	1	.	.	.	5	.	-6	-6	-6	0	-6	.	.	.	0.01	.
	G			Gethyllis sp. 21914	1	.	.	.	5	.	-2	-2	-2	12	-2	.	.	.	0	.
	G			Gladiolus sp. 3777	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0	.	.	.
	Cmes	3		Hermannia sp. 124822	1	11	.	.	.	.	9	-5	-5	-5	-5	0	.	.	.	.
	Cmes	3		Indigofera heterophylla	1	.	3	.	.	.	-3	5	-3	-3	-3	.	0	.	.	.
	Cmes			Jacobsenia kolbei	1	.	3	.	.	.	-2	8	-2	-2	-2	.	0.19	.	.	.
	H			Kedrostis psammophylla	1	.	.	.	.	4	-4	-4	-4	-4	4	.	.	.	.	0
	G			Lachenalia sp. 3715	1	.	.	.	.	4	-1	-1	-1	-1	20	.	.	.	.	0
	Cmes			Lampranthus densipetalus	1	11	.	.	.	.	17	-3	-3	-3	-3	0.01	.	.	.	.
	T	3		Lessertia diffusa	1	.	.	9	.	.	-2	-2	24	-2	-2	.	.	0	.	.
	Pnan	3		Lycium cinereum	1	.	.	.	.	4	-4	-4	-4	-4	2	.	.	.	.	0.03
	T			Lyperia tristis	1	.	.	.	.	4	-5	-5	-5	-5	1	.	.	.	.	0
	T			Manulea decipiens	1	.	.	.	.	4	-3	-3	-3	-3	4	.	.	.	.	0
	T	1	*	Mesembryanthemum hypertrophicum	1	.	.	9	.	.	-5	-5	7	-5	-5	.	.	0.01	.	.
	T	1		Mesembryanthemum nodiflorum	1	.	.	.	.	4	-4	-4	-4	-4	4	.	.	.	.	0
	Cmes			Monilaria scutata subsp. scutata	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0.03	.
	G			Monocotyledonic geophyte 21982	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0	.	.	.
	G			Monocotyledonic geophyte 3441	1	.	3	.	.	.	-2	7	-2	-2	-2	.	0	.	.	.
	G			Moraea bifida	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0	.	.	.
	G			Moraea sp. 20204	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0	.	.	.
	T	1	*	Oncosiphon grandiflorum	1	.	3	.	.	.	-5	0	-5	-5	-5	.	0	.	.	.
	G			Ornithogalum polyphyllum	1	.	.	9	.	.	-2	-2	23	-2	-2	.	.	0	.	.
	G			Ornithogalum sp. 2017	1	.	3	.	.	.	-3	6	-3	-3	-3	.	0	.	.	.
	G			Ornithogalum suaveolens	1	.	.	9	.	.	-2	-2	21	-2	-2	.	.	0	.	.
	G			Ornithogalum xanthochlorum	1	.	.	.	5	.	-2	-2	-2	16	-2	.	.	.	0	.
	T	3		Osteospermum pinnatum var. pinnatum	1	.	.	.	5	.	-3	-3	-3	8	-3	.	.	.	0	.
	Cmes	1		Osteospermum sp. 20236	1	.	.	.	5	.	-3	-3	-3	9	-3	.	.	.	0.1	.
	G			Othonna amplexifolia	1	.	.	.	.	4	-2	-2	-2	-2	8	.	.	.	.	0
	G			Othonna incisa	1	.	.	.	5	.	-3	-3	-3	10	-3	.	.	.	0	.
	Cmic			Othonna protecta	1	11	.	.	.	.	27	-2	-2	-2	-2	0.01	.	.	.	.
	G			Oxalis sp. 20235	1	.	.	.	.	4	-1	-1	-1	-1	20	.	.	.	.	0
	G			Oxalis sp. 22029	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0	.	.	.
	G			Oxalis sp. 2445	1	11	.	.	.	.	24	-3	-3	-3	-3	0	.	.	.	.
	Cmes			Phyllobolus oculatus	1	.	.	.	.	4	-2	-2	-2	-2	8	.	.	.	.	0
	T			Plantago cafra	1	.	3	.	.	.	-4	0	-4	-4	-4	.	0	.	.	.
	Pmic	3		Rhus undulata	1	.	3	.	.	.	-8	-5	-8	-8	-8	.	0	.	.	.
	Cmes			Ruschia sp. 132028	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0.01	.	.	.
	Cmes			Ruschia sp. 4025	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0.02	.	.	.
	Cmic			Ruschia sp. US07_2659	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0.03	.
	n.a.			Selago sp. 2582	1	.	.	.	.	4	-1	-1	-1	-1	20	.	.	.	.	0
	Cmes			Senecio sarcoides	1	.	3	.	.	.	-2	9	-2	-2	-2	.	0	.	.	.
	Cmes	1	*	Stipagrostis brevifolia	1	.	.	.	5	.	-1	-1	-1	22	-1	.	.	.	0	.
	H	1	*	Stipagrostis ciliata	1	.	.	.	.	4	-8	-8	-8	-8	-4	.	.	.	.	0
	H	2		Stipagrostis obtusa	1	.	3	.	.	.	-5	0	-5	-5	-5	.	0	.	.	.
	H	1	*	Stipagrostis zeyheri subsp. zeyheri	1	.	.	.	.	4	-6	-6	-6	-6	-1	.	.	.	.	0.02
	Pnan	2		Stoeberia utilis	1	.	.	.	.	4	-7	-7	-7	-7	-2	.	.	.	.	0.06
	T			Tripteris hyoseroides	1	.	3	.	.	.	-4	2	-4	-4	-4	.	0	.	.	.
	n.a.			Tripteris sp. 22029	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0.01	.	.	.
	Pnan	1	*	Tylecodon paniculatus	1	.	3	.	.	.	-2	12	-2	-2	-2	.	0	.	.	.
	Cmes	1	*	Tylecodon wallichii	1	.	.	9	.	.	-3	-3	14	-3	-3	.	.	0	.	.
	T			Ursinia cakilefolia	1	.	.	.	5	.	-3	-3	-3	9	-3	.	.	.	0.01	.
	T			Wahlenbergia sp. 2470	1	.	3	.	.	.	-1	17	-1	-1	-1	.	0	.	.	.
	Pnan			Zygophyllum leptopetalum	1	.	3	.	.	.	-2	10	-2	-2	-2	.	0.05	.	.	.
	Pnan	2	*	Zygophyllum morgsana	1	.	.	.	.	4	-10	-10	-10	-10	-6	.	.	.	.	0

Appendix S7. Relevé table of unit 2.3.

Complete table of the relevés assigned to the provisional unit 2.3 (quartz fields =TWINSPAN cluster 12; see Fig. 2). To the left of its name, each species is classified whether it can be considered as regional character species of one or of several syntaxa. Further, the species are classified according to life form (LF), palatability (Pal.; 1 = poisonous or unpalatable to 3 = frequently eaten), and associated problems (Pr.; * = problem plant; ** problem and exotic plant; Wells et al. 1986). Between species names and individual relevés, information at association level is provided, namely constancy, phi-value (calculated on the basis of all 17 units at association level), and mean cover (including those plots without occurrences). Colours are used to indicate species with particularly high constancy, fidelity (phi > 0.5: red; phi > 0.25: blue, phi > 0: green), or cover. All relevés included are from source 3 (additional relevés from the commonage 2007 and 2008).

Diagnostic values	LF	Pal.	Pr.	Taxon or field name	Constancy [%]	phi-value x 100	Mean values or mean cover [%]	Unit 2.3 (12)							
				Sequential No.	2.3.x.x	2.3.x.x	2.3.x.x	253	254	255	256	257	258	259	260
				Plot No. in database	*n* = 8	*n* = 8	*n* = 8	20071223	20071231	20071240	20071244	20071248	20071260	20071263	21080892
				Cluster No. (TWINSPAN)				12	12	12	12	12	12	12	12
				Nomenclatural type relevé of the association											
				Source				3	3	3	3	3	3	3	3
				Grazing intensity category				3	1	1	2	2	1	1	2
				Heuweltjie zone				.	.	.	.	.	.	.	.
				Date				20071001	20071002	20071004	20071004	20071004	20071006	20071006	20080820
				Latitude [°]				-30.233143	-30.116674	-30.157300	-30.187097	-30.168137	-30.103131	-30.094006	-30.119383
				Longitude [°]				17.534218	17.496886	17.487670	17.493775	17.490664	17.531107	17.527996	17.534218
				Aspect [°]				0	270	320	90	270	30	180	160
				Inclination [°]		2.5		0	2	1	5	2	3	6	1
				Relief position				Plain	Midslope	Shoulder	Midslope	Plain	Plain	Plain	Shoulder
				Grazing intensity [%]		86		163	60	60	95.5	95.5	73.7	73.7	68.3
				Soil group				Leptosol	Leptosol	Solonchak	Durisol	Leptosol	Durisol	Solonchak	Leptosol
				Fine material [%]		50		100	4	15	5	70	29	90	88
				Fine + medium gravel [%]		27.8		0	48	30	55	10	70	5	4
				Coarse gravel (2-6 cm) [%]		18.9		0	48	30	40	20	1	5	7
				Stones (6-20 cm) [%]		3.3		0	0	25	0	0	0	0	1
				Boulders (20-60 cm) [%]		0.0		0	0	0	0	0	0	0	0
				Larger boulders (> 60 cm) [%]		0.0		0	0	0	0	0	0	0	0
				Rock outcrops [%]		0.0		0	0	0	0	0	0	0	0
				Dead wood [%]		0.4		1	0.1	0	0.35	0	0.35	1	0.1
				Soft litter [%]		0.2		0.1	0	0.1	0.1	0	1	0	0.01
				Dung [%]		0.0		0	0	0.02	0	0	0	0	0.01
				Area disturbed by mammal activity [%]		0.0		0	0	0	0	0	0	0	0
				pH ($CaCl_2$)		6.06		7.70	4.60	6.30	4.20	6.70	7.20	5.70	6.10
				EC [µS cm^{-1}]		3173		3270	535	4210	2980	3710	886	5820	3970
				IC [%]		0.012		0.008	.	.	.	0.003	0.026	.	.
				OC [%]		0.765		0.420	1.308	1.442	0.969	0.150	0.228	0.332	1.269
				N [%]		0.050		0.042	0.062	0.099	0.048	0.021	0.026	0.033	0.070
				C/N ratio		13.9		10.0	21.1	14.6	20.2	7.1	8.8	11.1	18.1
				Species richness (100 m²)		11.8		18	20	11	8	9	7	10	11
				Shannon index		1.08		1.06	1.77	1.15	1.44	0.57	0.85	1.09	0.71
				Shannon evenness		0.45		0.37	0.59	0.48	0.69	0.26	0.44	0.47	0.30
				Simpson index		0.51		0.46	0.76	0.61	0.70	0.23	0.44	0.51	0.40
				Cover sum vegetation [%]		8.4		9.8	7.7	8.0	10.5	3.4	8.3	5.9	13.4
Unit 2.3															
2.3	2.3.x	2.3.x.x	Cmes	3		Salsola sp. 20223	88	93	3.00	7	0.5	3	4	3	6	0.5	.
2.3	2.3.x	2.3.x.x	Cmic	1		Jacobsenia vaginata	75	74	2.53	.	.	4	0.5	0.25	1.5	4	10
2.3	2.3.x	2.3.x.x	Cmic	1		Dicrocaulon ramulosum	63	67	0.08	0.05	0.02	0.1	0.25	.	.	.	0.25
2.3	2.3.x	2.3.x.x	Cmic	1		Dicrocaulon spissum	38	56	0.89	.	3	0.1	4	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan	1		Adromischus filicaulis subsp. filicaulis	25	49	0.00	.	0.01	.	.	.	.	.	0.01
2.3	2.3.x	2.3.x.x	Cnan			Spergularia sp. 20244	25	49	0.03	.	0.02	.	0.25	.	.	.	.
2.3	2.3.x	2.3.x.x	T	1		Mesembryanthemum nodiflorum	25	41	0.02	0.1	.	.	.	0.02	.	.	.
2.3	2.3.x	2.3.x.x	Cmes			Drosanthemum ramosissimum	25	40	0.19	1.5	.	.	.	0.05	.	.	.
2.3	2.3.x	2.3.x.x	Cmic			Afrolimon namaquanum	13	34	0.01	.	0.05	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cmes			Antimima sp. 124808	13	34	0.01	.	.	.	.	.	.	0.1	.
2.3	2.3.x	2.3.x.x	Cnan	1		Conophytum concavum	13	34	0.00	.	0.02	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan	1		Crassula susannae	13	34	0.00	.	.	.	.	0.02	.	.	.
2.3	2.3.x	2.3.x.x	Cnan	1		Euphorbia celata	13	34	0.00	.	0.01	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	T			Gazania lichtensteinii	13	34	0.01	.	0.1	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	G			Othonna cuneata	13	34	0.00	.	.	.	.	.	.	.	0.01
2.3	2.3.x	2.3.x.x	Cmic			Hirpicium sp. US07_2511	25	33	0.25	.	1.5	.	0.5	.	.	.	.
2.3	2.3.x	2.3.x.x	Cnan			Senecio aloides	25	33	0.00	0.01	0.01	.	.	.	.	.	.
2.3	2.3.x		Cmes			Aspazoma amplectens	25	30	0.31	.	1.5	.	1	.	.	.	.
2.3	2.3.x	2.3.x.x	G			Othonna incisa	13	28	0.01	.	.	.	.	.	.	0.05	.
2.3	2.3.x	2.3.x.x	H			Lessertia sp. 20203	13	28	0.01	0.05	.	.	.	.	.	.	.
2.3	2.3.x	2.3.x.x	T	1	*	Mesembryanthemum hypertrophicum	25	28	0.01	.	.	.	.	0.05	.	0.02	.
Class 2 - Didelto carnosae-Cephalophylletea inaequalis															
2				T	3		Didelta carnosa	75	11	0.02	0.05	.	0.01	0.02	0.01	0.05	0.05	.
2	2.2	2.2.1		Cnan	1		Cephalophyllum inaequale	50	2	0.16	0.05	0.01	.	.	.	0.2	1	.
2			2.2.1.3	Cnan			Ruschia sp. 124796	50	30	0.14	0.5	0.02	.	.	.	0.5	.	0.1
2	2.2	2.2.1		H	3		Gazania krebsiana subsp. krebsiana	25	10	0.00	.	.	0.01	.	.	.	.	0.01
2	2.2	2.2.1	2.2.1.1	Cmes	1		Sarcocaulon l´heritieri	13	0	0.00	.	.	.	.	.	0.01	.	.
2				Cmic	2		Zygophyllum cordifolium	13	-9	0.00	0.01	.	.	.	.	.	.	.
Differential species (one-sided)															
				Cmes			Othonna arbuscula	50	30	0.03	0.1	.	0.01	.	0.02	.	0.1	.
Companion species															
				Cmes	3		Salsola sp. US07_2312	38	-3	0.50	.	0.5	0.5	.	.	.	.	3
				T			Amellus microglossus	25	9	0.00	0.01	.	.	.	0.02	.	.	.
				Cmes			Antimima sp. US07_2582	25	16	0.01	.	0.05	0.02	.	.	.	.	.
				T	2	**	Atriplex lindleyi subsp. inflata	25	-1	0.00	.	.	0.01	.	.	.	.	0.02
				Cmic			Helichrysum dregeanum	25	22	0.01	0.05	0.05	.	.	.	.	.	.
				Cmes	3		Pteronia glabrata	25	11	0.01	0.1	.	.	.	.	.	.	0.01
				Cmes	3		Tetragonia verrucosa	25	1	0.02	.	0.05	.	.	.	.	0.1	.
				Pnan	3		Tripteris oppositifolia	25	18	0.02	0.1	.	.	.	.	.	.	0.02
				T			Helichrysum leontonyx	13	-1	0.00	0.01	.	.	.	.	.	.	.
				T	1		Karroochloa schismoides	13	-15	0.00	.	.	.	.	.	0.01	.	.
				Cmic			Meyerophytum globosum	13	22	0.03	.	.	0.25	.	.	.	.	.
				T	1	*	Oncosiphon suffruticosum	13	-8	0.00	0.01	.	.	.	.	.	.	.
				Cmic	1		Othonna rechingeri	13	14	0.00	.	0.01	.	.	.	.	.	.
				Cmes	3		Pelargonium crithmifolium	13	22	0.03	.	0.25	.	.	.	.	.	.
				Cmes	1		Psilocaulon dinteri	13	-10	0.01	0.05	.	.	.	.	.	.	.
				Cmes	3		Tetragonia fruticosa	13	-15	0.00	.	.	.	.	.	.	.	0.01
				G			Trachyandra revoluta	13	-19	0.00	.	.	.	.	.	.	0.01	.

Appendix S8. Differences between the 16 phytosociological associations and the one equivalent unit regarding landscape, soil, and vegetation parameters.

Only parameters with significant differences are shown. Note that some of the landscape and soil parameters were not available for a minority of plots; therefore, the number of replicates (*N*) differs between parameters. Differences among the alliances were tested with ANOVAs, applying a nominal α of 0.05 or, in cases of severe violation of assumptions, a nominal α of 0.01 (see Methods). The latter is indicated by † in the last column. Superscript letters in the columns indicate homogenous groups according to an HSD post-hoc test for unequal *N*. Note that in some cases the overall pattern deviated significantly from random while the post-hoc test did not find a single significant contrast.

Parameter	1.1.1.1		1.1.2.1		1.1.3.1		1.1.3.2		1.2.1.1		1.2.1.2		1.2.1.3		2.1.1.1		2.1.1.2		2.1.1.3		2.2.1.1		2.2.1.2		2.2.1.3		2.2.1.4		2.2.1.5		2.1.1.4		2.3		*p*
	N	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	*N*	Mean ± SD	
Landscape parameters																																	
Inclination [°]	11	0.6 ± 1.0^{a}	18	3.3 ± 2.6^{a}	18	3.1 ± 2.9^{a}	29	4.8 ± 2.8^{a}	24	8.2 ± 6.8^{ab}	21	11.0 ± 6.1^{bc}	31	15.1 ± 11.8^{c}	43	2.8 ± 2.9^{a}	14	7.7 ± 5.1^{abc}	19	3.5 ± 2.5^{a}	9	3.2 ± 2.1^{ab}	30	5.2 ± 4.1^{ab}	10	5.7 ± 3.9^{ab}	20	4.0 ± 3.1^{a}	22	4.6 ± 3.3^{a}	16	5.3 ± 2.3^{ab}	8	2.5 ± 2.1^{ab}	<0.001†
Cover fine material [%]	12	100.0 ± 0.0^{de}	19	96.8 ± 8.3^{de}	18	99.7 ± 0.5^{e}	32	95.2 ± 9.6^{de}	24	76.9 ± 26.1^{bd}	21	81.8 ± 22.3^{bde}	31	57.9 ± 29.4^{ac}	44	98.8 ± 4.1^{e}	14	99.4 ± 0.7^{de}	20	93.6 ± 16.9^{de}	9	88.1 ± 19.8^{cde}	31	92.6 ± 11.2^{de}	11	89.9 ± 10.0^{de}	20	90.8 ± 20.9^{de}	24	95.4 ± 10.8^{de}	16	98.3 ± 2.9^{de}	8	50.1 ± 41.0^{ab}	<0.001†
Grazing intensity [%]	4	74.4 ± 17.5^{abc}	19	78.7 ± 29.9^{abc}	18	95.3 ± 19.3^{abc}	25	106.4 ± 41.3^{bc}	24	115.7 ± 31.6^{bc}	22	115.2 ± 34.9^{bc}	31	88.8 ± 37.8^{abc}	44	93.9 ± 39.5^{abc}	14	123.3 ± 34.8^{c}	20	66.1 ± 27.9^{a}	9	65.8 ± 7.9^{ab}	31	87.0 ± 38.5^{abc}	11	90.5 ± 48.6^{abc}	20	115.7 ± 30.1^{bc}	24	99.8 ± 36.4^{abc}	15	76.4 ± 36.0^{ab}	8	86.2 ± 33.9^{abc}	0.032
Surface cover parameters																																	
Cover fine + medium gravel [%]	12	0.0 ± 0.0^{a}	19	3.0 ± 7.2^{a}	18	0.3 ± 0.5^{a}	32	3.0 ± 8.9^{a}	24	2.9 ± 6.4^{a}	21	1.0 ± 2.2^{a}	31	1.1 ± 1.4^{a}	44	1.1 ± 3.5^{a}	14	0.4 ± 0.5^{a}	20	1.1 ± 2.4^{a}	9	4.1 ± 6.7^{a}	31	3.8 ± 7.5^{a}	11	3.7 ± 4.7^{a}	20	4.4 ± 11.0^{a}	24	2.4 ± 3.9^{a}	16	1.5 ± 2.7^{a}	8	27.8 ± 27.0^{b}	<0.001†
Cover coarse gravel [%]	12	0.0 ± 0.0^{a}	19	0.3 ± 1.1^{a}	18	0.0 ± 0.0^{a}	32	0.1 ± 0.3^{a}	24	0.4 ± 0.6^{a}	21	0.4 ± 1.1^{a}	31	1.1 ± 1.9^{a}	44	0.1 ± 0.8^{a}	14	0.1 ± 0.3^{a}	20	4.8 ± 16.0^{a}	9	4.4 ± 6.7^{a}	31	0.7 ± 2.0^{a}	11	3.9 ± 6.1^{a}	20	3.4 ± 9.0^{a}	24	0.3 ± 0.6^{a}	16	0.2 ± 0.4^{a}	8	18.9 ± 18.6^{b}	<0.001†
Cover stones [%]	12	0.0 ± 0.0	19	0.0 ± 0.0	18	0.0 ± 0.0	32	0.1 ± 0.2	24	0.1 ± 0.3	21	0.8 ± 2.2	31	1.4 ± 2.6	44	0.0 ± 0.0	14	0.0 ± 0.0	20	0.3 ± 1.1	9	2.2 ± 4.4	31	0.2 ± 0.8	11	2.0 ± 4.0	20	0.8 ± 2.2	24	0.2 ± 0.7	16	0.0 ± 0.1	8	3.3 ± 8.8	<0.001†
Cover boulders [%]	12	0.0 ± 0.0^{ab}	19	0.0 ± 0.0^{ab}	18	0.0 ± 0.0^{ab}	32	0.0 ± 0.0^{a}	24	1.3 ± 6.1^{ab}	21	0.4 ± 0.9^{ab}	31	2.4 ± 3.9^{b}	44	0.0 ± 0.0^{a}	14	0.0 ± 0.0^{ab}	20	0.0 ± 0.0^{ab}	9	0.9 ± 2.7^{ab}	31	0.0 ± 0.1^{a}	11	0.2 ± 0.4^{ab}	20	0.4 ± 1.1^{ab}	24	0.2 ± 0.6^{ab}	16	0.0 ± 0.0^{a}	8	0.0 ± 0.0^{ab}	<0.001†
Cover large boulders [%]	12	0.0 ± 0.0^{ab}	19	0.0 ± 0.0^{a}	18	0.0 ± 0.0^{a}	32	0.0 ± 0.0^{a}	24	0.3 ± 0.8^{a}	21	1.1 ± 3.4^{ab}	31	3.9 ± 9.0^{b}	44	0.0 ± 0.0^{a}	14	0.0 ± 0.0^{ab}	20	0.0 ± 0.0^{a}	9	0.0 ± 0.0^{ab}	31	0.0 ± 0.0^{a}	11	0.0 ± 0.0^{ab}	20	0.0 ± 0.0^{a}	24	0.4 ± 2.0^{a}	16	0.0 ± 0.0^{ab}	8	0.0 ± 0.0^{ab}	<0.001†
Cover rock outcrops [%]	12	0.0 ± 0.0^{abc}	19	0.0 ± 0.0^{a}	18	0.0 ± 0.0^{ab}	32	1.7 ± 4.2^{ab}	24	18.1 ± 25.4^{c}	21	14.5 ± 20.4^{bc}	31	32.2 ± 24.7^{d}	44	0.0 ± 0.0^{a}	14	0.1 ± 0.3^{ab}	20	0.3 ± 1.1^{a}	9	0.2 ± 0.7^{abc}	31	2.6 ± 6.0^{ab}	11	0.3 ± 0.9^{abc}	20	0.4 ± 1.3^{a}	24	1.2 ± 5.1^{ab}	16	0.1 ± 0.3^{ab}	8	0.0 ± 0.0^{abc}	<0.001†
Cover dead wood [%]	12	4.2 ± 3.9^{ab}	19	3.3 ± 1.3^{ab}	18	3.3 ± 3.6^{ab}	32	2.1 ± 1.5^{a}	24	2.2 ± 2.0^{a}	22	3.2 ± 1.8^{ab}	31	5.8 ± 5.4^{b}	44	3.4 ± 3.2^{a}	14	3.5 ± 2.8^{ab}	20	0.9 ± 0.9^{a}	9	0.9 ± 1.4^{a}	31	2.3 ± 2.2^{a}	11	0.9 ± 0.9^{a}	20	2.7 ± 2.3^{a}	24	1.5 ± 1.2^{a}	16	2.2 ± 2.0^{a}	8	0.4 ± 0.4^{a}	<0.001
Cover soft litter [%]	12	5.1 ± 2.7	19	3.5 ± 3.6	18	1.3 ± 1.6	32	8.7 ± 15.8	24	7.6 ± 10.7	22	5.9 ± 5.8	31	8.0 ± 9.8	44	2.3 ± 4.1	14	5.1 ± 6.2	20	2.0 ± 2.8	9	0.6 ± 0.7	31	4.8 ± 5.4	11	3.0 ± 5.9	20	2.4 ± 3.1	24	2.7 ± 2.4	16	1.9 ± 2.8	8	0.2 ± 0.3	0.002†
Cover dung [%]	12	0.0 ± 0.0	19	0.1 ± 0.1	18	0.1 ± 0.1	32	0.1 ± 0.2	24	0.0 ± 0.1	22	0.1 ± 0.2	31	0.2 ± 0.4	44	0.1 ± 0.1	14	0.0 ± 0.0	20	0.0 ± 0.0	9	0.0 ± 0.1	31	0.0 ± 0.1	11	0.0 ± 0.0	20	0.1 ± 0.1	24	0.0 ± 0.1	16	0.0 ± 0.0	8	0.0 ± 0.0	<0.001
Cover bioturbation [%]	12	0.0 ± 0.1	19	1.4 ± 2.6	18	2.2 ± 5.1	32	1.0 ± 2.3	24	0.0 ± 0.2	22	0.0 ± 0.0	31	0.1 ± 0.2	44	7.1 ± 19.2	14	0.4 ± 0.9	20	3.7 ± 15.6	9	0.6 ± 1.3	31	0.3 ± 0.7	11	0.0 ± 0.0	20	0.2 ± 0.3	24	0.2 ± 0.4	16	5.9 ± 15.4	8	0.0 ± 0.0	0.022†
Soil parameters																																	
pH ($CaCl_2$)	4	6.68 ± 0.85^{abcdef}	19	6.66 ± 0.88^{cd}	9	6.91 ± 0.68^{bcdef}	25	6.79 ± 0.91^{cde}	23	5.37 ± 0.98^{a}	20	6.05 ± 0.85^{abc}	30	6.54 ± 0.73^{bcd}	42	7.81 ± 0.67^{f}	14	6.79 ± 0.90^{cdef}	19	7.72 ± 0.48^{ef}	9	6.10 ± 1.16^{abcd}	31	6.41 ± 0.74^{bcd}	11	6.43 ± 1.13^{abcd}	20	5.68 ± 0.85^{ab}	24	6.22 ± 0.68^{bcd}	14	7.21 ± 0.93^{def}	8	6.06 ± 1.21^{abcd}	<0.001
EC [µS/cm]	4	21 ± 11abc	19	154 ± 207^{a}	9	165 ± 144^{ab}	25	280 ± 304^{a}	23	282 ± 403^{a}	20	293 ± 200^{a}	30	504 ± 348^{ab}	42	773 ± 1194^{ab}	14	1015 ± 680^{abc}	19	1603 ± 2181^{bcd}	9	1224 ± 1538^{abc}	31	733 ± 684^{ab}	11	2626 ± 2278^{cd}	20	1000 ± 720^{abc}	24	986 ± 931^{abc}	14	409 ± 459^{ab}	8	3173 ± 1742^{c}	<0.001†
IC [%]	2	0.004 ± 0.003^{ab}	19	0.004 ± 0.006^{a}	8	0.006 ± 0.006^{a}	21	0.010 ± 0.012^{a}	11	0.004 ± 0.003^{a}	12	0.007 ± 0.007^{a}	28	0.021 ± 0.054^{a}	40	0.328 ± 0.265^{b}	13	0.018 ± 0.028^{a}	17	0.082 ± 0.128^{a}	7	0.005 ± 0.005^{a}	28	0.005 ± 0.007^{a}	6	0.009 ± 0.006^{a}	14	0.006 ± 0.011^{a}	20	0.010 ± 0.022^{a}	12	0.034 ± 0.046^{a}	3	0.012 ± 0.012^{ab}	<0.001†
OC [%]	4	0.188 ± 0.057^{ab}	19	0.353 ± 0.233^{a}	9	0.435 ± 0.158^{ab}	24	0.568 ± 0.376^{ab}	23	0.781 ± 0.299^{ab}	20	1.305 ± 1.214^{b}	29	2.156 ± 1.413^{c}	43	0.975 ± 0.509^{ab}	14	0.995 ± 0.508^{ab}	19	0.517 ± 0.272^{ab}	9	0.638 ± 0.298^{ab}	31	0.818 ± 0.348^{ab}	11	0.944 ± 0.334^{ab}	20	0.955 ± 0.340^{ab}	24	0.778 ± 0.309^{ab}	14	0.667 ± 0.273^{ab}	8	0.765 ± 0.538^{ab}	<0.001†
N [%]	4	0.022 ± 0.004^{ab}	19	0.032 ± 0.015^{a}	9	0.042 ± 0.010^{ab}	24	0.054 ± 0.029^{ab}	23	0.060 ± 0.016^{ab}	20	0.094 ± 0.068^{b}	29	0.161 ± 0.107^{c}	43	0.090 ± 0.034^{b}	14	0.082 ± 0.036^{ab}	19	0.053 ± 0.019^{ab}	9	0.050 ± 0.017^{ab}	31	0.064 ± 0.020^{ab}	11	0.066 ± 0.024^{ab}	20	0.063 ± 0.019^{ab}	24	0.058 ± 0.018^{ab}	14	0.059 ± 0.014^{ab}	8	0.050 ± 0.026^{ab}	<0.001†
C/N ratio	4	8.3 ± 1.7^{abcd}	19	10.5 ± 2.1^{abc}	9	10.3 ± 1.5^{abcd}	24	10.3 ± 1.8^{a}	23	12.8 ± 2.4^{bcdef}	20	13.1 ± 2.5^{cdef}	29	13.6 ± 1.8^{def}	43	13.0 ± 2.8^{cdef}	14	12.2 ± 1.3^{abcdef}	19	10.2 ± 2.5^{ab}	9	12.7 ± 1.8^{abcdef}	31	12.4 ± 1.8^{abcde}	11	14.4 ± 2.8^{ef}	20	15.2 ± 3.1^{f}	24	13.2 ± 1.9^{def}	14	11.4 ± 2.2^{abcde}	8	13.9 ± 5.4^{abcdef}	<0.001
Vegetation parameters																																	
Vegetation cover [%]	12	27.2 ± 8.1^{abc}	19	17.8 ± 8.2^{ab}	18	21.2 ± 8.5^{abc}	32	24.1 ± 14.7^{abc}	24	23.2 ± 12.1^{abc}	22	24.3 ± 14.6^{abc}	31	33.5 ± 16.8^{c}	44	23.5 ± 10.5^{abc}	14	27.7 ± 14.0^{abc}	20	16.3 ± 7.7^{ab}	9	23.4 ± 10.5^{abc}	31	29.3 ± 13.2^{ab}	11	28.0 ± 12.2^{abc}	20	26.7 ± 12.1^{abc}	24	28.2 ± 10.3^{abc}	16	18.9 ± 7.0^{ab}	8	8.4 ± 3.0^{a}	<0.001
Species richnes (100 m²)	12	16.6 ± 5.7^{abcd}	19	24.2 ± 8.2^{defgh}	18	17.9 ± 5.1^{abcd}	32	20.5 ± 7.6^{cdef}	24	28.5 ± 7.9^{fgh}	22	30.6 ± 8.2^{gh}	31	30.8 ± 8.8^{h}	44	14.3 ± 4.4^{a}	14	23.6 ± 6.7^{defgh}	20	14.4 ± 4.9^{ab}	9	20.3 ± 2.6^{abcdefg}	31	19.3 ± 4.5^{abcde}	11	20.5 ± 7.5^{abcdef}	20	26.1 ± 3.8^{efgh}	24	22.3 ± 5.6^{cdef}	16	20.3 ± 4.7^{abcde}	8	11.8 ± 4.7^{abc}	<0.001
Simpson index	12	0.80 ± 0.09^{cd}	19	0.7 ± 0.1^{abcd}	18	0.59 ± 0.20^{ac}	32	0.68 ± 0.18^{abcd}	24	0.78 ± 0.15^{bd}	22	0.83 ± 0.10^{d}	31	0.82 ± 0.07^{d}	44	0.58 ± 0.18^{a}	14	0.78 ± 0.11^{abcd}	20	0.64 ± 0.16^{abc}	9	0.61 ± 0.23^{abcd}	31	0.60 ± 0.19^{ac}	11	0.67 ± 0.18^{abcd}	20	0.73 ± 0.17^{abcd}	24	0.71 ± 0.14^{abcd}	16	0.66 ± 0.13^{abcd}	8	0.51 ± 0.17^{ab}	<0.001
Schannon index	12	1.96 ± 0.40^{defg}	19	1.8 ± 0.4^{cdefg}	18	1.28 ± 0.49^{ab}	32	1.67 ± 0.52^{bcde}	24	2.09 ± 0.48^{efg}	22	2.24 ± 0.43^{g}	31	2.16 ± 0.36^{fg}	44	1.26 ± 0.40^{a}	14	1.91 ± 0.41^{defg}	20	1.42 ± 0.40^{abcd}	9	1.54 ± 0.54^{abcdefg}	31	1.39 ± 0.44^{abcd}	11	1.61 ± 0.59^{abcdefg}	20	1.93 ± 0.51^{efg}	24	1.73 ± 0.47^{bcdef}	16	1.53 ± 0.32^{abcd}	8	1.08 ± 0.39^{abc}	<0.001
Evenness	12	0.71 ± 0.11^{c}	19	0.6 ± 0.1^{abc}	18	0.45 ± 0.16^{a}	32	0.56 ± 0.15^{abc}	24	0.63 ± 0.13^{bc}	22	0.66 ± 0.11^{bc}	31	0.64 ± 0.09^{bc}	44	0.48 ± 0.15^{a}	14	0.61 ± 0.12^{abc}	20	0.54 ± 0.12^{abc}	9	0.51 ± 0.18^{abc}	31	0.47 ± 0.15^{a}	11	0.53 ± 0.15^{abc}	20	0.59 ± 0.15^{abc}	24	0.56 ± 0.13^{abc}	16	0.52 ± 0.11^{a}	8	0.45 ± 0.14^{ab}	<0.001

Appendix S9. Detailed description of the syntaxa in the study area.

For each association, a photograph of a typical stand is provided, and all taxa with a mean cover of at least 0.2% are listed in decreasing order and grouped into the life-forms phanerophytes (P), chamaephytes (C), hemicryptophytes (H), geophytes (G), and therophytes (T).

Class 1: *Hermannio trifurcae-Zygophylletea morgsanae*

Order 1.1: *Hermannio trifurcae-Othonnetalia sedifoliae*

Alliance 1.1.1: *Othonnion cylindricae*

Deep, red sand; marginally saline, neutral

1.1.1.1 *Oncosiphono grandiflori-Othonnetum cylindricae*

Dominant species

P: *Zygophyllum morgsana*, *Euphorbia mauritanica*, *Lebeckia multiflora*, *Lycium ferocissimum*, *Lebeckia* sp. 20271, *Euphorbia burmannii*, *Lebeckia sericea*, *Ruschia* subg. *Tumidulae* sp. 2485, *Stoeberia utilis*, **C:** *Othonna cylindrica*, *Brownanthus* sp. 124828, *Tetragonia fruticosa*, *Euphorbia decussata*, *Ruschia* sp. US07_2384, *Hermannia trifurca*, *Salsola* sp. US07_2312, *Galenia fruticosa*, *Asparagus capensis*, *Ruschia versicolor* **H:** *Stipagrostis ciliata*, *Stipagrostis zeyheri* subsp. *zeyheri*, *Ehrharta melicoides*, *Cladoraphis spinosa*, *Cymbopogon* cf. *marginatus*, **T:** *Karroochloa schismoides*, *Oncosiphon grandiflorum.*

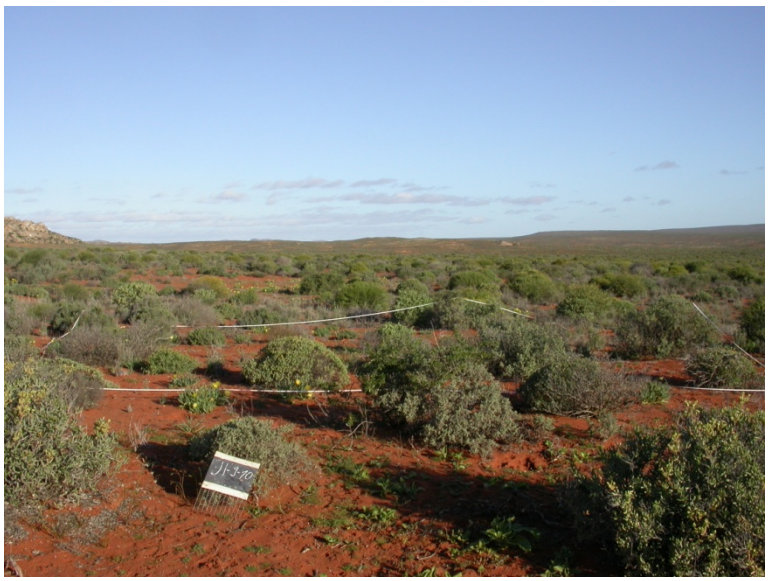
Characterisation: This species-poor association forms sparse stands of dwarf shrubs which are seldom higher than 1 m. It is dominated by the chamaephyte *Othonna cylindrica* and the tufty graminoid *Stipagrostis ciliata*. The association is very well defined by 32 exclusively diagnostic species. It has a low pasture value due to the high frequency of the unpalatable perennial grass *Stipagrostis ciliata*, annuals (e.g. *Oncosiphon grandiflorum*) and shrubs (e.g. *Othonna cylindrica*).

Habitat: The *Oncosiphono-Othonnetum* occurs in plains without *heuweltjies* on deep red sandy soils (Arenosols). The soils are very slightly acidic, and both salinity and the organic carbon content is very low. Due to the high infiltration potential of the sandy substrate, water availability is higher than on adjacent sites with shallower, finely textured soils.

Alliance 1.1.2: *Stipagrostio obtusae-Othonnion sedifoliae*

Sandy dunes; marginally saline, neutral

1.1.2.1 *Stipagrostio obtusae-Othonnetum sedifoliae*



Dominant species

P: *Ruschia* subg. *Tumidulae* sp. 3818, *Lebeckia multiflora*, *Stoeberia frutescens*, *Ruschia subg. Tumidulae* sp. 2485, *Aridaria noctiflora* subsp. *noctiflora*, *Euphorbia burmannii*, *Pteronia divaricata*, **C:** *Ruschia versicolor*, *Othonna sedifolia*, *Salsola* sp. US07_2312, *Galenia fruticosa*, *Tetragonia fruticosa*, *Othonna cylindrica*, *Hermannia trifurca*, *Leipoldtia schultzei*, *Cephalophyllum pillansii*, **H:** *Stipagrostis ciliata*, *Stipagrostis obtusa*, **T:** *Karroochloa schismoides*, *Ehrharta pusilla*, *Helichrysum alsinoides*,

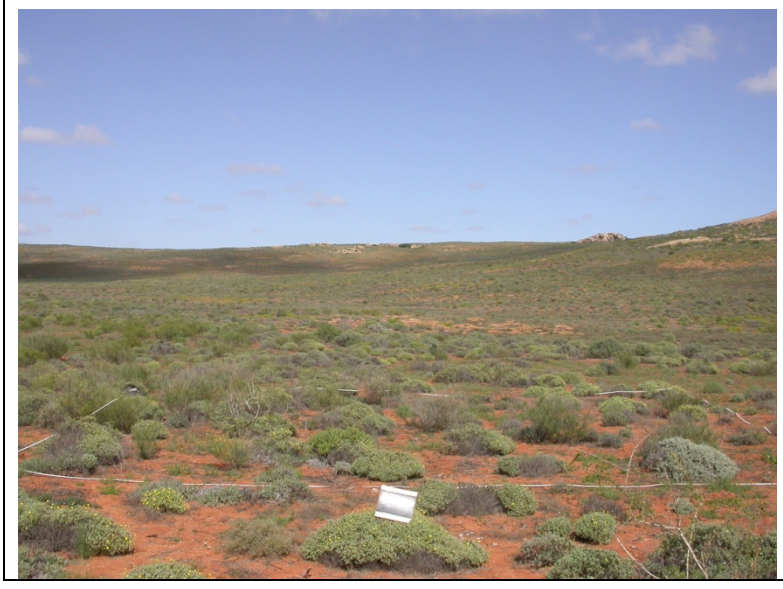
Characterisation: This moderately species-rich association is characterised by the nano-phanerophyte *Ruschia* subg. *Tumidula* sp. 3818 and a number of therophytic *Scrophulariaceae*. The *Ruschia* species and the tufty graminoid *Stipagrostis obtusa* are the dominant species. The association is well defined by 21 exclusively diagnostic species. It generally provides a better pasture than the *Oncosiphono-Othonnetum* (1.1.1.1) due to the higher abundance of palatable plants such as the perennial grass *Stipagrostis obtusa* and the shrub *Othonna sedifolia*, which is rated by the local farmers as being highly palatable.

Habitat: The *Stipagrostio-Othonnetum* occurs in plains and on gentle slopes without *heuweltjies*. The soils are deep Arenosols derived from red aeolian sands, with very slight acidity and very low salinity and organic carbon content. The sandy substrate is responsible for a fast infiltration of water after rain events and protects the sites from high evaporation. Therefore, water availability in this habitat is higher than on surrounding shallower, finely textured soils.

Alliance 1.1.3: *Grielo humifusi-Galenion sarcophyllae*

Sandy, shallow soils; marginally saline, neutral; disturbed places

1.1.3.1 *Grielo humifusi-Othonnetum sedifoliae*



Dominant species

P: *Lebeckia multiflora*, **T:** *Karroochloa schismoides*, *Stipa capensis*, *Tetragonia microptera*, *Mesembryanthemum guerichianum*, *Chenopodium album*, *Tribolium utriculosum*, **C:** *Othonna sedifolia*, *Salsola* sp. US07_2312, *Drosanthemum hispidum*, *Leipoldtia schultzei*, *Galenia fruticosa*, *Galenia sarcophylla*, *Eberlanzia cyathiformis*,

Characterisation: This species-poor association is seldom higher than 1 m and is characterised by sparse stands of the meso-chamaephyte *Othonna sedifolia*. Together with this species, the small therophytic graminoid *Karroochloa schismoides* can become dominant in winter and spring. This association is moderately defined by eight exclusively diagnostic species. Like the second association of the alliance, the *Grielo-Othonnetum* has a low grazing value due to the low cover of palatable plants and the high abundance of grasses with low to moderate palatability such as *Stipa capensis* and *Karrochloa schismoisdes*.

Habitat: The *Grielo-Othonnetum* occurs in plains without *heuweltjies*, predominantly on deep red sandy Durisols and Arenosols on the transition to shallower soils. They range from slightly acidic to very slightly alkaline, the salinity and content of organic carbon being very low. Due to the high infiltration potential of the sandy substrate, soil water availability is higher than on shallower, more finely textured soils.

1.1.3.2 *Emico australis-Lebeckietum multiflorae*

Dominant species

P: *Lebeckia multiflora*, *Stoeberia frutescens*, *Lycium ferocissimum*, *Ruschia* subg. *Tumidulae* sp. 3818, *Aridaria noctiflora* subsp. *noctiflora*, *Galenia africana*, *Zygophyllum retrofractum*, **C:** *Drosanthemum hispidum*, *Galenia fruticosa*, *Eberlanzia cyathiformis*, *Leipoldtia schultzei*, *Salsola* sp. US07_2312, *Othonna sedifolia*, *Hermannia trifurca*, *Galenia sarcophylla*, *Manochlamys albicans*, **T:** *Karroochloa schismoides*, *Leysera tenella*, *Dimorphotheca sinuata*, *Stipa capensis*, *Helichrysum alsinoides*, *Atriplex lindleyi* subsp. *inflata*, *Oncosiphon suffruticosum*, *Amsinckia retrorsa*, *Mesembryanthemum guerichianum*, *Grielum humifusum*,

Characterisation: This moderately species-poor association consists of widely scattered shrubs with interspersed bare patches which are covered by annuals during winter and spring. The sites are often dominated by the therophytic graminoid *Karroochloa schismoides* and by sparse stands of the nano-phanerophyte *Lebeckia multiflora.* The species composition is affected by historic overgrazing, and the occurrence of the unpalatable annuals *Emex australis* and *Salsola kali* in particular are indicators of such degradation. It can thus be interpreted as a degraded form of the *Grielo-Othonnetum.* The association is weakly defined by just six exclusively diagnostic species. Like the *Grielo-Othonnetum* (1.1.3.1), it has a moderate grazing value.

Habitat: The *Emico-Lebeckietum* occurs on open midslopes without *heuweltjies* on shallow and deep sandy and silty Regosols and Arenosols. The soil properties are similar to the *Grielo-Othonnetum* (1.1.3.1) but with a tendency to a slightly higher enrichment of organic carbon in the topsoils (median 0.44%).

Order 1.2: *Berkheyo fruticosae-Rhoetalia undulatae*

Alliance 1.2.1: *Berkheyo fruticosae-Rhoion undulatae*

Rocky slopes and summits; slightly acidic

1.2.1.1 *Ruschio goodiae-Lebeckietum sericeae*

Dominant species

P: *Ruschia* subg. *Tumidulae* sp. 2485, *Amphiglossa tomentosa*, *Lebeckia sericea*, *Rhus undulata*, *Ruschia* subg. *Tumidulae* sp. 3818, *Euphorbia mauritanica*, *Aridaria noctiflora* subsp. *noctiflora*, *Rhus incisa*, *Didelta spinosa*, *Berkheya fruticosa*, *Lebeckia multiflora*, *Montinia caryophyllacea*, **C:** *Ruschia versicolor*, *Leipoldtia schultzei*, *Ruschia goodiae*, *Ruschia viridifolia*, *Galenia fruticosa*, *Hermannia trifurca*, *Cephalophyllum inaequale*, *Tetragonia verrucosa*, *Meyerophytum meyeri*, *Euphorbia hamata*, *Drosanthemum hispidum*, *Tetragonia fruticosa*, *Hypertelis salsoloides* var. *salsoloides*, **T:** *Karroochloa schismoides*, *Ehrharta pusilla*, *Gorteria diffusa* subsp. *diffusa*, *Didelta carnosa*, *Tribolium utriculosum*,

Characterisation: This species-rich association is dominated by leaf-succulent, shrubby vegetation with some therophytic graminoids and herbs occurring in winter and spring. It is often dominated by the meso-chamaephytes *Ruschia versicolor* and *Leipoldtia schultzei*. It is moderately defined by 12 exclusively diagnostic species. Like all associations within the *Berkheyo-Rhoion*, this one is very valuable as pasture all year through due to the abundance of many highly palatable perennial plants such as *Rhus incisa* and *Didelta spinosa.*

Habitat: The *Ruschio-Lebeckietum* occurs on midslopes and shoulders where rocky outcrops occur sporadically alongside shallow and stony Regosols and Leptosols free of calcium carbonate. However, it doesn not occur on *heuweltjies*. Although only moderately acidic, the soils of the association show the lowest pH values of the study area. The salinity is very low, and the content of organic carbon is low. Nevertheless, the amount of topsoil organic carbon is twice as high as in any other association of the *Hermannio-Zygophylletea*; the C/N ratio is also larger, indicating a slower decomposition (see Appendix S8).

1.2.1.2 *Drosanthemo hispidi-Manochlamydetum albicantis*

Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, *Lycium ferocissimum*, *Rhus undulata*, *Galenia africana*, *Stoeberia utilis*, *Stoeberia frutescens*, *Lebeckia sericea*, *Euphorbia mauritanica*, *Zygophyllum morgsana*, *Didelta spinosa*, *Zygophyllum retrofractum*, *Solanum giftbergense*, *Lebeckia multiflora*, *Montinia caryophyllacea*, *Lycium oxycarpum*, *Thesium lineatum*, **C:** *Galenia fruticosa*, *Manochlamys albicans*, *Ruschia versicolor*, *Drosanthemum hispidum*, *Delosperma crassum*, *Zygophyllum cordifolium*, *Antimima komkansica*, *Leipoldtia schultzei*, *Berkheya fruticosa*, *Ruschia goodiae*, *Galenia sarcophylla*, *Euphorbia ephedroides*, *Ruschia* sp. 124809, **T:** *Bromus pectinatus*, *Ehrharta longiflora*, *Karroochloa schismoides*, *Oncosiphon suffruticosum*,

Helichrysum leontonyx, *Atriplex lindleyi* subsp. *inflata*, *Dimorphotheca sinuata*,

Characterisation: This species-rich association forms stands of dwarf shrubs and shrubs on the edges of rocky outcrops. It is often dominated by the nano-phanerophyte *Aridaria noctiflora* and the therophytic graminoid *Bromus pectinatus.* The association is weakly defined by seven exclusively diagnostic species. It is highly valuable as pasture due to the abundance of several palatable to highly palatable plants including *Manochlamys albicans* and *Stoeberia utilis.* However, due to the often low accessiblity, the sites are subject to a lower grazing intensity than the vegetation could support.

Habitat: The *Drosanthemo-Manochlamydetum* occurs on midslopes and shoulders where rocky outcrops arise intermittently from shallow and stony Regosols, Leptosols, and Durisols. Its soil properties are similar to those of the *Ruschio-Lebeckietum* (1.2.1.1) but with a higher accumulation of topsoil organic carbon (median 0.90%).

1.2.1.3 *Antizomato miersianae-Stoeberietum utilis*

Dominant species

P: *Rhus undulata*, *Stoeberia utilis*, *Zygophyllum morgsana*, *Montinia caryophyllacea*, *Stoeberia frutescens*, *Lycium ferocissimum*, *Antizoma miersiana*, *Tripteris oppositifolia*, *Rhus incisa*, *Zygophyllum retrofractum*, *Asparagus burchelli*, *Euphorbia mauritanica*, *Lebeckia sericea*, *Galenia africana*, *Lycium cinereum*, *Erythrophysa alata*, *Aridaria noctiflora* subsp. *noctiflora*, *Didelta spinosa*, *Asparagus bayeri*, *Lebeckia multiflora*, **C:** *Ruschia viridifolia*, *Galenia fruticosa*, *Berkheya fruticosa*, *Tetragonia fruticosa*, *Hermannia amoena*, *Leipoldtia schultzei*, *Ballota africana*, *Ruschia stricta*, *Zygophyllum cordifolium*, *Helichrysum hebelepis*, **H:** *Ehrharta calycina*, *Stipagrostis obtusa*, **T:** *Mesembryanthemum guerichianum*, *Bromus pectinatus*, *Ehrharta longiflora*, *Senecio sisymbriifolius*,

Characterisation: This species-rich association often forms thickets of up to 2 m in height. The vegetation is frequently dominated by the nano-phanerophyte *Stoeberia utilis* and the micro-phanerophyte *Rhus undulata*, which are among the largest plant species in the study area. The association is well defined by 18 exclusively diagnostic species. It is highly valuable as pasture due to the abundance of many palatable to highly palatable plants such as *Rhus undulata*, *Stoeberia utilis*, and *Montinia caryophyllacea.* However, the sites can be rather inaccessible and therefore subject to lower grazing intensity than its grazing value would suggest.

Habitat: The *Antizomato-Stoeberietum* occurs on midslopes, shoulders, and summits where rocky outcrops occur alongside shallow and stony Regosols. The soils are slightly acidic to very slightly alkaline; in some places small amounts of calcium carbonate have been found. These soils receive additional run-off from rock faces, with the water probably enriched with nitrogen by the nitrogen-fixing cyanobacteria which cover them. As a result the organic carbon (median 1.68%) and nitrogen contents are the highest in the study. Also as a result of the run-on, the concentration of soluble salts (median EC 419 µS cm^{-1}) is higher than in any other association of the *Hermannio-Zygophylletea* (see Appendix S8).

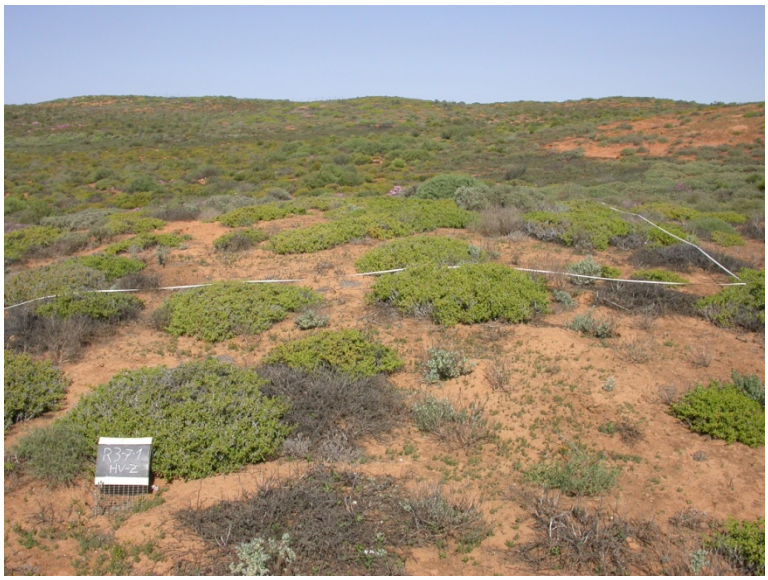
Class 2: *Didelto carnosae-Cephalophylletea inaequalis*

Order 2.1: *Mesembryanthemo guerichani-Eberlanzietalia cyathiformis*

Alliance 2.1.1: *Mesembryanthemo guerichani-Eberlanzion cyathiformis*

Heuweltjie centres and similar vegetation; highly saline, slightly alkaline

2.1.1.1 *Foveolino dichotomae-Eberlanzietum cyathiformis*



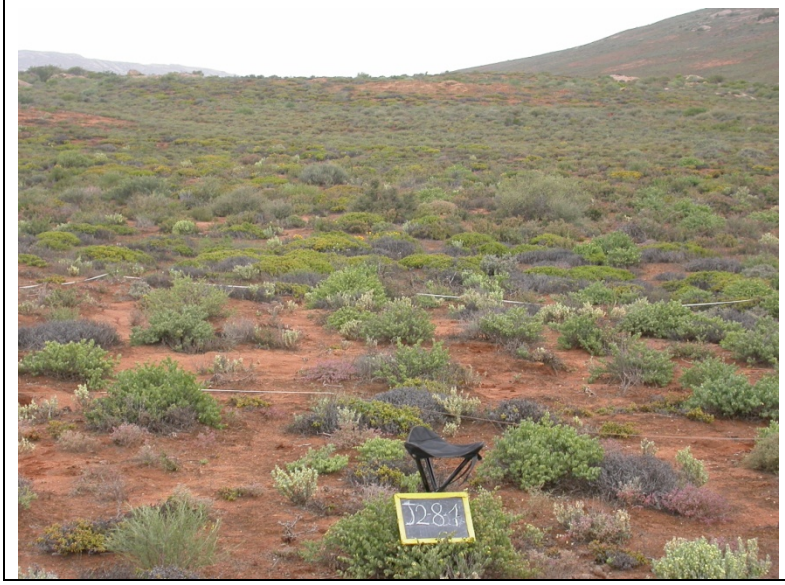
Dominant species

P: *Lebeckia multiflora*, **C:** *Eberlanzia cyathiformis*, *Salsola* sp. US07_2312, *Cephalophyllum inaequale*, *Galenia fruticosa*, *Zygophyllum cordifolium*, *Pteronia glabrata*, *Phyllobolus prasinus*, *Psilocaulon dinteri*, *Cheiridopsis robusta*, *Antimima komkansica*, *Phyllobolus spinuliferus*, **T:** *Foveolina dichotoma*, *Mesembryanthemum guerichianum*, *Karroochloa schismoides*, *Tetragonia microptera*,

Characterisation: This species-poor association consists of nearly circular stands of dwarf shrubs and many therophytes. It is dominated by the meso-chamaephyte *Eberlanzia cyathiformis* and, during winter and spring, the therophyte *Foveolina dichotoma*. The association is weakly defined by just one exclusively diagnostic species. It is valuable as a summer pasture due to the dominance of *Eberlanzia cyathiformis* and indigenous woody *Salsola* species, which are particularly browsed during the dry season.

Habitat: The *Foveolino-Eberlanzietum* occurs in plains on the centres of *heuweltjies*, preferentially on Calcisols and Durisols with calcium carbonate in the topsoils. The range of soil acidity is very narrow, all sites being neutral to slightly alkaline. The salinity and organic carbon content of the topsoil is low.

2.1.1.2 *Antimimato komkansicae-Zygophylletum cordifolii*



Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, *Ruschia* subg. *Tumidulae* sp. 2485, *Stoeberia frutescens*, *Lycium oxycarpum*, **C:***Galenia fruticosa*, *Cephalophyllum inaequale*, *Antimima komkansica*, *Zygophyllum cordifolium*, *Salsola* sp. US07_2312, *Drosanthemum hispidum*, *Drosanthemum curtophyllum*, *Leipoldtia schultzei*, *Phyllobolus trichotomus*, *Psilocaulon dinteri*, *Pteronia glabrata*, *Meyerophytum meyeri*, *Othonna sedifolia*, *Ruschia versicolor*, **T:** *Bromus pectinatus*, *Atriplex lindleyi* subsp. *inflata*, *Foveolina dichotoma*, *Karroochloa schismoides*.

Characterisation: This moderately species-rich association consists of dwarf shrubs of up to 1 m height. It is dominated by the micro-chamaephyte *Zygophyllum cordifolium* and is moderately defined by 12 exclusively diagnostic species. The association occurs in the direct vicinity of the *Foveolio-Eberlanzietum* (2.1.1.1). It provides good grazing resources due to the dominance of moderately to highly palatable species including *Hermannia cuneifolia* subsp. *glabrescens*, *Antimima komkansica*, and *Galenia fruticosa*.

Habitat: The *Antimimato-Zygophylletum* occurs in plains around the centres and fringes of *heuweltjies* on Cambisols. Here, the topsoils present a broad range of pH values (median 6.87) and only small concentrations of calcium carbonate occur, if at all. The salinity in most sites is substantially higher than in the *Foveolino-Eberlanzietum* (2.1.1.1), while the content of organic carbon is very low (see Appendix S8).

2.1.1.3 *Cheiridopsio robustae-Cephalophylletum inaequalis*

Dominant species

P: *Stoeberia utilis*, *Aridaria noctiflora* subsp. *noctiflora*, **C:** *Cephalophyllum inaequale*, *Salsola* sp. US07_2312, *Cheiridopsis robusta*, *Galenia fruticosa*, *Phyllobolus trichotomus*, *Ruschia leucosperma*, *Eberlanzia cyathiformis*, *Leipoldtia schultzei*, *Ruschia* sp. 124796, *Psilocaulon dinteri*, *Pteronia glabrata*, *Antimima komkansica*, *Phyllobolus spinuliferus*.

Characterisation: This species-poor association is dominated by dwarf shrubs, namely the creeping nano-chamaephyte *Cephalophyllum inaequale*. It is weakly defined by only three exclusively diagnostic species. The association typically occurs in the direct vicinity of the *Foveolino-Eberlanzietum*, but contributes only little to the grazing value of the vegetation due to the dominance of less palatable species such as *Cephalophyllum inaequale* and *Cheiridopsis robusta*.

Habitat: The *Cheiridopsio-Cephalophylletum* occurs in plains on the fringes of *heuweltjies* on a wide variety of soil types including Durisols, Solonchaks, Calcisols, and Leptosols. Soils are slightly alkaline; small amounts of carbonates are typical and in most cases the salinity is extremely high. The content of organic carbon is very low.

2.1.1.4 *Mesembryanthemo guerichani-Eberlanzietum cyathiformis*

Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, **C:** *Cephalophyllum inaequale*, *Leipoldtia schultzei*, *Eberlanzia cyathiformis*, *Ruschia versicolor*, *Salsola* sp. US07_2312, *Galenia fruticosa*, *Psilocaulon dinteri*, *Drosanthemum hispidum*, *Ruschia leucosperma*, *Phyllobolus trichotomus*, ***G:*** *Trachyandra falcata*, **T:** *Foveolina dichotoma*, *Atriplex lindleyi* subsp. *inflata*.

Characterisation: This moderately species-poor association is dominated by dwarf shrubs: the creeping nano-chamaephyte *Cephalophyllum inaequale*. It is the central association of the alliance *Mesembryanthemo-Eberlanzion* and has no exclusively diagnostic species. The association occurs in the direct vicinity of the *Foveolio-Eberlanzietum* (2.1.1.1). It provides good grazing value due to dominance of the palatable *Eberlanzia cyathiformis*, which is well grazed during the dry season.

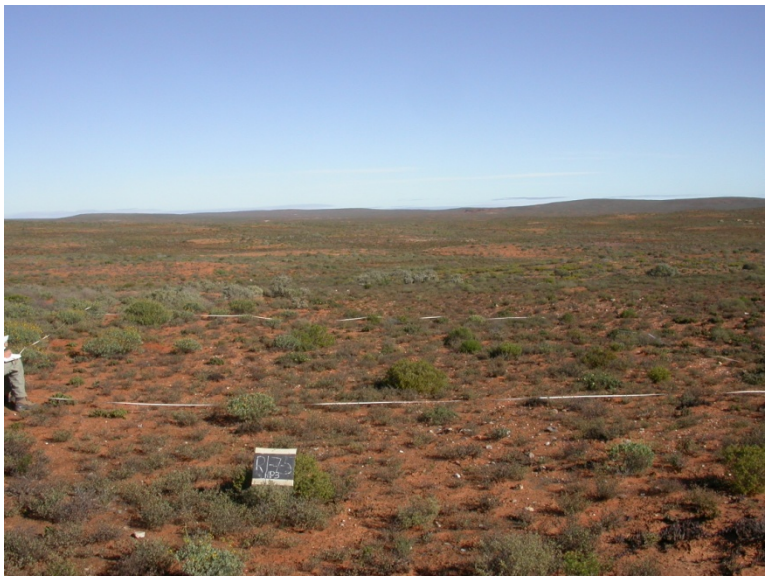
Habitat: Like the *Cheiridopsio-Cephalophylletum* (2.1.1.3), this community occurs in plains on the fringes of *heuweltjies* on a wide variety of soil types. The topsoil properties are also very similar to this other association, but with a tendency to lower amounts of inorganic carbon. The salinity is lowest within the *Didelto-Cephalophylletea* (see Appendix S8).

Order 2.2: *Euphorbio hamatae-Cephalophylletalia inaequalis*

Alliance 2.2.1: *Euphorbio hamatae-Cephalophyllion inaequalis*

Heuweltjie matrix; highly saline, slightly acidic

2.2.1.1 *Halliantho plani-Ruschietum leucospermae*



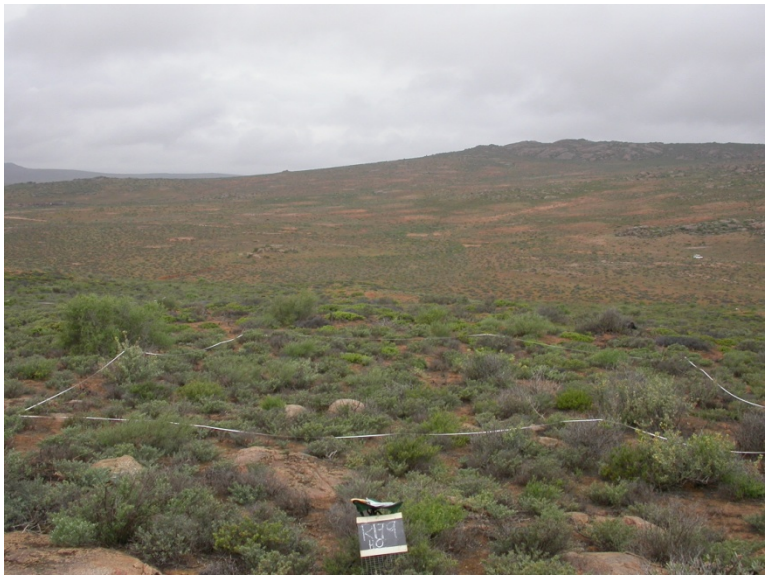
Dominant species

P: *Stoeberia frutescens*, *Aridaria noctiflora* subsp. *noctiflora*, **C:** *Ruschia leucosperma*, *Cephalophyllum inaequale*, *Ruschia viridifolia*, *Leipoldtia schultzei*, *Tetragonia fruticosa*, *Othonna arbuscula*, *Vanzijlia annulata*, *Cheiridopsis robusta*, *Sarcocaulon l´heritieri*, *Galenia fruticosa*, *Othonna sedifolia*, *Ruschia* sp. 124796, *Ruschia* sp. 22122, *Salsola* sp. US07_2312, *Phyllobolus spinuliferus*, *Aspazoma amplectens*, *Euphorbia hamata*, **G:** Monocotyledonic geophyte 1678.

Characterisation: This moderately species-poor association consists of dwarf shrubs, which are mostly not higher than 50 cm. It is dominated by the nano- and micro-chamaephytes *Cephalophyllum inaequale* and *Ruschia leucosperma*. The association is moderately defined by 14 exclusively diagnostic species. It is moderately valuable as pasture due to the joint dominance of poorly palatable *Aizoaceae* (e.g. *Ruschia leucosperma* and *Cephalophyllum inaequale*) and highly palatable species (e.g. *Euphorbia hamata* and *Tetragonia fruticosa*).

Habitat: The *Halliantho-Ruschietum* occurs in plains around the centres and fringes of *heuweltjies*, preferentially on Solonchaks without carbonates. The topsoil pH values vary from strongly acidic to very slightly alkaline, and the salinity ranges from moderate to high. The content of organic carbon and nitrogen is very low.

2.2.1.2 *Leipoldtio schultzei-Cephalophylletum inaequalis*



Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, *Stoeberia frutescens*, *Ruschia* subg. *Tumidulae* sp. 3818, **C:** *Cephalophyllum inaequale*, *Leipoldtia schultzei*, *Ruschia leucosperma*, *Galenia fruticosa*, *Eberlanzia cyathiformis*, *Tetragonia fruticosa*, *Meyerophytum meyeri*, *Zygophyllum cordifolium*, *Drosanthemum hispidum*, *Ruschia versicolor*, *Hypertelis salsoloides* var. *salsoloides*, *Ruschia stricta*, *Salsola* sp. US07_2312, *Jacobsenia kolbei*, *Antimima* sp. 2386, *Ruschia viridifolia*, *Vanzijlia annulata*, **G:** Monocotyledonic geophyte 1678.

Characterisation: This moderately species-poor association is dominated by dwarf shrubs, namely the nano- to microchamaephytes *Cephalophyllum inaequale* and *Leipoldtia schultzei*. The association is weakly defined by two exclusively diagnostic species. It is marginally valuable as pasture due to the dominance of the unpalatable *Leipoldtia schultzei* and *Ruschia leucosperma*, and the poorly palatable *Cephalophyllum inaequale*.

Habitat: The *Leipoldtio-Cephalophylletum* occurs in plains and on gentle slopes around the centres and fringes of *heuweltjies* on Durisols and Leptosols without carbonates. The soils are slightly acidic, the salinity is low to moderate, and the organic carbon content is low.

2.2.1.3 *Pteronio glabratae-Cephalophylletum inaequalis*

Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, *Tripteris oppositifolia*, *Lycium oxycarpum*, **C:** *Ruschia* sp. 124796, *Cephalophyllum inaequale*, *Leipoldtia* cf. *crassulifera*, *Salsola* sp. US07_2312, *Pteronia glabrata*, *Galenia fruticosa*, *Hirpicium* sp. US07_2511, *Meyerophytum meyeri*, *Zygophyllum cordifolium*, *Meyerophytum globosum*, *Jacobsenia vaginata*, *Ruschia* sp. 20228, *Phyllobolus prasinus*, *Othonna arbuscula*, *Cheiridopsis robusta*, *Ruschia viridifolia*, *Drosanthemum curtophyllum*, *Tetragonia fruticosa*.

Characterisation: This moderately species-poor association is dominated by dwarf shrubs: *Cephalophyllum inaequale* and *Ruschia* sp. 124796. The association is moderately defined by 15 exclusively diagnostic species. It is marginally valuable as pasture due to the dominance of the moderately palatable *Cephalophyllum inaequale*, which is frequently accompanied by highly palatable shrubs such as *Hermannia cuneifolia* subsp. *cuneifolia*, *Pteronia glabrata*, *Tetragonia fruticosa*, and *Tripteris sinuata* subsp. *sinuata*.

Habitat: The *Pteronio-Cephalophylletum* occurs in plains and on moderate slopes around the centres and fringes of *heuweltjies* on shallow soils, mostly Leptosols without carbonates in the topsoil. The topsoil acidity varies from slightly acidic to very slightly alkaline. At most sites the salinity is extremely high, and the content of organic carbon is low.

2.2.1.4 *Drosanthemo curtophylli-Meyerophytetum meyeri*

Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, *Stoeberia frutescens*, **T:** *Ehrharta pusilla*, *Atriplex lindleyi* subsp. *inflata*, **C:** *Meyerophytum meyeri*, *Cephalophyllum inaequale*, *Drosanthemum curtophyllum*, *Tetragonia fruticosa*, *Ruschia versicolor*, *Zygophyllum cordifolium*, *Galenia fruticosa*, *Leipoldtia* cf. *crassulifera*, *Euphorbia hamata*, *Ruschia viridifolia*, *Aspazoma amplectens*, *Dicrocaulon ramulosum*, *Pteronia ciliata*, *Phyllobolus prasinus*, *Salsola* sp. US07_2312, *Berkheya fruticosa*, *Othonna arbuscula*, *Ruschia* sp. 21952, *Eberlanzia cyathiformis*, *Phyllobolus trichotomus*, *Tetragonia verrucosa*, *Leipoldtia schultzei*.

Characterisation: This moderately species-rich association is dominated by dwarf shrubs, namely *Cephalophyllum inaequale* and *Meyerophytum meyeri*. The association is weakly defined by seven exclusively diagnostic species. The association has the highest grazing value within the *Euphorbio-Cephalophyllion*. Besides the dominant, moderately palatable *Meyerophytum meyeri*, relatively high cover values exist for the highly palatable shrubs *Pteronia ciliata*, *Euphorbia hamata* and *Tetragonia fruticosa*, as well as the moderately palatable *Drosanthemum curtophyllum*.

Habitat: The *Drosanthemo-Meyerophytetum* occurs in plains and on gentle slopes around the centres and fringes of *heuweltjies* on shallow soils, mainly Leptosols and Durisols without carbonates. The soils are slightly acidic, and salinity is moderate. The content of organic carbon is low.

2.2.1.5 *Ruschio versicoloris-Cephalophylletum inaequalis*

Dominant species

P: *Aridaria noctiflora* subsp. *noctiflora*, *Stoeberia frutescens*, **C:** *Cephalophyllum inaequale*, *Ruschia versicolor*, *Zygophyllum cordifolium*, *Galenia fruticosa*, *Salsola* sp. US07_2312, *Pteronia glabrata*, *Othonna sedifolia*, *Meyerophytum meyeri*, *Eberlanzia cyathiformis*, *Leipoldtia schultzei*, *Drosanthemum curtophyllum*, *Tetragonia fruticosa*, *Ruschia viridifolia*, *Berkheya fruticosa*, *Antimima komkansica*, *Euphorbia hamata*.

Characterisation: This moderately species-poor association is dominated by the dwarf shrubs *Cephalophyllum inaequale* and *Ruschia versicolor*. The association is weakly defined by one exclusively diagnostic species. It is marginally valuable as pasture due to the dominance of the poorly palatable *Ruschia versicolor* and *Cephalophyllum inaequale*.

Habitat: The *Ruschio-Cephalophylletum* occurs in plains and on moderate slopes around the centres and fringes of *heuweltjies* on shallow soils, preferentially Leptosols and Durisols without carbonates. The soils are very slightly acidic and the salinity is predominantly moderate. The content of organic carbon is low.

Unit 2.3 [probably belonging to a separate class]

Quartz patches; extremely saline, slightly acidic

[not named]

Dominant species

C: *Salsola* sp. 20223, *Jacobsenia vaginata*, *Dicrocaulon spissum*, *Salsola* sp. US07_2312, *Aspazoma amplectens*, *Hirpicium* sp. US07_2511, *Drosanthemum ramosissimum*, *Cephalophyllum inaequale*,

Characterisation: Unit 2.3 represents a group of several distinct plant communities that typically occur on the quartz fields of the study area. The number of relevés of this habitat type was insufficient to reflect the spectrum of the associations adequately. The unit is well defined by 20 exclusively diagnostic species. It has low grazing value because of sparse vegetation cover and very few palatable species.

Habitat: The quartz field communities occur on soils that are covered by white angular quartz gravel. The salinity and acidity of these soil types are highly variable, ranging from very saline to extremely saline, and from strongly acidic to very slightly alkaline. The organic carbon content is low.

Appendix S10. Relevance of the syntaxa for practitioners.

Vegetation units, with their distinct species composition and habitat requirements, have specific characteristics in terms of value for conservation and grazing for the different livestock types, resilience, and potential for invasion and restoration. These are facets that are critical for rangeland management decisions. Single vegetation units, or mosaics of them, can therefore be translated into management units as has been done by Rösch (2001) for the Goegap Nature Reserve (70 km northeast of Soebatsfontein).

In terms of livestock farming, the grazing value of rangeland is of highest importance. By integrating local knowledge on the palatability of single plants into our study, we were able to evaluate the grazing values of our syntaxa. The majority of the syntaxa provided moderate to good grazing resources. Highest grazing values were associated with the *Berkheyo-Rhoion* (1.2.1), while the quartz field communities (unit 2.3) had particularly poor grazing resources and thus are unattractive for livestock. Similarly poor grazing values (dominance of annuals and perennials of low palatability) were found in the associations of the *Grielo-Galenion* (1.1.3), which we interpreted as degraded states of the *Othonnion cylindricae* (1.1.1) and the *Stipagrostio-Othonnion* (1.1.2). Sustainable rangeland management that aims at maintaining good grazing values throughout the year should try to reduce grazing pressure in areas dominated by stands of the *Grielo-Galenion*, so as to allow the recovery of the of a more palatable vegetation.

Whilst having a very low importance for farming, the quartz fields (unit 2.3) are of very high conservation value. Despite being very species-poor at plot-level, they support a high number of local endemics and habitat specialists (Schmiedel & Jürgens 1999; Schmiedel 2004). Quartz fields have therefore been focal sites for the spatial design of conservation areas, for example the conservation area in the Knersvlakte (Desmet et al. 1999) and the Namaqua National Park directly adjacent to Soebatsfontein commonage). Trampling by livestock that passes through on its search for fodder can have long-lasting negative impacts on this habitat (Etzold 2006), and so grazing management should take special care of areas with high concentration of quartz fields, for example by fencing them off.

Invasive species pose a great threat to biodiversity worldwide (Sala et al. 2000). Fortunately, the syntaxa in our study area were only marginally invaded by exotic species. The only exotic species that had diagnostic value for a particular syntaxon were *Atriplex semibaccata* (in the *Drosanthemo-Manochlamydetum*) and *Salsola kali* (in the *Emico-Lebeckietum*) whereas *Erodium cicutarium* and *Atriplex lindleyi* subsp. *inflata* were merely classified as companion species. The latter, however, is an invasive species from Australia (Wells et al. 1986) that tends to invade brackish soils (U.S. own observation), and it was found in almost all associations. It was only absent from the *Stipagrostio-Othonnetum* (1.1.2.1), the *Grielo-Othonnetum* (1.1.3.1) and the *Halliantho-Ruschietum* (2.2.1.1). The first two associations occur on deep sandy soils (Arenosols), which are atypical for *A. lindleyi*, whereas the last occurs on shallow, moderately to highly saline soils (Solonchak) which could be potentially invaded by *A. lindleyi*, whose absence may be due to the low number of available relevés. The sometimes very high constancy and permanent cover of the native creeping dwarf shrub *Cephalophyllum inaequale* prevents *A. lindleyi* from spreading too easily. *C. inaequale* has already been identified as a suitable plant for restoration of denuded soils (Anderson et al. 2004).

Finally, poisonous plants did not show a clear distribution pattern in relation to syntaxa. Some are considered as diagnostic for various syntaxa, e.g. *Euphorbia mauritanica* (*Berkheyo-Rhoethalia*), *Lebeckia sericea* (*Ruschio-Lebeckietum*), *Galenia africana* (*Drosanthemo-Manochlamydetum*) and *Tylecodon reticulatus* (*Halliantho-Ruschietum*). Others are companion species without diagnostic values (e.g. *Tylecodon wallichii* and *T. paniculatus*). Farmers' perceptions of grazing values and problems associated with certain species may vary across the region, and even within a locality, due to different levels of farming experience (Allsopp et al. 2007). Differences in these properties themselves may also exist between local ecotypes of plant species. Participatory research on the grazing value of syntaxa is required for a sound transdisciplinary understanding of the values and management requirements of rangeland syntaxa.

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Appendix S11. Comparison of our syntaxa with previously described units.

To our knowledge, syntaxa with formal names according to ICPN have previously been described only twice from the Succulent Karoo. Knapp (1968) in his overview of the high-ranking syntaxa of various African regions listed the order *Psilocaulo-Ruschietalia* within his class *Psilocaulo-Ruschietea.* Both names are invalid according to Art. 8 ICPN. Based on the brief description and species lists, the *Psilocaulo-Ruschietalia* seems to correspond to the entirety of zonal vegetation types of lowland Namaqualand including the Knersvlakte, except the quartz fields (see Schmiedel & Jürgens 1999; Haarmeyer et al. 2010). Our quartz field unit 2.3 would fall into another also invalidly described class of Knapp (1968), the *Lithopso-Conophytetea*, but none of his three vicariant orders described from the Clanwilliam region in the south to the Richtersveld in the north seemingly covers our stands. As the descriptions of Knapp (1968) are very coarse, and he obviously had a far wider concept of class and order, we have decided not to validate his names, but instead propose new names for the high-ranking syntaxa described here.

The second source with formal descriptions of syntaxa is Jürgens (2004), who validly described 71 associations and nine alliances from the Richtersveld and adjacent regions, which lie approximately 150–300 km north of our study area. Within the Succulent Karoo vegetation, he distinguished fives alliances and two informal association groups, which he arranged into two informal higher-rank units. With *Othonna cylindrica*, *Stipagrostis ciliata* and *Cladoraphis spinosa* as alliance character species, plus several diagnostic species of higher rank, the *Othonnion cylindricae* Jürgens 2004 showed such high similarities with our alliance 1.1.1 that we could confirm their equivalence and nomenclatural identity. However, none of Jürgens' (2004) associations matched our *Oncosiphono-Stipagrostietum*. It is our impression that not all three other associations subordinated by Jürgens (2004) to the *Othonnion cylindricae*, besides its type association (*Brownantho arenosi-Stipagrostietum ciliatae* Jürgens 2004), should remain in this alliance. The *Dideltion spinosae* Jürgens 2004 is the second alliance that showed significant floristic similarities to syntaxa of the Soebatsfontein region; it seems to belong to the order *Berkheyo-Rhoetalia* but is different from our *Berkheyo-Rhoion*. The *Cephalophyllion regalis* Jürgens 2004 might be grouped with our unit 2.3 into a class of quartz field communities, while all other alliances and equivalent units of Jürgens (2004) – *Stoeberion beetzii, Brownanthion pseudoschlichtiani* and his units 1.2.2.2 (dwarf shrublands of Richtersveld plains) and 1.2.2.4 (mountain shrublands of the Richtersveld) – are so dissimilar to our vegetation types that they probably belong to one or more classes not represented in Soebatsfontein.

Haarmeyer et al. (2010) provided an informal classification of the major vegetation units found on the nine 1-km² Biodiversity Observatories along the BIOTA transect through the Succulent Karoo. They applied a similar methodology to that of the current investigation, though on a coarser syntaxonomic level and based on 1000-m² instead of 100-m² plots. Haarmeyer et al. (2010) distinguished three units on the Soebatsfontein Observatory, with unit 1 corresponding to our *Grielo-Galenion*, unit 2 to our *Berkheyo-Rhoion*, and unit 3 to our class *Didelto-Cephalophylletea*, and within this mainly to the *Euphorbio-Cephalophyllion*. From the three Observatories in the Richtersveld (approximately 250 km N of Soebatsfontein), both vegetation units of Groot Derm and unit 1

of Numees seem to belong to our class *Hermannio-Zygophylletea*, though probably to other alliances and orders than those of Soebatsfontein. By contrast, unit 2 of Groot Derm and both vegetation units of Koeroegap Vlakte are floristically so different from the communities in Soebatsfontein that they should be placed in different classes. Some of the vegetation units of the Observatories further east from Soebatsfontein showed such high similarities with our newly described alliances and orders that they could probably be included in these, namely unit 2 (*Stachys rugosa-Pteronia incana* community) of Paulshoek and units 2–4 of Remhoogte to our order *Berkheyo-Rhoetalia*, but probably not to the *Berkheyo-Rhoion*. Unit 2 of Goedehoop (*Senecio aloides-Ruschia burtoniae* community) and unit 2 of Moedverloren (*Amphibolia saginata-Ruschia versicolor* community), both from the Knersvlakte (approximately 150 km south of Soebatsfontein), could be included in the *Euphorbio-Cephalophyllion*. Unit 1 of Goedehoop and units 1 and 3 of Ratelgat in the Knersvlakte are quartz fields ecologically similar to our informal unit 2.3, but floristically well differentiated. Finally, on some of these Observatories (Paulshoek, Remhoogte, Moedverloren), vegetation of *riviere* (beds of episodic rivers) plays an important role. This vegetation type was not so frequent in our study area and thus was excluded from our sampling. Due to their huge floristic differences, such stands do not belong to any of the classes described in the present paper.

The plant communities described by Rösch (2001), from the Goegap Nature Reserve situated about 70 km northeast of Soebatsfontein in the more mountainous and rocky Kamiesberg region (unit SKn 6 = Kamiesberg Mountains Shrubland of the Namaqualand Hardeveld according to Mucina et al. 2006b), show only a little similarity in species composition with the associations in our study area. The exception is the sharing of some widespread species such as *Galenia sarcophylla*, *Lampranthus otzenanius* (= *Drosanthemum otzenianum*), *Leipoldtia shultzei* (= *L. pauciflora*) and *Tripteris sinuata* (= *Osteospermum sinuatum*). Just two of Rösch's (2001) upland communities, namely her "*Rhus undulata* tall sparse shrubland community" and her "*Leipoldtia pauciflora* short open shrubland community" (*L. pauciflora = L. schultzei*), are closely related to the *Berkheyo-Rhoion* of Soebatsfontein. They share diagnostic species (e.g. *Didelta spinosa*, *Montinia caryophyllacea*, and *Rhus undulata*) with our alliance, and they inhabit the same habitat types (i.e. gentle to steep slopes). However, due to Goegap Nature Reserve's higher altitude and, at 150 mm, 15% higher mean annual rainfall (Rösch 2001), its communities comprised many more Upland Succulent Karoo species (e.g. *Nenax namaquensis*, *Ruschia robusta*, and *Senecio cinerascens*) than we recorded for the Namaqualand Heuweltjieveld. They should therefore be considered as separate associations. The same applies to the upper slope vegetation of the Hantam-Tanqua-Roggeveld subregion (corresponding to the bioregions Trans-Escarpment Succulent Karoo and parts of the Rainshadow Valley Karoo of Mucina et al. 2006b), which has been classified by van der Merwe et al. (2008). The Hantam-Tanqua-Roggeveld subregion is situated more than 250 km southeast of our study area and much of it receives a higher mean annual rainfall (230 mm compared to 131 mm). Although there is a considerable overlap among the common species of both study areas, only the "*Eriocephalus purpureus* Hantam Karoo Association" of van der Merwe et al. (2008) showed closer similarity to any of the Hardeveld communities (again the *Berkheyo-Rhoion*) by having some diagnostic species (i.e. *Berkheya fruticosa*, *Ehrharta calycina*, and *Microloma sagittatum*) in common. In both areas, the syntaxa are largely restricted to upper slopes or ridges. This suggests that in a future larger-scale classification they might be combined into one syntaxon of higher rank (alliance or order).

In our study, the only eight relevés of quartz fields (unit 2.3) were placed within the class *Didelto-Cephalophylletea* according to the TWINSPAN analysis. However, both the almost complete absence of many determined class character species and the separated position in the ordination diagram strongly suggest that unit 2.3 should rather be treated as part of a third class. Yet with the scarcity of available relevés, itself caused by the relative rarity of quartz fields in the surroundings of Soebatsfontein, we refrained from a formal classification here. Generally, quartz fields in southern Africa are known for their highly specialised flora and vegetation, which is strongly differentiated from the surrounding matrix vegetation (Schmiedel & Jürgens 1999; Schmiedel 2002, 2004; see also Knapp 1968). Such quartz fields, with widely varying soil conditions (see discussion on Vegetation-environment relationships above), occur as patches ranging from a few square metres to several hectares in size, embedded in sandy or loamy plains and hills. The island-like distribution of quartz fields and their internal variability has contributed to a high number of local and regional quartz field endemics (Schmiedel 2002, 2004). Accordingly, the eight quartz field relevés of our study contained only a few species with higher constancy. In her study of the quartz fields of the wider surroundings of Soebatsfontein, Schmiedel (2002) distinguished six informal quartz-field communities, three of which also occurred in our study area and were included in unit 2.3: the *Jacobsenia vaginata* community, *Dicrocaulon ramulosum* community, and *D. spissum* community. This supports the view that our heterogeneous unit 2.3 should be split into several associations when more relevés become available. Formal phytosociological classifications are available for the quartz fields of the Richtersveld by Jürgens (2004), who described the *Cephalophyllion regalis* with four associations, and for the Little Karoo (approximately 500 km southeast of the study region) by Schmiedel & Mucina (2006), who described 16 associations arranged into five alliances or equivalent units. The quartz fields of Soebatsfontein show little floristic overlap with those of the Richtersveld (*Aspazoma amplectens* and *Gazania lichtensteinii*) and practically none with those in the Little Karoo. Given the high floristic differentiation between the quartz fields of various regions in the Succulent Karoo (Schmiedel 2002, 2004), it remains an open question whether they can all be classified into one phytosociological class or whether several vicariant classes are needed to reflect their full variety.

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