Chapter 3

FLORA OF THE SOUTH-WESTERN LITTLE SANDY DESERT

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ABSTRACT

The flora of the south-western Little Sandy Desert is diverse with 522 taxa. Many taxa are of biological and conservation significance and several were not previously recorded in the scientific literature. Many taxa are at the limits of their distributional range and are disjunct outliers of otherwise mostly northern or southern ranges. In broad terms the flora is dominated by central arid zone elements although southern and tropical arid zone groups are present. Floristic communities are readily distinguishable and their arrangement across the landscape appears to be controlled by topographic and edaphic considerations. The placement of the study area in a transitional zone between major phytogeographic elements in the Australian flora together with heterogeneity in land surface types and soils is advanced as justification for the botanical diversity recorded. This diversity differs notably from other areas in the biogeographical region and hence the study area warrants consideration for conservation.

INTRODUCTION

The flora of the Little Sandy Desert is a botanical unknown with very little survey and documentation having been undertaken. Earnest Giles in 1876 was the first to collect plants from the region, the most celebrated being *Eucalyptus rameliana* (Hopper 1992). Unfortunately, no account is available of the other plants that Giles collected on this expedition although the TYPE specimens for four species in addition to *E. rameliana* appear to have been collected by Giles in the Desert. These species are *Hakea rhombales*, *Hannafordia bissillii* subsp. *bissillii*, *Helichrysum gilesii* and *Stemodia linophylla*. Other early visitors to the region, notably John Forrest, Frank Hann, Lawrence Wells and William Rudall appeared to have paid only cursory attention to the plants, being mainly concerned by the presence of stock poisons such as *Gyrostemon ramulosa* and *Gastrolobium grandiflorum*. It is unclear if plants were collected as part of the ill-fated Calvert Scientific Exploring Expedition of 1896. Alfred Canning was another early visitor to the region, surveying and supervising construction of both the Canning Stock Route and the now abandoned No. 1 Vermin Proof Fence. His interest in the flora was limited, extending primarily to the obstacle it presented with respect to the alignment of the Fence and

its utility particularly for the supply of timber necessary for wells, fence posts and yard construction. In 1947 Robert Royce made a extensive plant collection from an area on the edge of this Little Sandy Desert when he travelled north from Jigalong along the route of the No. 1 Vermin Proof Fence to Eighty - Mile Beach (Royce 1948). In total he collected 436 vouchers during this journey although the actual number from the Little Sandy Desert is unclear as the alignment of the fence is mostly outside the western boundary of the Desert north of Jigalong.

Contemporary botanical exploration of the Desert commenced in the late 1970s to early 1980's as a consequence of the realisation by government agencies of a need for conservation reserves in the Great Sandy, Little Sandy and Gibson Deserts (CTRC 1974). Initially survey effort in the Little Sandy Desert was in the Carnarvon Range and Lake Disappointment areas (McKenzie and Burbidge 1979) however localities in the Rudall River area (Muir 1982, George and Mitchell 1983) were also targeted for investigation. These surveys were the forerunners to extensive and protracted investigations in the Rudall River area as a consequence of the activities of resource development companies (Martinick, 1986, 1987, Hart 1990, 1993). In recent times the botanical focus has shifted to the Canning Stock Route (Stephen Hopper, pers. comm.) and localities like the Carnarvon Range (Kenneally *et al.* 2002, Daphne Edinger pers. comm.).

In the early 1990's botanical attention was drawn to the south-western Little Sandy Desert as a consequence of the rediscovery of *E. rameliana* by bushman Nic Foot (Hopper 1992). Early visits to this part of the Desert indicated that the flora was diverse and undocumented, a fact not only clearly demonstrated by the abundance of *E. rameliana* but also by the collection of several poorly known species (e.g. *Stemodia linophylla*), together with species which were at their distributional range ends (e.g. *Calothamnus aridus*) and taxa which were apparently novel having not been reported in the scientific literature previously (e.g. *Sida* sp. nov. Little Sandy Desert (SVL 2489)).

This chapter reports the results of a botanical survey of the south-western Little Sandy Desert conducted over a decade of investigation. A species inventory obtained from systematic and opportunistic sampling throughout the study area is presented together with an analysis on how the flora is arranged into communities. Discussion is forthcoming on the floristics and botanical significance of the study area and recommendations are tendered for conservation.

METHODS

SAMPLING

The sampling regime developed for the botanical survey aimed to sample the dominant surface types typical of the study area as defined in Chapter 2. Initially this objective was accomplished through sampling the flora at each of the five pairs of permanent biological survey quadrats replicated in three localities across the survey area as described in Chapter 2. Subsequently, additional flora sampling sites were also established throughout the study area to sample surface and vegetation types not previously represented.

One hectare quadrats were established at each of the survey sites and all vascular plants within each quadrat were systematically recorded. Sampling time within a quadrats was standardised to two-person hours. All constituent floristic quadrats of the permanent biological survey sites were sampled on three occasions in June 1996, October 1996 and August 1997. All supplementary floristic quadrats were sampled on two occasions although the remoteness of some quadrats (e.g. F23) ensured that they were sampled only once. Quadrats are permanently marked on all corners and photographic records were captured from a fixed point. Orientation and geographical locality were also recorded using a compass and GPS.

In addition to the systematic sampling, considerable opportunistic sampling of the flora was undertaken. Such sampling typically occurred during vehicle traverses across the study area and primarily focused on taxa not previously cited or recorded during the survey. A summary of the sampling events and days of effort is provided in Table 3.1.

Table 3.1 Botanical sampling events and effort expressed as days in the field.

Date	Sampling effort (days in field)	Sampling strategy
August 1991	2	opportunistic
May 1992	7	opportunistic
July 1995	6	opportunistic
October 1995	8	opportunistic
June 1996	17	systematic - opportunistic
October 1996	17	systematic - opportunistic
April 1997	7	opportunistic
August 1997	17	systematic - opportunistic
September 1999	9	opportunistic
August 2001	8	opportunistic

Plant specimens were collected for most taxa encountered during the survey. These specimens were processed in the field and pressed in conventional herbarium plant presses for drying under ambient atmospheric conditions. Details on habit, abundance, locality, habitat, vegetation type and associated species were recorded for each collected specimen. Sufficient material was collected from each sample to facilitate the lodgement of voucher specimens in the Western Australian Herbarium (PERTH) and Pilbara Regional Herbarium (KARR). Duplicate material was also supplied to other Australian herbaria. Specimen identification was performed with reference to standard published floras applicable to the deserts of Western Australia, generic taxonomic treatments or through liaison with taxonomists at the PERTH and Eastern States herbaria. The classification of plants conforms to that currently employed by the Western Australia Herbarium as portrayed in Paczkowska and Chapman (2000) or with that promoted by subsequent taxonomic and systematic treatments.

ANALYSIS

For analytical purposes each quadrat was treated as an independent sampling site culminating in a floristic dataset which comprised 53 quadrats. Floristic composition and patterning was assessed using analytical routines provided in the PATN program (Belbin 1994). These analyses were performed on a presence/absence matrix generated using all taxa recorded from two or more quadrats during the survey. Annuals and ephemerals were included

in the analyses as field sampling was considered sufficiently adequate and comprehensive to document the presence of such plants.

Quadrats were classified according to similarities in taxa using the Czekanowski metric (Faith *et al.* 1987) and the unweighted pair grouped arithmetic averaging clustering strategy (UPGMA, β = -0.1, Belbin 1994). The veracity of the resulting clustering outcome with respect to the initial association matrix was subjectively investigated through the cophenetic correlation (Rohlf 2000). Similarly, deviation from randomness of the relationship between matrices was tested via the normalised Mantel statistic (Z) where the one-tailed probability of $Z = 0$ was determined from 9 999 random permutations (Rohlf 2000). Subsequently accord between the clustering outcome and the similarity matrix was also investigated by the construction of a two-way table of the Species Assemblages and Quadrats Groups using the two-step routine outlined by Belbin (1991).

RESULTS

FLORISTICS COMPOSITION

A total of 552 vascular plant taxa are recorded from the southern Little Sandy Desert during this survey (Appendix 3.1). These taxa comprise six ferns or fern allies and 546 flowering plants. A total of 3 960 quadrat occurrence records are obtained for 345 taxa recorded in the 53 quadrats. Specimens were collected from 203 localities throughout the study area. In total 1 049 voucher specimens representing the 552 taxa were collected.

The recorded flora represented 206 genera from 67 families. As anticipated for an arid sandy desert flora, dominant families in terms of taxonomic representation are the Poaceae (52 taxa), Asteraceae (46), Mimosaceae (46), Chenopodiaceae (35) and Goodeniaceae (34) which combined represent over 39% of the taxa encountered. Twenty-two families are represented by only one taxon while the number of families with five or less taxa is 44. At the generic level the taxonomically dominant groups are *Acacia* (46 taxa), *Eremophila* (21), *Ptilotus* (17), *Goodenia* (17), *Eucalyptus* (14) and *Sida* (13) while the majority of genera (118) are represented by only one taxon. Richness at the generic level is greatest in the families Asteraceae (21), Poaceae (11) and Papilionaceae (13).

Many significant botanical collections were made during the survey. While further taxonomic research is required to confirm exact numbers it appears that several taxa not previously recorded in the Western Australia Herbarium or cited in the scientific literature were collected during the survey. Noteworthy examples of such novel taxa are listed below.

Acacia sp. nov. Little Sandy Desert (SVL 4991)
This undescribed distinctive wattle was collected for the first time during this botanical survey. It appears endemic to sandstone rises east of Willie Soak. The taxon is a member of the Juliflorae and is possibly related to *A. wanyu* (Bruce Maslin, PERTH, pers. comm.).

Goodenia sp. nov. 4463 Little Sandy Desert (SVL 4463)
This undescribed *Goodenia* was collected for the first time during this botanical survey. It does not confirm suitably with any described species concept for a *Goodenia* in Western Australia. Currently is appears endemic to the Little Sandy Desert having been collected near Savory Creek and in a mulga woodland near Willie Soak (Leigh Sage, PERTH, pers. comm.).

Halosarcia sp. Yanneri Lake (SVL 3002)
This spectacular undescribed samphire, which has affinities to the *H. indica* complex, was first collected during this botanical survey. The taxon is endemic to the Yanneri-Terminal Lakes area where it is known from several populations encompassing several hundred-thousand plants (Kelly Shepherd, PERTH, pers. comm.).

Sida sp. nov. Little Sandy Desert (SVL 2666)
This undescribed *Sida* was collected for the first time during this botanical survey. It has close affinities to *S. cardiophylla,* however differs significantly in habit and the density of tomentosum on the branchlets. This taxon may be endemic to the Little Sandy Desert (Robyn Barker, AD, pers. comm.).

Another noteworthy record obtained during the survey is for *Synaptantha tillaeacea* var. *hispidula*. The collection of this taxon from the Ilgarari Creek wash west of Yanneri Lake represents the first record of this taxon in Western Australia. Previously this taxon was known from eastern Central Australia occurring in the Tanami Desert of the Northern Territory across into south-western Queensland, western New South Wales and into the Flinders Ranges of South Australia. Other noteworthy records were obtained for taxa of conservation significance or for those at the edge of their distributional ranges, as discussed below.

Three naturalised weeds (Bipinnate Beggartick (*Bidens bipinnata*), Whorled-Pigeon Grass (*Setaria verticillata*), Kapok (*Aerva javanica*)) were recorded during the survey. The first two taxa are typically short-lived annuals or ephemeral biennials while Kapok is a long-lived perennial. All weed species have a ubiquitous distribution throughout north-western Australia and are not unexpected in the study area. In the study area these weeds are typically found in areas experiencing considerable grazing pressure from livestock and feral animals (donkeys and rabbits) such as the flood plain of Savory Creek and the calcareous dunes and apron fringing Cooma and Moffettah Wells. Indeed, Kapok may have been introduced to the Wells as a consequence of maintenance camps situated at these sites to service the now abandoned No. 1 Vermin Proof Fence.

DISTRIBUTIONAL STATUS

The majority of taxa recorded during the survey have ubiquitous distributions across arid north-western and central Australia . Most species are typically recorded from the adjacent biogeographical regions, in particular the Pilbara, Great Sandy Desert and Gascoyne. The more widespread taxa have distributions which extend throughout the Eremaean Botanical Province and into the South-West Interzone. Many taxa also extend across the Great Victoria and Gibson Deserts into the Northern Territory and northern South Australia.

It appears that endemics to the Little Sandy Desert are limited. Apart from the four new taxa cited previously the only other endemic is *Eucalyptus rameliana*, which is currently known from 33 populations encompassing in excess of *ca* 200 000 plants over a geographical area of *ca*. 3 600 km^2. Most of these populations are with the current study area. Several other taxa are near-endemics (e.g. *Ptilotus aphyllus*, *P. stipitatus*), however they also occur in the neighbouring Pilbara and Gascoyne Biogeographical Regions.

Two-hundred and two taxa (37%) are recorded for the first time in the Little Sandy Desert Biogeographical Region during this survey (Appendix 3.1). Most of these records represent taxa which are distributed ubiquitously throughout the arid zone and interestingly, many are species associated with mulga woodland communities. Many range extensions are recorded and in numerous instances these extensions are substantial. Consequently, the populations identified in the study area represent disjunct outliers for 83 of the taxa recorded. Noteworthy examples of such taxa include the following:

Atriplex spongiosa
This small biennial shrub of samphire flats is sparsely distributed throughout the southern rangelands of Western Australia. Several populations were located during the survey on samphire flats associated with the Ilgarari Creek paleodrainage feature. These populations are 400 km north of the next known population in the Murchison Biogeographical Region.

Comesperma pallidum
This erect shrub is recorded from a number of sand dunes in the study area. It has a sparse distribution throughout the northern Great Sandy Desert and hence the populations located during this survey are 550 km south of the previously documented distributional range of this taxon.

Drosera burmanni
This pygmy sundew is recorded from a number of sites throughout the study area, principally habitats at the base of breakaways or in swales where soils are damp. The populations in the study area are the first recorded for the biogeographic region. These populations are 500 km removed from the next known population and over 1 000 km distant from the typical distributional range of the taxon which is in the northern Kimberley.

Goodenia gypsicola
This recently described small tufted perennial herb was collected from the lunette dunes of kopi adjacent to a number of the playas in the study area. These populations are over 700 km north of the only other known population in Western Australia near Menzies.

Goodenia modesta
This prostrate rambling herb was previously known from several localities in central-eastern West Australia. The populations on Savory Creek, near Yanneri Lake and adjacent to Willie Soak, represent a significant (600 km) westerly range extension for the taxon.

Lechenaultia striata
An erect biennial shrub of sand dune habitats this taxon has a distribution throughout the southern deserts and Central Ranges of Western Australia. The single population located during the survey is some 700 km removed from the next nearest known population west of Neale Junction in the Great Victoria Desert.

Numerous taxa recorded during the survey are at the limits of their distributional range (Appendix 3.1). Such taxa are typically at the southern limits of their range (61 taxa) although many are at their northern, eastern and western limits (32, 7 and 13 respectively). Notable examples of such taxa include the following:

Lomandra leucocephala subsp. *robusta*
The rhizomatous, robust, tussock-forming perennial herb is recorded from many sand dune sites throughout the study area. The taxon has a distribution typically in the Great Victoria Desert and Murchison Biogeographical Region. The populations identified during this survey are at the extreme northern limits of the distributional range for the taxon.

Casuarina pauper
This dioecious tree was recorded around a number of the playas in the study area (e.g. Moffettah Well, Terminal Lake) and is also prolific along Ilgarari Creek where it is intercepted by the abandoned No. 1 Vermin Proof Fence. These populations are at the extreme northern limits of the distributional range for the taxon which is mainly centred on the Goldfields and southern Murchison Biogeographical Regions.

Pimelea trichostachya

This semi-woody annual herb was collected on numerous occasions in mulga communities throughout the study area. These populations are at the extreme northern edge of the distributional range for the taxon, which is principally throughout the Murchison Biogeographical Region.

Acacia adoxa var. *adoxa*.

Several populations of the procumbent spreading shrub are recorded from sandstone rises and breakaway habitats throughout the study area. These populations are the most southern known for the taxon which has a distribution throughout northern Western Australia, mostly above latitude 23° 30' S.

Eucalyptus pachyphylla

Within the study area this mallee is recorded on sand plain habitats over lateritic duricrust west of the abandoned No. 1 Vermin Proof Fence. These populations represent the westerly extent of the distributional range for the taxon which is typically throughout the Gibson, Great Sandy and Tanami Deserts.

CONSERVATION STATUS

Sixteen taxa of conservation significance, as defined by the Department of Conservation and Land Management (Conservation and Land Management 2001), are recorded in the study area (Appendix 3.1). No Declared Rare Flora were identified. The 16 taxa of conservation significance are four Priority 1 species, three Priority 2 species, eight Priority 3 species and one Priority 4 taxon. (see Appendix 3.1 for definitions of Conservation Codes). Details on the taxa of conservation significance follows:

Acacia balsamea **Priority 3**

This taxon was collected on three occasions during the survey. Prior to this survey the species was known from ten localities in the Pilbara, northern Little Sandy Desert and Gibson Desert. The species is known to occur in the Gibson Desert Nature Reserve. Given the areal extent of this distribution it seems likely that this species is poorly collected rather than genuinely rare. Accordingly, a conservation classification of Priority 4 would seem more appropriate for this taxon and is consequently recommended.

Comesperma viscidulum **Priority 2**

This shrub was collected on five occasions from sand dune and swale habitats during the survey. Previously, in Western Australia the taxon was known from only one location near Giles in the Central Ranges Biogeographical Region. Recently it has been collected from four other locations, two on the western edge of the Great Victoria Desert and two from the Carnarvon Range area. This taxon appears to be widely distributed throughout arid central Western Australia as is probably poorly collected rather than genuinely rare. Consequently it is recommended that the conservation status of this species be revised to a Priority 4 classification.

Dampiera ramosa **Priority 2**

This tufted perennial herb was collected at five locations during the survey and recorded on another 16 occasions. In all instances the populations are moderately sized (25+ plants) and growing on the lower slopes of red sand dunes. Prior to this survey this species was known from six locations thorough central southern Western Australia and at least one of these populations is on a conservation reserve. Given the abundance of this taxon in the study area it appears to be poorly collected rather than genuinely rare. It is recommended that this species be removed from the Priority Flora list.

Daviesia arthropoda **Priority 1**

This spiny shrub was collected on a single occasion during the survey from a sand plain habitat west of Cooma Well. This taxon is now known from four localities in Western Australia, two of which are in the Carnarvon Range. This taxon has also been collected in the Northern Territory. Given our poor knowledge on the distributional status of this species it would be appropriate for the taxon to retain a Priority 1 conservation ranking.

Daviesia eremaea **Priority 3**

This rounded shrub was recorded from 20 populations during the survey. These populations are very extensive and comprise many thousands of plants. Prior to the survey this taxon was only known from a single location in the Hamersley Range, Pilbara Region, Western Australia, although the taxonomic status of plants from the Pilbara is unclear (van Leeuwen, unpublished data). The taxon is also known from the Central Ranges of the Northern Territory prior to this survey and subsequently has been collected from east of the Canning Stock Route in the Little Sandy Desert. Given the abundance of this taxon in the study area and its occurrence elsewhere in the Little Sandy Desert it appears that this taxon is poorly collected rather that rare and threatened. Therefore, it is recommended that this taxon be removed from the Priority Flora list.

Eucalyptus rameliana **Priority 4**

The rediscovery of this mallee in the Little Sandy Desert provided the impetuous for this survey which has consequently and conclusively demonstrated that this taxon is neither extinct nor biologically rare. The taxon was recorded from over 30 localities during the survey with populations ranging in size from a few individuals to those comprising several thousand plants. Current estimates indicate than in excess of 200 000 plants occur within the study area. Several additional populations of this mallee have also been located outside the study area in the dunefields abutting the northern apron of the Carnarvon Range. As a consequence of a vastly improved appreciation of the habitat requirement of this mallee it is recommended that the taxon be removed from the Priority Flora list.

Fimbristylis sieberiana **Priority 3**

This rhizomatous grass-like sedge was recorded on only one occasion during the survey. This population is the first to be recorded in the Little Sandy Desert and represents a disjunct outlier from a typically Pilbara and southern Kimberley distribution. This new populations confers little additional information to our appreciation of the conservation status of this taxon and therefore the current conservation ranking is supported.

Frankenia glomerata **Priority 1**

This small shrub was recorded on one occasion during the survey. Prior to the survey the taxon was known from four localities in the southern rangelands of Western Australia. This new population confers little additional information to our appreciation of the conservation status of this species and therefore the current conservation ranking is supported.

Goodenia modesta **Priority 3**

This trailing perennial herb was recorded on numerous occasions during the survey particularly in shallow deflation basins associated with mulga woodlands and calcareous soils. The populations recorded during this survey are the first for the Little Sandy Desert and are significantly removed from the typical distributional range of the taxon which is in the western Gibson and Great Sandy Deserts. Some uncertainly exists as to the taxonomic status of this taxon and its relationship to *G. lyrata*, itself a Priority 1 taxon. Consequently as a result of taxonomic uncertainty and insufficient knowledge it is recommended that this taxon retain its current conservation ranking.

Goodenia pascua **Priority 3**

This erect to ascending herb of heavy soils was collected on a single occasion within the study area during the survey. Prior to this collection the taxon was known from six populations in the central and western Pilbara. Considerable confusion exists as to the taxonomic status of this taxon and how the specimens collected from the Little Sandy Desert conform to the G. pascua species concept. Consequently, as a result of this taxonomic uncertainty and insufficient knowledge it is recommended that this taxon retain its current conservation ranking.

Goodenia schwerinensis **Priority 3**

This ascending and spreading shrub was collected on three occasions during the survey and recorded on another 11 in sand dune habitats. The taxon appears to be frequent throughout the study area. The species is also known from another nine localities throughout the central interior of Western Australia where it is commonly found in sand dune terrain. It would appear that this taxon is poorly collected rather than genuinely rare and accordingly it should be removed from the Priority Flora list.

Mimulus repens **Priority 3**

This prostrate creeping herb was collected on three occasions during the survey from alluvial wash areas adjacent to Savory Creek. These three localities represent the first record for this taxon in the Little Sandy Desert. The taxon is also known from seven other localities, principally to the south-west of the study area. The populations recorded during this survey are threatened by grazing and trampling from stock and feral animals. Consequently it is recommended that the taxon be retained on the Priority Flora list at its current conservation ranking.

Ptilotus aphyllus **Priority 3**

This open low shrub was collected on 10 occasions in the study area and recorded from numerous other localities during the survey. The taxon is not uncommon to broad swales and lateritic rises with red sand in the south-western portion of the Little Sandy Desert. The taxon is also known from four collections and numerous other localities south of McCameys Monster in the Pilbara. The current conservation ranking for this taxon appears inappropriate. Consequently it is recommended that the taxon be removed from the Priority Flora list.

Ptilotus stipitatus **Priority 1**

This erect low shrub or biennial herb was recorded on numerous occasions during the survey, principally from *Acacia* shrubland communities on sandy soils and occasionally amongst hummock grasses on lateritic rises. The taxon is not uncommon in the study area. The taxon is also known from five other populations, three of which are in or adjacent to the Little Sandy Desert and outside the current study area boundary. The current conservation ranking for this taxon appears inappropriate and consequently it is recommended that a conservation ranking of Priority 4 is be more appropriate.

Ptilotus tetrandrus **Priority 2**

This upright annual herb was collected on a single occasion during the survey from a burnt *Aluta maisonneuvei* dominated swale south of Willie Soak. This population, which is comprised of just a few individuals is the second recorded for the taxon. The TYPE specimen was collected on Glenorn Station in the southern Murchison in 1974. Given that extensive botanical survey work throughout the southern Murchison - northern Goldfield over the past 20 years has failed to record this taxon it may indeed be genuinely rare. Therefore it is recommended that the conservation status of this taxon be raised to a Priority 1 ranking.

Stemodia linophylla **Priority 1**

Prior to this survey this small upright aromatic herb was known from only two collections in Western Australia, apart from the TYPE which was collected by Giles somewhere 'Trans montes Alfred and Marie's Range' which broadly translated means 'beyond the Alfred and Marie Range'. Coincidentally this is the same locality description provided on the TYPE specimen of *E. rameliana*. Therefore it came as no surprise that this taxon was recorded in the study area, although its abundance and ubiquitous distribution across the landscape was astonishing. Approximately 80 populations of this herb were recorded during the survey over the entire latitudinal extent of the study area. Populations range in size from a few individuals fringing small playas to several thousand plants in calcareous soil depressions to several hundred-thousand plants in recently burnt sand plain habitat fringing both Savory and Ilgarari Creeks. The taxon has also recently been collected near Kintyre in the Rudall River area, near Telfer in the Great Sandy Desert and at Patients Well in the Gibson Desert. Clearly this species is far more common and widespread than previously appreciated. It is recommended that the species is removed from the Priority Flora list.

In addition to the taxa of conservation significance mentioned above, results from this survey indicate that several taxa should be considered for addition to the Priority Flora List. These taxa and justifications for the recommendations are provided below.

Halosarcia sp. Yanneri Lake (SVL 3002)

This novel taxon is a narrow endemic to samphire flats fringing playas and gypsiferous lake beds at the end of Ilgarari Creek. The species was not recorded from Lake Sunshine or the small plays north of Ilgarari Creek such as a Cooma and Moffettah Wells. The taxon appears to be genuinely rare although locally common. Obviously, no populations are known from land reserved for conservation. As threats are currently minimal it is recommended that this taxon is assigned a Priority 2 conservation code. It would not be inappropriate to considered this *Halosarcia* for gazettal as Declared Rare Flora as it appears genuinely rare and the stringent

survey requirement for gazettal have probably been achieved given the botanical survey effort in the south-western Little Sandy Desert over the past decade.

Comesperma pallidum

This erect shrub was known from four localities in the Little and Great Sandy Deserts prior to this survey. During the current survey it was recorded from two localities comprising populations of only a few (< 5) plants. When present the taxon is conspicuous as a consequence of its habit and hence it is unlikely to be overlooked by botanists. Therefore given the low number of known populations despite considerable survey effort associated with the Canning Stock Route and mineral development projects like Telfer and Kintyre in the Little and Great Sandy Deserts in recent times, this taxon may genuinely be rare. Therefore it is recommended that this taxon be assigned a Priority 2 conservation ranking.

Floristic Richness and Patterning

The floristic richness of sample sites varies from eight to 74 taxa per quadrat with a mean of 33.7 ± 14.4 (SE). The least specious quadrats tend to be those associated with the samphire communities fringing playas while the most specious tend to be those on the sandstone ridges and breakaways. Three-hundred and forty-five taxa are recorded from quadrats with the most frequently encountered taxon being *Aristida contorta* which is recorded from 28 (53%) sites. Other frequently encountered taxa are *A. ligulata*, *Hakea lorea*, *A. maisonneuvei*, *P. obovatus*, *Scaevola parvifolia* subsp. *pilbarae* and *Solanum lasiophyllum* which are all recorded from a minimum of 20 quadrats. Conversely, 71 (21%) taxa are recorded from one quadrat only and overall 232 (67%) taxa are recorded from five or fewer quadrats.

The dataset employed to undertake PATN analysis comprises 274 entities or 79% of the taxa recorded in quadrats. This dataset consisted of annuals and ephemeral taxa as sampling effort was considered adequate to consistently record such species and exploratory data analysis indicates that their exclusion has no impact on the resulting similarity matrix and thus clustering outcome. The 71 singletons, taxa recorded from only one quadrat, are excluded from the analysis as previous investigations indicate that they add little to the definition of cluster groups (Gibson *et al.* 1997, Keighery *et al.* 2000).

In the clustering routine, partitioning ceased at seven quadrat groups as valid ecological interpretations could be provided at this level (Figure 3.1). Subdivision beyond this level was ecological problematic although it is clear from Figure 3.1 that sub-groups exists within some of the primary quadrats groupings. The cophenetic correlation (r = 0.92) between the ultrametric values matrix used to generate the clustering outcome and the similarity matrix indicate that the clustering outcome is an excellent fit of the original similarity matrix. Inherently, this association between matrixes differs significantly from random (t = 21.21, P = 0.002). Appendix 3.2 depicts the distribution of the seven Quadrat Groups across the study area. No patterns associated with latitudinal or environmental gradients are evident.

Nine Species Assemblages are identified in the two-step species classification routine (Table 3.2). The cophenetic correlation (r = 0.73) subjectively indicates that the clustering outcome which facilitates the identification of these nine Species Assemblages is a 'poor fit' (Rohlf 2000) of the original similarity matrix. Nevertheless the two-step species classification provides valuable insight into the species composition of the Quadrats Groups and the fidelity of taxa to these community types.

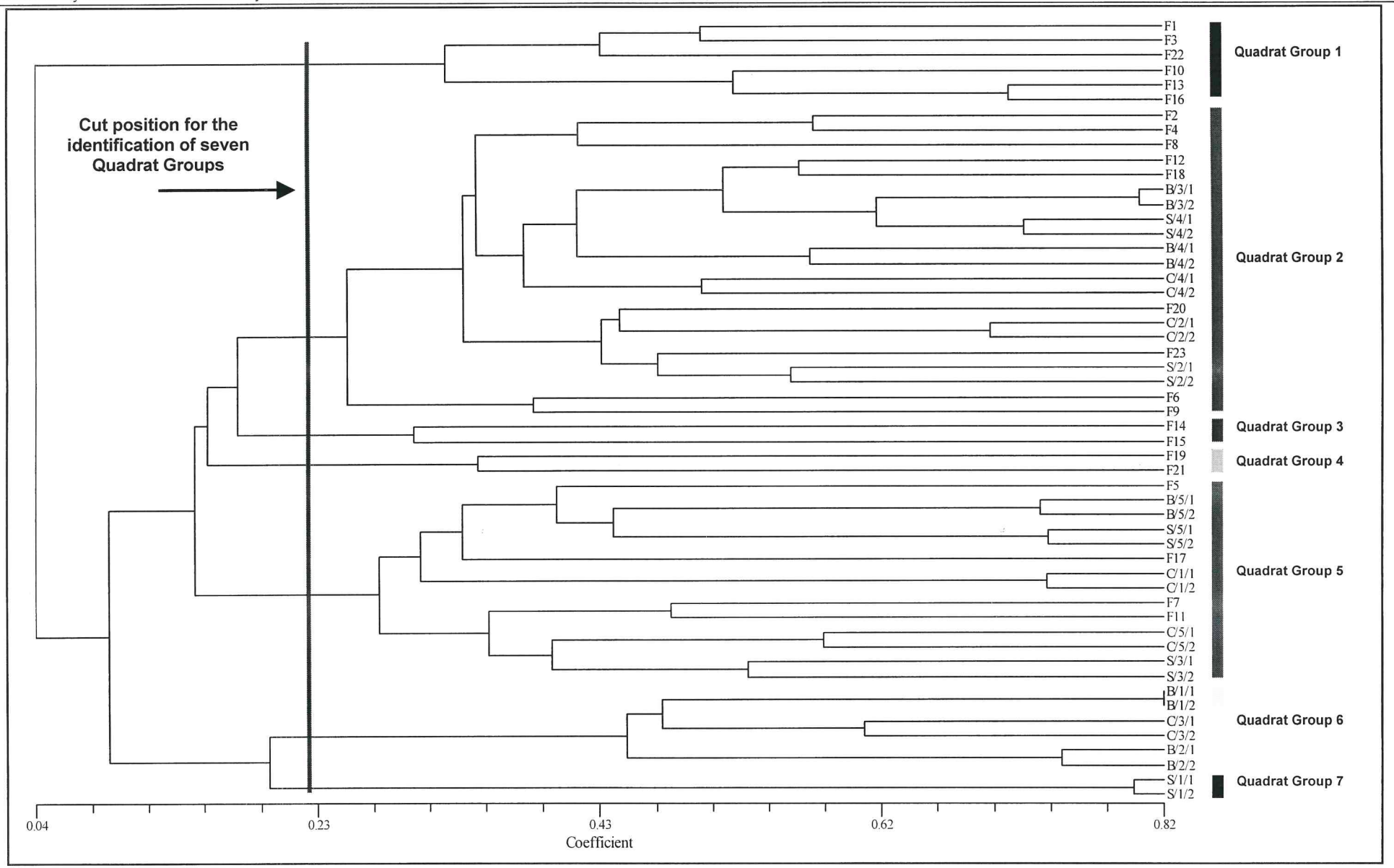


Figure 3.1 Dendrogram of 53 quadrats from the south-western Little Sandy Desert classified by their vascular flora using the Czekanowski metric and unweighted pair grouped arithmetic averaging clustering strategy (UPGMA, β = -0.1).

The ecological interpretation for the seven Quadrat Groups identified is uncomplicated and essentially is associated with geological and edaphic factors which are expressed in the field as differences among quadrats in topography and land surface types. Fundamentally the 53 quadrats are differentiated into seven cluster groups as a consequence of their topographical position and soil type. The primary dichotomy is between quadrats associated with playa and lake surfaces with hypersaline soils and those higher in the topographical sequence with mostly non-saline soils. This primary dichotomy is clearly evident in the two-way table classifying Quadrat Groups and Species Assemblages (Table 3.2). The next division in the dendrogram (Figure 3.1) distinguishes quadrats high in the topographic sequence where sandy pediments dominated from those lower in the landscape where heavy soils are encountered. Subsequent discrimination segregates the sandy pediment into those characterised by eolian sands, rocky sand pediments and gypsiferous or calcareous pediments. A description of the seven Quadrat Groups follows:

Quadrat Group 1

Characteristically located at the bottom of the topographic sequence and expressed as playa or lake bed habitats with hypersaline soil conditions. Vegetation of this Quadrat Group is best described as samphire heath dominated by *Halosarcia* and *Sclerolaena* taxa in conjunction with other halophytic plants. Eleven taxa are only recorded from this community which is best defined by taxa in Species Assemblage I (Table 3.2). This community type has the lowest floristic richness estimate of 14.3 ± 1.8 taxa per hectare.

Quadrat Group 2

This group of quadrats is dominated by eolian red sands and includes both sand dune and sand plain habitats. Potentially the group could be divided into two sub-groups based on these habitat types although the placement of some sand plain quadrats (F2, F4 and B4) within the greater dune cluster (quadrats F2 to C4) is problematic. Plants from Species Assemblages C, F and G are most frequently encountered in these eolian sand communities, particularly those from the latter Species Assemblage which display high fidelity (Table 3.2). Frequently encountered taxa are *A. maisonneuvei, A. melleodora, A. ligulata* and *Grevillea eriostachya* while loyal taxa are *Stylidium humphreysii, Corymbia chippendalei, Phyllota luehmannii* and *Goodenia xanthosperma*.

Quadrat Group 3

These quadrats are gypsiferous being located on lunette kopi dunes which are adjacent to playas. Constituent taxa recorded from these quadrats are principally derived from Species Assemblages F, G and I although the members of no particular Species Assemblage dominated (Table 3.2). Most of the constituents are ubiquitous taxa occurring in at least one other Quadrat Group although two taxa (*Eremophila glabra*, *Templetonia egena*) are endemic to this Quadrat Group.

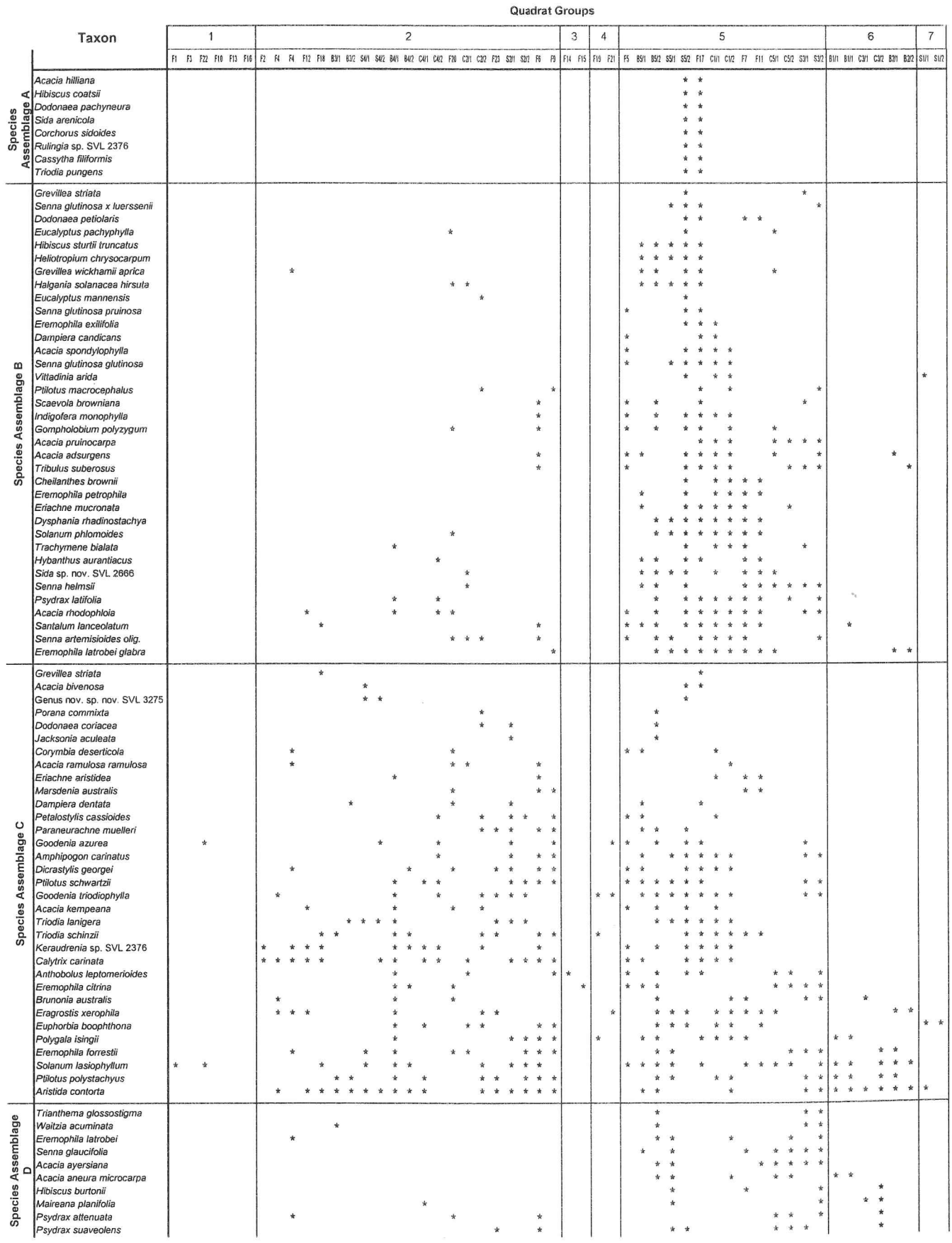
Quadrat Group 4

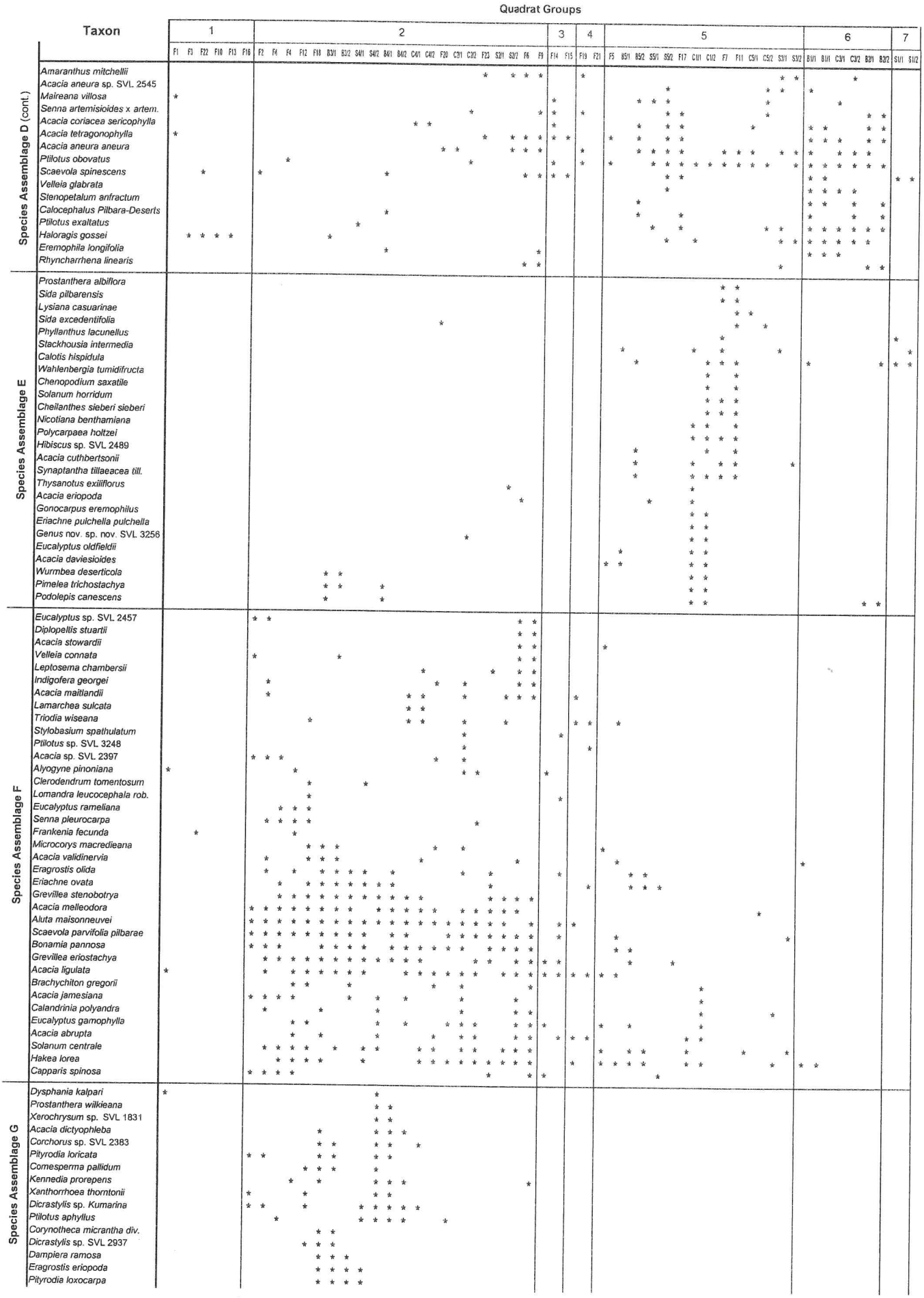
The two sites that comprise this Quadrat Group are described as being on calcareous pediments with a veneer of eolian sand. Visually both quadrats are dominated by *Melaleuca* heaths and hummock grasses. As with Quadrat Group 3 the constituent taxa of these quadrats are mostly ubiquitous (Table 3.2). This point is clearly demonstrated by infidelity in all taxa recorded from this community with the exception of *Maireana* sp. nov. Little Sandy Desert (SVL 3243).

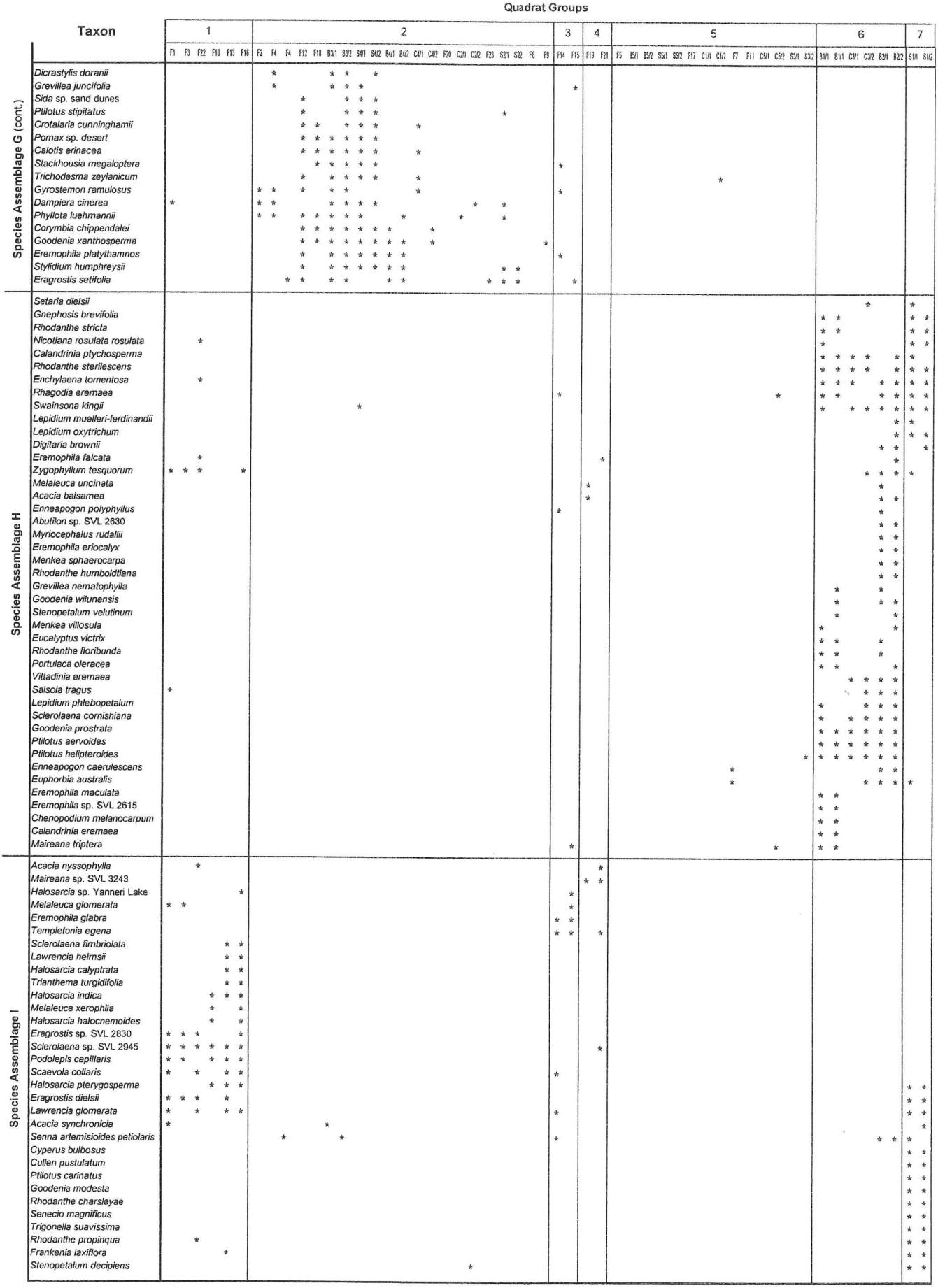
Quadrat Group 5

This group of quadrats comprises sites on rocky pediments as exemplified by sandstone ridges and breakaways together with rolling lateritic hills. This Quadrat Group could effortlessly and with minimal compromise be subdivided into two sub-groups expressed as sandstone uplands (B5 to C1) and lateritic hills (F7 to S3). Unfortunately the placement of the lateritic F5 quadrats in the Sandstone upland sub-group is somewhat problematic. Sites within this Quadrat Group are dominated by low mulga and mixed Acacia woodlands. Fidelity to this type of community was greatest for taxa of Species Assemblage A with all constituent species being recorded from this community type only. Many other taxa in Species Assemblages B, D and E are also exclusive to this floristic community. Other Species Assemblages with notable contribution of

Table 3.2 Sorted two-way table of the seven Quadrat Groups and nine Species Assemblages identified from 274 plants recorded from 53 quadrats in the south-western Little Sandy Desert Study area.




Quadrat Groups
Taxon
1
2
3
4
5
6
7
F1 F3 F22 F10 F13 F16
F2 F4 F4 F12 F18 B3/1 B3/2 S4/1 S4/2 B4/1 B4/2 C4/1 C4/2 F20 C9/1 C3/2 F23 S2/1 S2/2 F6 F9
F14 F15
F19 F21
F5 B5/1 B5/2 S5/1 S5/2 F17 C1/1 C1/2 F7 F11 C5/1 C5/2 S3/1 S3/2
B1/1 B1/1 C3/1 C3/2 B2/1 B2/2
S1/1 S1/2
Species Assemblage D (cont.)
Amaranthus mitchellii
Acacia aneura sp. SVL 2545
Maireana villosa
Senna artemisioides x artem.
Acacia coriacea sericophylla
Acacia tetragonophylla
Acacia aneura aneura
Ptilotus obovatus
Scaevola spinescens
Velleia glabrata
Stenopetalum anfractum
Calocephalus Pilbara-Deserts
Ptilotus exaltatus
Haloragis gossei
Eremophila longifolia
Rhyncharrhena linearis
Species Assemblage E
Prostanthera albiflora
Sida pilbarensis
Lysiana casuarinae
Sida excedentifolia
Phyllanthus lacunellus
Stackhousia intermedia
Calotis hispidula
Wahlenbergia tumidifructa
Chenopodium saxatile
Solanum horridum
Cheilanthes sieberi sieberi
Nicotiana benthamiana
Polycarpaea holtzei
Hibiscus sp. SVL 2489
Acacia cuthbertsonii
Synaptantha tillaeacea till.
Thysanotus exiliflorus
Acacia eriopoda
Gonocarpus eremophilus
Eriachne pulchella pulchella
Genus nov. sp. nov. SVL 3256
Eucalyptus oldfieldii
Acacia daviesioides
Wurmbea deserticola
Pimelea trichostachya
Podolepis canescens
Species Assemblage F
Eucalyptus sp. SVL 2457
Diplopeltis stuartii
Acacia stowardii
Velleia connata
Leptosema chambersii
Indigofera georgei
Acacia maitlandii
Lamarchea sulcata
Triodia wiseana
Stylobasium spathulatum
Ptilotus sp. SVL 3248
Acacia sp. SVL 2397
Alyogyne pinoniana
Clerodendrum tomentosum
Lomandra leucocephala rob.
Eucalyptus rameliana
Senna pleurocarpa
Frankenia fecunda
Microcorys macredieana
Acacia validinervia
Eragrostis olida
Eriachne ovata
Grevillea stenobotrya
Acacia melleodora
Aluta maisonneuvei
Scaevola parvifolia pilbarae
Bonamia pannosa
Grevillea eriostachya
Acacia ligulata
Brachychiton gregorii
Acacia jamesiana
Calandrinia polyandra
Eucalyptus gamophylla
Acacia abrupta
Solanum centrale
Hakea lorea
Capparis spinosa
Species Assemblage G
Dysphania kalpari
Prostanthera wilkieana
Xerochrysum sp. SVL 1831
Acacia dictyophleba
Corchorus sp. SVL 2383
Pityrodia loricata
Comesperma pallidum
Kennedia prorepens
Xanthorrhoea thorntonii
Dicrastylis sp. Kumarina
Ptilotus aphyllus
Corynotheca micrantha div.
Dicrastylis sp. SVL 2937
Dampiera ramosa
Eragrostis eriopoda
Pityrodia loxocarpa


Quadrat Groups
Taxon
1
2
3
4
5
6
7
F1 F3 F22 F10 F13 F16 F2 F4 F4 F12 F18 B3/1 B3/2 S4/1 B4/2 B4/1 B4/2 C4/1 C4/2 F20 C2/1 C2/2 F23 S2/1 S2/2 F8 F9 F14 F15 F19 F21 F5 B5/1 B5/2 S5/1 S5/2 F17 C1/1 C1/2 F7 F11 C5/1 C5/2 S3/1 S3/2 B1/1 B1/1 C3/1 C3/2 B2/1 B2/2 S1/1 S1/2
Species Assemblage G (cont.)
Dicrastylis doranii
Grevillea juncifolia
Sida sp. sand dunes
Ptilotus stipitatus
Crotalaria cunninghamii
Pomax sp. desert
Calotis erinacea
Stackhousia megaloptera
Trichodesma zeylanicum
Gyrostemon ramulosus
Dampiera cinerea
Phyllota luehmannii
Corymbia chippendalei
Goodenia xanthosperma
Eremophila platythamnos
Stylidium humphreysii
Eragrostis setifolia
Species Assemblage H
Setaria dielsii
Gnephosis brevifolia
Rhodanthe stricta
Nicotiana rosulata rosulata
Calandrinia ptychosperma
Rhodanthe sterilescens
Enchylaena tomentosa
Rhagodia eremaea
Swainsona kingii
Lepidium muelleri-ferdinandii
Lepidium oxytrichum
Digitaria brownii
Eremophila falcata
Zygophyllum tesquorum
Melaleuca uncinata
Acacia balsamea
Enneapogon polyphyllus
Abutilon sp. SVL 2630
Myriocephalus rudallii
Eremophila eriocalyx
Menkea sphaerocarpa
Rhodanthe humboldtiana
Grevillea nematophylla
Goodenia wilunensis
Stenopetalum velutinum
Menkea villosula
Eucalyptus victrix
Rhodanthe floribunda
Portulaca oleracea
Vittadinia eremaea
Salsola tragus
Lepidium phlebopetalum
Sclerolaena cornishiana
Goodenia prostrata
Ptilotus aervoides
Ptilotus helipteroides
Enneapogon caerulescens
Euphorbia australis
Eremophila maculata
Eremophila sp. SVL 2615
Chenopodium melanocarpum
Calandrinia eremaea
Maireana triptera
Species Assemblage I
Acacia nyssophylla
Maireana sp. SVL 3243
Halosarcia sp. Yanneri Lake
Melaleuca glomerata
Eremophila glabra
Templetonia egena
Sclerolaena fimbriolata
Lawrencia helmsii
Halosarcia calyptrata
Trianthema turgidifolia
Halosarcia indica
Melaleuca xerophila
Halosarcia halocnemoides
Eragrostis sp. SVL 2830
Sclerolaena sp. SVL 2945
Podolepis capillaris
Scaevola collaris
Halosarcia pterygosperma
Eragrostis dielsii
Lawrencia glomerata
Acacia synchronicia
Senna artemisioides petiolaris
Cyperus bulbosus
Cullen pustulatum
Ptilotus carinatus
Goodenia modesta
Rhodanthe charsleyae
Senecio magnificus
Trigonella suavissima
Rhodanthe propinqua
Frankenia laxiflora
Stenopetalum decipiens

taxa are C and F (Table 3.2). Characteristic taxa are *A. rhodophloia, Solanum lasiophyllum, E. latrobei* var. *glabra* and *Psydrax latifolia*. Floristically, quadrats within this community type are the most specious.

Quadrat Group 6

Quadrats which are dominated by mulga woodlands on clay-loam soils are the feature of this community type. Taxa which dominate the Quadrat Group principally belong to Species Assemblage H although many representatives from Species Assemblages D and to a minor extent C are also present (Table 3.2). Dominant taxa are *Aristida contorta*, *P. obovatus*, *P. exaltatus*, *P. helipteroides*, *P. aervoides* and *Goodenia prostrata*. The later two taxa are the most faithful of a suite of 21 taxa recorded only in these mulga woodland communities.

Quadrat Group 7

This Quadrat Group comprises the two sample sites located adjacent to Savory Creek. Both sites are dominated by a low samphires over annual herbs and grasses. The quadrats are also degraded as a consequence of flooding, grazing and trampling by livestock. Taxa from Species Assemblages H and I dominate in this community although minor elements of Groups B, C D and E are also present (Table 3.2). Seven taxa in Species Assemblage I are restricted to this community while a further 24 from other Species Assemblages are common to both quadrats.

Interestingly and reassuringly, floristic quadrats which were replicated at each biological survey site are always more closely associated to each other than to any other quadrat.

DISCUSSION

The floristic diversity and richness of the south-western Little Sandy Desert is noteworthy and somewhat unexpected given the subdued relief and uniformity in landforms. Although data is generally lacking for other arid desert areas a richness value of 57.2 species per 1 000 km^2 obtained from this survey is similar to that reported in the Rudall River area (54.5) for a study area of similar size (Hart 1993). The composition of the flora is dominated by arid zone elements as indicated by the preponderance of Poaceae, Goodeniaceae and Asteraceae taxa. This arid zone influence is partitioned between typically central dry-arid elements and those derived from southern arid areas although a small suite of taxa are representative of a tropical desert flora.

Unfortunately no comprehensive botanical species list is available for the Little Sandy Desert however current estimates suggest a flora in the vicinity of 800 to 900 species (van Leeuwen, unpublished data). The Western Australian Herbarium (PERTH) houses some 920 vouchers representing 460 taxa which cite the Little Sandy Desert as their collection locality. The majority of these specimens are from the Carnarvon Range although a proportion originates from the Canning Stock Route and Rudall River areas. Similarly the Pilbara Regional Herbarium (KARR) houses a collection of 490 species collected in the Rudall River area by resource development proponents. Considerable redundancy exists in these two floral inventories which is repeated in the inventory obtained from the current study area. Much of this repetition is associated with taxa from sand dune and sand plain habitats and tends to be those species which have ubiquitous distributions throughout the deserts of inland Western Australian, if not the entire arid zone (e.g. *Ptilotus obovatus*, *Aristida contorta*, *Acacia ancistrocarpa*).

Obvious deficiencies in the floral inventory of the current study area, as supported by the inventories compiled from specimens housed in both the Western Australian and Pilbara

Regional Herbaria, are related to taxa associated with major drainage features, dissected geologically heterogeneous hills and finally abrupt refugial mountain ranges. Basically the study area lacks floral elements typical of inland freshwater features such as Rudall River (e.g. *E. camaldulensis*, *Melaleuca leucadendra*), dissected hills such as the Throssell Range (*Dicrastylis cephalantha*, *Ficus opposita*) and abrupt mountains such as Mt Essendon in the Carnarvon Range (e.g. *Thysanotus manglesianus*, *Tetratheca chapmanii*). Conversely, the flora of the study area is enhanced by the presence of significant brackish to hypersaline paleodrainage features and their associated samphire and *Melaleuca* heaths. Similarly, the persistence of extensive *Acacia* (mulga) woodlands which are mostly absent from the remainder of the region also augment the flora of the study area.

The presence of mulga woodlands in the study area is phytogeographically important and associated with the juxtaposition of the *Acacia-Triodia* line (Beard 1975) in the region. To the west of the Little Sandy Desert this important phytogeographically boundary is roughly aligned with the junction of the Pilbara and Gascoyne Biogeographical Regions while to the east the boundary traverses the northern Gibson Desert. In the Little Sandy Desert this phytogeographically boundary drops south along the western margin of the sedimentary basin and onto the apron of Lake Nabberu, a feature clearly demonstrated through the rapid replacement of hummock grasses by *Acacia* woodlands. The study area fortuitously straddles this transitional zone and consequently contains significant areas of mulga woodland (Table 2.1) interspersed amongst the vegetation communities characterised by hummock grasses on the sedimentary land surfaces.

The high number of taxa at their distributional range-end within the study area is also an expression of the transitional nature of this part of the Little Sandy Desert. Among the sixty-one taxa at their southern limits, the majority is typically sandy desert specialists. As the study area coincides with the replacement of the desert sands by rocky and heavy pediments this result is not unexpected. A similar pattern is observed amongst the thirteen taxa at the western limits of their distributional range. The number of taxa at the northern end of their distributional range within the study area was perhaps not a great as anticipated given the large representation of taxa with typically southern arid zone affinities. This result may be attributed to the fact the rocky and heavy soil pediments upon which most taxa of southern affinities occur extend beyond the study area north into the Gascoyne and Pilbara. The frequency of these distributional range-end taxa in the flora commensurate with the occurrence of both central and southern arid zone floral elements indicate that that south-western Little Sandy Desert is a botanical change-over zone, a proposition that conforms neatly with the area also being a phytogeographic transitional zone.

The arrangement of the flora into communities across the landscape within the study area appears to be under topographic and edaphic control. The faithfulness of most taxa to a single community type is an obvious expression of this control and is clearly evident in the study area. Topographic and edaphic control over the arrangement of desert plant communities has been reported elsewhere in the Australian arid zone (Burbidge 1945, 1959, Griffin 1990). The mulga woodland community (Quadrat Group 5) contains the highest botanical diversity, an attribute undoubtedly attributed to the run-on nature of such habitats and thus their more favourable moisture regime. Such habitats also tend to be nutrient sinks and thus offer more favourable conditions for plant growth than the surrounding spinifex dominated plains. (Tongway and Ludwig 1994, Hodgkinson 2001, van Etten 1988). The least specious community type (Quadrat Group 1) is associated with the most hostile environment for plant growth with respect to

ecophysiology as conferred through hypersaline conditions and high surface reflectance which would impact on evapotranspiration.

Environmental gradients appear to have had little influence on the arrangement of floristic communities however this proposition may simply be related to a issue of scale in respect of the small size of the study area. Similarly, the apparent absence of any gradients may also be a reflection of inadequate sampling effort. This failure to identify any deterministic environmental gradients was not unexpected given the location of all sample sites with the same natural region and geological structure.

No significant threats impinging upon the flora of the study area are identified. Obviously, grazing by livestock and donkeys along Savory Creek is of concern, however is not unexpected given contemporary pastoral land management practices in the Western Australian rangelands. As livestock and donkeys tend to be restricted to areas close to free water the impacts of such grazing animals are generally insignificant over the remainder of the study area. However, what is of considerable concern is the impacts of grazing and trampling by camels. Evidence of camel grazing is indisputably manifested in the umbrella-shape canopy of most desert kurrajongs (*Brachychiton gregorii*). This shape is attained by camels browsing on the low branches of the tree until a maximum browse height (camel reach height) is achieved, thereby giving the tree the appearance of having a neatly trimmed, horizontal lower canopy. While this browsing does not appear to adversely affect the plant, the fringing and under-canopy vegetation is dramatically impacted through trampling. Characteristically, this fringing and under-canopy vegetation tends to be dominated by bird dispersed and clonal plants which form 'bush clumps'. The plants of these 'bush clumps' tend not to occur in other habitats or in association with other trees and hence are substantially impacted by this trampling. Another noticeable consequence of this preference of camels for kurrajong foliage is the presence of many dead juvenile trees which speculatively is caused by overgrazing to a point beyond the ability of the plant to regenerate. Insidiously, the complete absence of any kurrajong seedlings is also a product of camel grazing. The inability of the desert kurrajong to recruit new individuals into the population pool of the south-western Little Sandy Desert will have marked consequences for the long term survival of this species in the study area and consequently those plants which are restricted to the 'bush clumps' they harbour.

The study area has considerable botanical and conservation value as a consequence of its transitional nature with respect to a major phytogeographic boundary, the coincidental convergence of southern and central arid zone floral elements and a subdued, although heterogeneous land surface and soil environment. This actuality is further substantiated by the presence of many taxa which are at their distributional range-ends, are poorly known, are of conservation significance or are apparently new and await formal description. As noted by Thackway and Cresswell (1995), the Little Sandy Desert Biogeographical Region has a biased conservation reserve system which is confined to the northern portion of the Desert (Rudall River National Park) and is unrepresentative of features such as salt lakes. The inclusion of a large portion of the study area in a new conservation reserve would substantially reduce this regional reservation bias. Such a reserve would capture many land surface types and inherently, floristic communities and their constituent taxa which are not represented on the existing conservation estate and are of considerable biological, taxonomic and or conservation significance.

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APPENDIX 3.1

List of vascular plants recorded from the south-western Little Sandy Desert, their Department of Conservation and Land Management conservation code, frequency of occurrence within the Little Sandy Desert Biogeographical Region, geographic distribution and frequency of occurrence in 53 quadrats established within the study area.

EXPLANATION OF CODES

* Introduced or naturalised taxon.

Conservation Status:

Conservation status of taxa as defined by the Western Australian Department of Conservation and Land Management (2001).

1: Priority One - Poorly known Taxa
Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa
Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa
Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa
Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Little Sandy Desert frequency:

Y: Denotes taxa recorded during for the first time in the Little Sandy Desert Biogeographical Region during this botanical survey.

Geographical Distribution:

N: Denotes taxa at the northern end of their distributional range.
S: Denotes taxa at the southern limits of their distributional range.
E: Denotes taxa at the eastern limits of their distributional range.
W: Denotes taxa at the western limits of their distributional range.
NE: Denotes taxa at the north-eastern limits of their distributional range.
NW: Denotes taxa at the north-western limits of their distributional range.
SW: Denotes taxa at the south-western limits of their distributional range.
SE: Denotes taxa at the south-eastern limits of their distributional range.
D: Denotes taxa which are disjunct outliers from typical species distribution.

Quadrat occurrences:

Y: Denotes number of quadrats a taxon was recorded from during the botanical survey. Maximum number possible is 53. Blank cells denote taxa not recorded from quadrats.

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
OPHIOGLOSSACEAE				
Ophioglossum lusitanicum		Y		
ADIANTACEAE				
Cheilanthes brownii			S	5
Cheilanthes lasiophylla				
Cheilanthes sieberi subsp. *pseudovellea*		Y	S	
Cheilanthes sieberi subsp. *sieberi*				3
MARSILEACEAE				
Marsilea hirsuta				1
TYPHACEAE				
Typha domingensis		Y		
POTAMOGETONACEAE				
Ruppia maritima		Y	D	
JUNCAGINACEAE				
Triglochin nana				
POACEAE				
Amphipogon caricinus				12
Aristida contorta				28
Aristida holathera				
Aristida sp. Little Sandy Desert (SVL 3047)				
Brachyachne prostrata				
Chrysopogon fallax		Y		
Cymbopogon ambiguus				1
Cymbopogon bombycinus		Y	S	
Cymbopogon obtectus		Y		
Dichanthium sericeum subsp. *humilius*		Y		
Digitaria brownii				3
Enneapogon caerulescens				3
Enneapogon polyphyllus				2
Eragrostis desertorum			D	1
Eragrostis dielsii				6
Eragrostis eriopoda				4
Eragrostis olida			S, D	12
Eragrostis setifolia		Y		10
Eragrostis xerophila				17
Eragrostis sp. Little Sandy Desert (SVL 2491)				1
Eragrostis sp. Little Sandy Desert (SVL 2830)				4
Eriachne aristidea				5
Eriachne mucronata				7
Eriachne ovata		Y	N, D	13
Eriachne pulchella subsp. *pulchella*		Y		2
Eulalia aurea				
Iseilema eremaeum		Y		
Iseilema membranaceum			S	1
Paraneurachne muelleri				8
Paspalidium clementii		Y		
Paspalidium rarum				
Setaria dielsii				2
* *Setaria verticillata*		Y		
Sporobolus australasicus			S	1
Themeda triandra				
Tragus australianus				
Triodia angusta		Y	S	
Triodia brizoides		Y	S, D	
Triodia lanigera		Y	S	13
Triodia longiceps			S	
Triodia melvillei		Y	S	
Triodia pungens			S	2
Triodia schinzii				15
Triodia wiseana				8
Triodia sp. Little Sandy Desert (aff. *lanigera*) (SVL 4935)				
Tripogon loliiformis				1
Triraphis mollis				
Xerochloa laniflora			S	
Genus nov. sp. nov. Little Sandy Desert (SVL 3070)				
Genus nov. sp. nov. Little Sandy Desert (SVL 3126)				
Genus nov. sp. nov. Little Sandy Desert (SVL 3256)				3
Genus nov. sp. nov. Little Sandy Desert (SVL 5009)				1

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
CYPERACEAE				
Bulbostylis barbata				2
Cyperus bulbosus				
Cyperus centralis			N	
Cyperus squarrosus				
Cyperus sp. Little Sandy Desert (SVL 4470)				
Cyperus sp. Little Sandy Desert (SVL 4914)				
Cyperus sp. Little Sandy Desert (SVL 5016)				
Eleocharis sp. Little Sandy Desert (SVL 3055)				
Fimbristylis dichotoma				
Fimbristylis sieberiana	P3	Y	S, D	
CENTROLEPIDACEAE				
Centrolepis eremica		Y	N	
DASYPOGONACEAE				
Lomandra leucocephala subsp. *robusta*			N	2
XANTHORRHOEACEAE				
Xanthorrhoea thorntonii		Y	N	4
ANTHERICACEAE				
Corynotheca micrantha var. *divaricata*			W, D	2
Thysanotus exiliflorus			W, D	2
COLCHICACEAE				
Wurmbea deserticola				4
CASUARINACEAE				
Allocasuarina decaisneana			W	1
Casuarina pauper			N	1
MORACEAE				
Ficus brachypoda			S	1
PROTEACEAE				
Grevillea eriostachya				20
Grevillea eriostachya x *spinosa*				
Grevillea juncifolia				5
Grevillea nematophylla		Y	N, D	2
Grevillea pterosperma				
Grevillea spinosa			W	1
Grevillea stenobotrya				15
Grevillea striata				2
Grevillea wickhamii subsp. *aprica*				6
Hakea lorea				24
Hakea preissii		Y	N, D	
Hakea rhombales				
SANTALACEAE				
Anthobolus leptomerioides				11
Exocarpos sparteus				
Santalum lanceolatum				12
LORANTHACEAE				
Amyema bifurcata		Y	S, D	
Amyema fitzgeraldii		Y		1
Amyema gibberula var. *gibberula*				
Amyema hilliana			S	
Amyema miquelii				1
Amyema sanguinea var. *pulcher*			S	1
Lysiana casuarinae				2
CHENOPODIACEAE				
Atriplex spongiosa		Y	N, D	
Atriplex vesicaria				1
Chenopodium melanocarpum		Y		10
Chenopodium saxatile		Y		2
Dysphania kalpari				2
Dysphania rhadinostachya				8
Dysphania sphaerosperma		Y	S, D	
Enchylaena tomentosa				8
Halosarcia calyptrata				2
Halosarcia halocnemoides				2
Halosarcia indica				3
Halosarcia pterygosperma subsp. *pterygosperma*		Y	N, D	5
Halosarcia sp. Yanneri Lake (SVL 3002)		Y		2
Halosarcia sp. Little Sandy Desert (SVL 4973)				
Maireana georgei				
Maireana luehmannii		Y	D	1
Maireana melanocoma				
Maireana planifolia				5

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
Maireana thesioides		Y		
Maireana tomentosa				4
Maireana triptera				7
Maireana villosa				
Maireana sp. Little Sandy Desert (SVL 2985)				2
Maireana sp. Little Sandy Desert (SVL 3243)				8
Rhagodia eremaea				1
Rhagodia sp. Little Sandy Desert (SVL 2984)				4
Salsola tragus		Y	N	
Sclerolaena alata				5
Sclerolaena cornishiana				1
Sclerolaena cuneata				
Sclerolaena eriacantha		Y	N, D	2
Sclerolaena fimbriolata				7
Sclerolaena sp. Little Sandy Desert (SVL 2945)				1
Sclerolaena sp. Little Sandy Desert (SVL 3568)		Y		
Sclerostegia disarticulata				
AMARANTHACEAE		Y	S	
* *Aerva javanica*		Y	D	1
Amaranthus cuspidifolius				8
Amaranthus mitchellii				
Amaranthus sp. Little Sandy Desert (SVL 3348)		Y		
Hemichroa diandra		Y		6
Ptilotus aervoides		Y	S	6
Ptilotus aphyllus	P3			1
Ptilotus astrolasius			S	
Ptilotus calostachyus		Y	S, D	2
Ptilotus carinatus				11
Ptilotus exaltatus			S	1
Ptilotus fusiformis		Y		
Ptilotus gaudichaudii				7
Ptilotus helipteroides				5
Ptilotus macrocephalus				21
Ptilotus obovatus				19
Ptilotus polystachyus		Y	E	1
Ptilotus rotundifolius				15
Ptilotus schwartzii	P1		S	5
Ptilotus stipitatus	P2	Y	N, D	
Ptilotus tetrandrus				2
Ptilotus sp. Little Sandy Desert (SVL 2884)				
NYCTAGINACEAE		Y		
Boerhavia coccinea				
GYROSTEMONACEAE				
Codonocarpus cotinifolius				7
Gyrostemon ramulosus				
AIZOACEAE		Y		3
Trianthema glossostigma				1
Trianthema triquetra			S	2
Trianthema turgidifolia				
PORTULACACEAE			N	2
Calandrinia eremaea		Y		8
Calandrinia polyandra				6
Calandrinia ptychosperma		Y	S, D	
Portulaca filifolia		Y		3
Portulaca oleracea				
CARYOPHYLLACEAE		Y	S, D	4
Polycarpaea holtzei			S, D	
Polycarpaea involucrata				
LAURACEAE		Y	S	2
Cassytha filiformis				2
Cassytha sp. Little Sandy Desert (SVL 3233)				
CAPPARACEAE		Y	S	1
Capparis lasiantha				8
Capparis spinosa		Y	S, D	
Cleome oxalidea		Y		
BRASSICACEAE				1
Lepidium echinatum				2
Lepidium muelleri-ferdinandii				3
Lepidium oxytrichum				4
Lepidium pedicellosum				1
Lepidium phlebopetalum				

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
Menkea villosula		Y		2
Menkea sphaerocarpa		Y		2
Stenopetalum anfractum		Y		5
Stenopetalum decipiens			S, D	3
Stenopetalum pedicellare		Y		
Stenopetalum velutinum		Y	N, D	2
Stenopetalum sp. Little Sandy Desert (SVL 4964)				
DROSERACEAE				
Drosera burmanni		Y	S, D	
Drosera indica				
PITTOSPORACEAE				
Pittosporum angustifolium		Y	N, D	1
SURIANACEAE				
Stylobasium spathulatum				2
MIMOSACEAE				
Acacia abrupta				13
Acacia adoxa var. *adoxa*			S	
Acacia adsurgens		Y	S	10
Acacia ancistrocarpa			S	
Acacia aneura var. *aneura*				19
Acacia aneura var. *microcarpa*		Y		7
Acacia aneura var. *pilbarana*		Y	E, D	1
Acacia aneura var. (SVL 2545)				4
Acacia ayersiana		Y		7
Acacia balsamea	P3		W	3
Acacia bivenosa			S	3
Acacia citrinoviridis		Y		1
Acacia coriacea subsp. *pendens*		Y	SE	
Acacia coriacea subsp. *sericophylla*				11
Acacia cuthbertsonii				5
Acacia daviesioides			N, D	4
Acacia dictyophleba				4
Acacia eriopoda			S	3
Acacia hilliana			S	2
Acacia inaequilatera			S	1
Acacia jamesiana		Y	N	10
Acacia kempeana				8
Acacia ligulata				23
Acacia maitlandii				8
Acacia marramamba		Y		
Acacia melleodora				19
Acacia minyura		Y		
Acacia nyssophylla		Y	N, D	2
Acacia oswaldii		Y	N, D	1
Acacia pachyacra				
Acacia paraneura		Y		
Acacia prainii		Y	N	1
Acacia pruinocarpa				7
Acacia ramulosa var. *linophylla*		Y		
Acacia ramulosa var. *ramulosa*		Y	N	5
Acacia rhodophloia				14
Acacia spondylophylla			S	5
Acacia stowardii				3
Acacia synchronicia				3
Acacia tetragonophylla				16
Acacia validinervia			D	8
Acacia aff. *validinervia* (SVL 3234)				
Acacia wanyu				
Acacia sp. Little Sandy Desert (SVL 2397)				5
Acacia sp. Little Sandy Desert (SVL 3338)				
Acacia sp. Little Sandy Desert (SVL 4991)				
CAESALPINIACEAE				
Petalostylis cassioides				8
Senna artemisioides subsp. *helmsii*				10
Senna artemisioides subsp. *oligophylla*				12
Senna artemisioides subsp. *petiolaris*		Y	N, D	6
Senna artemisioides subsp. x *artemisioides*		Y		9
Senna artemisioides subsp. x *sturtii*		Y		1
Senna glaucifolia				7
Senna glutinosa subsp. *glutinosa*				6
Senna glutinosa subsp. *pruinosa*				3
Senna glutinosa subsp. x *luerssenii*				4

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
Senna notabilis				
Senna pleurocarpa var. *angustifolia*		Y		5
Senna sp. Meekatharra (E. Bailey 1-26)		Y		
PAPILIONACEAE				
Crotalaria cunninghamii				6
Cullen pustulatum			S, D	2
Daviesia arthropoda	P1	Y	W, D	1
Daviesia eremaea	P3	Y	D	
Daviesia grahamii		Y	N	
Gastrolobium grandiflorum		Y	S	
Gompholobium polyzygum				8
Indigofera georgei				5
Indigofera monophylla				7
Isotropis atropurpurea				
Isotropis forrestii		Y		
Jacksonia aculeata			S	2
Kennedia prorepens				6
Leptosema chambersii				4
Mirbelia viminalis		Y		
Muelleranthus trifoliolatus				1
Phyllota luehmannii		Y	N, D	10
Swainsona formosa				
Swainsona kingii				8
Swainsona microphylla				
Swainsona sp. Little Sandy Desert (SVL 5017)				
Templetonia egena		Y		3
Tephrosia sp. Little Sandy Desert (SVL 4966)				
Tephrosia sp. Little Sandy Desert (SVL 3195)				1
Trigonella suavissima		Y	NE	2
Genus nov. sp. nov. Little Sandy Desert (SVL 2645)				
Genus nov. sp. nov. Little Sandy Desert (SVL 3275)				3
ZYGOPHYLLACEAE				
Tribulus astrocarpus				1
Tribulus occidentalis				1
Tribulus platypterus				
Tribulus suberosus				10
Zygophyllum aurantiacum		Y		
Zygophyllum compressum				1
Zygophyllum iodocarpum				1
Zygophyllum simile		Y		
Zygophyllum tesquorum		Y	NW	8
POLYGALACEAE				
Comesperma pallidum			W, D	4
Comesperma viscidulum	P2	Y	NW, D	
Polygala isingii				14
EUPHORBIACEAE				
Adriana tomentosa var. *hookeri*				1
Euphorbia alsiniflora				
Euphorbia australis				5
Euphorbia boophthona				14
Euphorbia coghlanii			S	
Euphorbia stevenii		Y	S, D	
Monotaxis luteiflora				
Phyllanthus lacunellus				2
CELASTRACEAE				
Maytenus sp. Mt Windell (SVL 846)		Y	SE, D	
STACKHOUSIACEAE				
Macgregoria racemigera				
Stackhousia clementii			D	
Stackhousia intermedia				5
Stackhousia megaloptera		Y	N	6
Stackhousia sp. Little Sandy Desert (SVL 4426)				
SAPINDACEAE				
Diplopeltis stuartii var. *stuartii*				2
Dodonaea coriacea			S	3
Dodonaea pachyneura		Y	E	2
Dodonaea petiolaris				4
Dodonaea viscosa subsp. *angustissima*		Y	N	1
Dodonaea viscosa subsp. *spatulata*		Y	N	1
TILIACEAE				
Corchorus obtectus ms				

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
Corchorus sidoides			S	2
Corchorus tectus ms		Y	S, D	
Corchorus sp. Little Sandy Desert (SVL 2383)				5
Corchorus sp. Little Sandy Desert (SVL 4978)				
MALVACEAE				
Abutilon dioicum ms		Y	S, D	
Abutilon leucopetalum				
Abutilon sp. Little Sandy Desert (SVL 2630)				2
Alyogyne pinoniana				5
Hibiscus burtonii				4
Hibiscus coatesii				2
Hibiscus gardneri ms		Y		
Hibiscus leptocladus		Y	S	
Hibiscus sturtii var. *truncatus*				5
Hibiscus sp. Little Sandy Desert (SVL 2489)				3
Lawrencia glomerata		Y	D	7
Lawrencia helmsii		Y	N, D	2
Sida arenicola		Y	S, D	2
Sida cardiophylla				
Sida chrysocalyx ms		Y	N	1
Sida echinocarpa		Y	E	
Sida excedentifolia ms		Y		3
Sida pilbarensis ms		Y	S, D	2
Sida subarticulata ms		Y	S, D	1
Sida tescorum ms		Y	S, D	1
Sida sp. sand dunes (A.A. Mitchell PRP1208)			S	4
Sida sp. nov verrucose glands (F.H. Mollemans 2423)		Y	S, D	1
Sida sp. Little Sandy Desert (SVL 2489)				
Sida sp. Little Sandy Desert (SVL 2666)				9
Sida sp. (SVL 3227)				
STERCULIACEAE				
Brachychiton gregorii				7
Hannafordia bissillii subsp. *bissillii*			W, D	
Keraudrenia sp. Little Sandy Desert (SVL 2376)				16
Rulingia aff. *luteiflora*				2
ELATINACEAE				
Bergia trimera				
FRANKENIACEAE				
Frankenia fecunda		Y	N, D	2
Frankenia glomerata	P1	Y	N, D	
Frankenia interioris		Y	N, D	
Frankenia laxiflora		Y	N	3
Frankenia punctata		Y	N, D	
VIOLACEAE				
Hybanthus aurantiacus			S	7
THYMELAEACEAE				
Pimelea ammocharis				
Pimelea trichostachya		Y	N	5
MYRTACEAE				
Aluta maisonneuvei				22
Calothamnus aridus		Y	N, D	1
Calytrix carinata				20
Corymbia ? *aspera*			S	1
Corymbia chippendalei				8
Corymbia deserticola				5
Corymbia hamersleyana		Y	E	
Eucalyptus gamophylla				13
Eucalyptus kingsmillii subsp. *kingsmillii*				
Eucalyptus lucasii		Y		
Eucalyptus mannensis subsp. *mannensis*		Y		2
Eucalyptus oldfieldii			N	3
Eucalyptus pachyphylla			W	3
Eucalyptus rameliana	P4			3
Eucalyptus repullulans		Y	E, D	
Eucalyptus semota		Y	N	
Eucalyptus socialis				1
Eucalyptus victrix				1
Eucalyptus sp. Little Sandy Desert (SVL 2471)				4
Eucalyptus sp. Little Sandy Desert (SVL 2932)				1
Eucalyptus sp. Little Sandy Desert (SVL 3001)				1
Lamarchea sulcata			W	2
Melaleuca eleuterostachya				

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
Melaleuca glomerata				3
Melaleuca lasiandra			SW	
Melaleuca linophylla		Y	E	1
Melaleuca uncinata				2
Melaleuca xerophila		Y		2
Micromyrtus flaviflora				
HALORAGACEAE				
Gonocarpus eremophilus		Y	W	2
Haloragis gossei				14
Haloragis odontocarpa forma *rugosa*		Y	N	
APIACEAE				
Daucus glochidiatus		Y	NE	
Trachymene bialata		Y		6
Trachymene glaucifolia		Y	N	
Trachymene oleracea			S	
PRIMULACEAE				
Samolus sp. Little Sandy Desert (SVL 2912)				1
OLEACEAE				
Jasminum calcarium		Y		
GENTIANACEAE				
Centaurium spicatum		Y	E, D	
ASCLEPIADACEAE				
Cynanchum floribundum				
Marsdenia australis		Y	NE	5
Rhyncharrhena linearis		Y		5
Sarcostemma viminale subsp. *australe*				1
CONVOLVULACEAE				
Bonamia pannosa			S	19
Evolvulus alsinoides			S	
Porana commixta				2
BORAGINACEAE				
Halgania cyanea var. *latisepala* ms			N	1
Halgania glabra		Y	W	
Halgania gustafsenii		Y	E	1
Halgania solanacea var. *hirsuta* ms				7
Heliotropium chrysocarpum		Y		5
Heliotropium curassavicum				
Trichodesma zeylanicum var. *zeylanicum*			S	7
LAMIACEAE				
Clerodendrum tomentosum var. *lanceolatum*		Y	S, D	2
Dicrastylis cordifolia var. *cordifolia*		Y	S, D	
Dicrastylis doranii			W	4
Dicrastylis exsuccosa		Y	W, D	
Dicrastylis georgei				13
Dicrastylis sp. Kumarina (A.A. Mitchell 623)				8
Dicrastylis sp. Little Sandy Desert (SVL 2937)				3
Microcorys macredieana		Y	N	6
Newcastelia cladotricha				
Newcastelia spodiotricha			W	
Pityrodia loricata			W	6
Pityrodia loxocarpa				4
Prostanthera albiflora		Y	E, D	2
Prostanthera wilkieana		Y	N	2
SOLANACEAE				
Duboisia hopwoodii				1
Nicotiana benthamiana			S	3
Nicotiana rosulata subsp. *rosulata*				4
Solanum centrale				20
Solanum cleistogamum		Y		
Solanum gabrielae			S	
Solanum horridum		Y	S, D	3
Solanum lasiophyllum				25
Solanum phlomoides		Y	S	9
Solanum sturtianum				1
SCROPHULARIACEAE				
Buchnera linearis			S	
Mimulus gracilis		Y	S	
Mimulus repens	P3	Y	N	
Peplidium sp. C Evol. Fl. Fauna Arid Aust. (N.T. Burbidge & A. Kanis 8158)		Y		
Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)		Y	S	
Peplidium sp. Little Sandy Desert (SVL 4986)				

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
Stemodia linophylla	P1	Y	W, D	
MYOPORACEAE				
Eremophila citrina ms		Y	N	11
Eremophila clarkei		Y		
Eremophila eriocalyx		Y	N	2
Eremophila exilifolia				3
Eremophila falcata		Y	N	3
Eremophila forrestii				15
Eremophila fraseri subsp. *galeata* ms		Y		
Eremophila glabra subsp. *glabra* ms			N	2
Eremophila lanceolata ms			S	
Eremophila latrobei subsp. *filiformis* ms		Y		
Eremophila latrobei subsp. *glabra* ms				12
Eremophila latrobei subsp. *latrobei* ms				6
Eremophila longifolia				5
Eremophila maculata		Y		2
Eremophila pachomai ms			S	
Eremophila petrophila subsp. *petrophila* ms		Y	E	6
Eremophila phyllopoda subsp. *phyllopoda* ms		Y	E, D	
Eremophila platythamnos			NW	8
Eremophila punctata		Y	NW	
Eremophila sp. Little Sandy Desert (SVL 2615)				2
Eremophila sp. Little Sandy Desert (SVL 4959)				
RUBIACEAE				
Oldenlandia crouchiana			S	
Pomax sp. desert (A.S. George 11968)				6
Psydrax attenuata ms		Y	D	7
Psydrax latifolia ms				11
Psydrax suaveolens ms		Y		8
Synaptantha tillaeacea var *hispidula*				
Synaptantha tillaeacea var. *tillaeacea*				5
CUCURBITACEAE				
Mukia maderaspatana				
CAMPANULACEAE				
Wahlenbergia tumidifructa				2
LOBELIACEAE				
Lobelia heterophylla		Y		1
GOODENIACEAE				
Brunonia australis				9
Dampiera candicans			S	3
Dampiera cinerea				9
Dampiera dentata				5
Dampiera ramosa	P2	Y	N, D	3
Dampiera roycei		Y	N, D	
Goodenia azurea			W	11
Goodenia gypsicola		Y	N, D	1
Goodenia lamprosperma			S	
Goodenia microptera			S	1
Goodenia modesta	P3	Y	E, D	2
Goodenia pascua	P3	Y	S, D	
Goodenia prostrata				6
Goodenia schwerinensis	P3	Y	N	
Goodenia stobbsiana			S	
Goodenia triodiophila				18
Goodenia wilunensis		Y		3
Goodenia xanthosperma		Y	N, D	10
Goodenia sp. Little Sandy Desert (SVL 2926)				
Goodenia sp. Little Sandy Desert (SVL 3004)				
Goodenia sp. Little Sandy Desert (SVL 3293)				
Goodenia sp. Little Sandy Desert (SVL 4463)				
Lechenaultia striata		Y	N, D	
Scaevola amblyanthera var. *centralis*			S	
Scaevola basedowii			W	
Scaevola browniana subsp. *browniana*			S, D	5
Scaevola collaris		Y		5
Scaevola parvifolia subsp. *pilbarae*				21
Scaevola sericophylla				1
Scaevola spinescens				13
Velleia connata				4
Velleia glabrata				5
Velleia panduriformis			SW	

FAMILY *Taxon*	Conservation code	First record for region	Distributional range-ends	Frequency in quadrats
STYLIDIACEAE				
Levenhookia chippendalei				
Stylidium desertorum			SW	
Stylidium humphreysii			W	9
Stylidium inaequipetalum		Y	SW, D	
ASTERACEAE				
Actinobole uliginosum		Y	D	
Angianthus cyathifer		Y	W, D	
Angianthus milnei		Y	E, D	
Angianthus tomentosus		Y		
Angianthus sp. Little Sandy Desert (SVL 2911)				1
* *Bidens bipinnata*				
Brachyscome iberidifolia		Y		
Calocephalus knappii				
Calocephalus sp. Pilbara-Desert (M.E. Trudgen 11454)				6
Calotis erinacea			N	7
Calotis hispidula				8
Chrysocephalum eremaeum				
Chrysocephalum sp. Little Sandy Desert (SVL 4899)				
Erymophyllum ramosum subsp. *ramosum*		Y		
Gnephosis brevifolia		Y	NE	4
Ixiochlamys cuneifolia		Y	S	
Kippistia suaedifolia		Y	N, D	1
Minuria multiseta		Y	W, D	
Minuria sp. Little Sandy Desert 1 (SVL 4919)				
Myriocephalus rudallii		Y		2
Olearia incana ms		Y	N, D	1
Olearia stuartii		Y		
Olearia sp. Little Sandy Desert (SVL 3335)				
Pluchea dentex				
Pluchea tetranthera			S	
Podolepis canescens		Y		6
Podolepis capillaris				5
Pterocaulon sphacelatum				1
Rhodanthe charsleyae				2
Rhodanthe floribunda				3
Rhodanthe humboldtiana				2
Rhodanthe pollackii		Y	SE	
Rhodanthe propinqua		Y		3
Rhodanthe sterilescens		Y		7
Rhodanthe stricta				4
Rhodanthe tietkensii			SW	
Rutidosis helichrysoides				2
Schoenia cassiniana		Y		
Senecio magnificus		Y		2
Streptoglossa bubakii		Y	S	
Streptoglossa cylindriceps		Y		
Streptoglossa decurrens			S	1
Vittadinia arida		Y	E, D	4
Vittadinia eremaea		Y		4
Waitzia acuminata var. *acuminata*		Y	N	4
Xerochrysum sp. Beyondie (SVL 1831)				2

`APPENDIX 3.2

Map of the south-western Little Sandy Desert study area showing the distribution of the seven Quadrat Site groups amongst the 53 quadrats.