Vegetation and flora of Shark Bay, Western Australia

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Abstract

Shark Bay, despite being the site of some of the earliest studies made of the Australian flora, is still relatively poorly known. The region, because of the activities of early French collectors, is a major concentration of type localities for Western Australian plants.

The flora is greatly influenced by adjacent regions, numerous taxa are at the limits of their geographical ranges (both northern, 145 taxa, and southern, 39 taxa) and some (28) have differentiated into separate taxa. The high concentration of species at the limits of their ranges makes the area of immense phytogeographical significance both in an Australian and world context.

Résumé

La Baie des Chiens Marins, malgre qu'elle fût le site de certaines études antérieures effectuées sur la flore australienne, reste relativement peu connue. La région, à cause des activités des collectionneurs francais précédents, est une concentration majeure de localités types de plantes d'Australie-Occidentale.

La flore est grandement influencee par les régions adjacentes, de nombreux taxa se trouvent aux limites de leurs habitats géographiques (à la fois au nord, 145 taxa, et au sud, 39 taxa) et certains (28) se sont différenciés en taxa séparés. La concentration élevée d'espèces aux limites de leurs habitats rend la région d'une immense portée phytogéographique à la fois dans le contexte australien et mondial.

Introduction

The Shark Bay Region occurs towards the southern margin of the Carnarvon Basin as defined by Hocking *et al.* (1987) on the northern margin of temperate Western Australia which has a warm dry Mediterranean climate. This paper considers the botany of the Shark Bay Region in the context of the Carnarvon Basin and the Carnarvon Botanical Region defined by Beard (1980) - Figure 1.

Botanical studies - historical

Dampier made the first plant collections in the region in 1699 only two years after the earliest Australian collections made by Vlamingh at the Swan River. Many other early explorers landed in the region but the first extensive botanical collections were not made until Leschenault de La Tour collected with the Baudin Expedition (1803) and Quoy and Gaimard collected with the Freycinet Expedition (1818). These collections were studied by Decaisne and Gaudichaud (1824) making Sharks Bay the type locality of numerous Western Australian plants.

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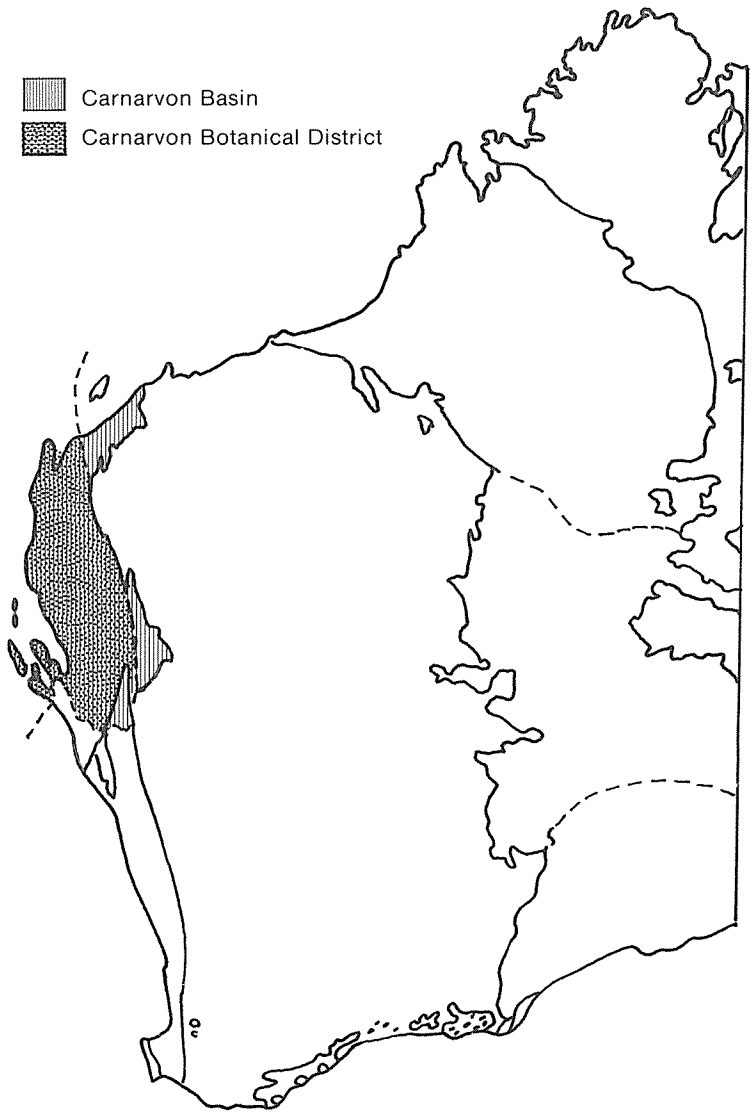

Figure 1. Map showing Carnarvon Basin and Carnarvon Botanical District.

Later significant early collectors in the region were Cunningham (with King in 1827) and Denham and Milne in 1850. These collections were studied by Bentham in compiling The Flora Australiensis. Mueller (1883) made use of all these early studies in his account of the region, as well as collections made by A. Forrest and himself.

Over the next 50-60 years little work was done on the area botanically. With improved access to the area in the 1950s the region was the subject of more botanical studies both of a general and specific nature. None of these have been detailed enough to generate a comprehensive floristic list of the region let alone a full flora of the Carnarvon District. However sufficient botanical studies have been carried out in the region to give some indication of the composition and distribution of plants in the region.

Botanical studies - current

(1) Phytogeography

Beard (1980) in his phytogeographical map of Western Australia places the Shark Bay region as the changeover zone between the temperate South West and desert Carnarvon Phytogeographical Region (Figure 2). This boundary is largely based on the dominant vegetation formations, especially the presence or absence of hummock grasses (*Triodia* sp.) as a dominant component of vegetation structure.

Beard (1976a) left most of Edel Land, Peron Peninsula and the islands to the north (Dirk Hartog, Bernier and Dorre) in the desert, while recognizing their intermediate character. However, a boundary based on floristics, not habit and physiognomy is not as discrete. The Edel Land peninsula and islands have enough winter rainfall and long enough growing season to support some South Western species. This is further reinforced by Burbidge and George (1978) for Dirk Hartog Island who noted that the majority of species listed for the island are south western or have strong southern affinities, and the vegetation formations themselves were mainly related to heath formations further south. Similarly Bernier and Dorre Islands (Royce 1962; Prince *et al.* unpub. data) which have more desert species are still somewhat intermediate in floristics and physiognomy.

Based on the floristic data the boundary between the South Western and desertic Carnarvon Region should be between the two peninsulas and include Dirk Hartog, Bernier and Dorre Islands (Figure 2) in the South Western Region.

(2) Vegetation Studies

The dominant vegetation of the entire Carnarvon district has been mapped by J. Beard at a scale of 1:250,000. These dyeline maps (held at the Geography Department, University of Western Australia) were compiled into single maps at scale of 1:1,000,000 and published in Beard (1976a).

The Shark Bay Region was mapped and documented separately at a scale of 1:250,000 by Beard (1976b).

Subsequently the entire region was mapped at a scale of 1:250,000 on a land system basis (a combination of vegetation and geomorphology) for rangeland management by Payne *et al.* (1988). In this study 89 land systems were defined, 19 of which occurred in the Shark Bay Region, 7 of these being confined to this region (Birrida, Cullawarra, Edel, Inscription, Peron, Taillifer and Tamala). These endemic land systems require more detailed floristic study, to complement the vegetation data already obtained at their monitoring sites.

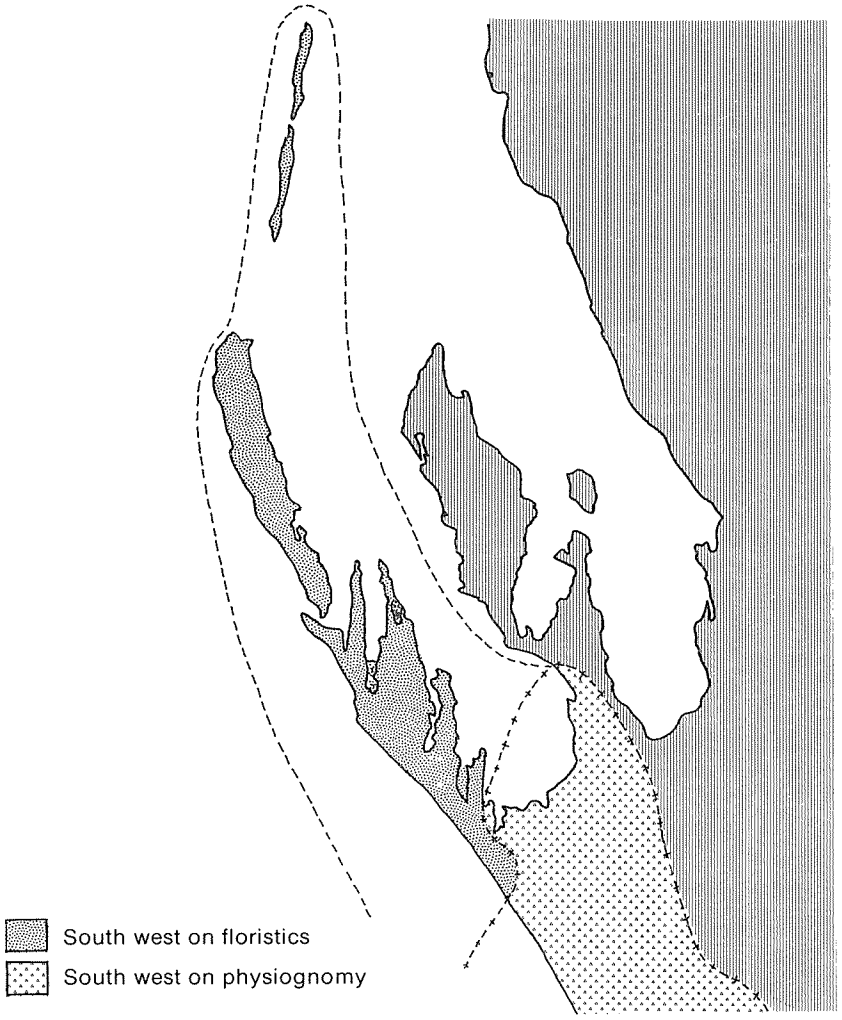

Figure 2. Boundary of south west botanical province.

(3) Floristics

As indicated previously little research has been carried out on the floristics of areas in the Carnarvon Basin.

Non vascular plants are perhaps the least documented. A list of Lichen species can be obtained from Sammy (1985), but no information is available on mosses or fungi.

Vascular plants present in the Carnarvon Botanical District are enumerated in the revision of the Descriptive Catalogue of Western Australian Plants (Keighery, in press - publishing date 1990). At a smaller scale many vascular plants have been mapped using a grid scale of 1:250,000. These include the Ferns, Gymnosperms and Monocotyledons (reference list and summary in Keighery 1984), *Acacia* (Maslin and Pedley 1981), *Eucalyptus* (Chippendale and Wolfe 1981), the families Goodeniaceae (Keighery 1983) and Asteraceae (Keighery 1988).

Species lists with vegetation data exist for North West Cape (Keighery 1987); Kennedy Ranges (Newby, unpub.); Bernier and Dorre Islands (Royce 1962) and Dirk Hartog Island (Burbidge and George 1978).

A few detailed site based floristic studies have been undertaken at Lake Macleod (north of Carnarvon) by Tyler (1988) and for three small islets in Shark Bay by Abbott (1981). Immediately south of the region studies have been undertaken in Coolomia Nature Reserve (Hopper, unpub.) and the Nerren Nerren region (Burbidge *et al.* 1980). Payne *et al.* (1988) have set up numerous monitoring quadrats for pastoral appraisal. These are based on perennial plants and form a positive basis for updating into complete floristic sites.

For this paper a search was undertaken at the Western Australian Herbarium for all known records of vascular plants recorded in the Shark Bay Region. This list was augmented by literature searches and field collecting during the Bicentennial Expedition, and is presented as Appendix I.

This list represents the known flora of the region to the end of 1988, when it comprised 673 taxa, 621 native and 52 naturalised. This is a diverse flora for a semi-arid region of low topographic relief. Major families represented are the Poaceae, Chenopodiaceae, Myrtaceae, Goodeniaceae and Asteraceae; reflecting the temperate and desert interface that Shark Bay is. Reasons for the composition and richness of the flora are expanded in the following section.

Analysis of current data

(1) Endemics of the Region

The Carnarvon Phytogeographical Region currently contains 40 known endemics and another 19 near endemics. This number is conservative as many

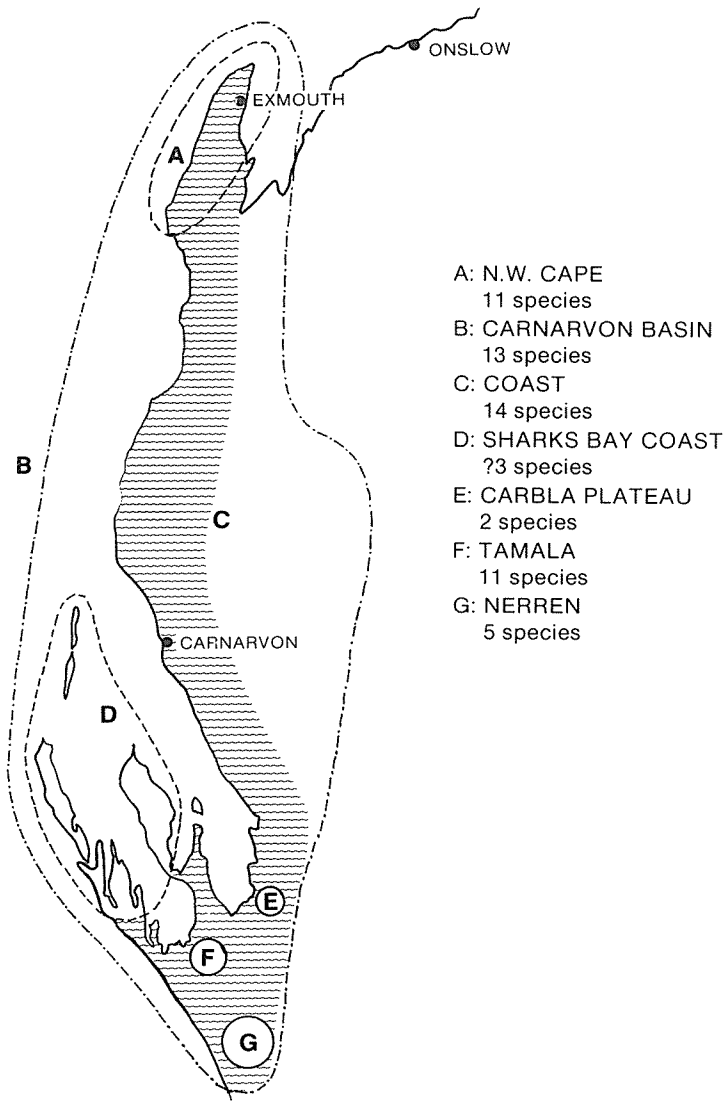

Figure 3. Nodes of endemism in the Carnarvon Basin.

groups require further study and revision, for example Table One lists the known endemics for North West Cape. Of the 11 endemics, four were named in the period 1963-7 after a collecting expedition, but six still have not been formally described.

The known endemics concentrate in 7 regions (Figure 3) which correspond with climatic and geographical zones. The richest of these areas are the ranges

of the North West Cape with 11 endemics and the Tamala Sandplain with the same number. Other significant areas are the Nerren-Nerren Sandplain (5 endemics), the Carbla Plateau (2 endemics) and the coastal zone around Shark Bay. This last area is of interest as it contains 2 endemics (an unnamed subspecies of sandalwood, *Santalum spicatum*, and an unnamed *Plectrachne*) and possibly more (*?Trachymene elachocarpa*). Another 13 species are confined within the general boundary of the Carnarvon Basin. Considering

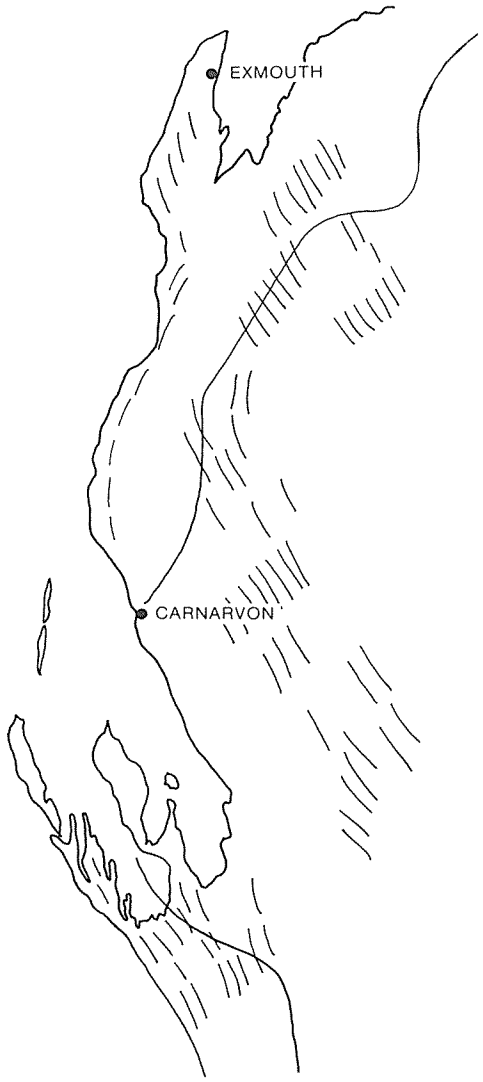

Figure 4. Diagrammatic representation of the sand dune systems of the Carnarvon Basin.

the large number of recently discovered and poorly known endemics in the region further study of the region could easily increase the level of endemism.

The near endemics are confined to the Sand Dune System (Figure 4) that extends from Kalbarri, south of the Region to the North West Cape within the Region. These Dunes are a unique feature of the Carnarvon Basin and are poorly known and largely outside the current reserve network.

(2) Composition of the Flora

The region contains a diverse range of species due to the variety of habitats within the region, the number of desert species that reach to the coast here and the large number of northern and southern species whose geographical ranges end in the region. Considering each of these factors:

(a) Habitats
The presence of large salt lakes, alluvial flats, birrida lakes, arid range systems and a rapidly changing climatic regime has led to a diverse annual flora. The families Poaceae (Keighery 1984), Amarantaceae (Keighery and Marchant 1982), Goodeniaceae (Keighery 1983), and Asteraceae (Keighery 1988) all containing numerous annual taxa are species diverse in the region, compared to other desert areas adding markedly to the diversity of the flora.

(b) Desert species
A large number of central desert taxa reach their western range limits in the Carnarvon Basin, and do not penetrate the temperate region further south. This desertic element is added to by numbers of semi-arid and arid taxa of southern affinities (i.e. those centred in the Austin, Ashburton and Coolgardie Phytogeographical Regions) which also occur in the Carnarvon Basin.

(c) Range ends
The number of taxa that reach the ends of their geographical range in the Shark Bay Region is a major feature of the region's flora. This can be easily seen in the maps of the Fabaceae presented in Keighery (1981, 1984) where the tropical genera *Crotalaria, Sesbania* and *Tephrosia* end in this area, as do the temperate genera *Bossiaea, Bugesia, Oxylobium* and *Pultenaea.*

Similar trends can be seen in *Acacia* (Maslin and Pedley, 1981) where 17 species reach their northern limits in the Region and 8 their southern limits. This also happens with species of *Ficus* (Keighery and Brighton 1982 - tropical genus). *Triodia* and *Plectrachne* (Poaceae, Keighery and Brighton 1983) and *Eucalyptus* (Chippendale and Wolfe 1979).

These factors, the diverse climatic and habitats present in the Carnarvon Basin have led to an unusual and diverse flora that is unique for an arid region of Western Australia.

Future directions

A major biological survey of the Carnarvon Basin is planned by the CALM Biogeography Program during 1990-1995 (CALM 1988). This survey will study vertebrates and plants in major geological zones of the basin and recommend conservation priorities.

Detailed floristic studies should be undertaken on the flora of North West Cape, the Shark Bay Peninsulas (Edel and Peron), the Tamala Sandplain, the sand dune systems (including the Kalbarri outliers) to enable a clearer understanding of the composition, relationships and phytogeographical placement of these important regions.

These studies must be integrated with the land units defined by Payne *et al.* (1988) which provide a convenient framework in which to place floristic studies.

During, and after these surveys it is desirable to stimulate taxonomic studies on the many poorly known groups present in the region. A flora of the region should be the long term goal of such studies.

Table 1 North West Cape Endemics

	Date named
MONOCOTYLEDONS	
Dasypogonaceae	
Acanthocarpus rupestris A.S. George	1985
DICOTYLEDON	
Proteaceae	
Grevillea calcicola A.S. George	1967
Grevillea stenobotrya ssp. nov.	-
Grevillea variifolia C.A. Gardn. et A.S. George	1963
Mimosaceae	
Acacia sp.	-
Fabaceae	
Dabiesia sp.	-
Daviesia sp.	-
Stackhousiaceae	
Stackhousia umbellata C.A. et A.S. George	1963
Sterculiaceae	
Brachychiton sp.	-
Myrtaceae	
Pileanthus sp.	-
Convolvulaceae	
Ipomaea yardiensis A.S. George	1967

Discussion

The flora of the Shark Bay region can only be understood in the context of the adjacent regions. To the south is temperate Western Australia, and on all other sides is the desertic Carnarvon region.

The Carnarvon region is unique for any desert region in Western Australia because of its diversity of annual taxa and range ends (both northern and southern central desert taxa and desert taxa of southern affinities) occurring in a general background of more widespread species.

Shark Bay is a subset of these influences, especially containing numerous temperate taxa at their northern limits and being the type locality of many Western Australian species. At least 28 taxa are endemic to the region, and these require further survey.

Appendix 1

Vascular plants recorded from the Shark Bay area.

* naturalized alien

Area recorded:
1: Bernier and Dorre Islands
2: Dirk Hartog Island
3: Edel Land
4: Peron Peninsula
5: Tamala-Hamelin Stations

Comments:
Northern limit: a south-western species at the northern limit of its range.

Southern limit: a northern or coastal desert species at the southern limit of its range.

Western or north-western limit: a widespread temperate desert species reaching the sea only in this area.

Statistics
Number of taxa recorded: 673
Monocotyledons: 115; 100 native, 15 naturalized
Dicotyledons: 558; 521 native, 37 naturalized

Endemic taxa (Shark Bay Region): 28
Northern limit: 145
Southern limit: 39
Western limit: 31

TAXON	COMMENT	1	2	3	4	5
FERNS						
Ophioglossum lusitanicum						
ssp. coriaceum		x	x			x
Marsilea mutica						x
GYMNOSPERMS						
Callitris columellaris					x	x
MONOCOTYLEDONS						
TYPHACEAE						
Typha domingensis	Hamelin Pool					x
POTAMOGETONACEAE						
Potamogeton pectinatus	Hamelin Pool					x
Ruppia polycarpa			x	x		
R. tuberosa				x		
ZANNICHELLIACEAE						
Lepilaena sp.					x	x
POSIDONIACEAE						
Posidonia angustifolia			x	x		
P. australis			x	x		
P. sinuosa		x	x	x		
P. coriacea			x	x		
CYMODACEAE						
Amphibolus antarctica		x	x	x	x	
A. griffithii		x	x	x	x	
Cymodocea angustata				x	x	
C. serrulata				x	x	
Halodule uninervis					x	
Syringodium isoetifolium					x	
NAJADACEAE						
Najas marina			x			
JUNCAGINACEAE						
Triglochin calcitrapa		x	x			
T. centrocarpa						x
T. mucronata			x			x
T. trichophora		x	x			
HYDROCHARITACEAE						
Halophila ovalis		x				
H. spinulosa			x	x	x	
POACEAE						
Amphipogon caricinus						x
A. turbinatus	northern limit					x
**Avena barbata*			x			x
Bothriochloa ewartiana					x	
**Briza minor*		x	x			
Bromus arenarius		x				
**B. diandrus*		x		x		x
**Cenchrus ciliaris*			x		x	
**C. echinatus*			x			
**C. setigera*		x	x			
Chrysopogon fallax		x				x

TAXON	COMMENT	1	2	3	4	5
Cymbypogon ambiguus		x				
C. obtectus					x	
**Cynodon dactylon*			x			
**Bromus hordeaceus*			x			
Danthonia caespitosa						x
D. racemosa		x				
Dicanthium affine						x
**Ehrharta breviflora*		x	x			x
**E. calycina*						x
Enneapogon caerulescens		x	x			
E. pallidus						x
Eragrostis dielsii			x			x
E. ? brownii			x			
E. falcata		x				
E. sp. (?setifolia)					x	
E. mucronata			x			
Eulalia fulva		x	x			
**Hordeum leporinum*			x			x
**Lolium loliaceum*			x			
**Lophochloa pumilla*		x				
Monachather paradoxa						x
Paractaenum novae-hollandiae		x	x			x
Paspalidium clementii		x	x			
P. gracile			x			x
P. tabulatum				x	x	
Plectrachne bromioides	northern limit					x
P. danthonioides	northern limit			x	x	x
P. drummondii	northern limit		x	x		x
P. sp.	?endemic		x	x		
**Polypogon monspeliensis*					x	
**Poa annua*			x			
Setaria dielsii		x		x		
S. verticillata		x	x			
S. ? surgens					x	
Spinifex longifolius		x	x	x	x	
Sporobolus virginicus		x	x			
Stipa crinita		x	x			
S. elegantissima	northern limit		x			x
Themeda australis						x
Tragus australianus					x	
**Trisetaria cristata*			x			
Triodia plurinervata	southern limit	x	x	x		
CYPERACEAE						
Bulbostylis barbata		x				
Cyperus bifax				x		
C. bulbosus	southern limit		x	x		
C. vaginatus					x	
Gahnia lanigera	northern limit			x		x
Isolepis cernuua	northern limit		x			

TAXON	COMMENT	1	2	3	4	5
Mesomelaena pseudostygia	northern limit			x		x
RESTIONACEAE						
Lepidobolus preissianus	northern limit		x			x
Ecdeiocolea monostachya	northern limit					x
Loxocarya flexuosa	northern limit		x			x
CENTROLEPIDACEAE						
Centrolepis humillima	northern limit		x			x
JUNCACEAE						
Juncus bufonius	?northern limit	x	x			x
DASYPOGONACEAE						
Acanthocarpus preissii		x	x	x	x	x
A. robustus	southern limit		x			x
A. verticillatus	southern limit	x	x	x		
PHORMIACEAE						
Dianella revoluta var. divaricata			x	x		x
ANTHERICACEAE						
Corynotheca micrantha var. micrantha			x	x		x
C. pungens						x
Laxmannia sessiliflora ssp. sessiliflora	northern limit					x
Dichopogon tyleri	southern limit		x			x
Murchisonia volubilis	southern limit					x
Thysanotus exiliflorus	western limit					x
T. manglesianus						x
T. patersonii		x	x			
T. speckii	northern limit	x	x			
Tricoryne sp.	?endemic		x			
ASPHODELUS						
**Asphodelus fistulosus*		x		x	x	
Bulbine semibarbata				x		x
DIOSCOREACEAE						
Dioscorea hastifolia						x
COLCHICACEAE						
Wurmbea inframedia					x	
W. monantha	northern limit		x			x
W. odorata	southern limit	x				
W. tenella	northern limit					x
HAEMODORACEAE						
Anigozanthos manglesii ssp. quadrans	northern limit					x
Conostylis aculeata ssp. septentrionora	northern limit					x
C. candicans ssp. flavifolia	northern limit					x
C. stylidioides	northern limit					x
HYPOXIDACEAE						
Hypoxis sp. (?glabella)	northern limit					x
ORCHIDACEAE						
Eriochilus dilatatus	northern limit		x			x
Lyperanthus nigricans	northern limit					x
DICOTYLEDONS						
CASUARINACEAE						
Allocasuarina acutivalvis	northern limit					x
A. helmsii	northern limit		x			

TAXON	COMMENT	1	2	3	4	5
MORACEAE						
Ficus platypoda var. minor	southern limit	x				
URTICACEAE						
Parietaria debilis		x	x	x		x
PROTEACEAE						
Adenanthos acanthophyllus	endemic					x
Banksia ashbyi					x	x
B. prionotes	northern limit					x
B. sceptrum	northern limit					x
Conospermum stoechadis	northern limit					x
Grevillea candelabroides	northern limit					x
G. eriostachya						x
G. rogersoniana	endemic					x
G. stenophylla			x			x
G. stenomera	northern limit					x
G. stenobotrya ssp. nov.	southern limit				x	x
G. thelemaniana ssp. pinaster	northern limit					x
Hakea ? sp.	?endemic		x			
H. stenophylla					x	x
Petrophile semifurcata	northern limit					x
SANTALACEAE						
Anthobolus foveolatus	northern limit					x
Exocarpus aphyllus		x	x	x	x	x
E. sparteus						x
Leptomeria preissiana	northern limit					x
L. spinosa	northern limit		x			
Santalum acuminatum	north-western limit					x
S. spicatum						x
S. spicatum ssp. nov.	endemic	x	x		x	
OLACACEAE						
Olax aurantia						x
LORANTHACEAE						
Ameyema benthamii	western limit				x	
A. linophylla			x			
A. maidenii						x
A. miraculosum	northern limit					x
A. preissii			x		x	
A. miquelii					x	x
Lysiana murrayi				x		
POLYGONACEAE						
**Emex australis*			x			
Muehlenbeckia adpressa						x
M. cunninghamii					x	
**Rumex vesicarius*					x	
CHENOPODIACEAE						
Atriplex bunburyana		x	x		x	
A. cinerea			x	x	x	
A. codonocarpa				x	x	
A. isatidea				x	x	

TAXON	COMMENT	1	2	3	4	5
A. paludosa ssp. baudinii					x	x
A. paludosa ssp. moquiniana	northern limit	x	x		x	x
A. semilunaris					x	x
A. vesicaria ssp. incompta					x	x
A. vesicaria ssp. variabilis		x	x			
Chenopodium gaudichaudianum			x			
C. melanocarpum		x	x			
**C. murale*		x	x	x		
Dysphania plantaginella		x	x		x	
D. sphaerosperma			x			
Dissocarpus paradoxus					x	x
Enchylaena tomentosa		x	x			
Didymanthus roei					x	x
Eriochiton sclerolaenoides					x	
Halosarcia doleiiformis						x
H. halocnemoides ssp. halocnemoides		x	x			x
H. halocnemoides ssp. tenuis						x
H. indica ssp. bidens			x			
H. indica ssp. leiostachya					x	x
H. peltata			x			
H. pergranulata			x			
H. pruinosa						x
H. pterygosperma ssp. pterygosperma						x
Maireana appressa					x	x
M. atkinsiana						x
M. carnosa					x	x
M. georgei					x	
M. lanosa					x	x
M. oppositifolia					x	
M. planifolia				x	x	
M. platycarpa					x	x
M. polypterygia					x	x
M. stipitata					x	
M. tomentosa					x	
Neobassia astrocarpa					x	
Osteocarpum acropterum var. acropterum	?western limit			x	x	
Salsola kali						
Sarcocornia blackiana			x			
S. quinqueflora ssp. quinqueflora						x
Rhagodia latifolia ssp. latifolia	northern limit	x	x			
R. preissii ssp. obovata	northern limit	x	x			
Sclerolaena diacantha					x	x
S. eurotioides						x
S. recurvicuspis						x
S. tridens						x
S. uniflora			x			
Threkeldia diffusa			x			x
AMARANTHACEAE						
Amaranthus pallidiflorus		x			x	

TAXON	COMMENT	1	2	3	4	5
Hemichroa diandra					x	
Ptilotus aervoides						x
P. alexandri	endemic		x	x		
P. chamaecladus						
P. divaricatus var. divaricatus		x	x	x	x	
P. divaricatus var. rubrescens	endemic					x
P. drummondii						x
P. exaltatus			x			
P. gaudichaudii var. gaudichaudii		x	x		x	x
P. gaudichaudii var. parviflorus	northern limit		x			x
P. grandiflorus var. grandiflorus						x
P. helichrysoides		x				
P. obovatus var. obovatus		x	x	x	x	x
P. obovatus var. laurifolius	endemic					x
P. stirlingii var. pumilus	endemic					x
P. villosiflorus		x	x	x	x	x
NYCTAGINACEAE						
Boerhavia burbidgeana	southern limit	x				
B. coccinea			x			
Commicarpus australis	southern limit				x	x
GYROSTEMONACEAE						
Codonocarpus cotonifolius					x	x
Gyrostemon ramulosus		x	x			x
AIZOACEAE						
Carpobrotus aff. rossii		x	x	x	x	
C. virescens				x		x
Gunniopsis rubra	northern limit					x
G. septifraga					x	
Glinus lotoides				x		
Macarthuria intricata	endemic					x
**Mesembryanthemum crystallinum*		x	x	x		
Sesuvium portulaccastrum		x			x	
Tetragonia diptera	?endemic	x	x	x	x	
T. implexicoma		x		x		
T. tetragonioides				x		
Trianthema turdigifolia					x	
PORTULACACEAE						
Calandrinia corrigioiloides	northern limit					x
C. papillata			x			
C. polyandra			x			
CARYOPHYLLACEAE						
**Cerastium glomeratum*			x			
**Silene gallica var. anglica*			x		x	
**Polycarpon tetraphyllum*			x			
**Spergularia diandra*						x
**S. rubra*			x			
RANUNCULACEAE						
Clematis microphylla		x	x			x

TAXON	COMMENT	1	2	3	4	5
LAURACEAE						
Cassytha aurea			x			x
C. filiformis		x			x	x
C. nodiflora					x	x
C. pomiformis	northern limit					x
C. racemosa forma racemosa	northern limit					x
C. racemosa forma pilosa						x
PAPAVACEAE						
**Argenome ochroleuca*			x			
CAPPARACEAE						
Capparis spinosa var. nummularia		x	x			x
EMBLINGIACEAE						
Emblingia calceoliflora						x
BRASSICACEAE						
**Brassica juncea*						x
**B. tournefortii*			x		x	x
Cakile maritima			x			
**Hymenobolus procumbens*			x			
**Diplotaxis muralis*			x			
Lepidium foliosum					x	
L. biplicatum			x	x		
L. linifolium			x			
L. lyratogynum				x		
L. phlebopetalum						x
L. platypetalum	western limit					x
L. rotundum	northern limit		x			x
Menkea ? australis						x
**Rhaphanus raphanistrum*						x
**Sisymbrium erysimoides*			x			x
**S. irio*		x			x	
**S. orientale*			x			x
Stenopetalum ? pedicellare						x
S. robustum	northern limit					x
S. sphaerocarpum			x			
DROSERACEAE						
Drosera stolonifera ssp. humilis	northern limit					x
CRASSULACEAE						
Crassula colorata var. colorata		x	x			x
C. colorata var. tuberculata						x
PITTOSPORACEAE						
Billardiera bicolor var. lineata						x
Bursaria occidentalis					x	x
Cheiranthera preissiana var. preissiana	northern limit					x
Pittosporum phylliraeoides var. phylliraeoides		x	x	x	x	
CUNONIACEAE						
Aphanopetalum clematideum	northern limit		x			x
STYLOBASIACEAE						
Stylobasium spathulatum		x			x	
S. australe						x

TAXON	COMMENT	1	2	3	4	5
MIMOSACAEAE						
Acacia ambyllophylla	northern limit				x	
A. bivenosa	southern limit	x	x			
A. brachystachya	north western limit				x	x
A. coriacea	southern limit	x	x			x
A. farnesiana	southern limit				x	x
A. grasbyi	western limit					x
A. idiomorpha	northern limit		x			
A. latipes	northern limit					x
A. leptospermoides	northern limit		x			
A. ligulata	western limit		x	x		
A. longispinea	northern limit					x
A. microcalyx	western limit					x
A. ramulosa				x	x	
A. roycei	endemic					x
A. sclerosperma		x				
A. spathulifolia						x
A. tetragonophylla			x			x
A. victoriae						x
A. xanthina	northern limit					x
A. xiphorphylla	southern limit					x
A. sp.	?endemic		x			
A. rostellifera	northern limit	x				
A. congesta	northern limit					x
CAESALPINACEAE						
Cassia chatelainiana			x			x
C. nemophila var. nemophila					x	x
C. nemophila var. platypoda						x
C. phyllodinea						x
C. sturtii						x
Labichea cassioides					x	x
Petalostylis labicheoides						x
FABACEAE						
Aotus ? phylicoides	northern limit					x
Bossiaea walkeri	northern limit				x	
B. spinosa	northern limit		x			
Brachysema aphylla	northern limit					x
B. daviesioides	northern limit					x
B. macrocarpum	southern limit	x	x			
Chorizema ericifolium	northern limit		x			x
Daviesia sp.	?endemic		x			x
Glycine tabacina			x		x	
Indigofera ? australis						x
I. boviperda			x		x	
I. georgei		x			x	
I. monophylla					x	
Lotus australis		x				
L. cruentus						
**Meliolotus indica*			x			

TAXON	COMMENT	1	2	3	4	5
**Medicago polymorpha*			x			
Mirbelia ramulosa		x	x			x
Psoralea cinerea						x
Swainsona beasleyana ssp. elegantoides			x			
S. canescens var. canescens						
S. elegans						
S. kingii ssp. kingii						
S. phacoides						
S. pterostylis						
GERANACEAE						
Erodium angustilobum		x	x			x
**Erodium aureum*			x			
**Erodium cicutarium*			x		x	x
Erodium cygnorum		x	x			x
OXALIDACEAE						
Oxalis perennenans		x	x			x
ZYGOPHYLLACEAE						
Nitraria billardierei		x	x		x	
Tribulus platyptera	?southern limit				x	
T. occidentalis			x			
T. forrestii				x		
T. terrestis					x	x
Zygophyllum ammophilum			x			
Z. aurantiacum			x			
Z. apiculatum		x				
Z. fruticulosum		x	x		x	x
Z. eremaeum	western limit	x				
Z. tesquorum					x	
RUTACEAE						
Boronia crenulata var. gracilis	northern limit					x
B. purdieana	northern limit					x
Diplolaena grandiflora		x	x			x
D. microcephala	northern limit		x			x
Geleznowia verrucosa	northern limit		x			x
POLYGALACEAE						
Comesperma integerrima	northern limit					x
C. scoparia	northern limit				x	
EUPHORBIACEAE						
Adriana tomentosa	southern limit				x	x
Beyeria cinerea			x		x	x
B. cyanescens	?endemic	x	x			
Euphorbia alsiniflora	western, southern limit	x				
E. atoto					x	
E. australis	western limit	x				x
E. boopthona	western limit	x				
E. drummondii	western limit	x			x	
E. myrtoides	western limit	x	x			
E. sharkoensis	southern limit		x			

TAXON	COMMENT	1	2	3	4	5
E. tannensis ssp. eremophila	western limit	x				x
Monotaxis lurida	northern limit					x
Poranthera microphylla			x			
Phyllanthus calycinus	northern limit	x				
P. fuernrohrii	southern limit	x				
**Riccinus communis*			x			x
Sauropus crassifolius			x			
STACKHOUSIACEAE						
Stackhousia muricata						x
S. pubescens						x
S. viminea		x	x			
SAPINDACEAE						
Diplopeltis huegelii var. subintegra	northern limit					x
D. intermedia var. intermedia						x
D. petiolaris	northern limit					x
Dodonaea aptera	northern limit		x			
D. inaequifolia	northern limit	x	x		x	x
D. viscoca ssp. angustissima	northern limit					x
Heterodendron oleifolium var. oleifolium	western limit	x	x		x	
RHAMNACEAE						
Cryptandra leucophracta						x
C. mutila	northern limit	x				
C. nudiflora	endemic	x				
Spyridium divaricatum	endemic		x			
STERCULIACEAE						
Commersonia gaudichaudii	northern limit		x			
Brachychiton gregorii	?western limit				x	
Guichenotia ledifolia	northern limit		x			x
Hannafordia quadrivalvis			x			x
Keraudrenia hermanniifolia			x			x
K. integrifolia						x
Lasiopetalum oppositifolium	northern limit	x	x			
Rulingia cygnorum var. borealis	northern limit		x			
R. luteiflora			x			x
R. densiflora	northern limit					x
R. malvifolia var. borealis	northern limit			x		
TILIACEAE						
Triumfetta appendiculata		x				
VITACEAE						
Clematicissus angustissima	northern limit					x
MALVACEAE						
Abutilon cryptopetalum	western limit	x				
A. exonemum	southern limit	x				
A. geranioides	southern limit	x	x			x
A. oxycarpum	southern limit		x			x
Alogyne cuneiformis		x	x			
A. pinoniana		x	x			x
**Lavatera cretica*			x			

TAXON	COMMENT	1	2	3	4	5
Hibiscus aff. coatesii						x
Hibiscus sturtii var. truricatus	western limit	x				
Lavatera plebeia						
Lawrencia densiflora				x	x	
L. viridigrisea			x	x		
**Malva parviflora*						x
Sida calyxhymenia			x			
S. corrugata			x			
S. kingii					x	
S. fibulifera	?southern limit	x				
DILLENIACEAE						
Hibbertia acerosa	northern limit					x
FRANKENIACEAE						
Frankenia cinerea	western limit		x			
F. confusa	western limit				x	
F. pauciflora		x	x	x	x	
F. setosa	western limit					x
THYMELAEACEAE						
Pimelea gilgiana	northern limit		x	x		
P. lehmanniana ssp. lehmanniana	northern limit					x
P. microcephala var. microcephala		x	x		x	
MYRTACEAE						
Baeckea pentagonantha			x			x
Beaufortia dampieri	northern limit	x	x			x
Calothamnus formosus ssp. formosus	endemic					x
C. quadrifidus	northern limit				x	x
C. kalbarriensis	northern limit					x
Calytrix brevifolia	northern limit		x		x	x
C. strigosa	northern limit	x			x	
Eucalyptus decipiens						x
E. beardiana	northern limit					x
E. dongarraensis		x	x			
E. eudesmoides						x
E. fruticosa	southern limit	x	x			
E. mannensis						x
E. gittinsii						x
E. jucunda					x	
E. oraria		x	x			
E. redunca					x	
E. roycei	endemic					x
E. oldfieldii	northern limit					x
Lamarchea hakeifolia var. hakeifolia	endemic				x	x
Malleostemon pedunculatus	northern limit					x
Melaleuca cardiophylla			x			x
M. eleutherostachya						x
M. holosericea	northern limit		x			
M. huegelii	northern limit	x		x	x	
M. lanceolata	northern limit		x			
M. leiopyxis	northern limit					x

TAXON	COMMENT	1	2	3	4	5
M. ? leptospermoides	northern limit or endemic		x			
M. aff. nesophila	northern limit or endemic			x	x	
M. ? oldfieldii	northern limit or endemic					x
M. scabra						x
M. uncinata	northern limit				x	
M. ? urceolaris	northern limit or endemic					x
Micromyrtus peltigera						
M. racemosa						
Pileanthus limacis	southern limit	x	x			
P. sp.				x		x
Scholtzia leptantha					x	x
S. oligandra					x	
S. umbellifera					x	
S. sp.	?endemic		x			
Thryptomene baeckeacea						x
T. decussata					x	x
HALORAGACEAE						
Glischrocaryon aureum var. aureum	northern limit					x
G. flavescens	northern limit					x
Haloragis gossei			x			
H. trigonocarpa		x	x			
APIACEAE						
Daucus glochidiatus			x			x
Neosciadium glochidiatum	northern limit		x			x
Trachymene elachocarpa	endemic	x	x			x
T. ornata						x
T. pilosa		x	x		x	
Uldinia ceratocarpa					x	
PRIMULACEAE						
**Anagallis arvensis var. arvensis*					x	
**A. arvensis var caerulea*			x			x
Samolus junceus					x	x
S. repens var. repens			x			
S. repens var. floribundus					x	
PLUMBAGINACEAE						
Muellerolimon salicorniaceum				x		
OLEACEAE						
Jasminum calcareum	?southern limit	x	x			
LOGANIACEAE						
Logania aff. vaginalis	southern limit		x			x
GENTIANACEAE						
**Centaurium erythraea*						x
APOCYNACEAE						
Alyxia buxifolia				x	x	

TAXON	COMMENT	1	2	3	4	5	
ASCELEPIDACEAE							
Cynanchum floribundum			x				
Gymnanthera nitida							
Leichardtia australis					x		
Rhyncharrhena linearis				x	x	x	
Sarcostemma australe		x	x				
CONVOLVULACEAE							
Bonamia rosea						x	
Convolvulus erubescens		x			x	x	
Porana sericea		x	x		x	x	
Wilsonia humilis				x			
CUSCUTACEAE							
Cuscuta australis						x	
BORAGINACEAE							
Halgania littoralis	northern limit	x	x	x			
H. viscosa			x		x		
Heliotropum curassavicum						x	
H. undulatum		x					
Trichodesma zeylanicum var. zeylanicum		x	x				
CHLOANTHACEAE							
Cyanostegia lanceolata	northern limit					x	
Dicrastylis cordifolia	western limit		x				
D. fulva	northern limit		x			x	
D. linearifolia	northern limit					x	
D. micrantha	northern limit					x	
Lachostachys eriobotrya	northern limit					x	
Newcastelia chrysophylla	northern limit					x	
Pityrodia atriplicina	northern limit		x			x	
P. cuneata	northern limit	x		x	x		
P. glabra	endemic					x	
P. hemigenioides	northern limit		x				
P. loxocarpa				x			
P. oldfieldii	northern limit					x	
P. panniculata	?southern limit				x	x	
AVICENNIACEAE							
Avicennia marina					x		
LAMIACEAE							
Hemiandra sp. (JSB 7059)	?endemic					x	
H. macrantha	northern limit					x	
H. sp.	northern limit					x	
**Salvia verbenacea*						x	
Westringia dampieri		x	x	x	x		
Eremophila pantonii	western limit					x	
E. platycalyx						x	
E. pterocarpa						x	
E. ? serrulata	western limit						x
E. subfloccosa	x						
Myoporum adscendens			x				

TAXON	COMMENT	1	2	3	4	5
M. insulare		x	x	x	x	
M. deserti		x	x		x	
M. tetrandrum		x				
SOLANACEAE						
Anthocercis littorea	northern limit		x		x	x
A. intricata	northern limit					x
Dubosia hopwoodii					x	
Anthotroche walcottii	northern limit		x			
Lycium australe					x	
**L. ferocissimum*						x
Datura leichhardtii					x	
**Solanum americanum*			x			
S. hesperium	northern limit		x		x	
S. lasiophyllum		x	x	x	x	x
**S. nigrum*						x
S. oldfieldii	northern limit					x
S. orbiculatum ssp. orbiculatum		x	x			
**Nicotiana glauca*			x		x	
N. occidentalis ssp. obliqua	western limit				x	x
N. occidentalis ssp. hesperis		x	x		x	
SCROPHULARIACEAE						
Morgania floribunda						x
Stemodia viscosa						x
MYOPORACEAE						
Eremophila clarkei	imprecise locality		x			?
E. decipiens						
E. glabra			x			
E. leucophylla	western limit					x
E. macklinyai	western limit				x	
E. maculata var. brevifolia				x		
E. maitlandii	southern limit			x	x	
E. oldfieldii	northern limit		x		x	x
PLANTAGINACEAE						
Plantago drummondii	northern limit	x				
P. sp. (Cranfield 2583)	1 other collection Yaringa Stn.				x	
RUBIACEAE						
Opercularia spermacocea	northern limit		x			
O. vaginata	northern limit	x				
CUCURBITACEAE						
Mukia maderaspatana	southern limit				x	
CAMPANULACEAE						
Wahlenbergia gracilenta			x			
LOBELIACEAE						
Lobelia heterophylla				x	x	x
GOODENIACEAE						
Dampiera altissima						x
D. incana var. incana		x	x	x		
D. incana var. fuscescens	northern limit					x

TAXON	COMMENT	1	2	3	4	5
D. lindleyi	northern limit				x	
D. spicigera	northern limit					x
Goodenia berardiana		x	x			
G. corynocarpa	southern limit	x				x
G. mimuloides	northern limit	x				
G. ochracea	endemic	x				
G. pinnatifida	north-western limit					x
G. xanthosperma	north-western limit			x		
Lechenaultia linearoides	endemic subspecies		x			x
L. subcymosa	southern limit		x			
Scaevola anchusifolia				x		x
S. crassifolia	northern limit	x	x	x		x
S. depauperata	western limit					x
S. dielsii			x			
S. globulifera						x
S. holosericea		x	x			
S. paludosa			x			
S. parviflora				x		
S. porocarya				x		
S. spinescens		x	x	x	x	x
S. tomentosa		x	x	x	x	x
Velleia cycnopotamica	northern limit					x
ASTERACEAE						
Actinobole condensatum	northern limit	x	x		x	x
A. drummondiana	southern limit				x	x
A. oldfieldiana						x
Angianthus acrohyalinus	southern limit	x	x	x		x
A. cunninghamii		x	x	x	x	x
A. microcephalus	western limit		x		x	x
A. milnei			x			x
A. tomentosus	northern limit		x			x
**Arctotheca calendula*			x			
**Bidens bipinnata*		x	x			
Brachycome cheilocarpa					x	
B. ciliaris		x	x	x	x	x
B. ciliocarpa						x
B. iberidifolia		x	x			x
B. latisquamea	southern limit		x		x	
Calocephalus brownii				x	x	
C. multiceps				x		
C. francisii			x			x
Calotis multicaulis			x			x
Centipedia cunninghamii					x	
C. minima					x	
Cephalipterum drummondii			x			
**Centaurium melitensis*			x			
Chrysocoryne pusilla	northern limit	x				
Chthonocephalus pseudevax						x
C. tomentellus	endemic				x	x

TAXON	COMMENT	1	2	3	4	5
Cotula cotuloides			x			
Calocephalus multiceps					x	
Gilruthia osbornei						x
Gnaphalum ? indutum/ polycaulon (ASW 10549)	northern or southern limit	x				
Gnephosis macrocephala			x			
G. gynotricha						x
G. pusilla		x	x			
G. skirrophora			x			
G. ? tenuissima			x			
Helichrysum ayersii	western limit					x
H. condensatum	northern limit	x	x			x
H. craspedioides						x
H. humboltianum	western limit		x		x	
H. hyalospermum	northern limit				x	x
H. splendidum						x
H. tenellum					x	
Hypochaeris glabra			x			x
Millotia myosotidifolia		x	x		x	
Myriocephalus guerinae						x
Oleria axillaris		x	x			
O. pimelioides			x			
O. revoluta		x				
O. sp. (ASG 11568)	?endemic		x	x		
Pluchea rubelliflora	southern limit	x	x			
Podolepis canescens	northern limit		x	x	x	x
P. gardneri		x				
*Pseudognaphalium luteoalbum		x		x		
Pogonolepis stricta			x			x
Podotheca angustifolia			x		x	x
P. gnaphalioides	northern limit		x		x	
Schoenia cassiniana						x
Senecio glossanthus		x	x			x
S. gregorii					x	
S. lautus ssp. lautus		x	x	x	x	
S. lautus ssp. maritimus				x		
S. lautus ssp. dissectifolius		x		x		
*Sonchus oleraceus		x	x	x	x	x
Streptoglossa liatroides						x
*Urospermum picroides						x
Vittadinia cervicularis var. cervicularis	northern limit		x			
V. cervicularis var. oldfieldii	northern limit					x
Waitzia citrina			x			
W. corymbosa			x			
W. podolepis				x		x

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