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A BOTANICAL SURVEY OF A RABBIT STUDY AREA,  
CAPE NATURALISTE

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ABSTRACT

Five plant communities were recognised within a Rabbit Study Area of about 275 ha at Cape Naturaliste, Western Australia. 235 plant species were recorded, of which 176 were native to the area and 59 were introduced aliens.

The vegetation and flora of the area were typical of those present on coastal calcareous soils, under similar conditions of clearing and disturbance.

INTRODUCTION

The Rabbit Study Area (RSA) at Cape Naturaliste was at the time of the botanical survey being used by the Research Section of the Agriculture Protection Board for studying the biology and control of rabbit populations. The RSA lies approximately 5 km south-south-east of Cape Naturaliste lighthouse ( $33^{\circ}34' S$ ,  $115^{\circ}02' E$ ), with the town of Busselton lying approximately 33 km to the south-east.

The RSA comprises parts of Sussex locations 1046 and 725 and is that area in these locations that had been cleared of native vegetation and converted to pasture, together with uncleared vegetation surrounding the cleared area to a distance of 20 m. The area of the RSA is approximately 275 ha.

The climate experienced is a mediterranean type with a mean annual rainfall of 838 mm and the wettest six-monthly period of the year from May to October. The maximum temperature means are  $25.8^{\circ}C$  in February and  $16.2^{\circ}C$  in July, with the minimum temperature means for the same months being  $15.8^{\circ}C$  and  $10.2^{\circ}C$  respectively. Climatic records are from the Cape Naturaliste lighthouse station (Table 1).

The soils of the RSA are calcareous sands overlying limestone which outcrops in small localised patches. The topography is undulating with the highest point about 200 m above sea level.

Table 1. Mean maximum and minimum temperatures and mean monthly rainfall recorded at Cape Naturaliste Lighthouse  $30^{\circ}32'S$ ,  $115^{\circ}1'E$ , elevation 111.9 m (courtesy Department of Science and Technology, Bureau of Meteorology, Perth).

	Daily Maximum Temperature Mean	Daily Minimum Temperature Mean	Rainfall mm Mean
JAN	25.4	15.4	10
FEB	25.8	15.8	12
MAR	24.1	14.8	25
APR	21.0	13.4	47
MAY	19.1	12.6	119
JUN	17.2	11.4	117
JUL	16.2	10.2	167
AUG	16.2	9.8	115
SEP	16.9	9.9	75
OCT	18.7	10.8	54
NOV	21.0	12.2	23
DEC	23.8	14.1	14
ANNUAL TOTAL			838

The area has, and was at the time of the survey, been utilized by the property owner, Mr. J. D'Espeissis, for grazing cattle. The other main herbivore found in the area is the Western grey kangaroo, *Macropus fuliginosus oxydromus*.

The botanical survey was conducted to provide base data for determining the habitat, and food preferences, of rabbits.

#### METHOD

The plant communities in the RSA were mapped by aerial photographic interpretation, supported by data obtained from ground traverses. The structural classification used follows that adopted by Aplin (1981).

Several locations in each of the vegetation communities were sampled floristically to provide a flora list of the area. Nomenclature follows Green (1981), and voucher specimens have been lodged at the Western Australian Herbarium (PERTH).

The composition of the hermland (pasture) vegetation was determined using the Point Quadrat method, along 8 transects, each about 100 m long. Points were set 1 m apart.

#### RESULTS

Five plant communities were recognised in the RSA and their distributions mapped on an aerial photograph (Fig. 1). They are:

1. Low woodland, consisting of *Agonis flexuosa* and, in localized areas, *Eucalyptus calophylla* (Fig. 2).
2. Open scrub of *Acacia rostellifera* (Fig. 3).
3. High shrubland, consisting of *Dryandra sessilis* on exposed limestone and *Agonis flexuosa* on shallow soils (Fig. 4).
4. Open heath of a mixture of species with emergent *Xanthorrhoea preissii*, usually found on high ground (Fig. 5).
5. Hermland, or annual pasture, consisting of species of naturalised alien plants (Fig. 6).

The species composition of hermland, measured over three consecutive years, are provided in Table 2.

Table 2. Percentage cover of species in the mixed hermland community.

Species	Percentage cover		
	1978	1979	1981
<i>Arctotheca calendula</i>	25.0	18.6	10.9
<i>Lolium rigidum</i>	22.4	37.8	58.9
<i>Medicago polymorpha</i>	16.8	-	0.8
<i>Trifolium subterraneum</i>	12.7	7.9	3.0
<i>Hypochoeris glabra</i>	9.4	4.2	2.6
<i>Erodium botrys</i>	7.2	9.5	10.6
<i>Hordeum leporinum</i>	2.9	-	-
<i>Bromus diandrus</i>	1.1	5.9	2.3
* <i>Orobanche australiana</i>	1.1	0.3	0.1
<i>Bromus hordeaceus</i>	0.5	6.1	5.4
<i>Aira caryophyllea</i>	0.4	-	-
<i>Trifolium glomeratum</i>	0.4	-	-
<i>Trifolium campestre</i>	0.2	2.1	1.9
<i>Polycarpon tetraphyllum</i>	-	4.4	0.9
<i>Vulpia bromoides</i>	-	2.9	2.6
<i>Ornithopus compressus</i>	-	0.1	-
<i>Romulea rosea</i>	-	0.1	-
<i>Bromus madritensis</i>	-	-	0.1

\* Native species. The rest are naturalised aliens.

235 plant species were recorded, in the RSA, of which 176 were native and 59 naturalised aliens (Appendix 1).

Most species were recorded in more than one plant community. Genera with the greatest number of species were *Hibbertia* and *Acacia* (5 species each), *Drosera*, *Lomandra* and *Stylidium* (4 each). Families with the greatest representation of species were Asteraceae, Leguminosae, Liliaceae, Orchidaceae and Poaceae.

177 of the plant species recorded in the RSA were herbaceous annuals or short-lived perennials, with only 58 woody perennial species present, the

latter belonging to families such as Casuarinaceae, Leguminosae, Myrtaceae, Proteaceae, Rutaceae and Thymelaeaceae.

## DISCUSSION

The plant communities, and the plant species, recorded in the RSA are typically seen on coastal calcareous sands, overlying limestone, in south-western Australia (Smith 1974; Fox *et al.* 1980; Beard 1981), while the high proportion (25%) of naturalised alien species reflects the considerable disturbance that had taken place in the hermland, and in adjacent woodland, scrub, shrubland and heath.

In a study at Yalgorup National Park, Fox *et al.* (1980) recorded 295 species, including 51 naturalised aliens (17%), in similar plant communities and soil types, but over a much larger area (ca. 11,000 ha). 141 of these species, including 30 naturalised aliens, occur in the RSA.

The botanical survey indicated that a large proportion of plants, native and naturalised aliens, are probably important in the diet of rabbits.

## REFERENCES

- Aplin, T.E.H. (1981). The Vegetation of Western Australia. In *Western Australian Year Book No. 19*: 66-80.  
Beard, J.S. (1981). Vegetation Survey of Western Australia, 1:1,000,000 series, Swan. Univ. of W. Aust. Press, Nedlands.  
Fox, J.E.D., Downes, S., and Maslin, B.R. (1980). The vascular plants of Yalgorup National Park. *W. Aust. Herb. Res. Notes* 3: 1-18.  
Green, J.W. (1981). *Census of Vascular Plants of Western Australia*. Published by the Western Australian Herbarium.  
Smith, F.G. (1973). Vegetation Survey of Western Australia, 1:250,000 series, Busselton and Augusta. W. Aust. Dept. Agriculture, Perth.

## APPENDIX I

### List of plant species

Families genera and species are arranged alphabetically. The site record numbers refer to plant communities as follows:

1. *Agonis flexuosa* low woodland.
2. *Acacia rostellifera* open scrub.
3. *Dryandra sessilis*-*Agonis flexuosa* high shrubland.
4. *Xanthorrhoea preissii* open heath.
5. Annual pasture hermland.



	Site record				
	1	2	3	4	5
<i>Crassula pedicellosa</i> (F. Muell.) Ostenf.	+	+		+	
<b>Cyperaceae</b>					
<i>Carex inversa</i> R.Br.				+	
<i>Lepidosperma angustatum</i> R.Br.			+		
<i>Lepidosperma gladiatum</i> Labill.	+		+		
<i>Lepidosperma longitudinale</i> Labill.				+	
<i>Lepidosperma pubisquamum</i> Steud.				+	
<i>Schoenus curvifolius</i> (R.Br.) Benth.				+	
<i>Schoenus grandiflorus</i> (Nees) F. Muell.				+	
<i>Scirpus marginatus</i> Thunb.		+			
<i>Scirpus nodosus</i> Rottb.				+	
<b>Dilleniaceae</b>					
<i>Hibbertia cuneiformis</i> (Labill.) Sm.	+	+	+	+	
<i>Hibbertia cunninghamii</i> W.T. Aiton	+		+	+	
<i>Hibbertia grossulariaefolia</i> (Salisb.) Salisb.	+		+	+	
<i>Hibbertia hypericoides</i> (DC.) Benth.			+	+	
<i>Hibbertia racemosa</i> (Endl.) Gilg.	+	+	+	+	
<b>Droseraceae</b>					
<i>Drosera erythrorhiza</i> Lindl.				+	+
<i>Drosera glanduligera</i> Lehm.	+				
<i>Drosera pallida</i> Lindl.	+	+	+		
<i>Drosera stricticaulis</i> (Diels) O.H. Sargent	+	+	+		
<b>Epacridaceae</b>					
<i>Leucopogon parviflorus</i> (Andr.) Lindl.	+	+	+	+	
<b>Euphorbiaceae</b>					
* <i>Euphorbia peplus</i> L.	+	+	+	+	
* <i>Euphorbia terracina</i> L.	+				
<i>Phyllanthus calycinus</i> Labill.	+	+	+	+	
<i>Phyllanthus crassifolius</i> F. Muell.				+	
<i>Poranthera microphylla</i> Brongn.	+			+	
<b>Fumariaceae</b>					
* <i>Fumaria officinalis</i> L.	+				
<b>Gentianaceae</b>					
* <i>Centaurium erythraea</i> Rafn.					+
<b>Geraniaceae</b>					
* <i>Erodium botrys</i> (Cav.) Bertol.	+			+	+
* <i>Erodium cicutarium</i> (L.) L'Herit.				+	+
* <i>Erodium moschatum</i> (L.) L'Herit.	+			+	+
* <i>Geranium molle</i> L.	+	+	+	+	
<i>Geranium solanderi</i> Carolin	+	+	+	+	
* <i>Pelargonium capitatum</i> (L.) L'Herit.	+			+	
<i>Pelargonium littorale</i> Huegel				+	
<b>Haemodoraceae</b>					
<i>Anigozanthus manglesii</i> D. Don	+	+	+	+	
<i>Conostylis aculeata</i> R.Br.				+	
<b>Iridaceae</b>					
<i>Orthrosanthus laxus</i> (Endl.) Benth.			+	+	
<i>Patersonia occidentalis</i> R.Br.		+	+	+	
* <i>Romulea rosea</i> (L.) Eckl.				+	+
* <i>Sparaxis grandiflora</i> (Delaroche) Ker-Gawl.			+	+	
<b>Juncaceae</b>					
<i>Juncus pallidus</i> R.Br.				+	
<i>Luzula meridionalis</i> Nordensk				+	†
<b>Juncaginaceae</b>					
<i>Triglochin calcitrappa</i> Hooker				+	

	Site record				
	1	2	3	4	5
<i>Triglochin tricophora</i> Nees ex Endl.		+		+	
Lauraceae					
<i>Cassytha nodiflora</i> Meisn.		+			
<i>Cassytha racemosa</i> Nees.		+	+	+	
Leguminosae - subfamily Mimosideae					
<i>Acacia cochlearis</i> (Labill.) H.L. Wendl.	+	+	+	+	
<i>Acacia littorea</i> Maslin	+	+	+	+	
<i>Acacia pulchella</i> R.Br.	+	+	+	+	
<i>Acacia rostellifera</i> Benth.		+	+	+	
<i>Acacia saligna</i> (Labill.) H.L. Wendl.		+			
Leguminosae - subfamily Papilionoideae					
<i>Bossiaea eriocarpa</i> Benth.	+	+	+	+	
<i>Bossiaea linophylla</i> R.Br.	+		+	+	
<i>Chorizema diversifolium</i> DC.	+	+	+	+	
<i>Chorizema ilicifolium</i> Labill.		+	+		
<i>Daviesia divaricata</i> Benth.	+	+	+	+	
<i>Gompholobium polymorphum</i> R.Br.				+	
<i>Gompholobium tomentosum</i> Labill.	+	+	+	+	
<i>Hardenbergia comptoniana</i> (Andr.) Benth.	+		+	+	
<i>Hovea chorizemifolia</i> (Sweet) DC.	+		+	+	
<i>Isotropis cuneifolia</i> (Sm.) Benth.				+	
<i>Jacksonia furcellata</i> (Bonpl.) DC.	+	+	+	+	
<i>Jacksonia horrida</i> DC.				+	
<i>Kennedia prostrata</i> R.Br.	+	+	+	+	
* <i>Lotus subbiflorus</i> Lag.	+				
* <i>Lupinus cosentinii</i> Guss.	+		+	+	
* <i>Medicago polymorpha</i> L.		+			+
* <i>Melilotus indica</i> (L.) All.	+	+	+		
* <i>Ornithopus compressus</i> L.	+				+
<i>Tempoletonia retusa</i> (Vent.) R.Br.	+				
* <i>Trifolium campestre</i> Schreber	+	+	+	+	+
* <i>Trifolium glomeratum</i> L.				+	+
* <i>Trifolium subterraneum</i> L.	+	+	+	+	+
* <i>Vicia sativa</i> L.				+	
Liliaceae					
<i>Acanthocarpus preissii</i> Lehm.		+	+		
<i>Bulbine semibarbata</i> (R.Br.) Haw.	+	+		+	
<i>Burchardia umbellata</i> R.Br.	+	+	+	+	
<i>Chamaescilla corymbosa</i> (R.Br.) F. Muell. ex Benth.	+	+	+	+	
<i>Lomandra caespitosa</i> (Benth.) Ewart				+	
<i>Lomandra endlicheri</i> (F. Muell.) Ewart				+	
<i>Lomandra pauciflora</i> (R.Br.) Ewart					+
<i>Lomandra preissii</i> (Endl.) Ewart	+				
<i>Sowerbaea laxiflora</i> Lindl.	+	+	+	+	
<i>Stypandra grandiflora</i> Lindl.	+	+	+	+	
<i>Thysanotus arenarius</i> N.H. Brittan				+	
<i>Thysanotus multiflorus</i> R.Br.				+	
<i>Thysanotus patersonii</i> R.Br.	+	+	+	+	
<i>Tricoryne elatior</i> R.Br.	+	+		+	
<i>Wurmbea dioica</i> (R.Br.) F. Muell.	+			+	
<i>Xanthorrhoea preissii</i> Endl.	+	+	+	+	
Lobeliaceae					
<i>Isotoma hypocrateriformis</i> (R.Br.) Druce	+			+	
<i>Lobelia rhytidosperma</i> Benth.				+	
<i>Lobelia tenuior</i> R.Br.	+	+		+	

## Site record

1 2 3 4 5

## Loganiaceae

*Logania serpyllifolia* R.Br.

+ + + +

*Mitrasacme paradoxa* R.Br.

+

## Myrtaceae

*Agonis flexuosa* (Spreng.) Schauer

+ + + +

*Calothamnus sanguineus* Labill.

+ +

*Eucalyptus calophylla* Lindl.

+

*Eucalyptus marginata* Donn ex Sm.

+

*Hypocalymma robustum* Endl.

+ + + +

*Melaleuca acerosa* Schauer

+ + + +

*Melaleuca huegelii* Endl.

+ + +

## Orchidaceae

*Caladenia flava* R.Br.

+ + + +

*Caladenia huegelii* H. Reichenb.

+ + + +

*Caladenia latifolia* R.Br.

+ + + +

*Diuris longifolia* R.Br.

+ + + +

*Elythranthera brunonis* (Endl.) George

+

*Eriochilus dilatatus* Lindl.

+ + + +

*Pterostylis nana* R.Br.

+ + + +

*Pterostylis scabra* Lindl.

+ + + +

*Pterostylis vittata* Lindl.

+ + + +

*Thelymitra villosa* Lindl.

+ + + +

## Orobanchaceae

*Orobanche australiana* F. Muell.

+ + + +

## Oxalidaceae

*Oxalis corniculata* L.

+ + + +

## Pittosporaceae

*Billardiera candida* (Endl.) E.M. Bennett

+ + +

*Billardiera erubescens* (Putterl.) E.M. Bennett

+ + +

## Plantaginaceae

*Plantago debilis* R.Br.

+ + + +

## Poaceae

\**Aira caryophyllea* L.

+ + + + +

\**Avellinia michelii* (Savi) Parl

+ + +

*Avena barbata* Link

+ + + +

*Briza maxima* L.

+ + + +

*Briza minor* L.

+ + + +

*Bromus diandrus* Roth

+ + + +

*Bromus hordeaceus* L.

+ + + +

*Bromus madritensis* L.

+ + + +

*Danthonia caespitosa* Gaud.

+ + +

*Dichelachne crinita* (L.F.) J.D. Hooker

+ + +

\**Ehrharta longiflora* Sm.

+ + +

*Hordeum leporinum* Link

+ + + + +

*Lagurus ovatus* L.

+ + + +

*Lolium perenne* L.

+ + + +

*Lolium rigidum* Gaud.

+ + + +

*Microlaena stipoides* (Labill.) R.Br.

+ +

\**Poa annua* L.

+ +

*Poa drummondiana* Nees

+ + +

*Stipa compressa* R.Br.

+ + +

*Stipa flavescens* Labill.

+ + +

\**Vulpia bromoides* (L.) S.F. Gray

+ + + +

\**Vulpia myuros* (L.) C.C. Gmelin

+ + +

		Site record				
		1	2	3	4	5
Polygalaceae						
<i>Comesperma confertum</i> Labill.		+		+	+	
Polygonaceae						
* <i>Emex australis</i> Steinh.			+	+		
<i>Muehlenbeckia adpressa</i> (Labill.) Meisn.			+	+	+	
* <i>Rumex acetosella</i> L.				+		
Portulacaceae						
<i>Calandrinia brevipedata</i> F. Muell.		+		+		
<i>Calandrinia calyprata</i> J.D. Hooker				+	+	
<i>Calandrinia liniflora</i> Fenzl						+
Primulaceae						
<i>Anagallis arvensis</i> L.			+	+	+	+
Proteaceae						
<i>Banksia grandis</i> Willd.						+
<i>Dryandra nivea</i> (Labill.) R.Br.		+	+	+	+	+
<i>Dryandra sessilis</i> (Knight) Domin.		+	+	+	+	+
<i>Grevillea vestita</i> (Endl.) Meisn.						+
<i>Hakea prostrata</i> R.Br.		+	+	+	+	+
<i>Hakea ruscifolia</i> Labill.		+	+			+
<i>Persoonia graminea</i> R.Br.		+				
<i>Petrophile linearis</i> R.Br.		+	+	+	+	+
Ranunculaceae						
<i>Clematis microphylla</i> DC.		+	+	+	+	+
<i>Clematis pubescens</i> Huegel		+		+	+	+
<i>Ranunculus colonorum</i> Endl.				+	+	
<i>Ranunculus sessiflorus</i> R.Br.					+	
Restionaceae						
<i>Loxocarya flexuosa</i> (R.Br.) Benth.		+	+	+	+	+
Rhamnaceae						
<i>Blackallia connata</i> (C.A. Gardner) C.A. Gardner			+	+	+	+
<i>Cryptandra arbutiflora</i> Fenzl						+
<i>Spyridium globulosum</i> (Labill.) Benth.		+		+	+	+
Rubiaceae						
* <i>Galium murale</i> (L.) All.				+		+
<i>Opercularia hispidula</i> Endl.		+				
<i>Opercularia vaginata</i> Labill.		+	+	+		+
* <i>Sherardia arvensis</i> L.		+	+	+		
Rutaceae						
<i>Diplolaena dampieri</i> Desf.						+
<i>Eriostemon spicatus</i> A. Rich.		+		+	+	
Scrophulariaceae						
* <i>Bellardia trixago</i> (L.) All.					+	+
* <i>Dischisma arenarium</i> E. Meyer		+				
* <i>Parentucellia latifolia</i> (L.) Caruel		+	+	+	+	+
* <i>Parentucellia viscosa</i> (L.) Caruel		+		+	+	
Solanaceae						
* <i>Solanum nigrum</i> L.						+
* <i>Solanum sodomeum</i> L.		+	+	+	+	+
Stackhousiaceae						
<i>Stackhousia brunonis</i> Benth.		+	+	+		+
<i>Stackhousia huegelii</i> Endl.			+	+		
Sterculiaceae						
<i>Thomasia cognata</i> Steud.						+
<i>Thomasia triphylla</i> (Labill.) J. Gray		+	+	+		

	Site record				
	1	2	3	4	5
<b>Styliadiaceae</b>					
<i>Levenhookia pusilla</i> R.Br.			+	+	
<i>Levenhookia stipitata</i> (Sonder) F. Muell.					+
<i>Styliidium adnatum</i> R.Br.		+	+		
<i>Styliidium calcaratum</i> R.Br.			+	+	
<i>Styliidium junceum</i> R.Br.		+		+	
<i>Styliidium striatum</i> Lindl.		+	+	+	
<b>Thymelaeaceae</b>					
<i>Pimelea rosea</i> R.Br.	+	+	+	+	
<b>Tremandraceae</b>					
<i>Tetratheca hirsuta</i> Lindl.					+
<i>Tetratheca setigera</i> Endl.	+		+		
<b>Urticaceae</b>					
<i>Parietaria debilis</i> G. Forster	+	+	+	+	
<b>Violaceae</b>					
<i>Hybanthus calycinus</i> (DC. ex Ging.) F. Muell.	+	+	+	+	



Fig. 1. Aerial photograph of rabbit study area with locations of vegetation communities depicted.



Fig. 2. *Agonis flexuosa* - woodland with hermland in foreground.



Fig. 3. *Acacia rostellifera* - open scrub. Note almost pure stand of *Acacia*.



Fig. 4. *Dryandra sessilis* - shrubland.



Fig. 5. *Xanthorrhoea preissii* - open heath.