

PENGUIN, SEAL, BIRD AND GULL ISLANDS AND SHAG ROCK

Boundary Definition: Penguin Island — bushland taken to cadastre boundary; other islands not mapped

SECTION 1: LOCATION INFORMATION

(only applies to Penguin Island)

Bush Forever Site no. 367

Area (ha): bushland 6.1

Map no. 68

Map sheet series ref. no. 2033–III NE

Other Names: not known

Local Authorities (Suburb): Shire of Rockingham (Penguin Island)

Includes CALM Managed Land: Reserve 24204 (Conservation of Flora and Fauna), 17070 (Recreation camping enjoyment by public for holidays thereon and for purposes ancillary thereto)

System 6 (1983): M101 part System area bushland, only bushland described

SECTION 2: REGIONAL INFORMATION

(only applies to Penguin Island)

LANDFORMS AND SOILS

Spearwood Dunes

Tamala Limestone (Qtl: LS1)

Quindalup Dunes (Holocene dunes)

Safety Bay Sands (Qhs: S2, S13)

VEGETATION AND FLORA

Vegetation Complexes

Quindalup Dunes

Quindalup Complex

Floristic Community Types: not sampled, types not inferred

WETLANDS

No wetlands mapped

THREATENED ECOLOGICAL COMMUNITIES

Not determined

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: island, vegetated uplands

Penguin Island

Vegetation and Flora: detailed survey (Abbot and Black 1980, Chape 1984, CALM 1992, Rippey *et al.* 1998, Storr 1961)

Structural Units: mapping (Chape 1984, CALM 1992)

Spearwood Dunes

Uplands — Tamala Limestone: Low Open Shrublands dominated by *Carpobrotus virescens* and *Frankenia pauciflora* or *Rhagodia baccata*; *Nitraria billardierei* Shrubland

Quindalup Dunes

Uplands — Youngest Dunes: Shrublands to Closed Heath dominated by *Olearia axillaris* and *Scaevola crassifolia*, by *Alyxia buxifolia* and *Scaevola crassifolia* or by *Acacia rostelifera*

Uplands — Strand: *Spinifex longifolius* and *S. hirsutus* Grassland

Total Flora: 51 native taxa, 61 weed taxa (compiled from Abbot and Black 1980, Chape 1984, Rippey *et al.* 1999 and Storr 1961 in Rippey *et al.* 1999) (estimated >95% expected flora)

Significant Flora: *Lavatera plebeia* var. *tomentosa* (Chape 1984, not recorded by Rippey *et al.* 1999) (virtually restricted to offshore islands — Keighery, GJ, 1990a)

Seal Island

Vegetation and Flora: detailed survey (Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961)

Structural Units

Spearwood Dunes

Uplands — Tamala Limestone: Low Open Shrublands dominated by *Carpobrotus virescens* and *Frankenia pauciflora* or *Rhagodia baccata*

Quindalup Dunes

Uplands — Strand: *Spinifex longifolius* Grassland

Total Flora: 25 native taxa, 22 weed taxa (compiled from Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961 in Rippey *et al.* 1999) (estimated >95% expected flora)

Significant Flora: *Lavatera plebeia* var. *tomentosa* (virtually restricted to offshore islands — Keighery, GJ, 1990a)

Gull Island

Vegetation and Flora: detailed survey (Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961)

Structural Units

Spearwood Dunes

Uplands — Tamala Limestone: *Nitraria billardierei* Shrubland

Total Flora: 4 native taxa (Storr 1961) (estimated >85% expected flora)

Significant Flora: none recorded

Bird Island

Vegetation and Flora: detailed survey (Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961)

Structural Units

Spearwood Dunes

Uplands — Tamala Limestones: *Nitraria billardierei* Shrubland; *Lavatera plebeia* var. *tomentosa* Low Shrubland

Total Flora: 18 native taxa, 20 weed taxa (compiled from Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961 in Rippey *et al.* 1999) (estimated >95% expected flora)

Significant Flora: *Lavatera plebeia* var. *tomentosa* (virtually restricted to offshore islands — Keighery, GJ, 1990a)

Shag Rock

Vegetation and Flora: detailed survey (Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961)

Structural Units

Spearwood Dunes

Uplands — Tamala Limestones: *Nitraria billardierei* Shrubland; *Lavatera plebeia* var. *tomentosa* Low Shrubland

Total Flora: West Shag Rock — 7 native taxa, 5 weed taxa; East Shag Rock — 5 native taxa, 1 weed taxon; Middle Shag Rock — 16 native taxa, 16 weed taxa (compiled from Abbot and Black 1980, Rippey *et al.* 1998, Storr 1961 in Rippey *et al.* 1999) (estimated >95% expected flora)

Significant Flora: *Lavatera plebeia* var. *tomentosa* (virtually restricted to offshore islands — Keighery, GJ, 1990a)

Vegetation Condition: >75% Very Good, <25% Good to Degraded, with areas of severe localised disturbance

Fauna: multiple surveys for birds (50 species) (Abbott 1977; RAOU 1996 D, 4 visits), native mammals (2 species) (CALM 1992a) and reptiles (6 species) (Costa 1977). Important breeding site for 14 bird species including Little Penguin and 11 other seabirds and important habitat for at least five JAMBA/CAMBA species. Significant bird species: category 2 (5) and category 3 (1). Significant breeding population of Bridled Tern. Significant mammal species: Australian Sea-lion

Linkage: no adjacent bushland

Other Special Attributes: Specific coastal reserve criteria not applied to small islands

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Entered in the Register of the National Estate; location for JAMBA/CAMBA species; subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Maintaining ecological processes or natural systems, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

Recommendation: Site with Some Existing Protection; the existing purpose, care, control and management of Reserves 17070 and 24204 is endorsed (see Table 3, Volume 1).

PENGUIN, SEAL, BIRD AND GULL ISLANDS AND SHAG ROCK

Boundary Definition: Penguin Island - bushland taken to cadastre boundary; other islands not mapped

SECTION 1: CADASTRAL INFORMATION

(only applies to Penguin Island)

(Lots, locations and derived information to be updated in the public submission period)

Bushplan Site no. 367 **Map no.** 86 **Map sheet series ref. no.** 2033-III NE

System 6 (1983): M101 part System area bushland, only bushland described

Other Names: not known

Area (ha): total 14.6; bushland 6.1

Local Authorities (Suburb)

Zoning

Shire of Rockingham (Penguin Island)

MRS: Parks and Recreation, Waterways

Other islands not mapped

TPS: Landscape

Ownership Categories

Lot/Location/Reserve numbers (Purpose),

State Government

Street name

17070

CALM Managed Land

Reserve 24204 (Conservation of Flora and Fauna), 17070

(Recreation camping enjoyment by public for holidays

thereon and for purposes ancillary thereto)

SECTION 2: REGIONAL INFORMATION

(only applies to Penguin Island)

LANDFORMS AND SOILS

Spearwood Dunes

Tamala Limestone (Qtl: LS1)

Quindalup Dunes (Holocene dunes)

Safety Bay Sands (Qhs: S2, S13)

VEGETATION AND FLORA

Vegetation Complexes

Quindalup Dunes

Quindalup Complex

Floristic Community Types: not sampled, types not inferred

WETLANDS

No wetlands mapped

THREATENED ECOLOGICAL COMMUNITIES

Not determined

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: island, vegetated uplands

Vegetation and Flora: detailed survey (Chape 1984, CALM 1992, Storr 1961)

Penguin Island

Structural Units: mapping (Chape 1984, CALM 1992)

Spearwood Dunes - Tamala Limestones: Low Open Shrublands dominated by *Carpobrotus virescens* and *Frankenia pauciflora* or *Rhagodia baccata*; *Nitraria billardierei* Shrubland

Quindalup Dunes

Youngest Dunes: Shrublands to Closed Heath dominated by *Olearia axillaris* and *Scaevola crassifolia*, by *Alyxia buxifolia* and *Scaevola crassifolia* or by *Acacia rostellifera*

Strand: *Spinifex longifolius* and *S. hirsutus* Grassland

Total Flora: 46 native taxa, 27 weeds (Storr 1961) (estimated >85% expected flora)

Significant Flora: none recorded

Seal Island

Structural Units

Spearwood Dunes - Tamala Limestones: Low Open Shrublands dominated by *Carpobrotus virescens* and *Frankenia pauciflora* or *Rhagodia baccata*

Quindalup Dunes - Strand: *Spinifex longifolius* Grassland

Total Flora: 18 native taxa, 14 weeds (Storr 1961) (estimated >85% expected flora)

Significant Flora: none recorded

Gull Island

Structural Units

Spearwood Dunes - Tamala Limestones: *Nitraria billardierei* Shrubland

Total Flora: 2 native taxa (Storr 1961) (estimated >85% expected flora)

Significant Flora: none recorded



Bird Island

Structural Units

Spearwood Dunes - Tamala Limestones: *Nitraria billardiarei* Shrubland; *Lavatera plebeia* var. *tomentosa* Low Shrubland

Total Flora: 18 native taxa, 13 weeds (Storr 1961) (estimated >85% expected flora)

Significant Flora: *Lavatera plebeia* var. *tomentosa* (virtually restricted to offshore Islands — Keighery, GJ, 1990a).

Shag Rock

Structural Units

Spearwood Dunes - Tamala Limestones: *Nitraria billardiarei* Shrubland; *Lavatera plebeia* var. *tomentosa* Low Shrubland

Total Flora: West Shag Rock — 6 native taxa; East Shag Rock — 4 native taxa (Storr 1961) (estimated >85% expected flora)

Significant Flora: *Lavatera plebeia* var. *tomentosa* (virtually restricted to offshore Islands — Keighery, GJ, 1990a).

Vegetation Condition: >75% Very Good, <25% Good to Degraded, with areas of severe localised disturbance

Fauna: multiple surveys by Abbott (1977) and RAOU (1996 D), 4 visits, for birds (50), by CALM (1992a) for native mammals (2) and Costa (1977) for reptiles (6). Important breeding site for 14 bird species including Little Penguin and 11 other seabirds and important habitat for at least five JAMBA/CAMBA species. Significant bird species: category 2 (5) and category 3 (1). Significant breeding population of Bridled Tern. Significant mammal species: Australian Sea-lion

Linkage: no adjacent bushland

Other Special Attributes

Specific coastal reserve criteria not applied to small islands

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Listed on the Register of the National Estate; Location for JAMBA/CAMBA species

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

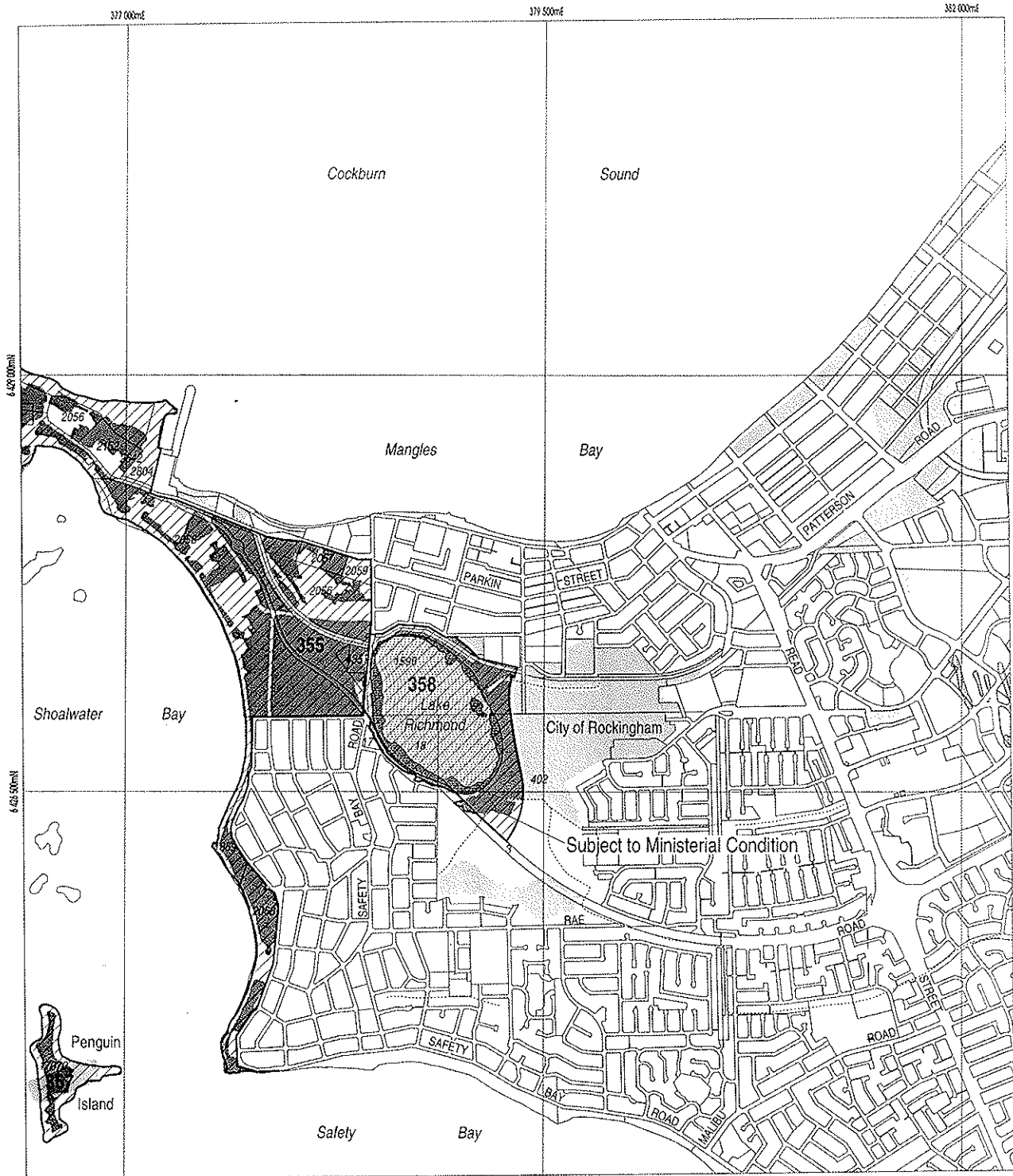
Criteria: Representation of ecological communities, Maintaining ecological processes or natural systems, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

Opportunities and/or Constraints








Opportunities: Bushplan Site/part Bushplan Site location of Scheduled Fauna; under MRS Parks and Recreation Reservation and TPS Landscape Zoning, Crown Reserve

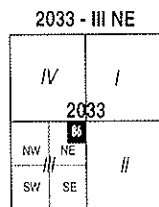
Recommendation: The existing purpose, care, control and management of Reserves 17070 and 24204 is endorsed.



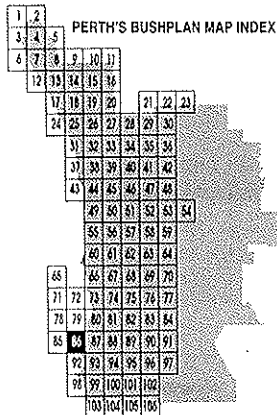


LEGEND

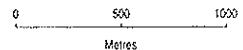
-  Bushplan Sites With Regionally Significant Bushland
-  Other Native Vegetation
-  Conservation Category Wetlands
-  Bushplan Sites With Some Existing Protection
-  Lot Number, Location Number
-  Channel Wetlands
-  Local Government Boundary



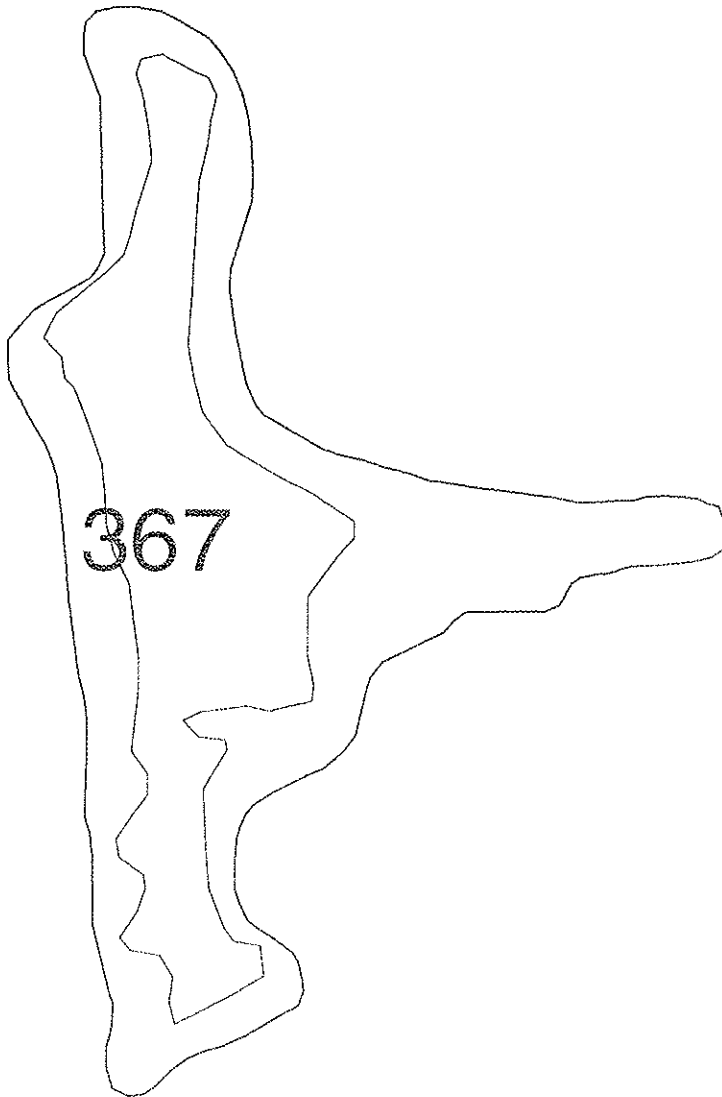
1 : 25 000 AMG Reference Grid showing Perth's Bushplan Map Sheet Breakdown



SCALE



Produced by Project Mapping Section
 Land Information Branch, Ministry for
 Planning, Perth W.A. November 1998
 ntw-map9/enviro/bushplan/bushv2_86.dgn
 Cadastral Data supplied by Department
 of Land Administration, W.A.
 Wetlands Data supplied by
 Water and Rivers Commission
 Native Vegetation Extent for Study Area
 supplied by Agriculture Western Australia



BUSHPLAN SITES CORRECTED

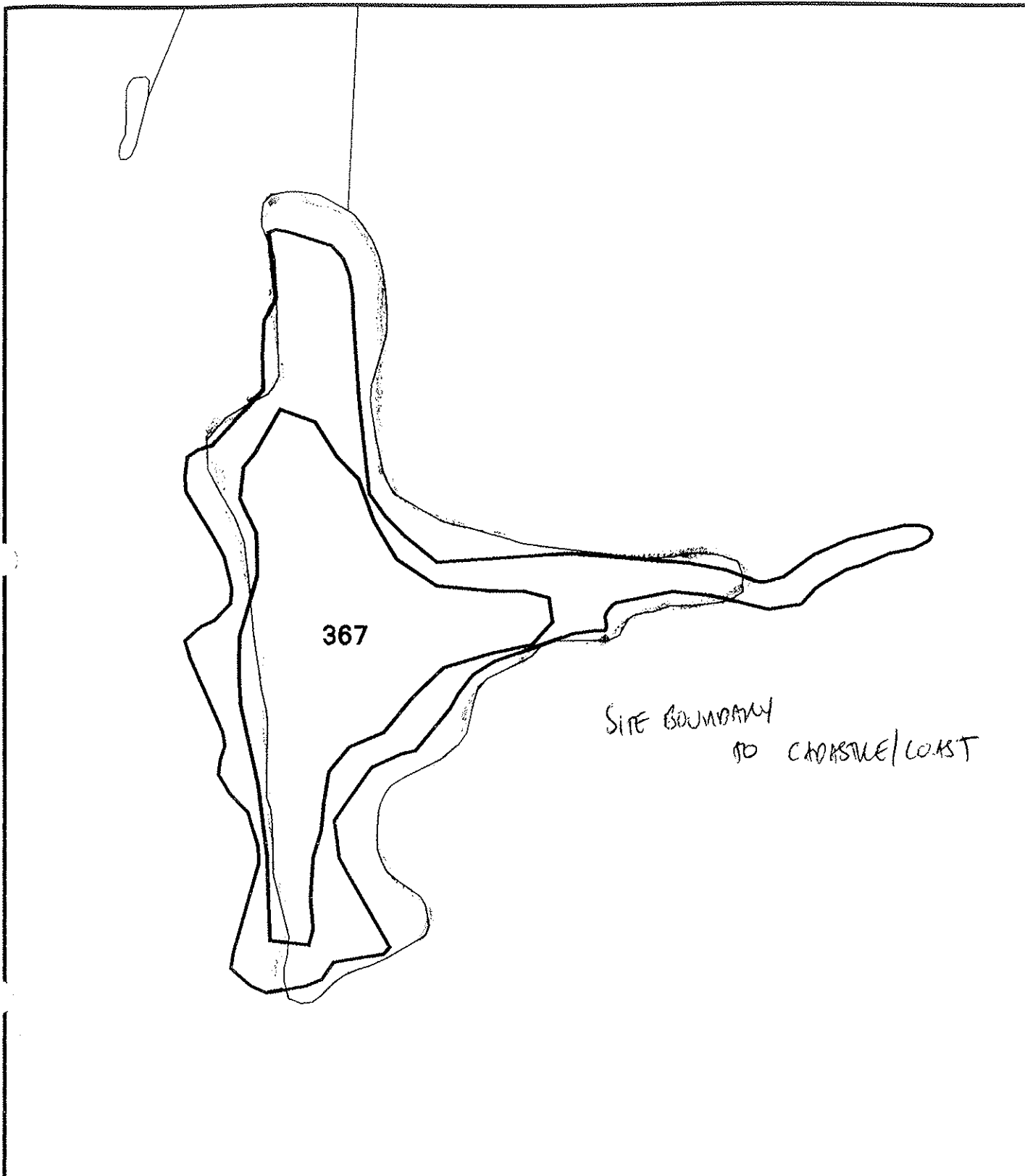


WESTERN
AUSTRALIAN
PLANNING
COMMISSION



B 12/22/21/22





SITE BOUNDARY TO CADASTRE/COAST

bp site 367

perman. full/seal ss.

AGVEG CHANGES RECAP

- Bushplan sites refno 1-500 SCP BOUNDARY THEME
- AG VEG 1998 BOUNDARY THEME
- Cadastre

SITE BOUNDARY TO CADASTRE

MFP INTERNAL USE ONLY

Prepared By: Andrea Zappacosta

Prepared For:

Map Ident: plot981002_1

Date: 02 Oct 98

Scale 1:5567

- NO AGVEG.
- USE OLD PPTA?



41

CITY OF ROCKINGHAM

Civic Boulevard, Rockingham
Western Australia

OUR REF: TP11-2-44 PM.mw
YOUR REF:

ENQUIRIES TO: Mr Monks

~~BS 379~~
367
PB170

23rd April 1999

Manager
Environmental Planning Branch
Ministry for Planning
469 Wellington Street
PERTH WA 6000

MINISTRY FOR
PLANNING
27 APR 1999
805-2-1-32PH2
FILE

Dear Sir

Re: Submission on the Draft Perth's Bushplan

I refer to your letter dated the 27th November 1998 inviting comment on the draft Perth's Bushplan. The report and plans were presented to Council at its ordinary Meeting held on the 23rd March 1999, where it was resolved to submit the following comments, which are divided into four sections:-

1. Principles and Recommendations.
2. Comments on specific sites nominated in the City of Rockingham.
3. General Comments.
4. Implementation.

1. PRINCIPLES AND RECOMMENDATIONS

The retention of regionally and locally significant bushland is an important measure that has the support of the City of Rockingham, and the draft Perth Bushplan provides important information and recommendations to achieve this objective.

The methodology used to establish which sites are of regional significance is clear, once the reporting structure of the various volumes of the documents is understood.

Council has attended a number of briefing sessions organised by the Ministry for Planning and WAMA and these sessions have played a very important role in understanding both the implications of the recommendations of Perth Bushplan, and the views of the various parties that are affected by the Report.

SUBMISSION NO. 501

- (xiii) Bushplan Site No. 367 - Penguin, Seal, Bird and Gull Islands and Shag Rock

These sites are part of the Shoalwater Islands Marine Park and are reserved in the MRS as 'Parks and Recreation'. The sites are subject to a management strategy prepared by CALM which is responsible for protection and ongoing management.

- (xiv) Bushplan Site No. [redacted] - Doghill Road Bushland, Baldivis

This site contains significant remnant vegetation and is wholly contained within private ownership. It is appropriate that Council, the Bushplan Co-ordinator and the Ministry for Planning liaise with the landowners on a negotiated planning solution that enables the retention of the significant vegetation whilst catering for the aspirations of the affected landowners.

Council's Rural Land Strategy permits subdivision of lots in the precinct within which these lots are located, to a minimum size of 2ha, however, it is a usual part of any planning process to identify physical features worthy of preservation and this should also occur in this instance.

It should be noted that Council has received copies of submissions from two of the affected landowners. Council supports the need for all the above parties to meet to determine the future development potential of the various landholdings, after taking into account the significant on-site vegetation.

- (xv) Bushplan Site No. [redacted] - Port Kennedy

The Port Kennedy area is reserved in the MRS as 'Parks and Recreation' and is an 'A' Class Reserve for Scientific Purposes. The site is also part of the Rockingham Lakes Regional Park, for which CALM is currently preparing a Management Plan.

- (xvi) Bushplan Site No. [redacted] - Anstey Swamp, Karnup

Anstey Swamp is currently reserved 'Parks and Recreation' in the MRS. The swamp is also an EPP and Conservation status sumpland and is appropriately nominated as a Bushplan site.

- (xvii) Bushplan Site No. [redacted] - Folly Pool, Baldivis

Folly Pool is vested with the Water Corporation and as such, management responsibilities should primarily rest with this authority, in consultation with other relevant authorities, including the City. The site is a nominated EPP and Resource Enhancement status sumpland.

BS 367

P/A

R. A. O. U. TRACKING DATABASE

23/06/96

PARK SIGHTINGS REPORT

Page No.

1

Shoalwater Islands M.P. (M101)

ORDER#	REF#	BIRD NAME	NO. SIGHTINGS
0054	0008	Little Penguin	2
0124	0104	Australasian Gannet	1
0129	0100	Little Pied Cormorant	2
0131	0099	Pied Cormorant	2
0133	0096	Great Cormorant	1
0141	0191	Eastern Reef Egret	2
0192	0046	Buff-banded Rail	1
0221	0152	Black-tailed Godwit	2 1
0225	0150	Whimbrel	2 1
0238	0129	Ruddy Turnstone	2 1
0240	0165	Great Knot	2 1
0265	0130	Pied Oystercatcher	2
0271	0136	Grey Plover	1
0297	0125	Silver Gull	2 3
0305	0115	Crested Tern	3
0306	0113	Roseate Tern	1
0313	0118	Fairy Tern	1
0314	0121	Bridled Tern	2
0324	0957	Rock Dove	2
0326	0988	Laughing Turtle-Dove	1
0327	0989	Spotted Turtle-Dove	1
0451	0326	Sacred Kingfisher	1
0524	0476	Inland Thornbill	3 1
0561	0608	Singing Honeyeater	3
0678	0424	Black-faced Cuckoo-shrike	1
0763	0357	Welcome Swallow	3
0765	0359	Tree Martin	2

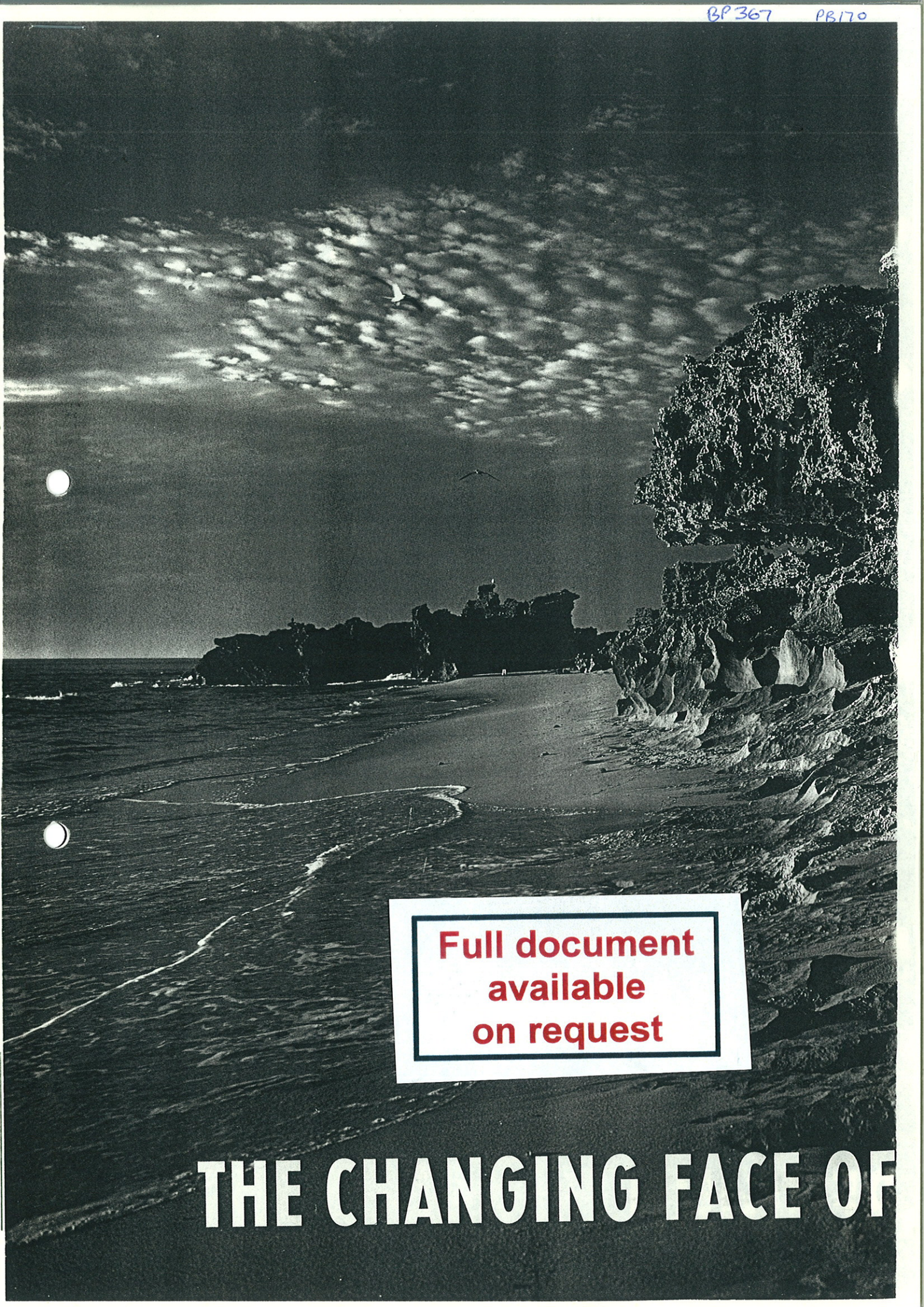
*** END OF REPORT ***

(2) 5
(3) 1

SUMMARY REPORT

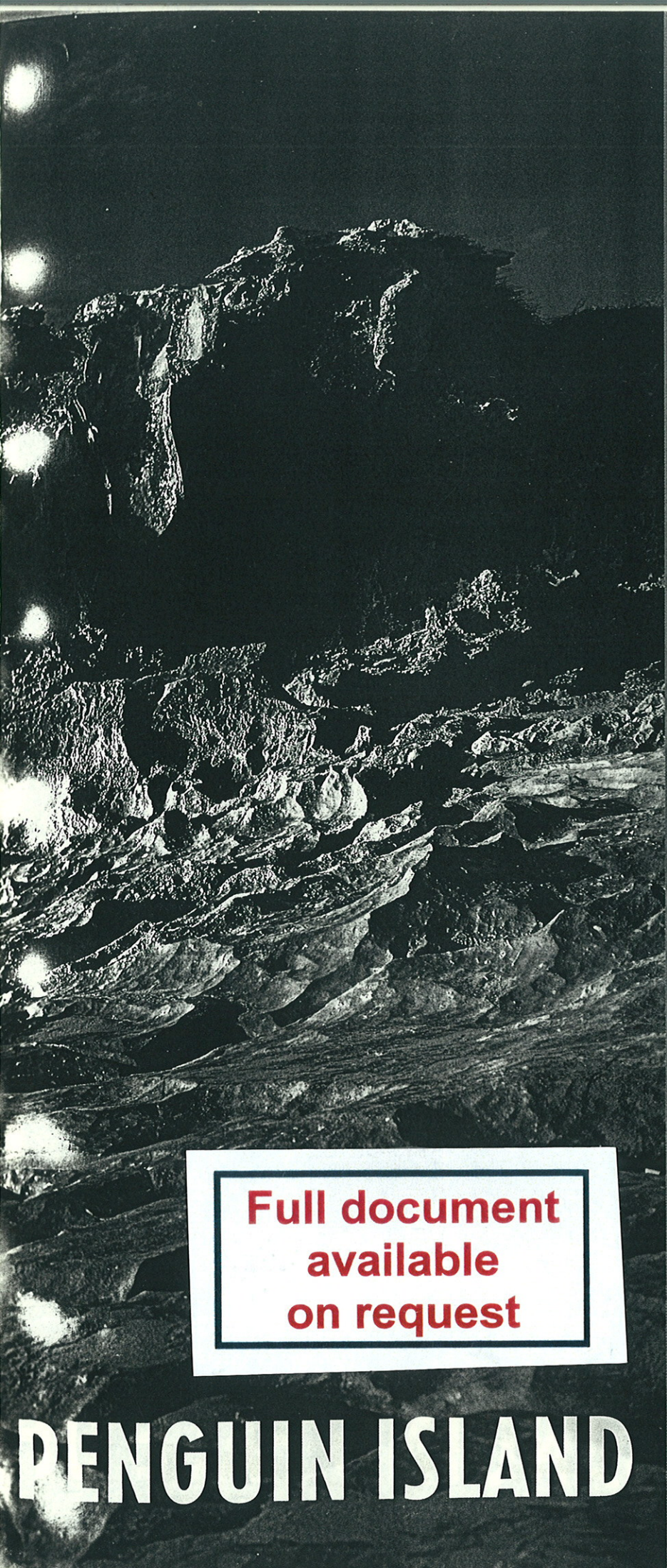
TOTAL BIRDS SIGHTED	:	27
TOTAL NUMBER OF CARDS	:	4

*** END OF SUMMARY ***



**Full document
available
on request**

THE CHANGING FACE OF



**Full document
available
on request**

PENGUIN ISLAND



Penguin Island has long been a favourite destination for those seeking a unique marine-based experience.



Over the decades, the island has seen millions of visitors and undergone dramatic changes. Now, with the construction of *The Penguin Experience—Island Discovery Centre*, the island is showing visitors a new face.

BY PETER DANS
Photos by Michael James

OCCURRENCE OF THE GHOST BAT, *MACRODERMA GIGAS*, IN THE GREAT VICTORIA DESERT, W.A.

By W. H. BUTLER, Bayswater

Hitherto the most southern recent records of live examples of the Ghost Bat, *Macroderma gigas*, in Western Australia have been from the Pilbara district (Finlayson, 1958: 923), though there was a sight observation from the Barlee Range (Robinson, 1957: 232). Sub-fossil remains in caves are known, however, as far south as Margaret River (Cook, 1960: 107).

In August-September 1961 I participated in an expedition by local naturalists to the Warburton Ranges and on August 29 collected a live specimen of the Ghost Bat in a shallow cave at Gahn-da rockhole, on the Laverton-Warburton road, approximately 65 miles south-west of the Australian Inland Mission at the Warburton Ranges.

The locality is in the "Desert Zone" described by Talbot and Clarke (1917) and recent rainfall maps give a mean annual rainfall for the region as between 6 and 8 in. The surrounding vegetation is spinifex (*Triodia*) and mulga (*Acacia aneura*). The cave was in a low "desert sandstone" (ferruginous laterite) breakaway, the opening being 12 ft. wide and 6 ft. high, expanding into a chamber 22 ft. long, 12 ft. high and 18 ft. wide, with two small tunnels extending further back. Tracks and bone remnants indicated these to be a dingo's lair.

The bat was flushed from the dark area immediately behind the entrance when I entered the cave at 11.30 a.m. It flew out of the cave and immediately returned, inspecting me whilst it was still in flight. It flew out again and I temporarily lost sight of it. I located it soon afterwards in a shallow overhang nearby just shaded from the sun. I collected it by firing a .22 calibre copper slug into the rock wall just below its head and the spatter of fragments stunned the animal sufficiently to enable me to capture it.

Particulars of the specimen, which has been lodged at the Western Australian Museum (No. M4637), are as follows: Adult male. Dimensions, length of head and body, 115 mm.; head, 53; forearm, 119; thumb, 12; 1st finger (1st joint), 87; 2nd finger (1st joint), 75; 3rd finger (1st joint), 84; 4th finger (1st joint), 88; lower leg, 51; ear, 51; tragus, 27. Colour, white underparts and wing membranes, pale grey on the back and shoulders.

This record re-opens the problem of the disappearance of the species from the more southern parts of the State. The Gahn-da locality is about 450 miles south-east of the Pilbara district, and in some of the harshest desert country in inland Western Australia. That the creature can exist here makes untenable the supposition of Wood Jones (1925: 444) that *Macroderma* disappeared from southern South Australia (he was referring to its former presence at the Carrieton Caves, east of Port Augusta) owing to increasing desiccation. Rather, it would appear, *Macroderma* in Western Australia (south of the Kimberley Division) and South

M101 BF# 367 (170)

Australia is a desert animal and its former presence in southern localities may be evidence of a more arid climatic interval at that time. Cook (1960: 108) has already offered this explanation to account for the presence of remains of the Fat-tailed Dunnart (*Sminthopsis crassicaudata*) and the Dalgite (*Macrotis lagotis*) in certain of the South-West caves. Some of the distribution maps given by Lundelius (1957) would suggest the same thing, namely that creatures (such as *Dasyercus* and *Sminthopsis hirtipes*) now found living only in distant desert areas once inhabited localities in what is now more humid country towards the South-West corner.

REFERENCES

- COOK, D. L. 1960. Some Mammal Remains found in Caves near Margaret River. *W.A. Nat.*, 7 (4): 107-108.
FINLAYSON, H. H. 1958. 'Recurrence' of *Macroderma gigas* Dobson. *Nature*, 181, March 29: 923.
LUNDELIUS, E. 1957. Additions to Knowledge of the Ranges of Western Australian Mammals. *W.A. Nat.*, 5 (7): 173-182.
ROBINSON, A. 1957. The Ghost Bat in the North-West. *W.A. Nat.*, 5 (8): 232.
TALBOT, H. W. B., and E. de C. CLARKE. 1917. A Geological Reconnaissance of the Country between Laverton and the South Australian Border. *Bull. Geol. Surv. W.A.*, 75: 1-207.
WOOD JONES, F. 1925. *The Mammals of South Australia*. Part 3. Govt. Printer, Adelaide.

THE FLORA OF THE SHOALWATER BAY ISLANDS

By G. M. STORR, Zoology Department, University of
Western Australia

INTRODUCTION

The Cape (or Point) Peron peninsula is the only portion of a north-south trending ridge of limestone that is now attached (as a tombolo) to the mainland. To the north of Cape Peron supramarine segments of the ridge constitute the present Garden and Carnac Islands, the Mewstone and the Stragglers. South from Cape Peron the ridge extends as a chain of islets and reefs to the southwestern corner of Warnbro' Sound. For geological details of this area see Fairbridge (1950) and Carrigy (1956).

The flora of Garden and Carnac Islands have been listed by McArthur (1957). The flora of the southern islands is described herein for the first time. All the islands forming the western boundary of Shoalwater Bay are vegetated. The rocks and islets stretching south from Penguin Island to the Seven Sisters were scanned from the former with field glasses and appeared devoid of plant-life.

A series of islands, such as Bird, Gull, Seal, Shag and Penguin, which vary in size and number of habitats, illustrates the process of floristic impoverishment in shrinking land masses. The larger islands, Penguin and Seal, with their beaches and dunes support a moderately rich flora. As the islands decrease in area from about three to two acres, especially when their longer axis as in Shag and Bird is east-west, dunes and beaches are swept away with

ensuing loss of several plant species. Further reduction in area results in the extinction of the last remnants of sclerophyllous shrubbery, and the process is complete when such hardy lithophytes as *Carpobrotus* and *Nitraria* disappear.

Another fruitful field is the effect on the vegetation of hordes of nesting and roosting seabirds. This aspect will be dealt with separately by Dr. Mary Gillham who accompanied the writer on the islands in October 1959.

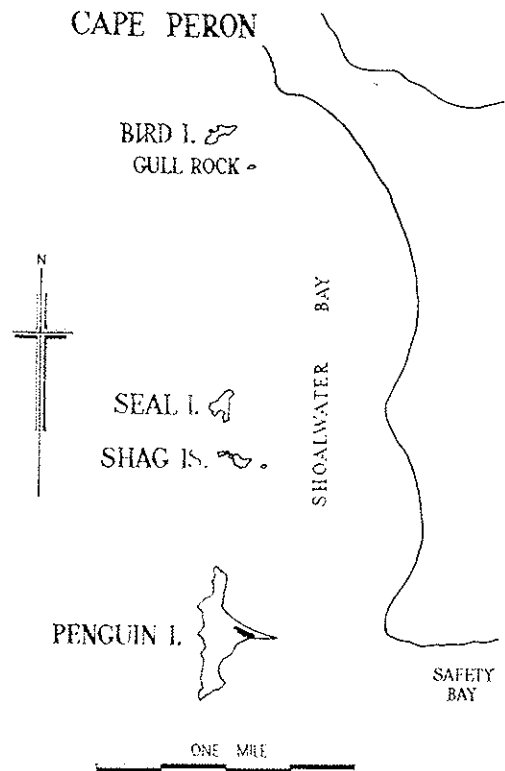


Fig. 1.—Map of islands south of Cape Peron. The extent of the settlement on Penguin Island is indicated by hachuring.

BRIEF DESCRIPTION OF THE ISLANDS

Penguin is by far the largest and most varied island in the group. In its orientation, shape and physiography, it is a small replica of Garden Island. The northern and southern headlands are rocky. The centre is covered with dunes whose western slopes are unstable and much of this area is blown out, the freshly exposed sand being reddish as on Garden Island. The steep sheltered eastern slopes of white sand are stable and heavily vegetated. To the east of the dunes a beach has been formed, which extends as a spit towards the mainland.

Shag Island has recently been fragmented into three unequal portions, herein referred to as West, Middle and East Shag. Owing to their east-west trend they lack dunes and beaches. The largest is Middle Shag, the top of which is a plateau gently dipping to the north and thinly covered with soil. Below the plateau on the northern side is a sand scree remarkable for a small but tenacious stand of *Myoporum insulare*. The southern face of the island is largely composed of rock falls interspersed with shelves of sand.

Seal Island consists of three rocky headlands (in the north, southwest and southeast) connected by a sandy saddle, in the lee of which a small beach has formed. Of the smaller islands its physiography is the most varied, as is consequently its vegetation.

Though a little larger and higher, Bird Island is very similar in orientation and physiognomy to Shag Island. Its plateau dips to the north and its western end is in process of being dismembered. Its eastern satellite is similar to East Shag but is further removed and has received a separate name—Gull Rock.

ISLAND HABITATS

1. **Honeycombed rock with soil restricted to cracks and depressions.** This comprises the whole of the smallest islands and the windward cliffs of the larger. *Nitraria schoberi* and *Carpobrotus aequilaterus* are usually the only plants present. *Salicornia australis*, *Sporobolus virginicus* and *Wilsonia backhousei* are rare and local in shallow depressions on rock edges drenched with spray.

2. **Talus slope.** Where undercut cliffs fall in sheltered situations there accumulate rock debris of various size together with sand formed locally by weathering of freshly-exposed soft limestone. Characteristic plants: *Nitraria*, *Carpobrotus*, *Enchylaena tomentosa*, *Threlkeldia diffusa*, *Tetragonia implexicoma*, *Calandrinia calypttrata*, *Senecio laetus*, *Bromus* spp., *Apium australe* and *Solanum nigrum*.

3. **Level or gently sloping rock with a thin mantle of soil.** This is typically represented by the plateau-like tops of the larger islands, and is the principal site of the gull rookeries. Characteristic plants: *Carpobrotus*, *Lavatera plebeia*, *Lepidium foliosum*, *Malva parviflora*, *Hordeum leporinum*, *Melilotus indica*, *Medicago denticulata*, and (where the soil is deeper) *Rhagodia baccata*. Where there are few or no surface-nesting sea-birds, as on Penguin Island, sclerophyllous species may be present, e.g. *Frankenia pauciflora*, *Scaevola crassifolia*, *Angianthus cunninghamii* and *Scirpus nodosus*.

4. **Foredunes.** Raised beaches occur only on the eastern side of the larger and north-south orientated islands, viz. Penguin and Seal; on the latter their extent is limited. Characteristic plants: *Cakile maritima*, *Arctotheca nivea*, *Tetragonia zeyheri*, *Salsola kali*, *Spinifex longifolius* and *Atriplex cinerea*.

5. **Windward slope of dunes.** Restricted to Penguin Island. Characteristic plants: *Spyridium globulosum*, *Alyxia buxifolia* and *Conostylis candidans*. Blowouts are common and there are extensive areas of bare sand near the central western coast.

6. **Leeward slope of dunes.** The sheltered eastern slopes of the dunes on Penguin Island are covered with *Acacia rostellifera* scrub. The habitat is absent on the other islands except for a slight development in the lee of the southwestern headland of Seal, where however there is no great depth of sand and the prevailing vegetation is a low, dense, wind-pruned thicket of *Pittosporum phillyraeoides*.

TABLE 1.—AREA, APPROXIMATE ALTITUDE AND HABITATS OF EACH ISLAND

island	area (acres)	altitude (feet)	niches present
Penguin	29.4	60	1,2,3,4,5,6
Seal	3.0	30	1,2,3,4,6
Bird	2.2	35	1,2,3
Middle Shag	1.1	30	1,2,3
West Shag	0.4	20	1,2,3
East Shag	0.1	15	1,3
Gull	0.1	10	1

ANNOTATED LIST OF PLANTS

Exotic species are prefixed with an asterisk.

GRAMINEAE

- **Stenotaphrum secundatum* (Walt.) O. Kuntze. "Buffalo grass" is established on the east side of Penguin in the vicinity of the settlement.
- Spinifex longifolius* R. Br. Coarse perennial grass, dominant above the eastern beaches of Penguin and Seal.
- Spinifex hirsutus* Labill. Coarse perennial grass, above beach at Penguin (rare).
- **Ehrharta longiflora* Sm. Annual grass. Penguin.
- Stipa variabilis* Hughes. Perennial tussock-grass. Penguin (dunes).
- Sporobolus virginicus* (L.) Kunth. Rare couch-like perennial grass growing near top of sea-sprayed cliffs. Penguin, Seal.
- **Avena fatua* L. "Wild oats." Penguin.
- Poa caespitosa* Forst. Perennial tussock-grass. Penguin (dunes).
- **Poa annua* L. Annual grass. Penguin, Seal, Bird.
- **Vulpia myuros* (L.) Gmel. Annual grass. Penguin.
- **Bromus gussonii* Parl. Annual grass. Penguin, Middle Shag, Seal.
- Bromus arenarius* Labill. Annual grass. Penguin, Middle Shag, Seal, Bird.
- **Brachypodium distachyon* (L.) Rolm. and S. Annual grass. Penguin.
- **Lolium rigidum* Gaud. "Wimmera rye-grass." Penguin, Seal, Bird.
- **Parapholis incurva* (L.) Hubb. Annual grass. Penguin.
- **Hordeum leporinum*. Link. "Barley-grass." Common in gull rookeries: Middle Shag, Seal, Bird.

CYPERACEAE

- Scirpus nodosus* Rottb. Tall perennial sedge. Penguin.
- Scirpus antarcticus* L. Small annual sedge. Penguin (common in dunes).
- Lepidosperma gladiatum* Labill. "Sword-rush." Penguin (common above beach).

LILIACEAE

- **Anthericum divaricatum* Jacq. Perennial herb. Above beaches: Penguin, Seal.
- Acanthocarpus preissii* Lehm. Sclerophyllous, subfruticose perennial. Penguin (dunes). Seal (2 plants only).

AMARYLLIDACEAE

- Conostylis candicans* Endl. Perennial herb. Penguin (windward slope of dunes).

URTICACEAE

- Parietaria debilis* G. Forst. Annual herb. Penguin, Middle Shag, Seal, Bird.

POLYGONACEAE

- Muehlenbeckia adpressa* (Labill.) Meisn. Perennial twiner. Penguin (above beach and on dunes).

CHENOPODIACEAE

- Rhagodia baccata* (Labill.) Moq. Succulent shrub. Penguin, Middle Shag, Seal, Bird.
- **Chenopodium murale* L. Annual herb. Middle Shag (common on northern talus slope), Bird (rare).
- Atriplex cinerea* Poir. Succulent shrub. Seal (above beach).
- Salsola kali* L. Annual herb. Above beaches: Penguin, Seal.
- Enchylaena tomentosa* R. Br. Spreading succulent shrub, common on talus slopes. Penguin, Middle Shag, Seal, Bird.
- Threkeldia diffusa* R. Br. Ascending succulent perennial. All islands except Gull (common on rock and talus).
- Salicornia australis* Banks and Sol. Ascending succulent perennial. Penguin (top of northwestern cliffs).

AIZOACEAE

- Carpobrotus aequilaterus* (Haw.) N.E.Br. Succulent perennial. All islands (common).
- **Carpobrotus edulis* (L.) N.E.Br. Succulent perennial, established in the settlement, Penguin.
- Tetragonia implexicoma* (Miq.) Hook. f. Succulent perennial, common on talus. Penguin, Middle Shag, Seal.
- Tetragonia zeyheri* Fenzl. Succulent perennial, common above beaches. Penguin, Middle Shag (rare). Seal, Bird (northern slopes).

PORTULACACEAE

- Calandrinia calyptata* Hook. f. Prostrate succulent annual, common on talus. Penguin, Middle and West Shag, Seal, Bird.

CARYOPHYLLACEAE

- **Cerastium viscosum* L., **Stellaria media* (L.) Vill., **Spergularia rubra* (L.) J. and C. Presl., **Polycarpon tetraphyllum* Loef. Small annual herbs in dunes. Penguin.

RANUNCULACEAE

- Clematis microphylla* DC. Woody climber in *Acacia rostellifera* scrub. Penguin.

LAURACEAE

- Cassytha racemosa* Nees. Perennial climber, on *Acacia rostellifera*, Penguin.

CRUCIFERAE

- **Sisymbrium orientale* L. Annual herb. Penguin, Middle Shag, Seal, Bird.
- Lepidium foliosum* Desv. Annual or short-lived perennial herb, common in gull rookeries. Middle Shag, Seal, Bird.
- Cakile maritima* Scop. Annual herb. Above beaches: Penguin and Seal.
- Hymenolobus procumbens* (L.) Nuttall. Small annual herb. Talus: Seal.

CRASSULACEAE

- Crassula colorata* (Nees) Ostenf. Small annual herb. Penguin (dunes), Seal and Bird (sandy talus).
- Crassula pedicellata* (F.v.M.) Ostenf. Small annual herb. Penguin (*Acacia rostellifera* scrub).

PITOSPORACEAE

- Pittosporum phillyraeoides* DC. Shrub. Penguin (rare), Seal (dense thicket).

LEGUMINOSAE

- Acacia cyclops* A. Cunn. Shrub. Penguin (a single clump in open *Spyridium-Alyxia*).
- Acacia rostellifera* Benth. Tall shrub. Penguin (forms dense scrub on leeward slope of sand-dunes), Bird (northern slopes).
- **Melilotus indica* (L.) All. Annual herb. Penguin, Middle Shag, Seal, Bird.
- **Medicago denticulata* Willd. Annual herb. Penguin, Seal, Bird.

GERANIACEAE

**Erodium cicutarium* (L.) L'Her. Annual herb. Gull rookeries: Middle Shag, Seal, Bird.

OXALIDACEAE

Oxalis corniculata L. Small annual herb. Penguin (shallow soil over limestone, rare).

ZYGOPHYLLACEAE

Nitraria schoberi L. Spreading succulent shrub, common on rock and talus, all islands.

Zygophyllum billardieri DC. Succulent scrambling herb. Seal (in sand among Rhagodia), Bird (sandy eastern top of western sector).

RHAMNACEAE

Spyridium globulosum (Labill.) Benth. Shrub. Penguin (windward slope of dunes).

MALVACEAE

**Lavatera arborea* L. Tall perennial herb. Bird (a few with *L. plebeia*, western sector).

Lavatera plebeia Sims. Tall perennial herb. Gull rookeries: East, Middle and West Shag, Seal, Bird.

**Malva parviflora* L. Annual herb. Gull rookeries: Middle Shag, Seal, Bird.

FRANKENIACEAE

Frankenia pauciflora DC. Small ericoid shrub. Shallow soil over limestone, especially above western cliffs: Penguin, Seal.

UMBELLIFERAE

Apium australe Pet.-Thou. Annual herb. Talus: Penguin, Middle Shag, Seal, Bird.

PRIMULACEAE

**Anagallis femina* Mill. Annual herb. Penguin (dunes).

APOCYNACEAE

Alyxia buxifolia R.Br. Shrub. Penguin (windward face of dunes).

CONVOLVULACEAE

Dichondra repens R. and G. Forst. Small, stoloniferous herb. Penguin (shallow sand over limestone).

Wilsonia backhousei Hook. Small, ascending, shrublet. Penguin (a single colony in a sea-sprayed depression near top of northwestern cliffs).

SOLANACEAE

**Solanum nigrum* L. Herb. Penguin, Middle Shag, Seal, Bird.

Anthocercis littorea Labill. Short-lived, mesophyllous shrub. Penguin (2 plants at eastern foot of dunes).

SCROPHULARIACEAE

**Dischisma arenarium* E. Mey. Annual herb. Penguin.

MYOPORACEAE

Myoporum insulare R. Br. Woody shrub with semi-succulent leaves. Penguin, Middle Shag, Seal, Bird.

GOODENIACEAE

Scaevola crassifolia Labill. Low, spreading shrub with semi-succulent leaves. Penguin (a few plants above southwestern cliffs).

COMPOSITAE

**Erigeron canadensis* L. Annual herb. Penguin.

Olearia axillaris (DC.) F.v.M. Shrub. Penguin (dunes), Seal (above beach), Bird (a few plants near top).

Senecio lautus Soland. Herb. Sandy talus: Penguin, Middle and West Shag, Seal, Bird.

**Arctotheca nivea* (L.) Hoffm. Annual herb. Seal (a few on beach).

**Arctotheca calendula* (L.) Levyns. Annual herb. Penguin, Seal, Bird.

Helichrysum cordatum DC. Perennial herb. Penguin (a few plants above beach).

Angianthus cunninghamii (DC.) Benth. Shrub. Penguin (a few plants in southwestern dunes).

**Carduus tenuiflorus* Curtis. Annual herb. Penguin (on sand in sheltered situations).

**Hypochoeris radicata* L. Annual herb. Penguin.

**Sonchus oleraceus* L. Annual herb. Penguin, Middle Shag, Seal, Bird.

TABLE 2.—CATEGORIES OF PLANTS ON EACH ISLAND

	Penguin	Seal	Bird	Middle Shag	West Shag	East Shag	Gull
Sclerophytes	22	7	3	1	0	0	0
Mesophytes	4	2	2	2	1	1	0
Succulents	8	9	7	7	3	3	2
Annuals	11	9	6	5	2	0	0
Total Indigenous	1+45	27	18	15	6	4	2
Exotics	27	14	13	9	0	0	0
Total Flora	72	41	31	24	6	4	2

DISCUSSION

When the number of indigenous species per island is plotted against the logarithm of its area, as in Fig. 2, the relationship is seen to be linear, which indicates a generally even rate of plant extinction with diminishing area.

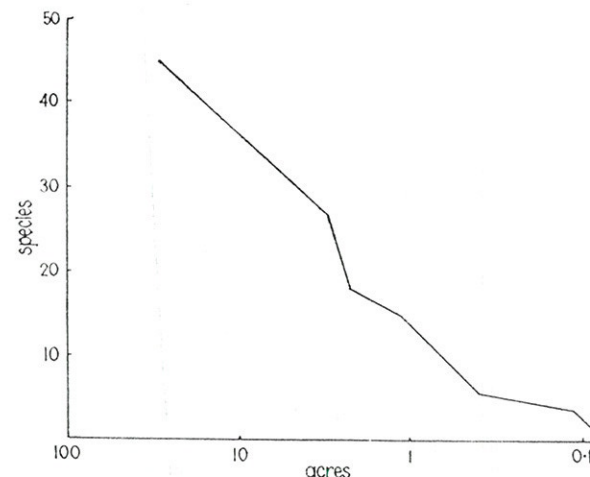


Fig. 2.—Number of plant species graphed against area of island (the scale of the latter is logarithmic).

The gradient is steepest between Seal and Bird, i.e. when area (aggravated by unfavourable orientation) becomes too small for the maintenance of dunes and beaches. These latter are the principal niches respectively for sclerophyllous shrubs and grasses (with sedges); consequently floristic disparity between Seal and Bird Islands is greatest in number of sclerophytes.

On the other hand the effect of diminishing area on number of succulent species is not nearly so marked, indeed Seal Island has

9 species against 8 on Penguin, which is ten times as large. The extinction rate for other plant categories lies between these extremes, the result of which is a steady change in composition of the flora, as well as its general impoverishment, as the islands diminish in area. For example, on Penguin Island sclerophytes comprise nearly half the indigenous flora; on Seal, Bird and Middle Shag their proportion is respectively 26, 17 and 7%.

Opportunity for exotic species to establish themselves likewise declines as the islands (and their number of niches) become smaller.

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FROM FIELD AND STUDY

Children's Python Preying on Free-tailed Bat.—On June 26, 1960, in a cave on Mt. Anderson, 70 miles south-east of Derby, I noticed a Children's Python (*Liasis childveni*) crawling along a rock ledge 20 ft. above the floor. Almost as soon as I saw the snake it struck at a Free-tailed Bat (*Taphazous georgianus*), secured a grip and coiled about it. The bat soon weakened and fell. The two creatures landed at my feet and when I picked them up the bat was dead. I carried them back to our camp a mile away and the snake did not release its hold until it was placed in a collecting bag. The snake measured 18 in. in length.

—PETER SLATER, Derby.

White Ibis in the South-West.—The White Ibis (*Threskiornis aethiopicus*) has made its appearance once more in the Murray District. In the irruption of 1952, when there was a large influx of the Straw-necked Ibis into this area, White Ibis were seen. This year beside the usual 30-50 resident Straw-necked Ibis there has been an influx of ibis presumably from the north but not so many as in 1952. In July 1961 Colin Paterson saw a White Ibis among 20-30 birds two miles north of Pinjarra. On August 9 Fred Grantham saw a White Ibis with black head and black tip to wing in a flock of 20-30 birds two miles west of Coolup. I have not heard of any other species which was noted in the southern irruption of 1952 (*W.A. Nat.*, 3: 177-196) having been seen this year.

—ANGUS ROBINSON, Coolup.

Pheasants Feeding on Snails at Rottneest I.—On October 9, 1960 a hen Pheasant (*Phasianus colchicus*), a species introduced on Rottneest Island, struck a power line after a high speed take off and dropped dead. The crop seemed unduly swollen and hard. On examination I found it to be crammed with snails (*Theba pisana*).

This confirms the observation of Serrenty and Storr (*W.A. Nat.*, 8 1959: 196).

Pheasants also eat the dune snail, *Cochlicella acuta*. On March 30, 1961 I was brought a hen pheasant killed when it flew into a wire fence near the water catchment. Its crop was filled with the small shells of *Cochlicella*. Mr. George Dittmer, lighthouse keeper, told me that the crop of a hen pheasant killed recently when it flew into a wireless aerial was also crammed with dune snails.

—W. A. FARMER, Rottneest Island.

Calls of the Boobook Owl (*Ninox novaeseelandiae*). Two observations which I made on the Peel Estate in September-October 1936 may possibly throw some light upon the function of the calls described by Eric Lindgren (*W.A. Nat.*, 8: 207) and by G. Storr (*W.A. Nat.*, 4: 143).

Twice I tried to locate a calling bird and on each occasion a persistent "normal" call was modified to a rapid and sustained "cook-cook-cook", the usual measured "boo-book" being resumed after my withdrawal from the vicinity.

More recently, December 29, 1960, when my son Lindsay and I were camped in the Porongorups, the "book-book-book" call was heard followed by a muffled "boo-book" which developed into the characteristic call. In this case the bird may have been influenced by our proximity.

In the foregoing paragraphs I have followed the relevant field notes in rendering the call as "cook-cook" in one place and "book-book" in the other. This is not significant.

Twice in January 1951, at Wooroloo, we heard atypical calls. In the first instance two birds were calling and I recorded—rather vaguely—that the calls were "obviously *Ninox* but not typical being almost tri-syllabic", and a few days later my son saw and heard a Boobook Owl, "the call being quite distinct from that usually associated with the species." I saw the bird only.

From these records it would seem that there are at least two variants of the well-known "book-book" call.

—ERIC H. SEDGWICK, Collie.

Possible Predation by a Lycosid Spider on a Vertebrate.—While collecting at Culham in September 1960 I turned over a stone and a small grey skink (possibly *Ablepharus* sp.) ran out. It was immediately seized by a spider (which was later identified by B. Y. Main as a juvenile *Lycosa*, possibly *L. leuckartii*).

The lizard as it struggled shed its tail. The spider then dropped its victim and pounced on the wriggling tail and the lizard made its escape into a pile of rocks.

This instance of possible predation adds to the list of spiders preying on vertebrates reported by Main and Butler (*W. Aust. Nat.*, 7, 1959: 52).

—P. McMILLAN, Guildford.

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THE CHANGING FLORA OF THE SHOALWATER BAY ISLANDS

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ABSTRACT

A survey on the flora of the Shoalwater Bay islands was conducted and compared with previous surveys dating back to 1959. Vegetation cover has varied on Penguin Island, as assessed by examination of aerial photographs, but is now in reasonable condition. Penguin Island has shown some turnover of species, especially annual aliens, but total species numbers have changed little. There has been a serious loss of species on the smaller islands with total devegetation of West Shag Island. Reduction in species variety seems most serious in Seal Island and Bird Island where there has been marked loss of native perennial species. In these two islands there has been extensive influx of aliens with large forests of *Lavatera arborea*, over 2 metres in height, and smaller stands of *Malva parviflora* which have replaced the original vegetation. Invasion by these weeds and others is noticeable on Penguin Island but is proportionately less. African Boxthorn (*Lycium ferocissimum*) has been noted for the first time on Penguin Island.

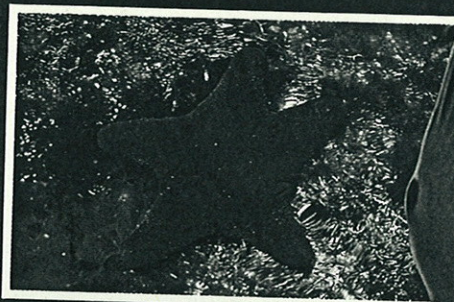
INTRODUCTION

The Shoalwater Bay Islands include Penguin Island, which with an area of 12.5 hectares is by

far the largest, and then in descending order of size, Seal Island, Bird Island, Middle, West and East Shag Islands and Gull Rock. There are also a few smaller

BS 355
POINT PERON
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Penguin Island Draft Management Plan

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