



DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

REPORT No 21

Published by the Director of Fisheries and Wildlife, Perth,
under the authority of the Hon. Minister for Fisheries and Wildlife

A Resource Survey of Woody Island, Archipelago of the Recherche

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WESTERN AUSTRALIA

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R E P O R T

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1976

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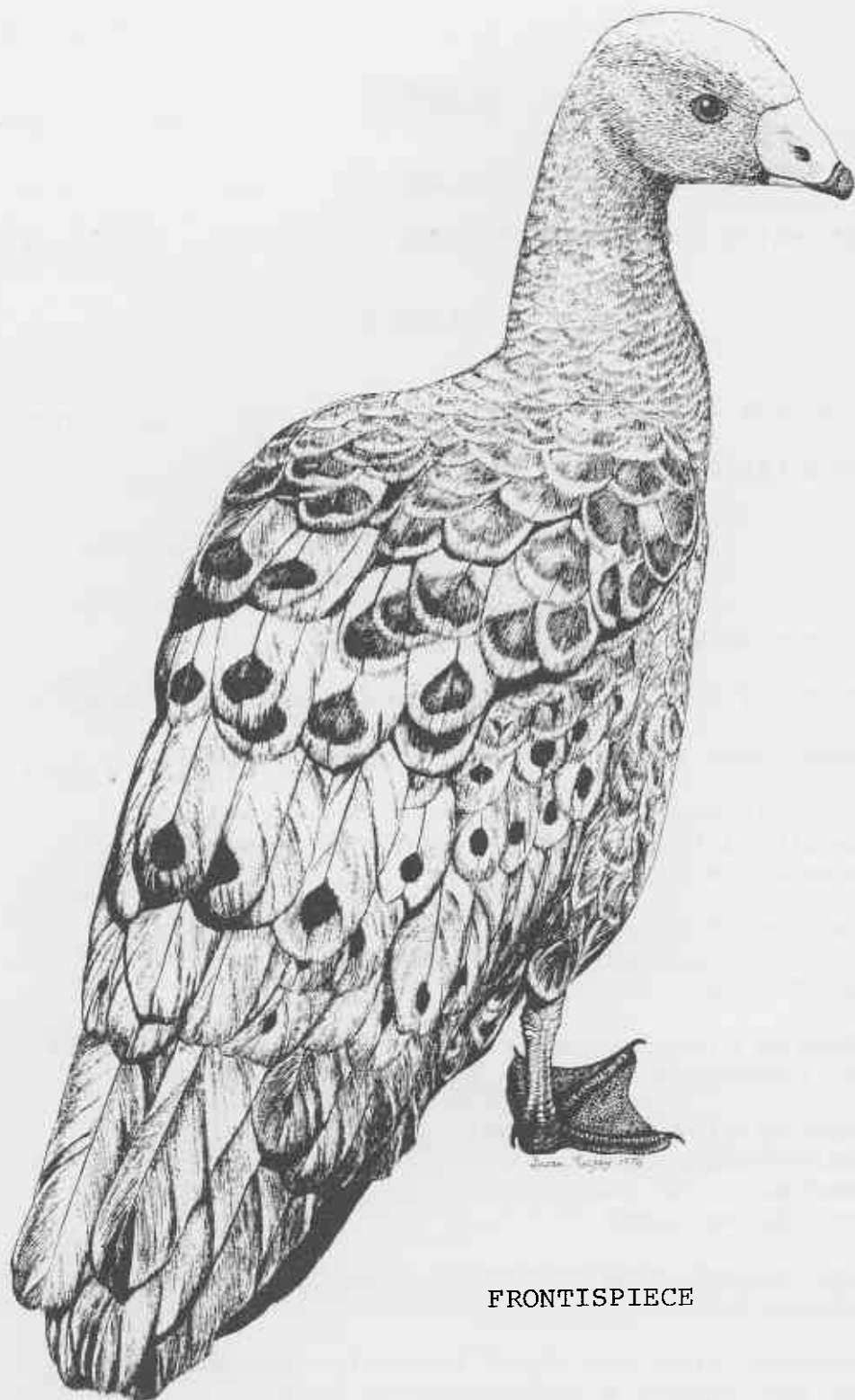
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FRONTISPIECE

Woody Island provides habitat for the Cape Barren Goose (*Cereopsis novaehollandiae*) an endangered species in Western Australia.

A RESOURCE SURVEY OF WOODY ISLAND, ARCHIPELAGO OF THE RECHERCHE.

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ABSTRACT

A resource survey of Woody Island was undertaken by the three authors from 26 October, 1975 to 3 November, 1975.

The island has some unusual faunal and floral features not yet recorded for the Archipelago. These are discussed.

Some problems in relation to the island's management are identified.

I INTRODUCTION

Woody Island is a relatively small island (240 ha approximately), and is part of a larger A class nature reserve No. A22796 (The Archipelago of the Recherche), comprising approximately 1,500 obstacles which lie off Western Australia's south coast opposite Esperance. This reserve is vested in the Western Australian Wildlife Authority, and is managed by the Department of Fisheries and Wildlife. The island is approximately 9 kilometres south of Esperance at 133° 58'S, 122° 01'E, and lies within Esperance Bay. The island is notable for tall stands of eucalypts on its eastern side for which it was named.

The W.A.W.A. recently decided to allow tourist use of the island because it has been said that the island is biologically depauperate. Esperance has a resident population of approximately 8,000 people and, at peak holiday periods, the town accommodates 5,000 tourists. As the State's population increases, then tourist use of the town will correspondingly increase. Consequently, demand for tourist use of Woody Island can also be expected to increase.

Tourist use of such a small fragile island would have to be subject to a plan of management, and the island has not been surveyed intensely in recent times. Consequently, the objective of the present survey was to collect adequate resource data that could be used as a basis for a management plan to accommodate tourist use of the island.

Recent scientific visits to the island have been few and of short duration. Unfortunately, they also occurred soon after the vegetation had been burnt (Basset Hull (1922); Australian Geographical Society, (1950)). There has been speculation that Woody Island was visited by the D'Entrecasteaux expedition in 1792, and is the type locality for the six plants collected by Labillardiere from the Recherche Archipelago during that expedition (Willis (1953)). Robert Brown in 1802 and George Maxwell in 1863 also visited the Archipelago but not Woody Island and a number of botanists have collected on the adjacent mainland.

At the time of the A.G.S. visit in 1950 Willis states that,

"... only the most meagre data existed concerning the flora" (p.5).

That expedition visited 20 islands and collected 240 indigenous flowering plants and ferns, 35 naturalized weeds, 22 bryophytes, 36 fungi, 22 lichens and 48 algae. The plant list included 46 new records for Western Australia. The expedition landed at the north-eastern corner of Woody Island shortly after it had been entirely burnt and following years of stock grazing and timber cutting. The inspection was cursory and recorded 27 exotics and regrowth of a few native species.

Basset Hull (1922), D.L. Serventy (1947), and V.N. Serventy (1952) have visited Woody Island as ornithologists and collectively recorded 14 bird species compared to 57 for the Archipelago. V.N. Serventy (1953) also recorded mammals and reptiles (Glauert (1954)), but found only the Ship Rat *Rattus rattus alexandrinus* and the Marbled Gecko *Phyllodactylus marmoratus* on Woody Island.

The present survey collected 121 plant species including one possible new species, 58 new records for the island and 21 new records for the Archipelago. Also recorded were 5 species of reptiles, 20 bird species including 6 nesting records and two new records for the Archipelago and 2 mammals (one a new record and two introduced species). In addition, although no systematic invertebrate surveys were made, two spiders, *Arachnura higginsii* and *Delena cancerides*, were identified.

II GEOGRAPHY

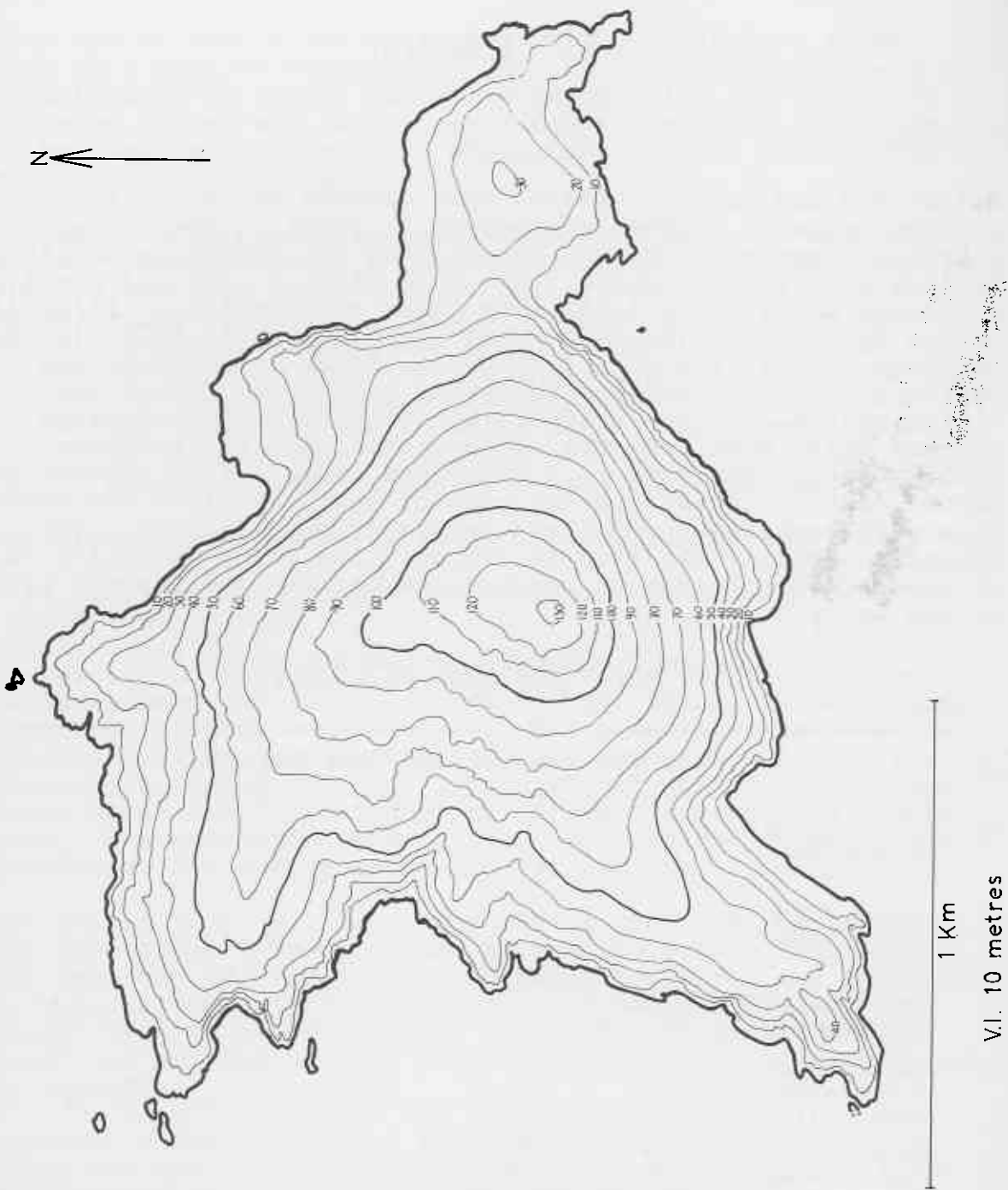
CLIMATE

Fairbridge and Serventy (1954) have already described the weather patterns of the Archipelago in detail. There are no permanent weather stations, but figures for Esperance and Israelite Bay are representative. The data given in Table I are a synthesis of data available from those two stations. Rainfall ranges from 508 to 762 mm per year, and most rain falls in the southern winter from June to August. Woody Island receives westerly winds for most of the year, especially during the winter months, and the weather is dominated by low pressure systems which move from the south-west across the southern Indian Ocean. The summer is short and extends from January to March. Anticyclones from the tropics partly replace the westerlies with easterlies which are generally much lighter. The dominant westerly air flow is probably the major causative factor of vegetation differences between the western and eastern sides of the island.

Table I. Climatic Data from Esperance
(Bureau of Meteorology)

No. Years		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
30	Average daily maximum temperature (°C)	25	25	24	22	20	17	17	17	19	20	22	24
30	Average daily minimum temperature (°C)	15	16	15	12	10	8	7	8	9	10	12	14
30	Monthly mean temperature (°C)	20	20	19	17	15	13	12	12	14	15	17	19
30	Average index of mean relative humidity (%)	70	69	72	75	77	77	77	77	72	73	71	70
44	Average daily 3 pm relative humidity (%)	63	64	64	65	64	65	65	62	63	64	64	63
30	Average monthly rainfall (mm)	20	18	32	49	92	100	107	95	66	52	25	22

FIGURE 1 CONTOUR MAP OF WOODY ISLAND



TOPOGRAPHY

The geology and land forms of Esperance Bay and its islands have been previously discussed by Morgan and Peers (1973). This section is based on their work.

Woody Island is 'Y' shaped (Figure I). It is 2.5 kilometres long. The foot of the 'Y' is the eastern headland and is much lower than the remaining part, which rises to 130.5 metres. The island's coastline is precipitous, and rocky cliffs rise to 30 metres from the ocean. The island's bedrock is of "precambrian migmatite, with alternating bands of mixed rock composed of lath granite and garnet gneiss". The bedrock is covered by a thin mantle of soil. The island features permanent water, with two streams on the western side and a dammed freshwater spring on the eastern headland. Another surface feature is the exposure of large rounded outcrops of bedrock.

Landforms have been moulded by climate, as well as a number of variations in sea level since the Eocene when the sea level fell from a much higher to a much lower level than present. Such variations are shown by wave cut benches throughout the Archipelago, above and below present sea level. Sea level remained relatively stable over the Pleistocene. During the Recent (from 20 000 to 5 000 years ago), the sea reached its present level.

SOILS

The island's bedrock is covered by an acid (pH 4 to 5) soil of varying proportions of sand and decaying bedrock.

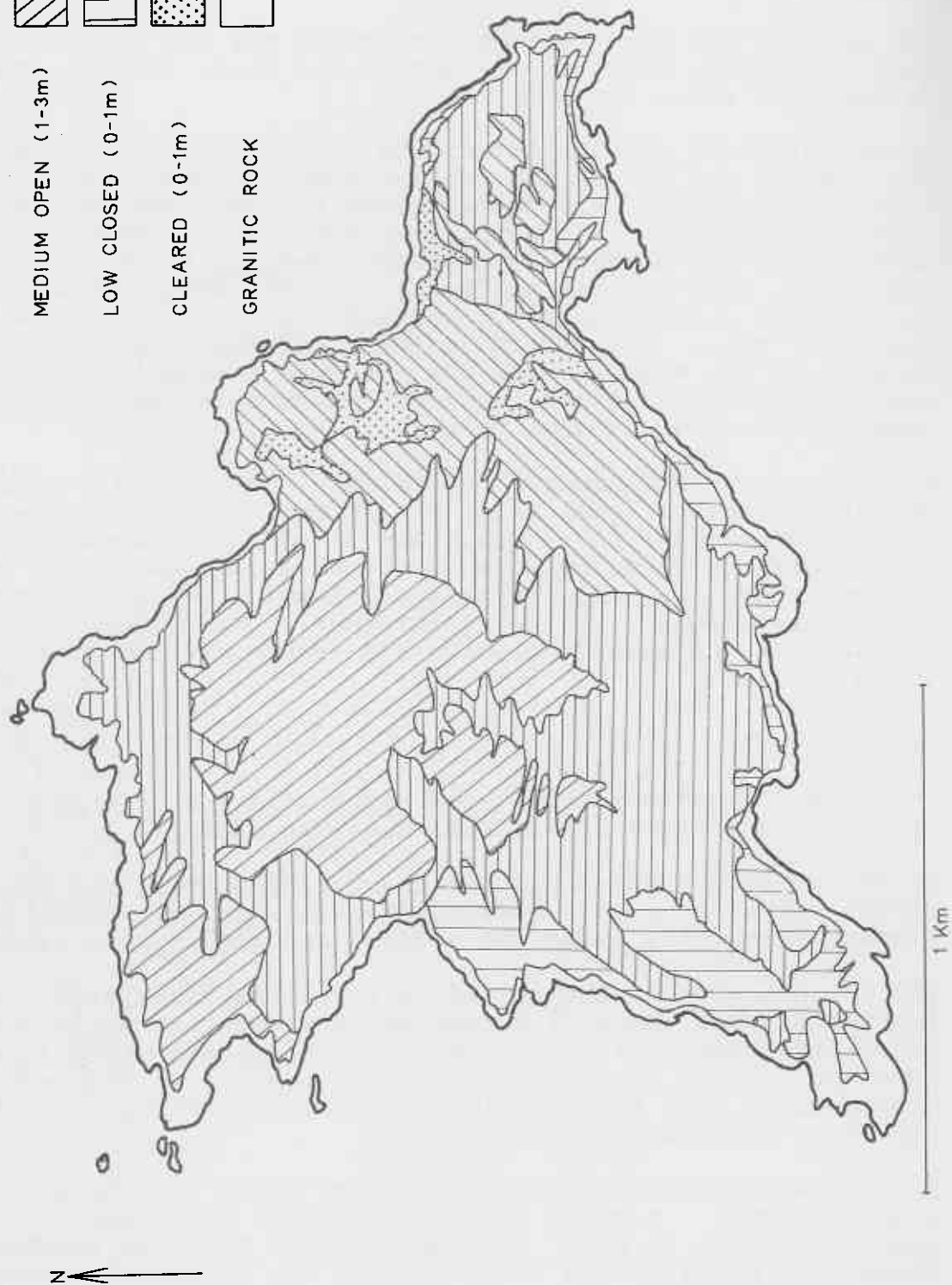
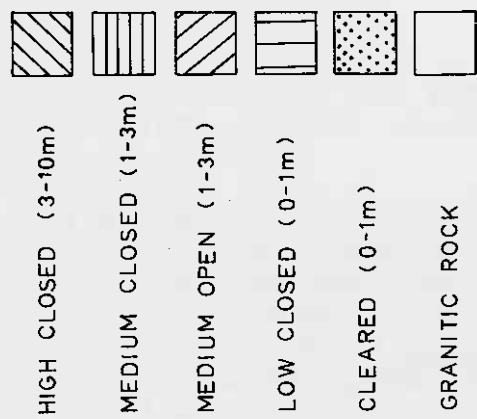
On the western exposed side of the island specialised heaths and shrubs stabilise poorly developed shallow soils. These soils are almost without any humus whatsoever, and are uniform lithosols.

The eastern side of the island is relatively sheltered. Here at lower altitudes, deep (1 metre) texture contrast soils support 10 metre high stands of several eucalyptus species which form a woodland. Here, the texture contrast profile is the result of prolonged in situ soil development under conditions peculiar to the local climate (Corbett 1969).

At highest altitudes, where slopes are steep and therefore erosion prone, texture contrast profiles are absent. This indicates that, in situ soil development is being inhibited. On these high parts of the island, soils are relatively young because

FIGURE 2

VEGETATION ZONES



soil parent material is being continually eroded downslope. At lowest altitudes where slopes are relatively gentle, soils remain in situ long enough for strata of the soil profile to develop.

This brief description of the island's soils shows various relationships. There is interdependence between exposure, slope gradient and soil depth. There is also an interdependence between soil depth and dominant vegetative formations, on which the island's integrity depends. Moreover, adequate soil depth contributes to suitable habitat for the burrowing Ashy Grey Mice and Fleshy-footed Shearwaters.

III LAND FLORA

The only detailed flora collection of Woody Island is that made by Willis (1953) who comments -

"Our cursory inspection embraced only a part of the northern coast, which presented a very desolate appearance - sole survivals would seem to be a few shrubs and small trees, mostly hugging the cliff faces. Of the 27 introduced species found on Woody Island, 14 were grasses, the dense crops of wild oats (*Avena fatua*) being astounding, in favourable places they often exceeded six feet in height, impeding progress over acres of country. The grasses *Aira praecox* and *Vulpia membranacea*, which were noted also on seven other islands, had never before been collected in Western Australia. Already copious seedlings of *Albizzia* sp., *Rulingia* sp. and *Melaleuca pubescens* were springing up on the burnt earth, and doubtless much other native growth would reappear in the absence of further holocausts. The degeneration in indigenous plant life as a result of grazing and successive fires on Woody Island is all the more deplorable when one realises that this is most probably the site of Labillardiere's first collecting in 1792." (p.6.)

Fortunately, Woody Island has escaped subsequent holocausts in the past 25 years since Willis' visit and the copious seedlings have reafforested the island to such an extent that the severity of past fires is hard to imagine. With the regrowth of native vegetation, the distribution of Wild Oat has receded to relatively small areas and now the native vegetation impedes progress instead - in some places being almost impenetrable.

It should be mentioned that five natural categories of vegetative zones are mapped on Figure 2. These categories bear no relation to Specht's (1970), vegetative classes which, if used, would have yielded only two distinct categories.

TABLE 2. PLANT SPECIES RECORDED FOR WOODY ISLAND

ORDER	FAMILY	S P E C I E S	Recorded by		New Record	Woody Is.	Archipelago	Indigenous	Introduced	Annual	Perennial	Ground Cover	Shrub	Tree
			Willis	Present										
PTERIDOPHYTA	POLYPODIACEAE	<i>Cheilanthes tenuifolia</i> (Burm.f.) Sw.	X	X							X			
ANGIOSPERMAE SUB-ORDER: MONOCOTYLEDONEAE	GRAMINEAE	<i>Aira caryophyllea</i> L.	X	X					X	X				
		<i>Aira praecox</i> L.	X	X					X	X				
		<i>Agrostis avanaceae</i> Gmel.	X	X					X	X				
		<i>Avena fatua</i> L.	X	X					X	X				
		<i>Brisa minor</i> L.	X	X					X	X				
		<i>Bromus arenarius</i> Labill.	X	X					X	X				
		<i>Bromus diandrus</i> Roth	X	X					X	X				
		<i>Bromus hordeaceus</i> L.	X	X					X	X				
		<i>Cynodon dactylon</i> Rich. in Pers.	X	X					X	X				
		<i>Eriharta longiflora</i> Sm.	X	X					X	X				
		<i>Hordeum murinum</i> L.	X	X					X	X				
		<i>Koeleria phaeoides</i> (Vill.) Pers.	X	X					X	X				
		<i>Lagurus ovatus</i> L.	X	X					X	X				
		<i>Parapholis incurva</i> (L.) Hubbard	X	X					X	X				
		<i>Poa caespitosa</i> Forst.	X	X					X	X				
		<i>Poa porphyroclados</i> Nees	X	X					X	X				
		<i>Polygonon monspeliensis</i> Desf.	X	X					X	X				
		<i>Stipa variabilis</i> Hughes	X	X					X	X				
		<i>Vulpia bromoides</i> (L.) S.F. Gray	X	X					X	X				
		<i>Vulpia membranacea</i> (L.) Dum.	X	X					X	X				
CYPERACEAE		<i>Gahnia trifida</i> Labill.	X	X					X	X				
		<i>Lepidoasperma leptostachyum</i> Benth	X	X					X	X				
		<i>Lepidoasperma</i> sp.	X	X					X	X				
		<i>Lepidoasperma</i> ? <i>tuberculatum</i> Nees	X	X					X	X				
		<i>Scirpus antarcticus</i> L.	X	X					X	X				
		<i>Scirpus nodosus</i> Rottb.	X	X					X	X				
CENTROLEPIDACEAE		<i>Centrolepis polygyna</i> (R.Br.) Hieron.	X	X					X	X				
		<i>Centrolepis strigosa</i> (R.Br.) Roem. & Schultze	X	X					X	X				
JUNCACEAE		<i>Juncus bufonius</i> L.	X	X					X	X				
		<i>Juncus plebeius</i> R. Br.	X	X					X	X				
LILIACEAE		<i>Stypandra</i> ? <i>glauca</i> R.Br.	X	X					X	X				
		<i>Stypandra emarginata</i> R.Br.	X	X					X	X				
		<i>Thysanotus dichotomus</i> (Labill.) R.Br.	X	X						X	X			
		<i>Thysanotus patersonii</i> R.Br.	X	X						X	X			
XANTHORRHACEAE		<i>Lomandra rigida</i> Labill.	X	X				X	X					
ORCHIDACEAE		<i>Microrhis unifolia</i> (Forst.f.) Reichb.f.	X	X					X	X				
		<i>Prasophyllum</i> sp	X	X					X	X				

(contd.)

TABLE 2. - - (CONTD.)

ORDER	FAMILY	SPECIES										
		Recorded by		Woody Is.	New Record	Indigenous	Introduced	Annual	Perennial	Ground Cover	Shrub	Tree
		Wills	Present									
	EUPHORBIACEAE	X	X			X					X	
	RHAMNACEAE	X	X			X					X	
	MALVACEAE	X	X	X	X	X				X		
	STERCULIACEAE	X	X	X	X	X					X	
	DILLENIACEAE	X	X	X	X	X					X	
	FRANKENIACEAE	X	X	X	X	X					X	
	THYMELAEACEAE	X	X	X	X	X					X	
	MYRTACEAE	X	X	X	X	X					X	
	HALORAGACEAE	X	X	X	X	X					X	
	APIACEAE (UMBELLIFERAE)	X	X	X	X	X					X	

Conspicuous features of the land flora are as follows:

- (1) Species composition is relatively high in diversity (Table 2);
- (2) Vegetation covers almost all the island and the projective foliage cover of the tallest stratum is usually from 70 to 100%;
- (3) There is a marked difference between the flora of the south-eastern portion of the island compared to the more exposed north-western section;
- (4) There are sharp boundaries between vegetative zones.

The high closed zone on the south-eastern portion of Woody Island is dominated by belts of tall eucalypts *E. lehmanni*, *E. platypus* var. *heterophylla* and *E. cornuta* growing in pure and mixed stands as tall, straight-boled trees to 10 metres and growing on or above the 10-metre contour (Figure 2). These belts are mixed with thickets of acacias (*A. acuminata* var. *latifolia*, *A. myrtifolia*, *A. subcaerulea* and *Albizzia lophantha*), melaleucas (*M. elliptica* and *M. lanceolata*) and *Hakea suaveolens*. These thickets have a maximum height of about 5 metres. Some of the acacia thickets are particularly dense and movement through these is further impeded by the undershrub *Platysace compressa*. Here, both the eucalypt and acacia-melaleuca complex comprise the high closed zone. Relatively deep soils of one metre and less are found here.

The medium closed zone at lower altitudes of the eastern part of the island, particularly on the narrow eastern-most headland, contains vegetation consisting mainly of dense shrubs 1-3 metres high. Such vegetation decreases in height with increasing closeness to the sea. Conspicuous plants of this complex are *Rhagodia radiata*, *Melaleuca* spp., *Pimelia clavata*, *Myoporum tetrandrum* and *Olearia axillaris*. Deep soils of one metre and less are also found here.

The medium open zone of the north-western portion of the island is dominated by dense shrubs from 1-3 metres in height with *Calothamnus quadrifidius*, *Acacia heteroclita* and *Gastrolobium bilobum* particularly abundant. Belts of mallee-form *Eucalyptus angulosa* from 3-4 metres are prominent above the scrub in places. *E. lehmanni* also occurs as a mallee in this area, as does two unidentified species of eucalyptus of which only few specimens were found. Soils are shallow (30 cms and less), and granite outcrops rise above the surface in many places.

The medium open zone of the north-western side supports the island's shallowest soils (15 cms and less). Here a number of

species of the family Proteaceae (*Banksia speciosa*, *Dryandra nivea*, *Hakea trifurcata*, *Isopogon formosus* and *I. trilobus*) were found, as were the *Lepidosperma* sp. and *Thysanotus* spp., and the orchid *Prasophyllum* sp.

A low closed zone up to 1 metre high occurs just above the bare granite cliffs along the south-western coast and bordering taller vegetation. *Pimelia ferruginea* is the most dominant plant of this very dense community. *Hakea clavata* is also found here. In the low closed zone, vegetation extends onto the granite cliffs that form the shoreline and includes some grasses (*Paraphelis incurvata*, *Koelaria phleioides*, *Plantago varia*, *Vulpia bromoides*), a rush (*Scirpus nodosus*), and the Noon-flower (*Carpobrotus aequilaterus*).

Some areas of wild oats (*Avena fatua*) persist on the cleared zone of the eastern slopes.

Important plant discoveries were a few individuals of two species of Eucalyptus, which are still being classified. There is a possibility that both are new species, and are endemic to the island. Both are presently being examined at the Forestry and Timber Bureau, Canberra.

Another interest was the variety of species of the Proteaceae which were formerly thought to be absent from the Archipelago. All of the Proteas were very limited in distribution apart from *Hakea suaveolens*. Two plants of *Banksia speciosa* growing to 2 metres and flowering were found. Beneath one of these the only specimen of *Dryandra nivea* was discovered. Plants of *Isopogon formosus*, *I. trilobus*, *Petrophile teretifolia*, *Hakea trifurcata* and *H. clavata* were also very few.

Myoporum tetrandrum, of which Willis found only a single specimen on Middle Island, is common on Woody Island. Finally, a new record of an orchid (*Prasophyllum* spp.) is added to the list for the Archipelago and the range of *Hibbertia* sp. aff. *acerosa* is extended to include Woody Island.

The lower non-flowering plants were not collected. However, there is one exception in that one obvious island fern was sampled and is listed. A systematic list of all species collected during the present survey and by Willis is given on Table 2.

IV LAND FAUNA

REPTILES

Lizards are conspicuous on Woody Island due to the abundance of

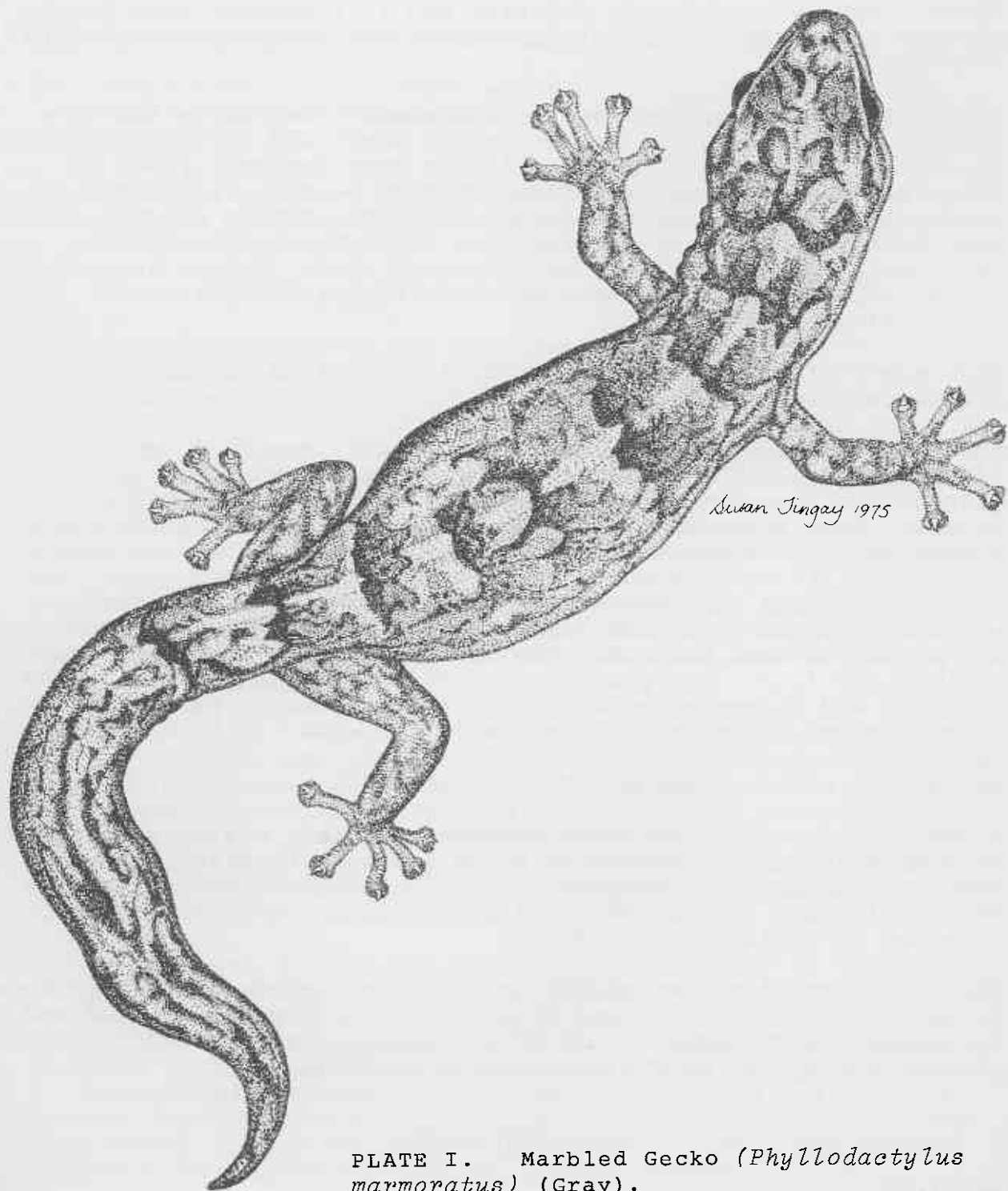


PLATE I. Marbled Gecko (*Phyllodactylus marmoratus*) (Gray).

exfoliating granite. Two diurnal skinks and two nocturnal geckos were plentiful. A third species of skink appeared to be subterranean at the time of the survey and only two individuals were discovered. No snakes were recorded.

1. BARKING GECKO (*Gymnodactylus milii*)

This lizard was common on the sheltered eastern side of the island but was not recorded on the exposed western portion. It was found either singly or in groups of up to four individuals under granite rocks.

2. MARBLED GECKO (*Phyllodactylus marmoratus*) (Gray)

At night, this gecko was often seen hunting on granite rocks even along the shore. It inhabited the whole island and was common on the eastern side. By day, individuals or small groups were often uncovered under rocks.

3. *Egernia multiscutata* (Mitchell and Behrndt)

These skinks were abundant and, because of their size and diurnal activity, they were the most conspicuous lizard. They occurred throughout the island and were particularly noticeable on large granite boulders.

4. GRAY'S SKINK (*Lygosoma labillardiere*) (D & B)

This diurnal skink was often seen on large granite outcrops and was common under rocks throughout the island.

5. FOUR-TOED SKINK (*Lygosoma quadridigitatum*) (Werner)

Glauert found the Four-toed Skink on ten of the islands visited so it may be deduced that it was readily found at that time. However only two were discovered during our visit and both of these were under 10-15 cm of soil and were dug up after a night of steady but light rainfall.

Four of these lizards have previously been recorded for the Archipelago but *E. multiscutata* is apparently a new record. The Barking Gecko, Gray's Skink and possibly the Four-toed Skink are new records for the island.

BIRDS

Twenty-one species of birds were recorded during the visit, thirteen of which are essentially land dwellers and eight are

dependent to some extent on the sea. The five passerine species were common to abundant, and the island probably supports maximum populations of other resident species. Six nesting species were recorded and it is probable that at least eight of the remaining species also nest on the island at other times of the year.

The White-faced Storm Petrel (*Pelagodroma marina*) and the Australian Pipit (*Anthus novaeseelandiae*) recorded by previous observers were not seen during the present survey. The decline of the Australian Pipit may well be due to a continuing reduction in its preferred habitat as the native vegetation regrows. Details of the species recorded are as follows:

1. FLESHY-FOOTED SHEARWATER (*Puffinus carneipes*)

Occupied burrows of the Fleshy-footed Shearwater were common along the south coast of the island where the soil is relatively deep. The island population increased at night and became more vocal. One bird was captured and examined above ground. We were unable to definitely ascertain whether egg-laying had commenced but there were signs that the nesting season had begun.

2. BLACK-FACED CORMORANT (*Phalacrocorax fuscenscens*)

One bird was seen fishing successfully off the north-eastern coast. This is a new record for the island.

3. CAPE BARREN GOOSE (*Cereopsis novaehollandiae*)

This species perfectly accords with the wilderness of the Archipelago which is its range in Western Australia. Birds were seen in pairs or small groups (up to 4) on the low granite shores of the eastern part of Woody Island. They allowed a close approach before taking to the ocean and swimming away, even in rough seas.

4. SWAMP HARRIER (*Circus approximans*)

A single bird over the summit of the island was identified from underwing pattern, flight habit and white rump patch. A new record for the Archipelago, it was probably a visitor from the mainland and not a resident of the island.

5. BROWN GOSHAWK (*Accipiter fasciatus*)

A pair of Goshawks were resident on the island and were

seen near the campsite almost every day. This is the first record since 1944.

6. NANKEEN KESTREL (*Falco cenchroides*)

One bird was seen hovering over the southwestern tip of the island.

7. BROWN QUAIL (*Synoicus ypsilophorus*)

The Brown Quail occurred on the eastern part of the island but was not restricted to the open areas of wild oats. Its persistent calls, and its habit of bursting out from underfoot, indicated that it was abundant. A family group was flushed, confirming that it was a nesting species.

8. SOOTY OYSTERCATCHER (*Haematopus fuliginosus*)

A very vocal pair of Sooty Oystercatchers were reluctant to leave the south-western tip of the island whenever approached but no nest was found.

9. COMMON SANDPIPER (*Tringa hypoleucos*)

One bird was flushed from under a rocky ledge near the shore but flew only a few metres, and thus enabled positive identification from both flight pattern and other features. Probably the same individual was seen again on a subsequent day on another part of the shoreline. This is a new record for the Archipelago.

10. PACIFIC GULL (*Larus pacificus*)

This gull has the habit of dropping gastropods onto granite outcrops to expose the snail which it then eats. Such shell-cracking platforms occur on the south-western and south-eastern tips of the island. The latter usually had a Pacific Gull nearby.

11. SILVER GULL (*Larus novaehollandiae*)

The Silver Gull was surprisingly uncommon on Woody Island and only one pair was resident, sharing the south-eastern tip with the Sooty Oystercatchers. The gulls were very aggressive but no nest was found.

12. CASPIAN TERN (*Hydroprogne caspia*)

One bird was seen flying along the southern coast.

13. BRUSH BRONZEWING (*Phaps elegans*)

Basset Hull (1922) found this species fairly plentiful on Woody Island but we sighted it on only two occasions. Perhaps this is another indicator species of the changing environment of the island following the cessation of grazing and burning.

14. ROCK PARROT (*Neophema petrophila*)

Small flocks (up to 12) of the Rock Parrot were present on the island. It would seem that its population has remained stable for some time as Serventy recorded 20 in 1950.

15. BARN OWL (*Tyto alba*)

The Barn Owl was positively identified both from its call and by sightings for the first time in the Archipelago although its presence has long been suspected. Only one pair appeared to be resident.

16. WELCOME SWALLOW (*Hirundo neoxena*)

A very common nesting resident on Woody Island.

17. GOLDEN WHISTLER (*Pachycephala pectoralis*)

The Golden Whistler was common in the tall eucalypt and acacia stands of the eastern portion of the island and fledged young were often observed being fed by adults.

18. WESTERN SILVEREYE (*Zosterops gouldi*)

Another common species which was found to be nesting at the time of our visit.

SINGING HONEYEATER (*Meliphaga virescens*)

The Singing Honeyeater was less abundant than the other resident honeyeater, undoubtedly due to differences in their social organisation, but it occurred in pairs throughout the island.

20. NEW HOLLAND HONEYEATER (*Phylidonyris novaehollandiae*)

Probably the most abundant bird of the island; noisy groups of this species were found in all habitats. One nest was discovered in a *Melaleuca elliptica* about one metre above ground.

21. AUSTRALIAN RAVEN (*Corvus coronoides*)

A small group (4) of Ravens was resident on the wooded eastern half. V.N. Serventy recorded it as a nesting species.

MAMMALS

Mammal traps were set on five nights in various habitats. On the island's eastern side they were set in Eucalyptus and *Melaleuca elliptica* formations. Traps were also set at the margins of Eucalyptus formations and cleared areas. On the island's western side, traps were set in the medium open zones. The number of traps set varied from 30 to over 100 and consisted mainly of small and medium Elliot traps. Two species of mammal and one native. All individuals were released at the trapping site. Another species was sighted during the day.

1. WESTERN GREY KANGAROO (*Macropus fuliginosus*)

A pair of Western Grey Kangaroos was sighted in the same locality on two separate occasions. Their tracks and pads are common on the eastern slopes of the summit. The island is too small to support a viable kangaroo population (Main and Yadav 1971), therefore these animals must have been introduced relatively recently.

2. SHIP RAT (*Rattus rattus alexandrinus*)

The Ship Rat was common on the island (e.g. 21 were caught



PLATE 2. Ashy Grey Mouse (*Pseudomys albocinereus*).

in 100 traps on one night) but it was not in plague proportions. It was widespread and was caught in all habitats.

3. ASHY-GREY MOUSE (*Pseudomys albocinereus*)

This small native rodent is a new mammal record for the Archipelago. It was captured on eight separate occasions but only in traps set on the margin between eucalypt thickets and open areas. Unfortunately there was insufficient time to conduct a survey to ascertain whether it was restricted to such habitats.

V DISCUSSION

VEGETATIVE ZONES AND BOUNDARIES

Vegetation of the island's western and eastern sides is quite different. The western side of the island is exposed. Here soils are shallow, poorly developed and erosion prone. However, these sites are stabilised by medium open zone vegetation. The eastern part is sheltered. Soils are deep and well developed and support eucalyptus trees to 10 metres high. These sites represent the two extremes of the island's environmental spectrum.

Between the two extremes occur vegetative zones separated by sharp boundaries. Vegetative boundaries are usually found at environmental discontinuities (Shimwell 1971), in this case mainly caused by the island's varying soil depths and degree of exposure. If vegetation remains undisturbed, then invading plants from adjacent vegetative zones may mask the boundary effect (Watts 1971). Other similar mosaics of vegetative zones separated by sharp boundaries have been attributed to recent fire regimes (Webb 1968). Therefore, there is every possibility that the present vegetation, even after 25 protected years, may not yet resemble its original form that existed prior to settlement.

The island vegetation is diverse in form and composition. There is no doubt that such diversity would contribute to prime plant and animal habitat.

PLANT AND ANIMAL GEOGRAPHY

The survey revealed a number of mainland plants, one mammal and two birds not previously recorded for the Archipelago. The *Proteas* might have germinated from seeds carried to the island by

winds or birds. The two birds are undoubtedly visitors, but dispersal from the mainland seems unlikely for the unidentified eucalyptus species. Consequently, there is a possibility that these few plants are all that remain of much larger populations which may have been present on a larger island at the time of isolation from the mainland during the last rise in sea levels from 20 000 to 5 000 years ago. The presence of these plants and the Ashy Grey Mouse might reflect affinities with the mainland at the time of isolation rather than affinities with a present day mainland.

THE ARCHIPELAGO RESERVE SYSTEM

The bathymetry of Esperance Bay suggests that sets of islands were isolated at different times during the last rise in sea levels. It is also known that the biological features of some islands are quite distinctive. No doubt factors involved in the moulding of each island environment were environmental features peculiar to each island. However, the nature of the mainland environment at the time of isolation and the period of isolation are two factors which would have played major roles in the moulding of each island environment.

By comparing the biological features of Woody Island with other islands of the Archipelago, differences and similarities can yield useful information in relation to two aspects - first, the genesis of island environments since their isolation and, second, the nature of mainland environments at the times of isolation. Thus the Archipelago Reserve is a system comprised of island units.

For another reason, Woody Island can be regarded as a unit of a larger reserve system because the island is one of the few islands in the Archipelago with a supply of fresh water, and avian visitors have been observed. This may imply that some avian species use a set of nearby islands to satisfy their range of habitat requirements.

The full importance of the island's contribution to the reserve system will not be known until more work is undertaken. In the meantime, lack of information warrants the island's protection.

VI MANAGEMENT RECOMMENDATIONS

The interdependence between animals, plants and substrates exists in a delicate balance which can be easily upset by conflicting land uses. Such a possibility should be minimized.

Prior to being declared an A class reserve, the island has been subjected to conflicting uses such as timber-cutting, recurring fires and the introduction of exotic animals and plants. Reservation has not completely removed these threats.

The recent introduction of the Grey Kangaroo might pose another threat. An island of such size cannot sustain a viable population of Grey Kangaroos. If a population explosion of kangaroos occurred, the island's vegetation could be seriously depleted by the animals' feeding behaviour even before the kangaroo population reached its maximum. It is recommended that these animals should be removed from the island.

With the granting of permissive use of Woody Island to the tourist industry a number of new potential hazards have been introduced. Firstly, ease of access to all boat owners has been considerably increased through the construction of a wharf. In addition, in the peak of the summer holiday season (December - January), tourists are landed frequently and present risks to readily accessible Shearwater nesting sites, and to vegetation through trampling, erosion and fire. The fire hazard would be further increased if barbecue facilities are permitted. Another potential hazard is the possible pollution of ground-water by waste disposal facilities.

The fragile nature of Woody Island means that it would be almost impossible to accommodate tourist use there without jeopardising the island's integrity. However, it is to be expected that if a management plan is to have any measure of success, then the plan should include stringent controls which would have to be rigidly imposed.

VII ACKNOWLEDGEMENTS

We thank the staff of the State Herbarium of W.A., particularly Mr Malcolm Trudgeon and Mr Ted Aplin, for identifying and providing information on the plant collection. The identification of fauna was made in the field by the authors.

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PLATE 3. View of the north coast of the eastern headland through the high closed zone, showing a cleared zone.



PLATE 4. Margin of *Eucalyptus cornuta* belt high on the island's eastern side, bounding on area of wild oats.



PLATE 5. Medium closed zone on eastern headland. Stands of eucalypts occur on top of the headland.



PLATE 6. Medium closed zone dominated by Hakea and Calothamnus species on the island's north-western side looking towards Frenchman's Peak on the mainland.



PLATE 7. Low closed zone bordering granite cliffs and shores of the island's southern side.



PLATE 8. Walkway from the wharf recently constructed on the island's north-eastern side.