THE ISLANDS OF THE NORTH-WEST KIMBERLEY

Western Australia

EDITED BY

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and

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1978

DEPARTMENT OF FISHERIES AND WILDLIFE
PERTH, WESTERN AUSTRALIA

Wildl. Res. Bull. West. Aust. 1978 No. 7, 1—47.

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ABSTRACT

THE ISLANDS OF THE NORTH-WEST KIMBERLEY, WESTERN AUSTRALIA

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Biological survey work was undertaken on the islands of the north-west Kimberley coast in the dry seasons of 1971, 1972 and 1973. Twenty-seven islands were visited, ranging in area from 1 to 17 950 ha.

The islands are geologically, topographically, climatically and vegetationally typical of the adjacent Kimberley mainland. Rock-types include sandstones, volcanics and laterites; the climate is tropical and sub-humid with a distinct dry season. A variety of forest, woodland, shrubland, grassland and mangrove communities were recorded as well as semi-deciduous vine thickets.

Annotated lists of mammals, birds, reptiles and amphibians are presented. The 22 native mammal, 146 bird, 42 reptile and 3 amphibian species recorded are all extant on the north-west Kimberley mainland today. Some islands harbour populations of species which are little known on the Kimberley mainland including the Scaly-tailed Possum (*Wyulda squamicaudata*), Little Rock Wallaby (*Peradorcas concinna*), Warabi (*Petrogale burbidgei*), Lesser Warty-nosed Horseshoe Bat (*Hipposideros stenotis*), Mangrove Kingfisher (*Halcyon chloris sordida*), Scrub Fowl (*Megapodius freycinet tumulus*) and Red-crowned Pigeon (*Ptilinopus regina ewingii*). Eight of the 17 endemic north-west Kimberley reptiles occur on the islands. Feral mammals were recorded on only two islands.

Recommendations are made for reservation of many of the islands as nature reserves.

PART I

INTRODUCTION

by A. A. BURBIDGE[1] and N. L. McKENZIE[1]

BACKGROUND

Some of the most important Nature Reserves in Western Australia are islands. Some offshore islands harbour animals which are rare or extinct on the Australian mainland, some have unique assemblages, species or sub-species of animals and plants, and almost all have been unaffected by the exotic animals introduced into Australia by European man.

Until recently work on Western Australian islands was largely restricted to those south of Port Hedland (Willis 1954; Main 1961; Ride *et al.* 1962; Storr 1960, 1964; Butler 1970; Main and Yadav 1971; Burbidge 1971; Burbidge and Prince 1972) and almost nothing was known of the biota of islands further north. For this reason the Department of Fisheries and Wildlife decided to examine the islands in the Kimberley Division and work commenced on this project in 1971.

Most islands in the Kimberley occur off the western coast between Cape Levêque and Cape Londonderry (Figs 1, 2, 3, 4). In this region there are two archipelagos and several smaller groups. From north to south there are: Governor Islands, Sir Graham Moore Islands, Eclipse Islands, Osborn Islands, Institut Islands, Bonaparte Archipelago, Montgomery Islands, Kingfisher Islands and Buccaneer Archipelago. This report is concerned with the Kingfisher Islands, the islands of the Bonaparte Archipelago and most of the groups further north.

HISTORY

Almost all the continental islands we visited showed signs of occupation by aborigines. On some islands, e.g. Borda, Wollaston and Bigge, we saw both Bradshaw and Wandjina cave paintings (see Crawford 1968) and on others e.g. South Maret, East Montalivet, Sir Graham Moore, Fenelon and Augustus there are stone arrangements.

The first European to visit the Kimberley coastline was Abel Tasman in 1644 but his log has been lost and it is not known where he landed. The region was first explored by the French scientific expedition under Nicholas Baudin in 1803. Although many of the islands were named at this time little scientific work was reported (Cornell 1974).

The next explorer was P. P. King who explored and mapped the Kimberley coast between 1820 and 1822 (King 1827). He named many of the islands although his landings were chiefly on the mainland, in search of water. King was accompanied by the botanist Allan Cunningham who collected many previously unknown species of plants during these explorations. During our surveys we rediscovered a Baobab tree carved with the name of King's vessel, His Majesty's Cutter "Mermaid" and the date 1820 at Careening Bay, in the Prince Regent River Nature Reserve (Burbidge 1975).

The next maritime explorers in the region were Wickham and Stokes in H.M.S. Beagle (Stokes 1846) who examined the coastline as far north as Port George IV. At this time George Grey explored the mainland in the vicinity of the Glenelg River (Grey 1841).

In recent times the islands have been visited by geologists, surveyors and military personnel. During World War II a radio base was constructed on Sir Graham Moore Island by the United States Air Force.

There are no previous publications on the flora or vertebrate fauna of islands of the north-west Kimberley covered by this report.

NARRATIVE

In 1971, 1972 and 1973, the Western Australian Department of Fisheries and Wildlife (F. & W.) organised and largely financed surveys of the coastal islands of the north-west Kimberley (Fig. 1.). The Western Australian Museum (W.A.M.) and the Western Australian Herbarium (W.A.H.) contributed staff to take part in the field work, and curated and identified the material collected.

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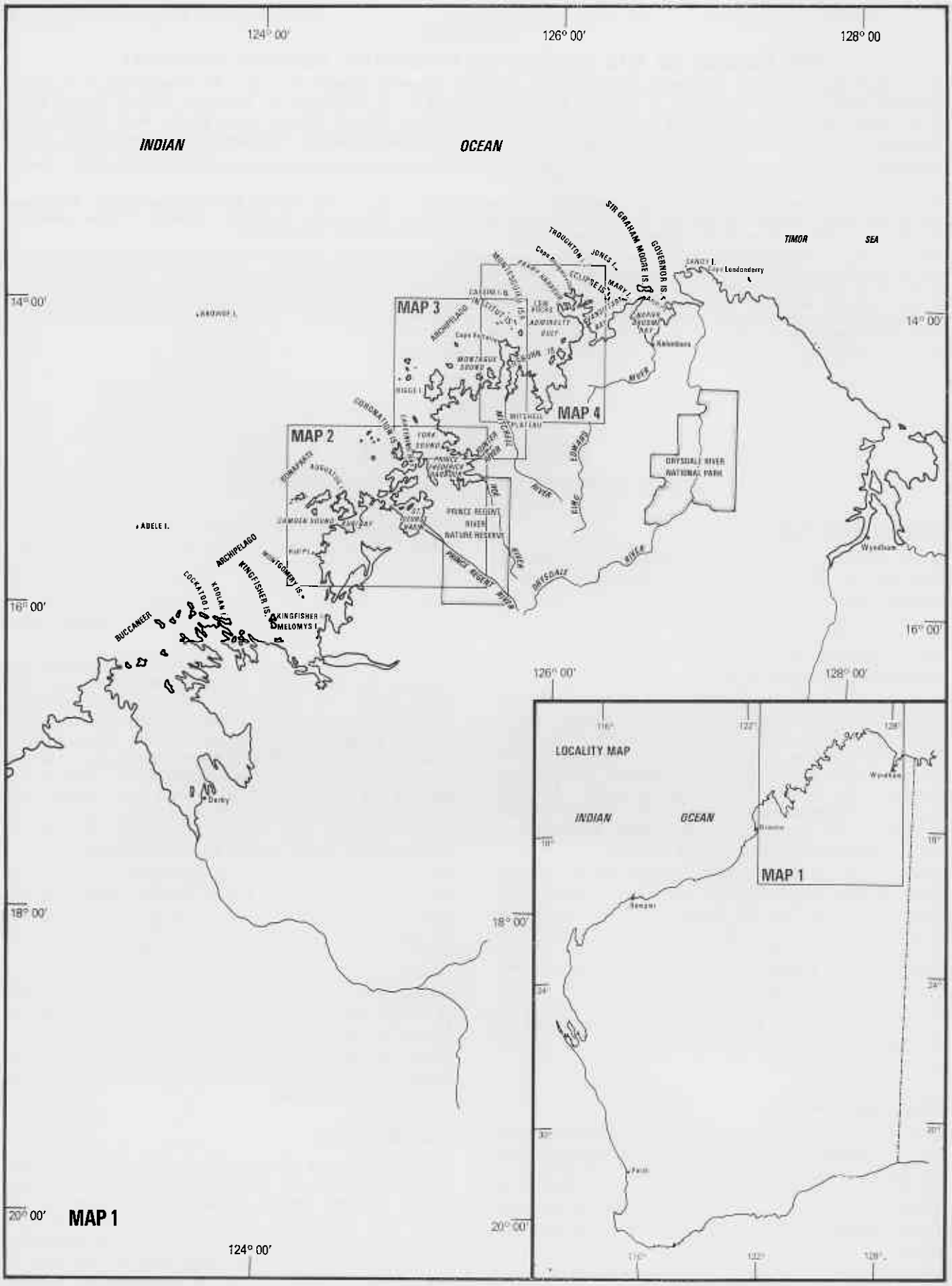

Figure 1—The north-west Kimberley, showing island groups.

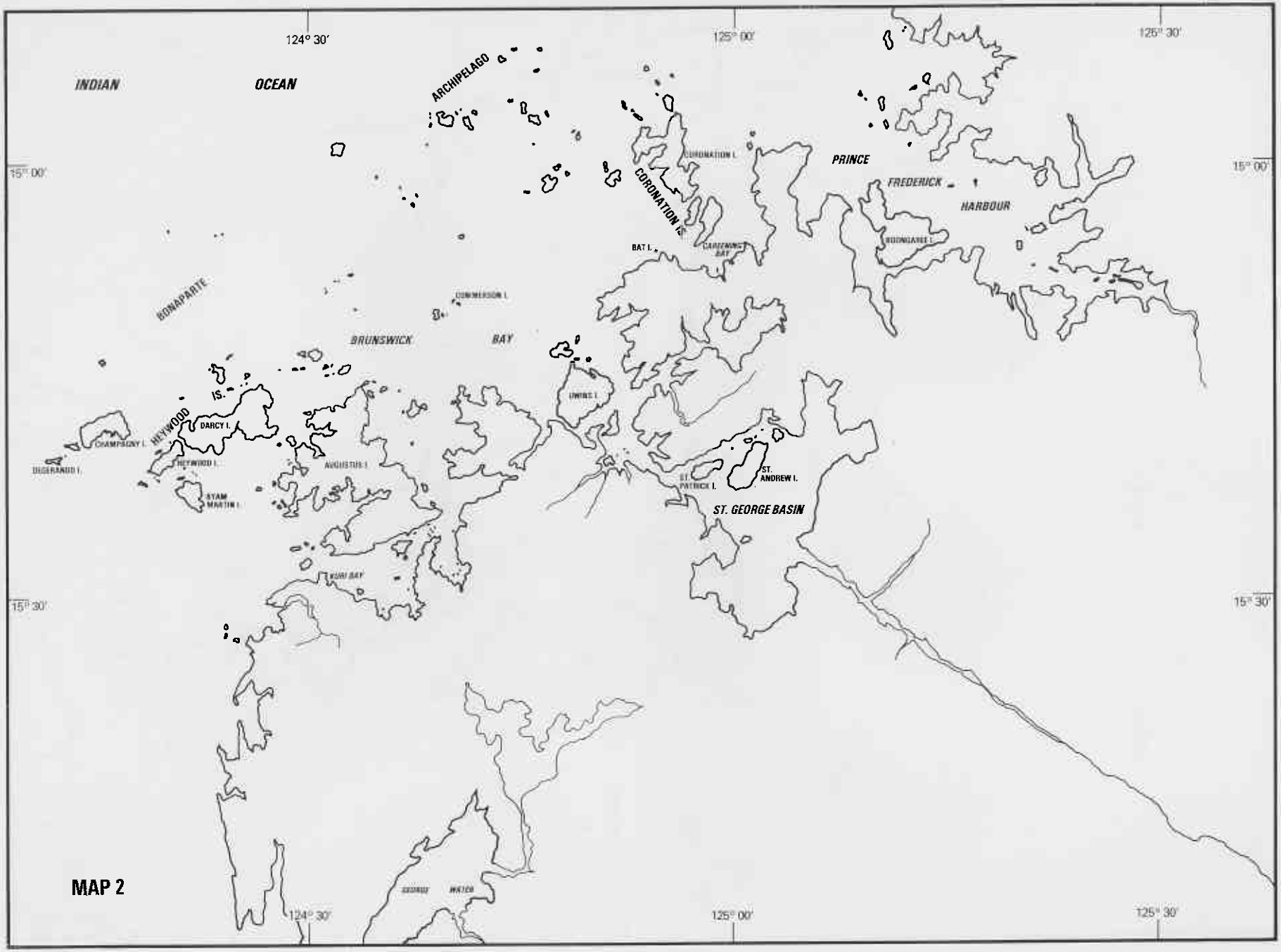

Figure 2—Augustus Group to Prince Frederick Harbour.

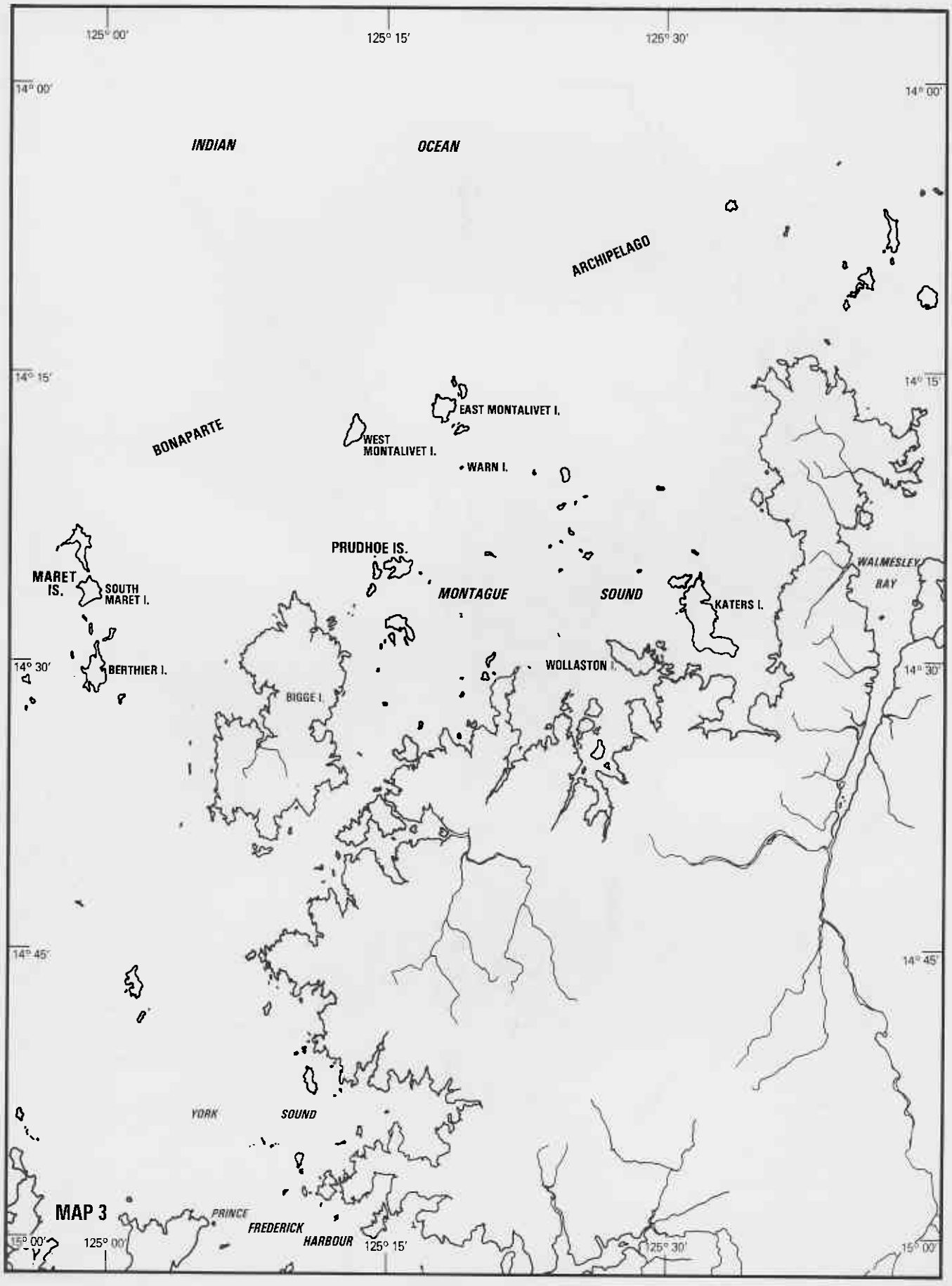

Figure 3—Montague Sound area.

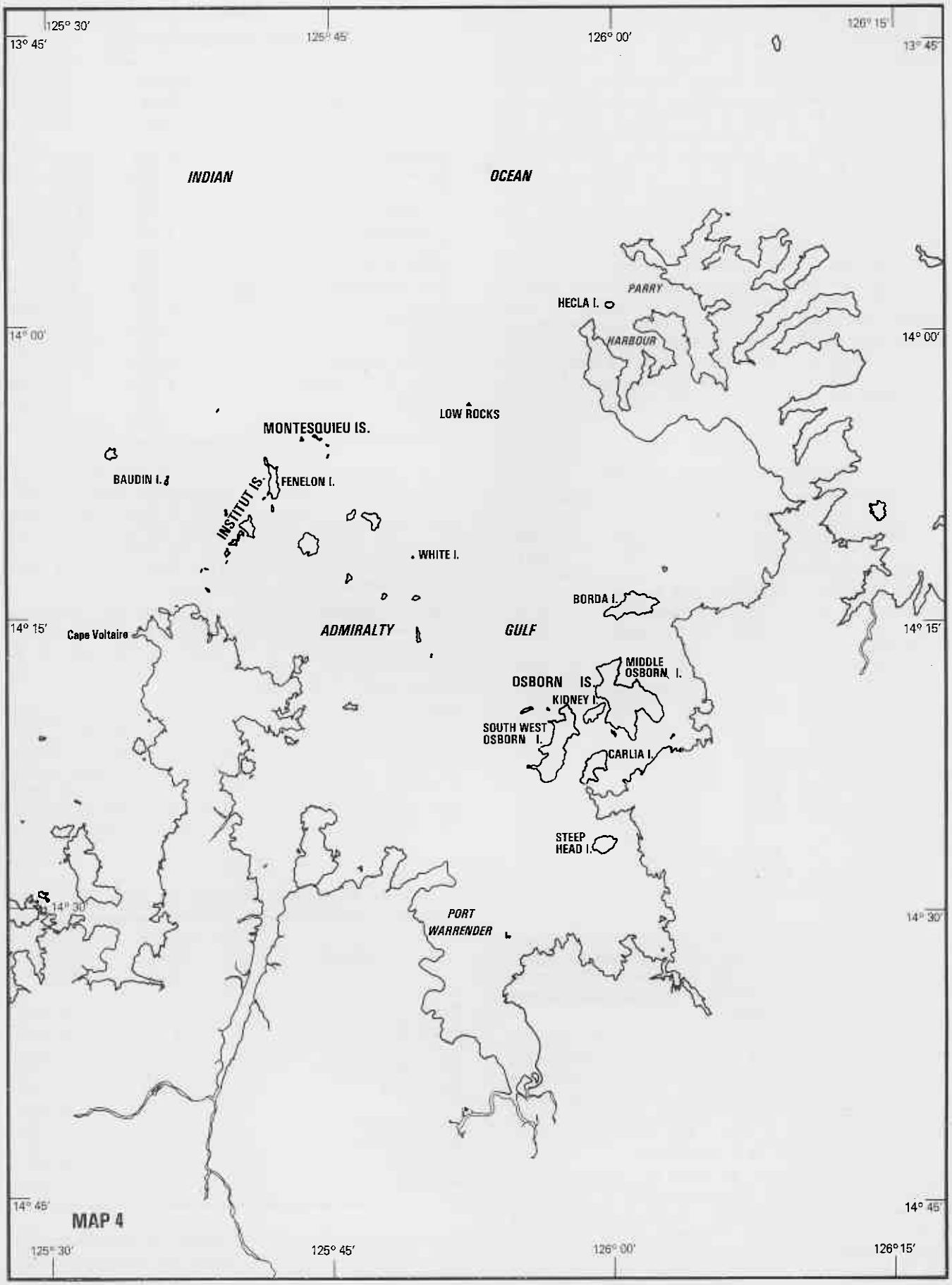

Figure 4—Admiralty Gulf area.

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Survey work commenced in August and September 1971. At that time the Royal Australian Survey Corps was undertaking a mapping programme in the north-west Kimberley and Major C. Sargent, the commanding officer of the 5 Field Survey Squadron, generously agreed to provide accommodation, food and helicopter transportation to islands as and when it fitted in with his programme. A. A. Burbidge (F. & W.) was attached to the Squadron at Kalumburu from 31 July to 14 August, N. L. McKenzie (F. & W.) and L. A. Smith (W.A.M.) were based at Kunmunya from 15 August to 4 September and D. J. Kitchener (W.A.M.) was based at Mitchell Plateau from 4 to 10 September 1971. The biologists were able to visit 15 islands ranging in size from one hectare to nearly 18 000. The islands visited and the time spent on each is given in Table 1. Although animals were collected on nearly all these islands, mammal trapping was only undertaken on certain large islands where overnight stops were arranged. Fauna collections made at the sites of the Army camps have been lodged at the Western Australian Museum along with the specimens from the islands.

TABLE 1

ISLANDS VISITED IN 1971

Island	Approx. Area (ha)	Dates Visited (1971)	Duration of Visit (hrs)
Middle Osborn	2 300	3–4 August	25·5
Fenelon	280	6 August	5·5
Borda	600	8 August	6·5
South West Osborn	1 370	8 August	2·0
Low Rocks	4	12 August	1·0
Sir Graham Moore	2 660	12 August	2·5
Louis	40	12 August	0·25
North Eclipse	320	12 August	0·1
Augustus	17 950	16–20 August	88·0
Darcy	4 800	20–22 August	51·0
Champagny	1 330	22 August	4·0
Uwins	3 300	23 August	0·5
Commerson	2	23 August	0·1
Coronation	3 830	29–30 August	31·5
Bigge	17 190	7 September	2·0

The objects of the work in 1971 were to visit and make fauna collections on as many islands as possible and to build up a knowledge of local conditions. This knowledge was used in the planning of more detailed surveys in the two subsequent years.

The 1972 expedition was divided into two separate teams. The teams spent two consecutive three-week periods examining islands as far north as Admiralty Gulf. The Fisheries and Wildlife 15 m Patrol Vessel "Dampier", working out of Koolan Island in Yampi Sound, was used as a base. She was skippered by E. J. Little and crewed by J. van Roon.

N. L. McKenzie and R. F. Dear (F. & W.), P. G. Wilson (W.A.H.), and A. Chapman and R. F. Johnstone (W.A.M.) were the first team. Between 11 May and 30 May 1972 they worked on islands at the south end of the Bonaparte Archipelago (Table 2) and also made brief inspections of the mainland at Careening Bay, St. George Basin and the Prince Regent River.

TABLE 2

ISLANDS VISITED IN 1972

Island	Approx. Area (ha)	Dates Visited (1972)
Augustus	17 950	12–19 May
Heywood	760	20–23 May
Darcy	4 800	20–23 May
Coronation	3 830	23–26 May
Champagny	1 330	27–29 May
Bigge	17 190	1–7 June
South Maret	320	7–8 June
East Montalivet	320	8–9 June
Katers	1 775	9–12 June
Wollaston	850	9–12 June
Borda	600	12–15 June
Middle Osborn	2 300	13–16 June
South West Osborn....	1 370	16 June
Browse	61	17 June
Adele	218	18–19 June

A. A. Burbidge and T. Evans (F. & W.), N. G. Marchant (W.A.H.), and L. A. Smith and J. Dell (W.A.M.) were the second team. Between 31 May and 20 June 1972 they worked on the islands further north in the Bonaparte Archipelago and on the Osborn Islands in Admiralty Gulf (Table 2). They also made brief visits to two oceanic islands—Browse and Adele.

The 1973 expedition was based on the Department of Fisheries and Wildlife 22 m Research Vessel "Flinders". She was crewed by C. J. Seabrook (Master), B. J. Duckrell (Mate), R. R. Birch (Engineer), A. A. da Franca and J. F. Rodrigues.

The survey team was A. A. Burbidge, N. L. McKenzie and W. K. Youngson (F. & W.), L. A. Smith, J. Dell and R. F. Johnstone (W.A.M.), and P. G. Wilson (W.A.H.) Between 26 June and 13 July they visited a number of islands that had not been visited in 1972 and revisited one that had only been partly examined. The islands visited in 1973 are shown in Table 3.

TABLE 3

ISLANDS VISITED IN 1973

Island	Approx. Area (ha)	Dates Visited (1973)
Bat	30	26 June
South West Osborn....	1 370	27–29 June
Carlia	480	27–29 June
Sir Graham Moore	2 660	30–3 July
Boongaree	4 880	4–7 July
Uwins	3 310	7–8 July
Saint Andrew	1 410	8–10 July
Byam Martin	760	11–12 July
Kingfisher	1 010	12–13 July
Melomys	850	12–13 July

Some work was done on the mainland at Anjo Peninsula while Sir Graham Moore Island was being surveyed. The mouth of the Hunter River was visited and a trip was made up the Prince Regent River to King Cascade.

After the 1973 trip was completed it was decided to transfer survey work to the mainland, partly to aid interpretation of the data gained during the island surveys and partly for its own value. The first of these surveys was of the Prince Regent River Nature Reserve (Miles and Burbidge 1975).

A. A. Burbidge and P. J. Fuller (F. & W.) briefly visited Bigge and Baudin Islands during July 1977.

LAND STATUS

The present status of islands described in this publication is as follows:

1. Sir Graham Moore Islands. Sir Graham Moore Island comprises Class C Reserve No. 18303 for "Cultivation and Grazing". It is not vested. The smaller islands are vacant Crown land.
2. Osborn Islands. Vacant Crown land.
3. Low Rocks. Low Rocks comprise Class C Reserve No. 33832 for "Conservation of Flora and Fauna". The Reserve is vested in the Western Australian Wildlife Authority.
4. Bonaparte Archipelago. The following islands are vacant Crown land: Katers, Wollaston, Bigge, the Maret Islands, the Montalivet Islands, Boongaree, the Coronation Islands and Bat Island. All islands south of a line running north-west from Cape Wellington to and including the Montgomery Islands are included in Class C Reserve No. 23079 for "Use and benefit of Aborigines" which is vested in the Aboriginal Lands Trust. These include the following islands described in this report: Uwins, St. Andrew, Augustus, Darcy, Heywood, Byam Martin and Champagny. Part of Degerando Island, which lies to the south-west of Champagny is freehold, owned by the Commonwealth of Australia for a lighthouse site.
5. Kingfisher Islands. All islands in this group are vacant Crown land.
6. Browse Island. This island is Reserve no. 22697 for "Minerals—Phosphatic Rock". It is not vested.
7. Adele Island. The whole of Adele is owned by the Commonwealth of Australia.

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PART II

ENVIRONMENT

by A. A. Burbidge[1], N. G. Marchant[2], N. L. McKenzie[1] and P. G. Wilson[2].

CLIMATE

The north-west Kimberley area has two distinct seasons—the "wet", lasting roughly from December to March and a dry season between June and September when little or no rain falls. The Bureau of Meteorology (Anon. 1975) has recently updated information on the climate of the Kimberley. Data from the region described in this report are extremely limited, with only the recently established stations at Kuri Bay and Mitchell Plateau to complement data from Troughton Island, Kalumburu and Yampi Sound.

Rainfall in the region is high, ranging from over 1 400 mm at Mitchell Plateau to 1 000 mm at Kalumburu and Yampi. Since rainfall decreases rapidly further inland, information from stations away from the coast is of little value. Heavy falls, usually associated with tropical cyclones or thunderstorms, can occur. Kalumburu has recorded 304 mm in a 24 hour period.

Average maximum and minimum temperatures for four stations are given in Table 1. It can be seen that temperatures are mild to warm throughout the year. Conditions on the islands are probably milder than those given for Mitchell Plateau and Kalumburu which are a short distance inland. This is probably especially so in relation to winter minimum temperatures (see Troughton Island data but note that Troughton is further offshore and smaller than most islands described here). The average monthly 9 a.m. and 3 p.m. relative humidity for two stations is also given in Table 1.

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[2] Western Australian Herbarium, George Street, South Perth, W.A. 6151.

GEOLOGY

A series of 1:250 000 maps with explanatory notes, describing the geology of the north-west Kimberley have been published by Gellatly and Sofoulis (1969, 1973), Allen (1971) and Williams and Sofoulis (1971). The nomenclature used by these authors is followed throughout this report.

The stratigraphy of the islands is the same as the adjacent mainland although, because of their restricted size, even the largest islands usually include only two or three of the rock types found on the mainland (Table 2). Descriptions of these rock-types and a time-stratigraphic interpretation have been included in the above publications.

The sandstones and volcanics of the islands are of Pre-Cambrian age and are overlain in places by superficial Cenozoic deposits. Quaternary deposits occur in coastal situations. The Carpentarian Kimberley Strata found on the islands include King Leopold Sandstone (Pkl), Carson Volcanics (Pkc), the Buckland Point Member of the Warton Sandstone (Pkb), Warton Sandstone (Pkw), the Yampi Member of the Pentecost Sandstone (Pkpy) and Hart Dolerite (Pdh). In broad terms the sandstones are expressed as resistant, cliff-forming quartz sandstones giving rise to a rugged, dissected terraine with joint-controlled gorges and drainage.

TABLE 1

WEATHER DATA FOR SELECTED NORTH-WEST KIMBERLEY STATIONS

AVERAGE MAXIMUM AND MINIMUM TEMPERATURES (°C)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Troughton Island	31·7	31·3	31·8	32·5	30·7	28·7	27·8	28·4	29·9	31·4	32·6	32·9	30·8
	26·1	25·9	26·2	26·6	25·0	23·2	22·0	22·5	24·2	26·0	27·0	27·0	25·1
Kalumburu	33·9	33·5	34·0	34·3	32·8	31·9	31·9	33·6	35·7	37·2	37·7	36·4	34·4
	24·6	24·5	23·9	21·3	17·8	14·9	13·4	15·1	18·4	22·2	24·5	25·0	20·5
Mitchell Plateau	33·6	32·6	32·4	32·4	31·6	30·0	30·6	33·2	35·1	36·7	36·1	33·3	33·1
	22·3	22·0	21·3	18·6	12·8	10·8	8·3	12·1	16·6	20·0	21·5	22·5	17·4
Kuri Bay	32·9	32·4	33·1	34·3	32·8	31·1	30·6	31·6	33·1	33·6	34·0	34·0	32·8
	25·8	25·1	25·0	24·2	22·4	19·5	18·4	20·0	22·3	24·3	25·9	26·4	23·3

AVERAGE MONTHLY RELATIVE HUMIDITY (%)

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Kalumburu (30 year average)	9 a.m.	71	74	70	60	48	43	38	37	41	45	50	61	53
	3 p.m.	62	66	60	47	39	33	28	28	35	42	47	54	48
Mitchell Plateau (1970–74)	9 a.m.	70	74	70	59	39	36	31	38	40	44	52	66	52
	3 p.m.	57	63	57	45	30	28	22	27	34	40	43	55	42

The Carson Volcanics are expressed as rounded, usually soil covered, undulating country with gentle gradients and dendritic drainage. Hart Dolerite occurs as dark-gray to black bouldery outcrops and is generally found in valleys between King Leopold Sandstone slopes or cliffs.

TABLE 2

ISLAND STRATIGRAPHY

Island Name	Precambrian Strata*	Cenozoic Strata*
Augustus	Pkw, Pkc	Czs, Qc, Qs
Darcy	Pkw	Qc, Qs
Heywood	Pkw	Qc, Qs
Champagny	Pkw	Qs, Qc
Byam Martin	Pkw, Pkb	Qc, Qs
Uwins	Pkw	Qc, Qs
St Andrew	Pkw, Pkc	Qc, Qs
Coronation	Pkc, Pkl	Qc, Qs
Boongaree	Pkl, Pdh	Czs, Qc, Qs
Bigge	Pkl, Pdh	Czs, Qc, Qs
South Maret	Pkc	Tb, Qs
Wollaston	Pkl	Qs
Katers	Pkl, Pdh	Czs, Qs
East Montalivet	Pkc	Tb, Qs
Fenelon	Pdh	Tp, Qs
Carlia	Pkw, Pkc	Qc, Qs
South West Osborn	Pkc, Pkw	Qs
Middle Osborn	Pkc	Tb, Qs
Borda	Pkl	Qs
Sir Graham Moore	Pkl	Tp
Kingfisher	Pkpy	Qc
Melomys	Pkpy	Qc

*Strata are listed in descending order of importance.

The oldest of the Cenozoic strata are Tertiary deposits of various laterites (Tb, Tp) which occur as capping, in the form of mesas and dissected tablelands, on top of Carson Volcanics and King Leopold Sandstone. Such lateritic strata are only found on the more northerly islands. Cenozoic soils (Czs), as pale sandy light-textured soil overlying sandstone, occur as high-level plains on King Leopold Sandstone on Bigge and Boongaree Islands and in a valley situation on Warton Sandstone on Augustus Island. Comparatively young Quaternary soils are present as beach sands (Qs) and coastal deposits (Qc) of grey sticky chloropal saline mud with some silt and fine sand.

Soils associated with the various rock-types have been described by Speck (1960).

Following rejuvenation of the drainage system in the late Tertiary or early Pleistocene the Kimberley Plateau Province underwent a period of active dissection (Stewart *et al.* 1960, Allen 1971). Later, a Quaternary rise in sea level resulted in the drowning of valleys and the formation of the indented shoreline with many offshore islands and a coastal configuration strongly controlled by the jointing in the King Leopold and Warton sandstones.

Work by such authors as Nix and Kalma (1972) in Northern Australia, Fujii *et al.* (1971) in Asia, and Mörner (1971) in Scandinavia on sea level changes in the last 20 000 years, along with limited bathymetric data available from the north-west Kimberley coast, indicate that the islands were part of the mainland as recently as 8 000 to 10 000 years ago. This was about the time that Torres and Bass Straits were submerged (Gentilli 1961). A few islands, such as Boongaree Island, have possibly had a much more recent separation.

Kimberley island shorelines are usually rocky although small sandy beaches are present between some headlands. Along sheltered shorelines a narrow strip of littoral mud occurs and in sheltered bays there are often extensive littoral mudflats traversed by incised tidal creeks. Shallow rocky shoals and coral reefs occur around many of the islands.

DESCRIPTION

Plant specimens were collected from most of the islands visited. The collections are lodged in the Western Australian Herbarium.

1. **Sir Graham Moore Islands**

These islands lie off Anjo Peninsula, the north-western edge of Napier Broome Bay. They comprise two small islands—Scorpion and Kim—as well as Sir Graham Moore itself. Only the main island was visited.

Sir Graham Moore Island (2 660 ha).

The western portion of this sandstone island has a low profile and is mostly covered with sandy soil At the eastern end is a mesa capped by laterite. The two sections are joined by a narrow sandy isthmus.

An open-woodland of *Eucalyptus miniata* A. Cunn. ex Schau., *E. bleeseri* Blakely and *E. papuana* F. Muell. covers most of the island (Fig. 1). Shrubs of *Pouteria sericea* (Ait.) Bachr., *Acacia stigmatophylla* Benth. and *Terminalia canescens* (DC) Radlk. above *Plectrachne pungens* (R.Br.) C. E. Hubb., *Heteropogon* and *Cymbopogon* form scattered areas of low open-shrubland. Wide crevices, where sandstone is exposed, support *Pandanus* sp., *Eucalyptus* spp., *Owenia vernicosa* F. Muell. and *Ficus platypoda* A. Cunn. over hummock grasslands. Extensive areas of swamp supporting a closed-sedgeland of *Fuirena ciliaris* (L.) Roxb. surrounded by low-closed forests of *Melaleuca viridiflora* Soland. ex Gaertn. occur in the western portion of the island. *Xyris complanata* R. Br. and *Stylidium multiscapum* O. Schwartz commonly occur in these wetlands.

Sandy areas at the eastern end of the island have a low open-shrubland of *Pouteria sericea* (Ait.) Bachr. *Grevillea* sp., *Banksia dentata* L.f. and *Pandanus* with hummock grasslands.

Figure 1—Sir Graham Moore Island. Low open *Eucalyptus* woodland with shrubs of *Acacia* and grasses.

The flat laterite plateau of the mesa is covered with an open *Eucalyptus* woodland over hummock grasses (Fig. 2). *Acacia gonocarpa* F. Muell. and *Acacia translucens* A. Cunn. ex Hook. occur as scattered low open-shrublands. The laterite scree slopes of the mesa are covered with a low open or low closed-shrubland with some areas of *Pandanus* and *Adansonia gregorii* F. Muell.

Figure 2—Sir Graham Moore Island showing vegetation on laterite capped mesa.

Figure 3—Borda Island. Rugged King Leopold Sandstone with sparse vegetation. The shrubs are *Ficus platypoda* A. Cunn.

2. **Osborn Islands**

The Osborn Islands are located in Admiralty Gulf. There are six main islands—Borda, Middle Osborn, Kidney, South-West Osborn, Carlia and Steep Head. Kidney and Steep Head Islands were not inspected.

Borda Island (600 ha).

This island is composed of strongly dissected King Leopold Sandstone with deep, wide fissures. In places there are extensive sandy flats at the base of the sandstone cliffs.

Vegetation cover is sparse on the exposed sandstone (Fig. 3) with *Plectrachne* and *Triodia*, *Ficus platypoda* A. Cunn., *Gyrocarpus americanus* Jacq. and *Calytrix exstipulata* DC. Deep, wide fissures support a low open-shrubland of *Acacia retinervis* Benth. over *Plectrachne*.

A limited area of vine thicket, with *Tinospora* and a few large trees of *Albizia lebbek* (Willd.) Benth. and *Toona* sp., occurs at the foot of a high sandstone cliff. Wet areas near this cliff, support low open-forests of *Melaleuca viridiflora* Soland. ex Gaertn.

Extensive littoral areas of *Plectrachne* and *Spinifex longifolius* R.Br. with occasional *Pandanus* occur on a coastal sandplain in the north-west portion of the island.

Middle Osborn Island (2 300 ha).

This island consists of weathered Carson Volcanic rocks and associated red soils. Structurally it consists of high peaks surrounded by undulating slopes (Fig. 4).

Figure 4—Middle Osborn Island. The main peak with a fringing closed-scrub and low shrubland. *Sorghum* grassland in the middle distance.

The dominant vegetation is a low open-woodland of *Eucalyptus* with a grass and shrub understorey. Steep slopes support open and closed-shrublands of *Canarium australanium* F. Muell., *Buchanania obovata* Engl. and *Mimusops elengi* L. Low shrublands of *Cochlospermum heteroneurum* (F. Muell.) Benth. and *Brachychiton* occur on less steeply sloping areas. Small areas of an open-shrubland including *Acacia stigmatophylla* A. Cunn. ex Benth., *Trema aspera* Brongn.) Blume, *Grevillea mimosoides* R.Br., *Celtis philipinnensis* Blanco. and *Paramygnia trimera* (Oliv.) Burkill are scattered in the shrublands of steep and

gradual slope areas. *Sorghum* sp. and *Heteropogon contortus* (L.) Beauv. ex Roem. et Schultz occur under these shrublands.

Littoral areas have narrow zones of mangroves with closed-shrublands of *Thespesia populnea* Soland. ex Corr. and extensive flats of *Sporobolus virginicus* (L.) Kunth. and *Spinifex longifolius* R.Br. *Adansonia gregorii* F. Muell. occurs in the supra-littoral.

South West Osborn Island (1 370 ha).

This island includes two Warton sandstone mesas surrounded by extensive areas of steep and undulating volcanic slopes (Figs. 5, 6).

Figure 5—South West Osborn Island. Dissected Warton Sandstone on top of mesa with a tall shrubland of *Acacia* sp. over a *Plectrachne* hummock grassland.

Figure 6—South West Osborn Island. Fringing tall vine thicket containing numerous species below cliff. *Themeda* grassland in foreground.

Scattered low open-shrublands, mostly in crevices, dominate the dissected sandstone on top of the mesas. *Pouteria sericea* (Ait.) Bachr. is the most common shrub with *Ficus platypoda* A. Cunn., *Exocarpos latifolius* R.Br., *Canarium australanicum* F. Muell. and *Grevillea refracta* R.Br.

Sandstone scree slopes, at the foot of the sandstone cliffs of the mesas and adjacent areas of steeply sloping volcanic soils, support tall vine thickets of *Albizia lebbek* (Willd.) Benth., *Randia* cf. *racemosa* (Low) F. Vill, *Acacia hemignosta* F. Muell. and *Eugenia grandis* (Blume) Wight with *Tinospora smilacina* Benth. and other lianes.

At lower levels the volcanic soil slopes and areas of alluvium are characterised by *Adansonia gregorii* F. Muell. and extensive areas of *Themeda australis* (R.Br.) Stapf. and *Sorghum*. *Acacia dunnii* (Maiden) Turrill, *Zizyphus quadrilocularis* F. Muell. and *Hakea macrocarpa* R.Br. also occur on the lower slopes as components of scattered low open-shrublands.

Littoral areas in sheltered bays support some low closed-forests of mangroves. A small estuarine salt marsh occurs on the western coast.

Carlia Island (480 ha).

Carlia is geomorphologically similar to South West Osborn though the sandstone plateau is less well defined and without a pronounced scree slope. The vegetation is also similar.

The sandstone areas are sparsely vegetated except in crevices where *Ficus*, *Pouteria sericea* (Ait.) Bachr., *Atalaya veriifolia* (F. Muell.) Benth. and *Owenia vernicosa* F. Muell. frequently occur.

Both basic soils developed over volcanic rocks and alluvial soils in valleys support low open-woodlands with a ground cover of grasses. There are no areas of fringing vine thicket although a low forest was recorded at the base of a volcanic scree slope behind a beach on the western coast.

Extensive low closed-forests of mangroves, including *Ceriops tagal* (Perr.) C.B. Robinson and *Avicennia marina* (Forsk.) Vierh., occur on the central eastern coast.

3. **Low Rocks** (4 ha).

Low Rocks are situated in the northern part of Admiralty Gulf. There is one main rocky island with some low vegetation cover, mainly grasses and *Ipomoea* sp.

4. **Bonaparte Archipelago**

The Bonaparte Archipelago includes all islands from Cape Voltaire south to near Hall Point. There are a large number of islands varying in size from a few square metres to the two largest Kimberley islands—Augustus and Bigge. We visited most of the larger islands in this group.

Katers Island (1 775 ha).

Katers and Wollaston Islands are located in Montague Sound about 40 km north-west of Mitchell Plateau.

Extensive areas of Katers Island are composed of horizontally bedded sandstones with a sparse vegetation cover of shrubs and small trees over an open hummock grassland. The small areas of basic soil over dolerite support denser vegetation.

Sandstone rock terraces with shallow soil support scattered shrubs of *Ficus*, *Ervatamia orientalis* (R.Br.) Turrill., *Alstonia actinophylla* (A. Cunn.) K. Schum. and *Strychnos lucida* R.Br. An open hummock grassland of *Plectrachne*, with some *Acacia retinervis* Benth. shrubs, occurs on the deeper soils of wider sandstone terraces.

Ficus is particularly common in rock fissures although *Acacia xylocarpa* Benth. and occasional *Eucalyptus* sp. and *Erythrophleum chlorostachys* (F. Muell.) Baill. form tall open-shrublands in wider gullies.

Basic soil associated with the dolerite outcrop in the northern part of the island supports a tall to low open-shrubland of *Acacia xylocarpa* Benth. with some *Eucalyptus* sp. A steeply dipping slope on the southern edge of the dolerite outcrop is covered with a poorly developed vine thicket including *Tinospora smilacina* Benth. and *Aristolochia* sp.

Some sandy littoral areas occur. These are characterised by *Spinifex longifolius* R.Br. and *Ipomoea brasiliensis* (L.) Sw. Mangrove communities are not developed.

Wollaston Island (850 ha).

Vegetative cover on this sandstone island is very sparse and only well developed in crevices and on terraces (Fig. 7).

Figure 7—Wollaston Island. Sparse vegetation on King Leopold Sandstone terraces. *Pouteria sericea* (Ait.) Bachr., *Ficus platypoda* A. Cunn., *Acacia* sp. and hummock grasses in foreground.

The plant species and their habitats are similar to nearby Katers Island with rocky terraces characterised by *Ficus*, *Alstonia* sp. and *Acacia*. *Gyrocarpus americanus* Jacq. is one of the tallest trees present occurring on the shallow soil and rocky outcrops of the terraces.

Deep gullies crossing the centre of the island have a low open to closed-shrubland of *Acacia* ? *aulacocarpa* A. Cunn. ex Benth. and *Acacia retinervis* Benth. Restricted water seepage areas provide a habitat for the ferns *Lygodium microphyllum* (Cav.) R.Br. and *Stenochlaena palustris* (Burm.f.) Beddome.

There are no extensive mangrove stands. *Avicennia marina* (Forsk.) Vierh. and *Rhizophora stylosa* Griff. occur as small thickets in sheltered areas.

East Montalivet Island (320 ha).

This island, situated at the entrance of Montague Sound, is dominated by a laterite plateau supporting a hummock grassland of *Plectrachne* with some scattered shrubs of *Acacia* sp. The breakaway and scree slopes of the plateau support dense thickets of the same species as occur further down-slope although *Flagellaria indica* L. and *Abrus precatorius* L. are more common in this habitat.

The surrounding slopes of volcanic soil and rock outcrops are characterised by low open-shrublands of *Brachychiton* with scattered shrubs of *Mimusops elengi* L., *Diospyros nitens* W. V. Fitzgerald, *Randia* sp., *Terminalia* sp. and *Buchanania obovata* Engl.

An extensive sandy littoral area dominated by *Spinifex longifolius* R.Br. and *Salsola kali* L. occurs on the south side of the island.

South Maret Island (320 ha).

Lying 18 km seaward of Bigge Island, South Maret (Fig. 8) resembles East Montalivet.

Figure 8—South Maret Island showing laterite capped mesa and breakaways. A low open-shrubland occurs on the plateau while on the scree in the foreground is a thicket of low shrubs including *Randia* sp. and the scrambler *Abrus precatorius* L.

Most of the island is a laterite capped plateau supporting a low open-shrubland to an open hummock grassland of spinifex. *Acacia* ? *retinervis* Benth., *Eucalyptus* sp., *Grevillea pyramidalis* A. Cunn. ex R.Br. and *Diospyros nitens* W. V. Fitzg. are the common shrubs and trees. A medium dense or open grass understorey of *Plectrachne* and *Heteropogon contortus* (L.) Beauv. ex Roem. et Schultz occurs on the more weathered laterite and open areas of laterite support *Crinum flaccidum* Herbert, *Cadaba capparoides* DC. and *Gomphrena* sp. The steep scree slopes over volcanic rocks are generally covered by thickets of low shrubs such as *Pouteria sericea* (Ait.) Bachr. and *Randia* with *Flagellaria indica* L. and *Abrus precatorius* L. *Pandanus* trees were noted in deeper valleys.

Littoral vegetation is limited to narrow zones of *Spinifex longifolius* R.Br. on the western and eastern shores.

Bigge Island (17 190 ha).

Bigge is the second largest island in the Kimberley. It lies between Montague and York Sounds and is separated from the mainland by Scott Straight.

Most of the island consists of strongly dissected King Leopold sandstone with a sparse vegetation cover. Extensive areas of superficial Cenozoic deposits occur in the central and southern parts of the island.

The sandstone outcrops (Fig. 9) support scattered small trees and shrubs of *Owenia vernicosa* F. Muell., *Alstonia actinophylla* (A. Cunn.) K. Schum. and *Pouteria sericea* (Ait.) Bachr. Rock crevices and narrow, steep-sided valleys are characterised by low and tall open-shrublands, as well as woodlands of *Acacia* ? *retinervis* Benth., *Strychnos lucida* R.Br., *Gardenia pantonii* F. Muell. and *Eucalytpus* sp. A hummock grassland to an open-hummock grassland of *Plectrachne* occurs in all situations.

Figure 9—Bigge Island. Exposed King Leopold Sandstone with Native Walnut (*Owenia vernicosa* F. Muell.).

Broader valleys in the sandstone areas generally have well defined scree slopes with an open-hummock grassland of *Plectrachne* and scattered trees and shrubs of *Ficus platypoda* A. Cunn., *Owenia vernicosa* F. Muell., *Acacia* spp. and *Pouteria sericea* (Ait.) Bachr. Valley floors with deeper soil support a closed-grassland of *Plectrachne* sp. and *Cymbopogon procerus* (R.Br.) Domin. with an open upper storey of *Eucalyptus miniata* A. Cunn. ex Schau., *Acacia* sp. and, along watercourses, *Banksia dentata* L.f.

On the undulating central and southern parts of the island, Cenozoic soils support extensive woodlands of *Eucalyptus miniata* A. Cunn. ex Schau., *Terminalia* sp., *Buchanania obovata* Engl. and shrubs of *Celtis philipinnensis* Blanco. over a medium dense to sparse cover of *Plectrachne* sp. and *Cymbopogon procerus* (R.Br.) Domin. (Fig. 10).

Figure 10—Bigge Island. Woodland of *Eucalyptus miniata* A. Cunn. ex Schau.

Shorelines are mostly rocky though there are some wide areas of coastal sands with a closed-grassland of *Spinifex longifolius* R.Br. and emergent *Scaevola taccada* (Gaertn.) Roxb. and *Morinda citrifolia* L.

Mangrove areas are nowhere extensive except around Boomerang Bay and a few sheltered bays on the east side.

Boongaree Island (4 880 ha).

Boongaree Island is situated in Prince Frederick Harbour adjacent to the Prince Regent River Nature Reserve (Miles and Burbidge 1975). Most of the island is composed of King Leopold Sandstone but a large dome of Hart Dolerite in the central part divides the sandstone into two discrete areas.

The vegetation of the sandstone is mostly a low open-woodland of *Eucalyptus miniata* A. Cunn. ex Schau. and *E. brachyandra* F. Muell. with shrubs of *Acacia delibrata* A. Cunn. ex Benth., *Calytrix exstipulata* DC., *Dodonaea viscosa* L. and *Grevillea* sp. Rocky areas are more sparsely vegetated with *Ficus platypoda* A. Cunn. and *Cassine melanocarpa* (F. Muell.) O. Kuntze as well as *Terminalia canescens* (DC.) Radlk. Areas of deeper soils support woodlands or *Acacia* spp. low open-shrublands over

Figure 11—Boongaree Island. Woodland of *Eucalyptus miniata* A. Cunn. ex Schau. Low closed-forest of mangroves behind.

Plectrachne hummock grasses (Fig. 11). A small area of poorly developed vine thicket was found on coastal scree under a sandstone cliff.

On soils associated with dolerite, *Cochlospermum fraseri* Planch., *Sterculia viridiflora* W. V. Fitzg. and *Adansonia gregorii* F. Muell. occur over tall grass (*Cymbopogon procerus* (R.Br.) Domin.).

Extensive low closed-forests of mangroves, dominated by *Avicennia marina* (Forsk.) Vierh., *Rhizophora stylosa* Griff. and *Sonneratia alba* J. Sm. almost connect with the mainland mangrove forests.

Coronation Island (3 830 ha).

The Coronation Islands are a group of islands lying between York Sound and Brunswick Bay. They enclose the western side of Port Nelson.

The largest island (Coronation) is very irregular in outline and is mostly composed of gentle slopes and rounded hills of volcanic soils with occasional rocky outcrops (Fig. 12). There are many sandy

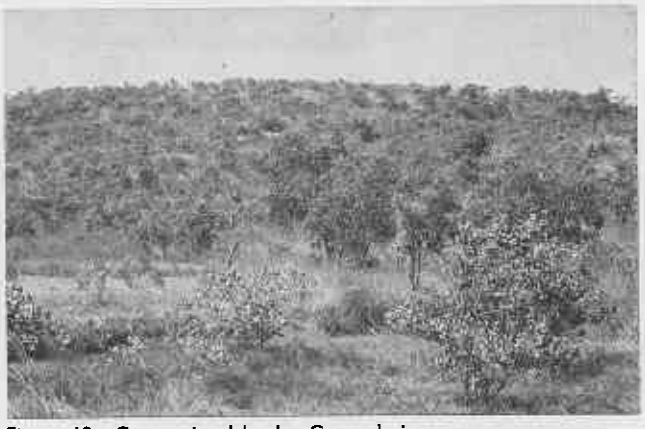

Figure 12—Coronation Island. General view.

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Figure 13—Coronation Island. Open-woodland of *Eucalyptus latifolia* F. Muell.

beaches and rocky basaltic headlands with steep cliffs and scree slopes. A small area of King Leopold Sandstone occurs in the northern part.

Most of the island is covered by a low open-woodland of *Eucalyptus latifolia* F. Muell. with a more or less complete shrub and grass ground cover (Fig. 13). *Indigofera linifolia* Retz., *Acacia stigmatophylla* A. Cunn. ex Benth. and *Buechnera* sp. with *Heteropogon contortus* (L.) Beauv. ex Roem. et Schultz and *Sorghum* are common shrubs and grasses in this habitat. Areas of low closed-woodland or low closed-forest are scattered throughout the island. *Eucalyptus latifolia* F. Muell. and *Phyllanthus*

Figure 14—Coronation Island. Pool in watercourse.

maderaspatanus L. commonly occur here. Narrow valleys or gullies support dense thickets of *Terminalia fitzgeraldii* C. A. Gardn. and *Abrus precatorius* L. with dense cover of *Sorghum* ? *australiense* Garber et Snyder. There are occasional watercourses with semi-permanent pools (Fig. 14).

The small area of sandstone supports an open-woodland of *Acacia* over *Plectrachne*.

Extensive low closed mangrove forests occur in large sheltered bays. Rocky coasts support scattered shrubs of *Lumnitzera racemosa* Willd., *Lysiphylla cunninghamii* (Benth.) De Wit. and *Securinega melanthesoides* (F. Muell.) Airy Shaw.

Bat Island (30 ha).

Lying off Cape Brewster, Bat Island is joined to the mainland at low tide. It has a vegetation similar to that of the adjacent Warton Sandstone and Carson Volcanic areas of the adjacent mainland (Miles, Kenneally, and George 1975).

Uwins Island (3 310 ha.)

Uwins (Fig. 15) lies at the mouth of the Prince Regent River.

As in the case of the other sandstone islands, sparse vegetation is developed on elevated areas between the numerous deep, seasonally wet crevices. The dissected sandstone areas support a low open-woodland of *Eucalyptus miniata* A. Cunn. ex Schau., *E. ferruginea* Schau. and *E. perfoliata* Benth. Shrublands of scattered *Acacia stipulosa* F. Muell. and *Acacia humifusa* Benth. over *Plectrachne* also occur. Broader crevices (gullies) support denser vegetation with some development of poor vine thicket. *Livistona* sp., *Pandanus* and *Bossiaea bossiaeoides* (A. Cunn. ex Benth.) A. B. Court commonly occur in this situation.

Mangrove low closed-forests of *Avicennia marina* (Forsk.) Vierh. and *Ceriops tagal* (Perr.) C. B. Robinson occur in sheltered areas. Sandy beaches with *Spinifex longifolius* R.Br. are not common,

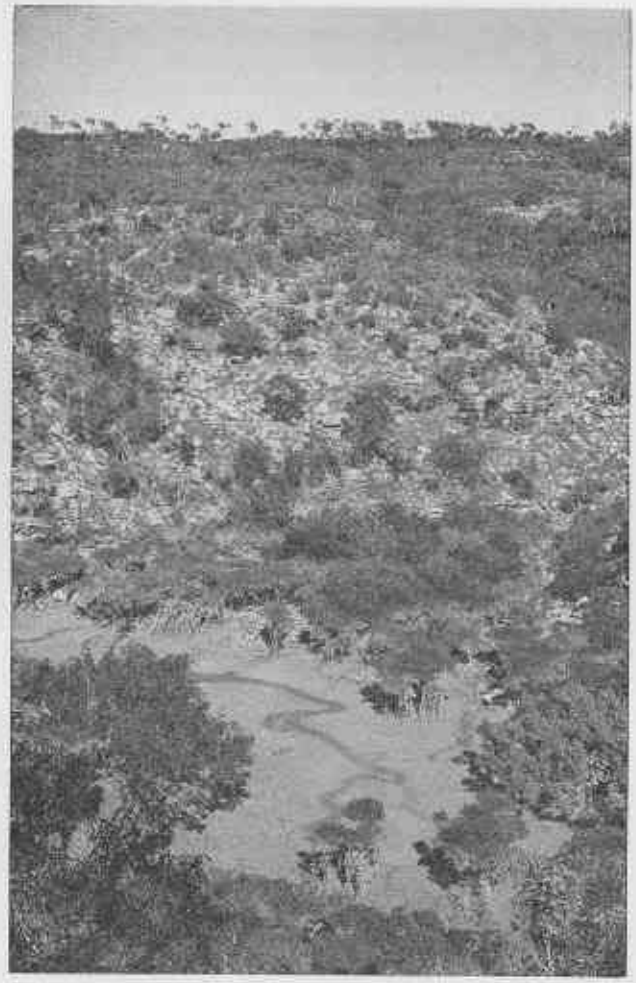

Figure 15.—Uwins Island. Sandstone plateau and scree and adjacent mangroves at low tide.

most of the shoreline being rocky with vegetation characteristic of more elevated parts of the island approaching the shore line.

Saint Andrew Island (1 410 ha).

This and St Patrick Island (which we did not visit) lie within St George Basin near the mouth of the Prince Regent River.

St Andrew consists of a central Warton Sandstone plateau surrounded by scree slopes on Carson Volcanic rock. The vegetation of the sandstone is typical for that type of country on the mainland (see Miles, Kenneally and George 1975) with sparse cover except in the numerous crevices and where some soil has developed on rock terraces.

Figure 16—Augustus Island. Warton Sandstone with low open-shrubland and hummock grassland of *Plectrachne*.

Figure 17—Augustus Island. Vine thicket below cliff. Hummock grasses in foreground.

Small areas of poorly developed vine thicket occur on steeply sloping moist soil areas below the sandstone cliffs. Much of the slopes are covered by low open-woodlands of *Eucalyptus miniata* A. Cunn. ex Schau. and *Terminalia ferdinandiana* Exell. over hummock grasslands and open grasslands.

Augustus Island (17 950 ha).

Augustus is the largest island in the Kimberley. It, and nearby islands, divide Brunswick Bay from Camden Sound. The Kuri Bay pearl culture centre is sheltered from the open sea by Augustus Island. Most of Augustus Island is strongly dissected Warton Sandstone country with joint controlled

Figure 18—Augustus Island. *Eucalyptus* woodland with *Pandanus* on alluvial soil.

drainage. In the central northern part of the island there is a small area of alluvail soil. Volcanic areas which outcrop on the island were not examined.

Sparse vegetation cover typifies the Warton Sandstone (Fig. 16). A low open-woodland of *Eucalyptus* sp. and *Owenia vernicosa* F. Muell. with a ground cover of *Plectrachne pungens* (R.Br.) C. E. Hubb. is quite widespread. Low open-shrublands of *Acacia gonocarpa* F. Muell. are also common and scattered shrubs of *Buchanania obovata* Engl. and *Grivellea agrifolia* A. Cunn. ex Benth. occur throughout the shrublands and woodlands. Dissected sandstone outcrops are sparsely covered with *Ficus leucotricha* Miq., *Ervatamia* sp. and, in some areas, *Callitris intratropica* Baker et Smith.

Steeply sloping areas or steep cliffs with a scree slope support open-shrublands with *Maba humilis* R.Br. and other shrubs frequently covered by the creeper *Abrus precatorius* L. Areas near the south coast support vine thicket in suitable habitats (Fig. 17).

Alluvial soil supports a low closed to low open-woodland of *Eucalyptus* sp., *Acacia plectocarpa* Benth., *A. tumida* Benth., and *Pandanus* with *Calytrix achaeta* F. Muell., *Cyperus* cf. *holoschoenus* R Br. and *Eriachne sulcata* Hartley (Fig. 18). Permanent fresh water occurs in watercourses through the alluvial soils. These provide a habitat for *Nymphaea gigantea* Hook. and *Xyris complanata* R.Br. Lower reaches of the watercourses support fringing forests to woodlands of *Melaleuca leucadendron* (L.) L. and *Melaleuca viridiflora* Soland. ex Gaertn. (Fig. 19).

Figure 19—Augustus Island. Permanent fresh water pool with ringing *Melaleuca viridiflora* Soland. ex Gaertn.

The littoral habitat is restricted because of the steep cliffs and scree slopes around most of the coastline. Narrow mangrove areas occur in sheltered inlets and *Ceriops tagal* (Perr.) C. B. Robinson, *Bruguiera exaristata* Ding Hou, *Aegiceras corniculata* (L.) Blanco and two species of *Rhizophora* were recorded.

Heywood Islands

The Heywood Islands comprise two fairly large islands and a number of smaller ones. They are situated to the north-west of Augustus Island.

The two larger islands (Darcy Island and Heywood Island) are low profile Warton Sandstone islands with less habitat diversity than Augustus Island.

Most of Darcy Island (4 801 ha) is covered with a low open-woodland of *Eucalyptus* spp. mostly *Eucalyptus miniata* A. Cunn. ex Schau., with a variable shrub layer of *Acacia* spp. (including *Acacia delibrata* A. Cunn. ex Benth.), *Grevillea* sp. and *Dodonaea* sp. over hummock grasses. Shallow joint controlled drainage valleys which cross the island in a number of directions support denser vegetation—low woodlands and thickets—mostly of the same species as on intervening areas.

Figure 20—Darcy Island. Valley behind beach with woodland of *Eucalyptus confertiflora* F. Muell. with *Cycas media* R.Br. over hummock grassland.

A tall closed-forest of *Melaleuca leucodendron* (L.) L, surrounded by a flood-plain with scattered *Pandanus*, and *Byblis liniflora* Salisb. was recorded in the mouth of a valley opening onto a sandy pebble beach.

A smaller valley with steep sandstone scree sides, opening onto the same beach, supports a woodland of *Euclayptus confertiflora* F. Muell., *Acacia delibrata*, A. Cunn. ex Benth., *Ficus opposita* Miq., *Owenia vernicosa* F. Muell. and *Cycas media* R.Br. over hummock grassland (Fig. 20).

Heywood Island (760 ha) is smaller than Darcy and appears to have the same degree of vegetation cover with an extensive low open-woodland of *Eucalyptus* spp., *Acacia* and *Pandanus* over *Plectrachne*.

Low closed-forests of mangroves are restricted to a few localities. There is one extensive mangrove formation on Darcy. Sandy beaches commonly occur around both islands. These have *Spinifex longifolus* R.Br. and *Triodia* cf. *angusta* N. T. Burbidge with *Salsola kali* L. on the low dunes.

Figure 21—Byam Martin Island. General view.

Byam Martin Island (760 ha)

Byam Martin lies to the west of Augustus and to the south of Heywood Island. It is similar to the latter in its geomorphology, being a low profile sandstone island with numerous joint controlled drainage lines. The western part of the island is composed of the Buckland Point Member of the Warton Sandstone but no obvious vegetation difference was noted.

Most of the island is covered by a low or tall open-shrubland of *Acacia sericata* A. Cunn. ex Benth. and *Acacia plectocarpa* Benth. with scattered *Eucalyptus perfoliata* Benth. (Figs 21, 22). Open vegetation occurs on rocky areas where *Petalostigma pubescen* Domin. and *Verticordia cunninghamii* Schau. commonly occur *Adansonia gregorii* F. Muell. appears on pockets of deeper soil. Seasonal watercourses in the sandstone crevices support *Pandanus* with *Oldenlandia scleranthoides* (F. Muell.) Jackson and *Melaleuca viridiflora* Soland. ex Gaertn.

Mangrove low closed-forests are very limited in extent, shorelines being mostly rocky or sandy. *Aegialitis annulata* R.Br. was recorded from one mangrove area.

Champagny Island (1 330 ha)

Situated to the west-north-west of the Heywood Islands, the Warton Sandstones of Champagny have an even lower profile and numerous shallow joint controlled drainage lines.

Figure 22—Byam Martin Island. Tall open-shrubland of *Acacia sericata* A. Cunn. ex Benth. over *Plectrachne*.

Low rocky headlands occur around the coast; these have low open-shrubland including *Tephrosia leptoclada* Benth. and *Fimbristylis* sp.

Most of the island is covered by a tall open-shrubland of *Acacia plectocarpa* Benth. and *Acacia tumida* F. Muell. with scattered *Eucalyptus perfoliata* Benth. over *Plectrachne* and *Cymbopogon procerus* (R.Br.) Domin. Open areas support hummock grassland of *Plectrachne* and, in rocky areas, *Ficus leucotricha* Miq. and *Ficus* cf. *puberula* Miq.

5. **Kingfisher Islands**

Situated in Collier Bay these comprise two major islands—Kingfisher (1 010 ha) and Melomys (850 ha)—and some smaller ones. Until recently they were known as the Wood Islands.

Both islands support extensive low open-woodlands of *Eucalyptus* spp. especially *E. miniata* A. Cunn. ex. Schau. with local development of low closed-shrubland in drainage channels. *Terminalia canescens* (DC.) Radlk., *Acacia hippuroides* Hew. ex Benth., *Cassia oligoclada* F. Muell. and *Celtis phillipinnensis* Blanco. are common shrubs, with an understorey of *Ptilotus exaltatus* Nees., *Amaranthus leptostachys* Benth., *Phyllanthus* spp. and other small shrubs. Steep scree slopes occur near the coast and these are vegetated with hummock grasslands of *Plectrachne danthonioides* (F. Muell.) C. E. Hubb. and other grasses with emergent *Acacia tumida* F. Muell. ex Benth. Rocky outcrops and coastal slopes support scattered small trees of *Ficus leucotricha* Miq., *F. opposita* Miq., *Calytrix exstipulata* DC. and other small shrubs. Mangrove formations are limited to narrow strips in sheltered areas.

6. **Browse Island**

Browse Island is a small cay (*ca* 60 ha) situated on the Sahul Shelf about 350 km north of Derby. The island once held large deposits of guano but these have been mined out, resulting in a disturbed surface (Fig. 23).

Figure 23—Browse Island, showing disturbed surface following guano mining. The creeper *Ipomoea brasiliense* (L.) Sw. is scrambling over rocks in the foreground.

Behind the beaches is a sparse vegetation consisting mainly of *Ipomoea brasiliense* (L.) Sw. and a few scattered bushes of *Scaevola taccada* (Gaertn.) Roxb. On undisturbed coral sand the most common species are *Abutilon indicum* (L.) G. Don. and an unidentified *Sida*. The grasses *Eragrostis* sp. and *Cenchrus brownii* Roem. et Schultz. are also common. Disturbed areas have been colonised by *Ipomoea* and *Sida*.

7. **Adele Island**

Lying about 100 km north-north-east of cape Levêque Adele is a low, flat, sandy cay of about 200 ha. The lowest, more frequently inundated areas support grasslands of *Sporobolus virginicus* (L.) Kunth. Slightly elevated soils have a dense cover of *Spinifex longifolius* R.Br. Areas disturbed by nesting seabirds support *Boerhavia chinensis* L. and *Amaranthus* cf. *spinosus*. *Canavalia maritima* (Aubl.) Urb. is relatively common, particularly on the beaches. *Salsola kali* L., *Portulacca oligosperma* F. Muell., *Cyperus conicus* (R.Br.) Boek., *Euphorbia chrysochaeta* W. V. Fitzg., *Sesuvium portulacastrum* L. and an *Ipomoea* were the only other species recorded.

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PART III

MAMMALS

by N. L. McKenzie[1], A. A. Burbidge[1], A. Chapman[2] and W. K. Youngson[1].

INTRODUCTION

This paper is based on information collected during biological surveys in 1971, 1972 and 1973. Islands visited are described in Burbidge, Marchant, McKenzie and Wilson (this publication) and a map showing the location of islands is included in the Introduction (Burbidge and McKenzie, this publication). All specimens have been lodged in the Western Australian Museum with registration numbers M8484—8496, 9248—9362, 10348—10353, 10356—10367, 10371—10390, 10400—10448, 10452, 10454—10463, 10465—10472, 10476—10478 and 15414—15418.

Mammals were collected on 18 islands by trapping and spotlighting techniques similar to those described in McKenzie *et al.* (1975). The period of collection on islands varied from a few hours to eleven days; the length of stay mainly depended on island size (see Introduction, Tables 1–3) and habitat diversity.

Data are presented in the following order in the annotated species list.

(1) Number of males and females collected from each island.

(2) Habitat.

(3) Breeding information where mammary development and/or signs of pregnancy were detected.

(4) Taxonomic notes.

(5) Mode and time of collection.

ANNOTATED SPECIES LIST

FAMILY MACROPODIDAE

Petrogale burbidgei Kitchener & Sanson **Warabi**

Bigge (5♂, 2♀), Boongaree (1♂), Katers (2♂, 2♀). A skull (WAM M5978) was collected on Bigge on 20 September 1963, and another was collected in July 1977.

Tracks and scats of a wallaby of similar size were recorded on Uwins and Darcy. Wallabies of a similar size were also sighted on Wollaston. We cannot assign these records to either *Petrogale burbidgei* or *Peradorcas concinna* without specimens.

Rugged King Leopold Sandstone country with low open-woodlands of *Eucalyptus* spp. and *Owenia vernicosa* over hummock grassland (*Plectrachne* spp.).

One pouch young (♀, 40 mm crown-rump, June 1972, Bigge).

This species is known also from the mainland at Mitchell Plateau and the Prince Regent River Nature Reserve (Kitchener and Sanson 1978).

Shot after dark and during the day. Often flushed from cover during the day.

Peradorcas concinna (Gould) **Little Rock-Wallaby**

Augustus (1♂?, 1♀), Borda (1♂, 1♀).

Rugged Warton and King Leopold Sandstone country with low open-woodlands of *Eucalyptus* spp. and *Owenia vernicosa* over hummock grasslands. Often seen near mangroves on Augustus.

We did not note any differences between the habitat or behaviour of this and the preceding species although Augustus and Borda probably receive lower rainfall than Bigge, Boongaree and Katers (Anon. 1975).

The females both had joeys. Augustus (no data, May 1972), Borda (♂, 30 mm crown-rump, June 1972).

Shot after dark.

FAMILY PHALANGERIDAE

Wyulda squamicaudata Alexander **Scaly-tailed Possum**

Boongaree (1♀). (Reported on Bigge by Royal Australian Survey Corps., 26 August 1971).

Under a coastal Baobab (*Adansonia gregorii*) on the edge of a low open-woodland of *Eucalyptus* spp. over tussock grassland in rugged King Leopold Sandstone country.

One ♀ pouch young (21 mm crown-rump, 7 July 1973).

Cage trap.

FAMILY PETAURIDAE

Petaurus breviceps Waterhouse **Sugar Glider**

Augustus (1♂).

Rugged Warton Sandstone boulder slope supporting a low open-woodland of *Eucalyptus* spp. with scattered *Owenia vernicosa* over rank hummock grassland. In fruiting *Owenia vernicosa* tree.

Shot after dark.

FAMILY PERAMELIDAE

Isoodon macrourus macrourus (Gould) **Brindled Bandicoot**

St Andrew (2♂).

One came from an area of canegrass on Carson Volcanic soils with some scree near the edge of a dense vine thicket.

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The other came from alluvial creek soils with Warton Sandstone boulders in an area of open-woodland of *Eucalyptus* and *Owenia vernicosa* over tall dense canegrass.

Trapped.

Isoodon auratus (Ramsay) **Golden Bandicoot**

Augustus (1♂).

Rugged Warton Sandstone country supporting a low open-woodland of *Eucalyptus* spp. over hummock grassland.

Trapped.

FAMILY DASYURIDAE

Dasyurus hallucatus Gould **Little Northern Native-Cat**

Augustus (1♂), Wollaston (1♂), Bigge (2♂, 2♀), Uwins (2♂), Boongaree (1♂, 2♀). Seen on Carlia.

Rugged Warton and King Leopold Sandstone country supporting woodlands of *Eucalyptus* spp. over hummock grassland and, in more sandy areas, canegrass. Also in vine thickets and low open-forests of *Terminalia* and *Ficus*, with *Flagellaria* and lianes, below cliffs and in gullies. Commonly collected and observed at night in coastal situations between mangroves and sandstone country; also observed in the littoral zone at low tide.

One was seen at night on a Carson Volcanic scree slope in a low forest on Carlia.

On Boongaree several were trapped on deep soil supporting canegrass near the foot of a sandstone slope. They had been eating *Rattus tunneyi* caught in traps set over a burrow system in the deep soil. On two of the sandstone islands (Uwins and Boongaree) they were relatively common and specimens were released from traps.

Shot both at dusk and after dark. Trapped.

Antechinus sp.

Augustus (1♂), South Heywood (1♀).

Rugged Warton Sandstone country. *Plectrachne* hummock grassland. On Heywood a tall open-shrubland of *Acacia* was also present.

Probably referable to *Antechinus bilarni* (M. Archer, pers. comm.).

Shot at dawn. Trapped.

FAMILY MURIDAE

Rattus tunneyi (Thomas) **Tunney's Rat**

Boongaree (13♂, 7♀), St Andrew (2♂, 1♀).

Most from Boongaree were trapped near a burrow system in deep soil supporting a *Eucalyptus* open-woodland over canegrass. The rest came from open-woodlands of *Eucalyptus* and *Acacia* over patches of hummock grassland and canegrasses on sandy soil with occasional sandstone boulders.

The St Andrew specimens came from *Eucalyptus* open-woodland over hummock grasslands and cane-grasslands on Warton Sandstone derived soils (some scree) and Carson Volcanic derived soils respectively. Five of the Boongaree females were pregnant with between 2 and 7 foetuses (5–7 July 1973). The St Andrew female was a non-parous juvenile (10 July 1973).

Trapped.

Hydromys chrysogaster Geoffroy **Water Rat**

Sir Graham Moore (1♂), Kingfisher (1♀).

In a coastal situation on rugged sandstone behind mangroves (Kingfisher Island).

On a beach near mangroves adjacent to a woodland of *Eucalyptus* and *Terminalia* over "sorghum" grassland on sandy sandstone derived soils with occasional King Leopold Sandstone outcrops (Sir Graham Moore).

Trapped.

Mesembriomys macrurus (Peters) **Golden-backed Tree-Rat**

Wollaston (1♂), Carlia (1♂), Uwins (1♂).

In hummock grassland at the junction of beach sand and rugged King Leopold Sandstone country (Wollaston).

On a sandy beach at the foot of a Carson Volcanic slope covered with low open-woodland (Carlia).

In rugged Warton Sandstone country with *Eucalyptus miniata* open-woodland over hummock grassland (Uwins).

Trapped. Shot.

Zyzomys argurus (Thomas) **Common Rock-Rat**

Augustus (15♂, 12♀), Coronation (1♂, 1♀).

Rugged Warton Sandstone country supporting low open-woodlands to woodlands of *Eucalyptus* spp., *Owenia vernicosa* and some *Ficus* over hummock grassland (Augustus).

King Leopold Sandstone country supporting a tall open-shrubland of *Acacia* sp. over hummock grassland (Coronation). Cave in coastal Carson Volcanic cliff (Coronation).

Four females were pregnant with 2 foetuses each, another three females showed uterine distension and mammary development (12–19 May 1972). The female from Coronation had 3 foetuses (25 May 1972).

The Coronation specimens were unusually large (♂ 75 gm, ♀ 80 gm) compared with *Z. argurus* from the adjacent mainland (McKenzie *et al.* 1975). The coloration of specimens from Coronation was distinctly different being brownish on the underside with white throat patches. Further specimens are needed to establish the status of this island population.

Trapped.

Zyzomys woodwardi (Thomas) **Woodward's Rock-Rat**

Augustus (3♂, 1♀), Darcy (4♂, 5♀), Bigge (7♂, 13♀), Katers (3♂, 3♀), Middle Osborn (2♂), South West Osborn (15♂, 11♀), Boongaree (5♂, 7♀), Borda (3♂, 2♀). A rodent, possibly *Z. woodwardi*, was seen on Heywood and Champagny.

All types of rugged King Leopold and Warton Sandstone country including low open-woodlands of *Eucalyptus* spp. and tall shrublands of *Acacia* over hummock grasslands, vine thickets over leaf litter, and fringing formations of *Terminalia*, *Eucalyptus*, *Pandanus* and *Ficus*. Also on sandy beaches adjacent to sandstone country. Carson Volcanic scree covered with vine thickets on Middle Osborn.

Breeding information is summarised in Table 1.

Trapped. Shot at night.

Pseudomys delicatulus (Gould) **Little Native-Mouse**

Bigge (1♂, 4♀, 2 undertemined).

White sand with *Spinifex longifolius* grassland and *Plectrachne* hummock grassland behind a beach. In low open-woodland of *Eucalyptus* spp. over low hummock grassland on sandy soil with occasional exposures of sandstone.

Two females were pregnant with 1 and 3 foetuses (2 and 6 June 1972).

Trapped.

Melomys sp.

Sir Graham Moore (8♂, 5♀), Melomys (1♀).

Open-woodland of *Eucalyptus* and *Terminalia* over Sorghum type grasses on sandy soils with exposed King Leopold Sandstone. Some *Pandanus* in patches. Laterite scree slope supporting low open-woodland of *Eucalyptus* over patches of dense canegrass and leaf litter.

The Melomys Island specimen came from a pebble beach beneath a sandstone slope supporting hummock grassland.

Four specimens from Sir Graham Moore were pregnant (1–3 July 1973). Two had three foetuses and two had two foetuses. The Melomys Island specimen was also pregnant with two foetuses (13 July 1973). We infer that breeding was well advanced at the time of collection because two animals from Sir Graham Moore with small foetuses (crown-rump length 5 and 7 mm) had enlarged teats indicative of lactation and were probably suckling a previous litter.

The Melomys Island specimen was heavier (93 gm) than females from Sir Graham Moore ($67 \cdot 2 \pm 5 \cdot 04$ gm ($n = 5$)), was larger in all external body measurements, and had a different fur texture. The taxonomy of *Melomys* is in need of revision (Parker 1973).

Trapped.

Mus musculus Linnaeus **House Mouse**

Browse (8; sex undetermined).

An introduced species seldom recorded in the north Kimberley.

Trapped by oil company personnel stationed on island.

FAMILY VESPERTILIONIDAE

Eptesicus pumilis Gray **Little Bat**

Boongaree (1♂, 1 undetermined), Bat (1♂, 2♀).

Flying over a Hart Dolerite exposure on the coast (Boongaree).

In a deep cave, just above the high tide line, in Carson Volcanic rock on the south side of Bat Island.

One female (Bat Island, 26 June 1973) had enlarged uteri and developed mammae.

Shot at dusk. Caught in a cave during the daytime.

FAMILY HIPPOSIDERIDAE

Hipposideros ater Templeton **Dusky Horshoe Bat**

Augustus (3♂), Byam Martin (1♂).

5 m into a tunnel penetrating a depression filled with sandstone boulders in rugged Warton Sandstone country. Humidity in the tunnel was very high (Augustus).

TABLE 1

FEMALE *Zyzomys woodwardi* BREEDING DATA

Island	Date	No. of ♀♀	Non-Parous (Juveniles and sub-adults)	Pregnant (F = foetus)	Signs of reproductive activity*
Augustus	20 August 1971	1	....	....	1
Darcy	21 August 1971	3	....	....	1
Augustus	14 May 1972	1	....	....	1
Darcy	23 May 1972	2	....	....	2
Bigge	2–6 June 1972	13	2	1 (2F)	9
Katers	10–12 June 1972	3	....	....	1
Borda	13–14 June 1972	2	....	....	2
South West Osborn	16 June 1972	1	1	....	....
South West Osborn	28–30 June 1973	10	2	2 (3F each)	5
Boongaree	5–7 July 1973	7	....	5 (2F each)	2

*Enlarged uteri, developed mammae, vascular areas on uteri.

Flying over coastal sandstone (Byam Martin).

Caught in a cave during daytime. Shot at dusk.

Hipposideros stenotis Thomas **Lesser Warty-nosed Horseshoe Bat**

Boongaree (2♀).

10 m into cleft in coastal King Leopold Sandstone cliff. The entrance was partially blocked with boulders and the humidity was very high.

Flying over Hart Dolerite exposure on coast.

One had enlarged uteri and developed mammae (5 July 1973). The other was sub-adult.

In separating this species from *Hipposideros semoni* Matschie we have followed Hill (1963).

Caught in cave during daytime. Shot at dusk.

FAMILY EMBALLONURIDAE

Taphozous georgianus Thomas **Common Sheath-tailed Bat**

Augustus (1♂, 1♀), Bat (3♂, 1♀), Boongaree (6♂), Bigge (2♂, 2♀).

Over P.V. *Dampier* at anchor in a coastal inlet fringed by mangroves and Warton Sandstone country (Augustus).

In a deep cave, just above high tide line, in Carson Volcanic rock on south side of Bat Island. Crevices in Coastal King Leopold Sandstone (Boongaree).

From caves in rugged King Leopold Sandstone country (Bigge).

Shot after dark. Caught in caves during daytime.

FAMILY PTEROPODIDAE

Pteropus alecto Temminck **Black Flying Fox**

Coronation (1♀), Boongaree (1♂), St Andrew (1♀).

Also seen on Augustus in large numbers.

In a flowering *Eucalyptus papuana* in open-woodland behind beach in Carson Volcanic country (Coronation).

Over Hart Dolerite coastal ledges fringed with mangroves (Boongaree).

Seen roosting at night in mangroves and one collected from a *Eucalyptus* tree in rugged coastal Warton Sandstone country behind mangroves (St Andrew).

Shot after dark.

FAMILY TACHYGLOSSIDAE

Tachyglossus aculeatus (Shaw) **Echidna**

Bigge (scats).

Rugged King Leopold Sandstone country.

FAMILY CANIDAE

Canis familiaris dingo Meyer **Dingo**

Scats and/or tracks on Augustus, Middle Osborn, Wollaston. Scats recorded on Bigge by Royal Australian Survey Corps., 26 August 1971, and by us in 1977.

Rugged King Leopold and Warton Sandstone country, Carson Volcanics, beaches.

FAMILY SUIDAE

Sus scrofa Linnaeus **Pig**

Sir Graham Moore.

All habitats on the island. Many seen.

One shot, not collected.

DISCUSSION

Twenty-two species of native mammal and two species of introduced mammal were recorded on islands off the north-west Kimberley coast during the survey. We can find only one previous mammal record from these islands (*Petrogale burbidgei*, Bigge Island, 1963, W.A. Museum M5978) although collections are available from Koolan and Cockatoo Islands in the Buccaneer Archipelago (W.A. Museum).

In terms of climate (Anon. 1975), geology (Burbidge *et al.* this publication) and flora, the islands off the north-west Kimberley coast are very similar to the adjacent mainland (see Miles and Burbidge 1975; Gelatly and Sofoulis 1969). The same situation holds for the mammals. All the mammal species recorded on the islands are known from the north-west Kimberley mainland to-day.

Nix and Kalma (1972) indicate that the islands were part of the mainland coast as recently as 8 000 years ago. It is reasonable to assume therefore that the mammal faunas of the islands are derived from the north-west Kimberley mainland fauna and that terrestrial species have been isolated for 8 000 years or less. Certain inshore islands probably separated from the mainland comparatively recently. For example Boongaree Island is separated from the mainland by a channel less than 0·5 km wide, running through a mangrove mud-flat. It is doubtful whether the mammal faunas of islands such as this have achieved a "final equilibrium situation" (as discussed in Diamond 1975).

There are many published instances of reduction in species diversity of faunas isolated on continental islands and the principles behind the expectation of changes in density and diversity of island faunas have been discussed by McArthur, Diamond and Karr (1972), Diamond (1975) and others. Although at least fifty-seven species of native mammal are known from the north-west Kimberley to-day, on even the largest islands no more than eleven species were collected (Table 2). The island collections are certainly incomplete because only a limited amount of collecting was undertaken. For example, the five bat species recorded represent only a fraction of the number of species known from the adjacent mainland; tracks of a possum-sized mammal were recorded on a beach at Darcy Island and rodents were sighted on both Champagny and Heywood Islands.

TABLE 2

NATIVE MAMMALS RECORDED ON THE ISLANDS

Species	Predominantly Sandstone Islands															Sandstone and Volcanic Islands			Predominantly Volcanic Islands	
	Augustus	Bigge	Boongaree	Darcy	Uwins	Sir Graham Moore	Katers	Champagny	Kingfisher	Wollaston	Melomys	Heywood	Byam Martin	Berda	Bat	St. Andrew	S.W. Osborn	Carlia	Coronation	Middle Osborn
Peradorcas concinna	X			?	?					?				X						
Petrogale burbidgei		X	X	?	?		X			?										
Wyulda squamicaudata		?	X																	
Petaurus breviceps	X																			
Isoodon auratus	X																			
Isoodon macrourus																X				
Dasyurus hallucatus	X	X	X		X					X								?		
Antechinus sp.....	X											X								
Rattus tunneyi....			X													X				
Hydromys chrysogaster						X			X									X		
Mesembriomys macrurus					X					X									X	
Zyzomys argurus	X																			
Zyzomys woodwardi	X	X	X	X			X	?				?		X			X			X
Pseudomys delicatulus		X																		
Melomys sp.						X					X									
Canis familiaris dingo	X	X								X										X
Tachyglossus aculeatus		X																		
Hipposideros ater	X												X							
Hipposideros stenotis			X																	
Taphozous georgianus	X	X	X												X					
Eptesicus pumilis			X												X					
Pteropus alecto	?		X													X			X	
No. of Species	11	8	9	2*	3*	2	2	1	1	4*	1	2	1	2	2	3	1	2	2	2
Area of Island (ha)	17 950	17 190	4 880	4 800	3 310	2 660	1 780	1 330	1 010	850	850	760	760	610	30	1 410	1 370	848	3 830	2 300
Duration of Visit (Full Days)	11	6	3	2	1	3	3	2	1	3	1	3	1	3	0	2	2	2	4	4

*Evidence indicated the presence of a small wallaby but no specimen was obtained.

Main (1961) and Main and Yadav (1971) have discussed the distribution and persistence of macropods on islands off the Western Australian coast. In the Kimberley it appears that only *Peradorcas concinna* and *Petrogale burbidgei* occur on islands although another five species are known from the adjacent mainland. The absence of *Petrogale brachyotis*, which is widespread on the adjacent mainland, is noteworthy.

The two species which are present on islands are the smallest macropods in the region and their size may be a significant factor in their persistence. Dingos were recorded on four of the islands we visited. They were present in Australia at the time of island separation and even if they did not occur on the islands naturally, they were probably taken to most by the aborigines. (We saw evidence of aboriginal occupation on many islands.) The dingo is an efficient predator and may have eliminated species which were too large to take refuge in rock cavities into which it cannot follow.

The macropod species persisting on the islands may also have been determined by the climatic history of the area. In northern Australia 8 000 years B.P., when the islands were beginning to separate from the mainland, the rainfall was probably much greater than to-day—Nix and Kalma (1972, p. 89) suggest that precipitation was 1·5 times the present figure. Data from the Northern Territory (Parker 1973) and the Kimberley (W.A. Museum collection) show that *Peradorcas concinna* and *Petrogale burbidgei* have only been recorded in high rainfall areas. *Petrogale brachyotis* on the other hand also occurs in low to medium rainfall regions. McKenzie *et al.* (1975, p. 71) recorded *P. concinna* more often than *P. brachyotis* in higher rainfall areas of the Prince Regent River Nature Reserve. Thus, *P. brachyotis* may not have been present in the north-west Kimberley at the time of island separation. A similar hypothesis has been suggested by Main (1961) for islands off the south-west coast of Australia.

Wetter conditions at the time of isolation of the Kimberley islands may also have influenced the distribution of the two species of *Zyzomys*. An examination of the distribution of *Zyzomys* in the Northern Territory (Parker 1973), data available from Kimberley collections in the W.A. Museum, and information collected by McKenzie *et al.* (1975, 1977) in adjacent parts of the Kimberley suggest that on the mainland *Zyzomys argurus* is now far more common and widespread than *Z. woodwardi*, and that *Z. woodwardi* is restricted to high rainfall areas. In contrast, *Z. woodwardi* was the only species of *Zyzomys* found on seven islands and *Z. argurus* was found on only two islands.

The habitats in which species were recorded on the islands were generally the same as on the nearby mainland. *Peradorcas concinna*, *Wyulda squamicaudata*, *Petaurus breviceps*, *Isoodon auratus* and *Antechinus* cf. *bilarni* were all collected on predominantly rugged sandstone islands in habitats similar to those described for these species on the Prince Regent River Nature Reserve and/or the Drysdale River National Park (McKenzie *et al.* 1975, 1977). *Pseudomys delicatulus* came from beach sands and Cenozoic sandy soils similar to habitats described by McKenzie *et al.* (*ibid.*) in the Kimberley and by Johnson (1964) and Calaby and Keith (1974) in the Northern Territory.

Although *Dasyurus hallucatus*, *Zyzomys woodwardi* and *Z. argurus* were most commonly collected in rugged sandstone habitats, records from Middle Osborn (*Z. woodwardi*), Coronation (*Z. argurus*) and Carlia (*D. hallucatus*) suggest that other rocky situations are suitable. *Z. argurus* is known from laterite scree in volcanic country on the Prince Regent River Nature Reserve and Burbidge and Prince (1971) collected *Z. argurus* and *D. hallucatus* on rocky igneous and volcanic islands in the Dampier Archipelago. In the Northern Territory, Johnson (1964) records *D. hallucatus* from broken laterite terrain, rugged sandstone, limestone caves, and hollow trees away from rocky country, and *Z. argurus* from areas of "rocky substrate".

The collection of *Rattus tunneyi* and *Isoodon macrourus* only from islands where deeper soils are prominent, such as Cenozoic deposits on sandstones and deep volcanic soils, is again similar to data from the Kimberley mainland. In McKenzie *et al.* (1975) there are data which indicate that these species are found on deep soils, e.g. along watercourses, in valley bottoms and in Carson Volcanic country.

Females with pouch young or with foetuses were recorded in seven of the native species collected. A further two species had enlarged uteri or swollen teats. These data are comparable with those from elsewhere in the Kimberley where births in the dry season have been recorded for a variety of mammals (McKenzie *et al.* 1975, 1976). Annual breeding patterns are unknown because few Kimberley mammal collections have been made during the wet season and no data have been published.

The importance of these coastal islands to mammal conservation in the Kimberley is twofold:

1. They support high densities of three mammal species little known on the mainland: *Zyzomys woodwardi*, *Petrogale burbidgei* and *Peradorcas concinna*. They also support populations of *Wyulda squamicaudata* and *Hipposideros stenotis*, two species considered rare on the mainland.

2. They support undisturbed populations of many mainland mammal species which will probably persist regardless of increased development on the mainland and of depredations by introduced species, such as cattle and cats, which are common in the Kimberley to-day. The value of islands to conservation in Western Australia is dramatically evident on the coastal islands of the Pilbara and Shark Bay where a number of species persist which are now rare or extinct on the mainland.

ACKNOWLEDGEMENTS

We are indebted to all members of the expeditions for assisting in the collection of mammals and for providing relevant information from their field notes. Mr A. Baynes and Dr D. J. Kitchener of the Western Australian Museum identified many of the rodents and the macropods respectively, and Dr M. Archer of the Queensland Museum commented on *Antechinus*.

We also thank Drs D. J. Kitchener, G. M. Storr and A. N. Start and Mr J. L. McKean for commenting on the draft.

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PART IV

BIRDS

By L. A. SMITH[1], R. E. JOHNSTONE[1] and JOHN DELL[2]

INTRODUCTION

This paper is based mainly on data obtained during a biological survey of the major islands in the Bonaparte Archipelago and the Institut, Osborn and Sir Graham Moore groups of islands. We also visited Koolan Island and Kingfisher Islands (northern end of Buccaneer Archipelago), St Andrew Island (St George Basin), and two coral islands (Browse and Adele). Brief visits were made to the mainland at Kuri Bay (twice) Careening Bay, Prince Regent River (twice) and the Hunter River estuary. Three days were spent at Anjo Point (opposite Sir Graham Moore Island). See Fig. 1 in Burbidge and McKenzie (this publication) for positions of islands. The surveys were conducted in the winters of 1971–73, six weeks being spent in the area in 1971 and 1972 and three weeks in 1973. Smith and Burbidge were responsible for the collection of data in 1971. In 1972 Johnstone collected data between 10 and 29 May, and Smith and Dell data between 31 May and 20 June. All authors were in the field together between 25 June and 14 July 1973.

Some breeding data were given to Smith in 1971 by Royal Australian Survey Corps (RASC) personnel. We also include records prior to our own. These include data from Hecla, Mary and Augustus Islands (Hill 1911); Low Rocks, Sand, Warn and Adele Islands (Serventy *et al.* 1971); Adele, Browse and White Islands and Low Rocks (Serventy 1952); and Browse (Serventy and Whittell 1976). We have also used data from Bowdler Sharpe (1892 and 1896) and Oates (1902) for Baudin, Jones, Cassini and Troughton Islands.

The size of islands and time spent on them varied greatly. Most time was spent on Augustus (11 days over two visits), while minutes were spent investigating roosting seabirds on islets often no more than rocks. Table 1 (this paper) gives the position of islands for which there are data, the areas of the larger islands and the dates of our visits.

Collecting localities on the largest islands were as follows: Sir Graham Moore—mainly around Geranium Harbour, Katers—west coast, Wollaston—eastern end, Bigge—Boomerang Bay, Coronation (1971 and 1972)—about 5 km east of Low Rock, an islet off west coast of island, Boongaree—mid north-east coast, Darcy (1971)—mid north coast, Darcy (1972)—watercourse about 3 km east of north east tip of Heywood Island, Champagny (1971 and 1972)—mid south coast, Augustus (1971)—north side of bay, about 5 km south of Square Hill, Augustus (1972)—watercourse south side of Bay, about 6 km south of Square Hill and Byam Martin—west coast.

Visits of varying length to so many different sized islands, scattered over such a wide area makes it difficult to know how efficiently we have investigated the avifauna. Because of their size and difficult terrain it was only possible to explore small areas of the larger islands.

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TABLE 1

CO-ORDINATES AND AREAS OF ISLANDS AND DATES VISITED. (THOSE WITHOUT DATES NOT VISITED BY US)

Name of Island	Position	Approx. Area (ha)	Dates
Jones	13°45′S 126°21′E		
Troughton	13°45′ 126°09′		
Sand	13°51′ 125°44′		
North Eclipse	13°53′ 126°18′	320	12 Aug. 1971
Sir Graham Moore	13°54′ 126°32′	2 660	12 Aug. 1971 30 June–3 July 1973
Cassini	13°56′ 125°37′		
Hecla	13°59′ 126°00′		
Mary	14°00′ 126°22′		
Low Rocks	14°04′ 125°52′	4	12 Aug. 1971
Browse	14°06′ 123°33′	61	17 June 1972
Fenelon	14°09′ 125°42′	280	6 Aug. 1971
Baudin	14°09′ 125°37′		
Borda	14°14′ 126°01′	600	8 Aug. 1971 12–15 June '72
East Montalivet	14°17′ 125°18′	320	8–9 June 1972
Middle Osborn	14°19′ 126°01′	2 300	3–4 Aug. 1971 13–16 June '72
Warn	14°21′ 125°20′		
South West Osborn	14°22′ 125°57′	1 370	8 Aug. 1971 16 June 1972 27–29 June '73
Carlia	14°23′ 125°59′	480	27–29 June '73
South Maret	14°26′ 125°00′	320	7–8 June 1972
Katers....	14°28′ 125°32′	1 775	9–12 June 1972
Wollaston	14°30′ 125°28′	850	9–12 June 1972
Bigge	14°32′ 125°11′	17 190	1–7 June 1972
Coronation	15°00′ 124°56′	3 830	29–30 Aug. 1971 23–26 Aug. 1972
Low Rock	15°02′ 124°53′		
Small islet at mouth of Hunter River	15°02′ 125°22′		
White	15°04′ 124°19′		
Boongaree	15°04′ 125°12′	4 880	4–7 July 1973
Bat	15°06′ 124°55′	30	26 June 1973
Commerson	15°09′ 124°40′		
Uwins	15°15′ 124°50′	3 310	23 Aug. 1971 7–8 June 1973
Darcy	15°17′ 124°25′	4 800	20–22 Aug. 1971 20–23 May 1972
Champagny	15°18′ 124°15′	1 330	22 Aug. 1971 27–29 May '72
Augustus	15°20′ 124°34′	17 950	16–20 Aug. '71 12–19 May '72
Heywood	15°20′ 124°20′	760	20–23 May '72
St. Andrew	15°21′ 125°01′	1 410	8–10 July '73
Byam Martin....	15°22′ 124°21′	760	11–12 July '73
Adele	15°32′ 123°09′	218	18–19 June '72
Kingfisher	16°06′ 124°04′	1 010	12–13 July '73
Koolan	16°08′ 123°45′		
Melomys	16°10′ 124°04′	850	12–13 July '73

Because 63 per cent of islands are within 10 km of the mainland there are not enough islands of similar size and geology at varying distances from the mainland to test the effect of distance from mainland on the avifaunas of individual islands. The situation is further complicated by chains of islands which bridge gaps between outer islands and mainland. They also assist inter-island commuters. Thus, Torres Strait Pigeons

were seen flying from Byam Martin to Heywood Island and Red-tailed Black Cockatoos were seen flying from South West Osborn to Carlia Island.

Accurate assessment of the present status of sea birds breeding on the oceanic islands is difficult. Prior to our visit the islands of Browse and Adele had been visited only twice by ornithologists in sixty years (Walker 1892, Serventy 1952). Furthermore, visits have not always been in the same season. Visits are usually restricted to an hour or two, making it difficult to estimate species numbers accurately. This means that only simple conclusions can be drawn from comparisons of different observers' data. Twenty years after Serventy's visit we can do no more than confirm that on Adele, Brown Boobies, Masked Boobies and Lesser Frigate-birds are autumn breeders.

Serventy (1952) found no birds breeding on Browse Island. We found Reef Herons preparing to breed.

In the list of species we present the following data:

1. Localities at which each species was recorded.
2. Locality, weight, sex and date of collection of specimens. These are lodged in the Western Australian Museum under registered numbers A11780–A11803, A12454, A12605–A12632, A12640–A12645, A12647 and A12763–64.
3. Relative abundance.
4. Habitat preferences.
5. Breeding data.
6. Taxonomic notes.

Nomenclature is in accordance with Storr (1977).

Where possible vegetation classification follows Specht *et al.* (1974).

LIST OF SPECIES

FAMILY OCEANITIDAE

Oceanites oceanicus (Kuhl) **Wilson's Storm-petrel**

Moderately common in seas.

A12618 ♀ 23 g Geranium Harbour, Sir Graham Moore 1 July.

FAMILY PELECANIDAE

Pelacanus conspicillatus Temminck **Australian Pelican**

Scarce. Two on Adele 18 June.

Breeds on Sand (Serventy *et al.* 1971).

FAMILY SULIDAE

Sula dactylatra personata Gould **Masked Booby**

About 100 breeding pairs on Adele on 18 June. Nests with two eggs or one egg and one young were in areas of bare white sand, mostly on beach but also sparsely scattered over island. Two flying north from island to feed as we approached.

Sula leucogaster plotus (Forster) **Brown Booby**

Scarce in seas between Sir Graham Moore and Koolan islands; about 30 seen, the largest group being 8. Estimated 1 000–1 500 breeding pairs on Adele Island on 18 June. Nests with two eggs, one egg and one chick just hatched, or one egg and one fluffy chick were scattered over the island but concentrated over the southern two-thirds of the island, particularly in an area of trampled *Sporobolus*. Brown Boobies nesting on the beach choose the zone strewn with dark brown weed, while the predominantly white Masked Booby nests on bare white sand.

About 100 seen flying north in groups of 4–6 during the last 15 km of our approach to Adele (0530–0630). Seen feeding with Crested Terns, Lesser Crested Terns and Lesser Frigate-birds.

FAMILY PHALACROCORACIDAE

Phalacrocorax varius (Gmelin) **Pied Cormorant**

Scarce. Twelve at both Adele and Sir Graham Moore; two in Parry Harbour. RASC reported "black and white shags in tens of thousands" on White Island on 24 August. About 100 almost mature chicks in nests on Low Rocks on 12 August. Serventy, *et al.* (1971) recorded breeding on Low Rocks, Sand and Adele.

FAMILY FREGATIDAE

Fregata ariel (Gray) **Lesser Frigate-bird**

Moderately common in groups up to 10 in waters between Sir Graham Moore and Koolan.

Estimated 2 000–4 000 breeding pairs on Adele on 18 June. Nests had one egg, one young just hatched, or one large young. They were in groups of 250–400; each nest was a platform formed from a trampled *Spinifex longifolius* clump. Seen feeding with Brown Boobies, Lesser Crested Terns and Crested Terns. At Adele Island we saw two black birds that were larger than the many Lesser Frigate-birds. They could have been Greater Frigate-birds (*Fregata minor*).

FAMILY ARDEIDAE

Ardea sumatrana Raffles **Great-billed Heron**

Scarce. Five on the east side of Uwins.

Ardea novaehollandiae Latham. **White-faced Heron**

Sir Graham Moore, Darcy and Augustus.

Scarce. Eight seen, mostly near freshwater pools.

Egretta alba (Linnaeus) **Great Egret**

Scarce. One on Adele (Serventy 1952).

Egretta sacra sacra (Gmelin) **Reef Heron**

Jones (Oates 1902), Troughton (Oates 1902), Sir Graham Moore, Browse, East Montalivet, Middle Osborn, South West Osborn, Carlia, South Maret, Katers, Wollaston, Bigge, Coronation, islet at mouth of Hunter River, Boongaree, Bat, Commerson

(RASC), Darcy, Champagny, Augustus, Heywood, Byam Martin, Adele, Kingfisher and Koolan. Also on mainland at Kuri Bay and Anjo Point.

Common. Dark phase birds outnumber white phase birds about 5:1.

Several nests were being constructed in a solitary mangrove tree on 18 June on Browse. Breeding on Commerson in August (RASC), and on Jones and Troughton (Oates 1902).

Butorides striatus cinereus Mayr **Mangrove Heron**

Sir Graham Moore, Borda, Middle Osborn, Carlia, South Maret, Bigge, Boongaree, Uwins, Darcy, Byam Martin and Melomys.

Uncommon. All grey phase. Confined to mangroves, particularly sparse mangroves on rocky shores.

Nycticorax caledonicus hilli Mathews **Nankeen Night-heron**

Moderately common on Adele (Serventy 1952).

FAMILY CICONIIDAE

Xenorhynchus asiaticus (Latham) **Black-necked Stork**

Sir Graham Moore and Bigge. Also mouth of Hunter River.

Breeding on Bigge 3 June. Nest with two eggs about 0·5 km inland on sandstone pillar 8–10 m above sparse mangroves.

FAMILY ACCIPITRIDAE

Elanus scriptus Gould **Letter-winged Kite**

H. Tarlton Phillips saw 10 circling the light tower on Adele on 10 July 1952 (Serventy 1953).

Lophoictini aisura (Gould) **Square-tailed Kite**

Sir Graham Moore and Boongaree. Also on mainland at Anjo Point.

Scarce. Single birds.

Hamirostra melanosternon (Gould) **Black-breasted Kite**

Bigge, Darcy, Augustus and Heywood. Also at Kuri Bay.

Scarce. Seven single birds seen.

Haliastur indus girrenera (Vieillot) **Brahminy Kite**

Sir Graham Moore, East Montalivet, Middle Osborn, Carlia, South Maret, Katers, Wollaston, Bigge, Coronation, Boongaree, Bat, Uwins, Champagny, Augustus, Heywood, St Andrew, Byam Martin, Kingfisher, Koolan and Melomys.

Common. Mainly coastal, along beaches and cliffs; occasionally in *Melaleuca* along creeks.

A11786 ♂ Augustus 18 May.

Haliastur sphenurus (Vieillot) **Whistling Kite**

Sir Graham Moore, Fenelon, South Maret, Wollaston, Uwins, Augustus and Kingfisher. Also at Kuri Bay. Common at Kuri Bay (8 seen), scarce elsewhere.

Milvus migrans affinis Gould **Black Kite**

Sir Graham Moore, Darcy, Augustus, Heywood and Koolan Also at Kuri Bay.

Scarce. In ones and twos (except Koolan Island where 4 were seen together over the town).

Accipiter fasciatus (Vigors & Horsfield) **Brown Goshawk**

Coronation, Boongaree and Augustus (? species).

Scarce. Single birds along watercourses and in mangroves.

Stomach of one contained 3 skinks (*Carlia*).

Accipiter cirrocephalus cirrocephalus (Vieillot) **Collared Sparrowhawk**

Sir Graham Moore (? species), East Montalivet, South West Osborn, Carlia (? species), Augustus and Byam Martin (? species).

Apparently scarce, Open woodland and edges of semi-deciduous vine thickets.

Aquila audax (Latham) **Wedge-tailed Eagle**

Borda, Katers, Wollaston, Bigge and Augustus.

Scarce. Single birds, usually soaring over islands.

All the above islands have populations of rock wallabies.

Haliaeetus leucogaster (Gmelin) **White-breasted Sea-eagle**

Sir Graham Moore, Borda, Middle Osborn, South West Osborn, Katers, Wollaston, Coronation, Boongaree, Uwins, Darcy, Augustus, Heywood, Byam Martin and Koolan. Also at Anjo Point and Kuri Bay.

Moderately common. Coastlines.

Pandion haliaetus cristatus Vieillot **Osprey**

Troughton, Sir Graham Moore, Cassini, Borda, East Montalivet, Middle Osborn, South West Osborn, South Maret, Katers, Wollaston, Coronation, Commerson (RASC), Boongaree, Champagny, Augustus, Byam Martin, Kingfisher, Koolan and Melomys. Also at Parry Harbour and mouth of Hunter River.

Moderately common. Coastlines.

Breeding on Troughton (Oates 1902), Sir Graham Moore 30 June (nest with three newly hatched chicks) and 1 July (nest in large, dead gum tree 1 km inland); Cassini (Oates 1902); Borda 14 June (nest on sandstone pinnacle completely surrounded by water, north side of island, attended by adults); South Maret 7 June (nest with young on west side of island, just below cliff); Katers 10 June (nest with three eggs on 10 m high rocky spur); Champagny 28 May (nest with three eggs on large pinnacle of rock); Byam Martin 11 July

(nest on rocky spit, easily approached, three chicks about size of bantams, one almost dead, mouths bright pink, eyes brown); and Melomys 12 July (nest in cliff, two birds carrying fish to nest). Also breeding at Parry Harbour (Hill 1911).

FAMILY FALCONIDAE

Falco peregrinus macropus Swainson **Peregrine Falcon**

South West Osborn. Also at mouth of Hunter River.

Scarce. In vicinity of cliffs.

Copulating on South West Osborn 28 July.

Falco longipennis longipennis Swainson **Little Falcon**

South Maret. Also mouth of Hunter River.

Scarce. In vicinity of cliffs.

Falco berigora berigora Vigors & Horsfield **Brown Falcon**

Scarce. Two at east end of Koolan Island.

Falco cenchroides cenchroides Vigors & Horsfield **Nankeen Kestrel**

Scarce. Single birds at Browse, Champagny, and Adele. Open woodland and grassland.

FAMILY MEGAPODIIDAE

Megapodius freycinet tumulus Gould **Scrub Fowl**

Hecla (Hill 1911), Middle Osborn, South West Osborn, St Andrew and Augustus (pers. comm. E. Little). Also mouth of Hunter River.

Moderately common on South West Osborn Island and Hunter River. Elsewhere uncommon.

Confined to semi-deciduous vine thickets.

Breeding on South West Osborn (chicks and active nests seen; males with enlarged testes).

A12454 ♂ 970 g South West Osborn 15 June.

A12614 ♂ South West Osborn 27 June.

A12615 ♀ South West Osborn 27 June.

A12616 ♀ South West Osborn 28 June.

FAMILY PHASIANIDAE

Coturnix ypsilophora australis (Latham) **Brown Quail**

Breeding on Baudin in July (Oates 1901).

FAMILY TURNICIDAE

Turnix sp.

One of the species of button quail was fairly common on Sir Graham Moore Island.

Unidentified quail were seen on Browse Island.

FAMILY GRUIDAE

Grus rubicundus (Perry). **Brolga**

Scarce. Two feeding on salt lake on Sir Graham Moore and two on beach at Bigge.

FAMILY RALLIDAE

Eulabeornis castaneoventris castaneoventris Gould **Chestnut Rail**

Sir Graham Moore, South West Osborn, Carlia, Bigge and Boongaree.

Uncommon. Confined to dense mangroves.

A12640 ♂ 910 g Sir Graham Moore 1 July.

FAMILY HAEMATOPODIDAE

Haematopus ostralegus longirostris Vieillot **Pied Oystercatcher**

Troughton (Oates 1902), Sir Graham Moore, Fenelon, Borda, South Maret, Bigge, islet at mouth of Hunter River, Uwins, Augustus, Heywood, Adele (Serventy 1952) and Kingfisher.

Uncommon. Mostly in twos and threes, once 6. Usually on sandy beaches, occasionally rocks.

Breeding on Troughton (Oates 1902). Chicks seen on Fenelon.

Haematopus fuliginosus opthalmicus Castelnau & Ramsay **Sooty Oystercatcher**

Troughton (Oates 1902 and Bowdler Sharpe 1896), Sir Graham Moore, Borda, East Montalivet, South West Osborn, South Maret, Katers, Wollaston, Bigge, Coronation, islet at mouth of Hunter River, Champagny, Augustus, Heywood, Byam Martin and Kingfisher. Also Anjo Point.

Fairly common. Mostly in twos and threes, occasionally in flocks of 8–10. This species outnumbered the preceding about 3:1. Usually on rocky beaches, occasionally sand.

Breeding on Troughton (Oates 1902).

FAMILY CHARADRIIDAE

Pluvialis squatarola (Linnaeus) **Grey Plover**

Scarce. One on Sir Graham Moore, and one on Bigge.

Both on beaches.

Pluvialis dominica fulva (Gmelin) **Eastern Golden Plover**

Scarce. Two on rocky beach on Sir Graham Moore. Also on Adele (Serventy 1952).

A12623 ♀ 115 g Sir Graham Moore 2 July.

Charadrius ruficapillus Temminck **Red-capped Dotterel**

Sir Graham Moore, Borda, South Maret, Wollaston, Byam Martin and Adele.

Scarce on beaches.

Charadrius mongolus mongolus Pallas **Mongolian Sand-dotterel**

Scarce. Troughton (Bowdler-Sharpe 1896). One on mudflat at edge of mangroves on Augustus.

Charadrius leschenaultii Lesson **Large Sand-dotterel**

Sir Graham Moore, Coronation and Adele (Serventy 1952).

Scarce. On rocks and sandy beaches.

A11791 70 g Coronation 24 May.

FAMILY SCOLOPACIDAE

Numenius phaeopus (Linnaeus) **Whimbrel**

Sir Graham Moore. South West Osborn, Bigge, islet at mouth of Hunter River, Boongaree, Augustus, Byam Martin, Kingfisher and Melomys. Also Anjo Point.

Moderately common. Usually in groups of 6–12 (one group of 21), mostly on mudflats but also sandy beaches with rocks.

Numenius madagascariensis (Linnaeus) **Eastern Curlew**

Scarce. One on Kingfisher.

Limosa lapponica baueri Naumann **Bar-tailed Godwit**

Sir Graham Moore and Adele (Serventy 1952).

Scarce. Rocky beaches.

Tringa nebularia (Gunnerus) **Greenshank**

Scarce. One on Augustus and a total of 10 on Bigge.

Sandy Beaches.

Tringa brevipes (Vieillot) **Grey-tailed Tattler**

Sir Graham Moore, Fenelon, Borda, Katers, Wollaston, Bigge, Augustus and Kingfisher.

Moderately common. Several flocks of 11–15 seen, mostly on mudflats or perched on partly submerged rocks.

A12622 ♂ 86 g Sir Graham Moore 1 July.

Arenaria interpres interpres (Linnaeus) **Turnstone**

Troughton (Bowdler Sharpe 1896), Low Rocks, Borda and Adele (Serventy 1952).

Scarce.

Calidris ruficollis (Pallas) **Red-necked Stint**

Sir Graham Moore, Borda, Bigge, Coronation and Adele (Serventy 1952).

Common on Coronation (40–50 with some Large Sand-dotterels), but generally uncommon. On sandy beaches or rocks at low tide.

A11790 ♂ 23 g Coronation 24 May.

FAMILY BURHINIDAE

Burhinus grallarius (Latham) **Bush Stone-curlew**

Scarce. One on laterite plateau of Sir Graham Moore, the other on beach at Bigge.

Esacus magnirostris (Vieillot) **Beach Stone-curlew**

Troughton (Oates 1902), Sir Graham Moore, Fenelon, East Montalivet, South West Osborn, Carlia, South Maret, Wollaston, Coronation, Uwins, Augustus, Heywood, Byam Martin and Kingfisher.

Moderately common. Mostly in twos, sometimes single birds, on beaches.

Breeding on Troughton (Oates 1892).

FAMILY LARIDAE

Larus novaehollandiae Stephens **Silver Gull**

Jones (Oates 1892), Sir Graham Moore, Borda, East Montalivet, Bigge, Boongaree, Champagny, Augustus, Adele, and Koolan.

Locally common at Koolan (up to 30 at wharf) and Adele (about 50 robbing food from young boobies). Scarce at other islands. Rarely seen en route between islands.

Breeds on Jones (Oates 1892).

Sterna anaethetus Scopoli **Bridled Tern**

Breeds on Low Rocks and Warn Is (Serventy *et al.* 1971).

Sterna nilotica macrotarsa Gould **Gull-billed Tern**

Scarce. Two adults and one juvenile feeding on small prawns from mudflats at Kingfisher.

A12645 220 g Kingfisher 12 July.

Sterna caspia Pallas **Caspian Tern**

Islet at mouth of Hunter River, Boongaree and Adele.

Scarce.

Nest with two downy chicks in open on basalt on islet at mouth of Hunter River.

Sterna bergii Lichtenstein **Crested Tern**

Uncommon in waters between Koolan and Coronation; becoming scarcer further north.

Breeding on Low Rocks 11 August 1971.

Sterna bengalensis Lesson **Lesser Crested Tern**

Common. Flocks of up to 200 along all inter-island routes and around all islands. One flock of about 200 at the Hunter River islet contained about 100 juveniles. This species outnumbered the Crested Tern about 30:1. Altogether about 950 "crested terns" were seen. About 5% were not identified.

A12642 ♀ 175 g Sir Graham Moore 30 June.

A12643 ♂ 220 g Hunter River mouth 6 July.

A12644 ♂ 200 g Hunter River mouth 6 July.

Breeding on Adele (Walker 1892)

Sterna dougallii gracilis Gould **Roseate Tern**

Generally uncommon. Two flocks of about 200 each near Augustus on 17 and 18 May; mixed flock of 30 adults and juveniles feeding with 40 Lesser Crested Terns at Sir Graham Moore on 30 June.

A12641 ♂ 87 g Sir Graham Moore 30 June.

Sterna sinensis Gmelin **Little Tern**

Scarce. Three possible sightings: 6 at Darcy, small flock near East Montalivet and three near Borda.

Sterna anaethetus anaethetus Scopoli **Bridled Tern**

Low Rocks (Serventy *et al.* 1917), Warn (incorrectly called Warm in Serventy *et al.* 1971) and Adele (Serventy 1952).

Scarce.

Breeds on Low Rocks and Warn (Serventy *et al.* 1971).

Anous stolidus pileatus (Scopoli) **Common Noddy**

Scarce. Only at Adele (Serventy 1952).

FAMILY COLUMBIDAE

Ptilinopus regina ewingii Gould **Red-crowned Pigeon**

Middle Osborn, South West Osborn and St Andrew. Also mouth of Hunter River.

Scarce. Confined to canopy of tall semi-deciduous vine forest.

Diet: fruit of *Zizyphus quadrilocularis*.

A12611 ♂ South West Osborn 28 June.

A12612 ♂ South West Osborn 28 June.

A12613 ♀ South West Osborn 28 June.

Ducula spilorrhoa spilorrhoa (Gray) **Torres Strait Pigeon**

Sir Graham Moore, Borda, South West Osborn, Carlia, Bigge, Coronation, Boongaree, Augustus, St Andrew and Byam Martin. Also Anjo Point.

Moderately common in flocks of 2–18. Generally associated with dense vegetation (mangroves and semi-deciduous vine forest) but occasionally in open woodland. Nine seen flying north west from Byam Martin to Heywood.

Diet: seeds of *Randia cochinchinensis* on Augustus.

Prey of Peregrine Falcon at South West Osborn.

A11780 ♀ 490 g Augustus 12 May.

Geopelia humeralis (Temminck) **Bar-shouldered Dove**

Sir Graham Moore, Borda, Middle Osborn, South West Osborn, Carlia, South Maret, Bigge, Coronation, Boongaree, Uwins, Darcy, Champagny, Augustus, St Andrew, Byam Martin and Kingfisher. Also Anjo Point and mouth of Hunter River.

Common in semi-deciduous vine thicket, mangroves and margins of watercourses.

Geopelia striata placida Gould **Peaceful Dove**

Sir Graham Moore, East Montalivet, Middle Osborn, South West Osborn, Carlia, Wollaston, Bigge, Coronation, Boongaree, Uwins, Darcy, Champagny, Augustus and Koolan. Also mouth of Hunter River.

Common on Augustus and Darcy; moderately common on Carlia and Boongaree, scarce elsewhere.

Mostly at margins of watercourses and woodland, occasionally in semi-deciduous vine thickets, rarely in mangroves.

Geopelia cuneata (Latham) **Diamond Dove**

Coronation and Augustus.

Scarce. Possibly only a dry season visitor.

Along dry creek beds and small waterholes.

Chalcophaps indica longirostris Gould **Green-winged Pigeon**

South West Osborn, South Maret, Coronation and Augustus. Also mouth of Hunter River.

Scarce in vine forest at South West Osborn and Hunter River and in creekside vegetation on Augustus and Coronation.

A11792 ♂ 145 g Coronation 25 May.

Petrophassa albipennis Gould **White-quilled Rock Pigeon**

Wollaston, Boongaree and Uwins.

Generally scarce but locally common.

Confined to areas of rugged jumbled sandstone.

A11797 ♂ 145 g Wollaston 11 June.

Phaps chalcoptera (Latham) **Common Bronzewing**

Bigge, Uwins, Darcy, Byam Martin and Koolan.

Scarce. Visiting freshwater seepages near mangroves at dusk on Bigge.

FAMILY PSITTACIDAE

Trichoglossus haematodus rubritorquis Vigors & Horsfield **Red-collared Lorikeet**

Scarce in eucalypts along watercourse on Augustus.

Trichoglossus versicolor Lear **Varied Lorikeet**

Scarce on Augustus. Also at Anjo Point.

In eucalypts along watercourses.

Aprosmictus erythropterus (Gmelin) **Red-winged Parrot**

Sir Graham Moore, South West Osborn, Wollaston, Bigge. Coronation, Boongaree, Uwins, Darcy, Champagny, Augustus, Heywood, St. Andrew, Kingfisher and Koolan. Also at Kuri Bay and Anjo Point.

Moderately common (flocks up to 11) in eucalypt woodland

Platycercus venustus (Kuhl) **Northern Rosella**

Coronation, Boongaree, Uwins, Augustus and Koolan.

Common in eucalypt woodland on Koolan where it was seen feeding on *Tridax procumbens*; elsewhere scarce.

Calyptorhynchus magnificus (Shaw) **Red-tailed Black Cockatoo**

Sir Graham Moore, South West Osborn, Carlia, Coronation, Boongaree and Koolan.

Moderately common (flocks of up to 32). Visitor in flocks to Koolan and Cockatoo (pers. comm. MacRobertson Miller Airline Staff).

Cacatua tenuirostris sanguinea (Gould) **Corella**

Middle Osborn, Augustus, Kingfisher, Melomys and Koolan. Uncommon. Flocks of up to 6 birds.

Cacatua galerita (Latham) **Sulphur-crested Cockatoo**

Sir Graham Moore, South West Osborn, Carlia, Boongaree, Augustus, St Andrew. Also at Kuri Bay.

Moderately common in thick creekside vegetation. Also in vine forest and mangroves.

FAMILY CUCULIDAE

Cuculus pallidus (Latham) **Pallid Cuckoo**

Scarce. One recorded on Byam Martin and another on Melomys.

Chrysococcyx osculans (Gould) **Black-eared Cuckoo**

Scarce. Only recorded from Wollaston.

A11798 ♂ 28 g Wollaston 11 June.

Chrysococcyx basalis (Horsfield) **Horsfield Bronze-cuckoo**

Possible sighting; two flying south over South Maret.

Centropus phasianinus phasianinus (Latham) **Pheasant Coucal**

Sir Graham Moore, Fenelon, Borda, East Montalivet, Middle Osborn, South West Osborn, Katers, Bigge, Coronation, Boongaree, Uwins, Champagny, Augustus, Heywood, St Andrew, Byam Martin and Koolan.

Moderately common in tall grass on basalt and in spinifex on sandstone.

FAMILY STRIGIDAE

Tyto sp.

Scarce. Two calling on Boongaree along cliff face.

Ninox novaeseelandiae boobook (Latham) **Boobook Owl**

Sir Graham Moore, South West Osborn, Bigge, Boongaree, Augustus, Kingfisher and Melomys.

Apparently scarce. Single records for each of the above islands. Open woodland.

FAMILY PODARGIDAE

Podargus strigoides phalaenoides Gould **Tawny Frogmouth**

Scarce. One at Carlia. Also at Anjo Point.

A12647 240 g Carlia 27 June.

FAMILY AEGOTHELIDAE

Aegotheles cristatus leucogaster Gould **Crested Owlet-nightjar**

Scarce. One flushed from small tree at edge of a spring on Augustus.

FAMILY CAPRIMULGIDAE

Eurostopodus guttatus (Vigors & Horsfield) **Spotted Nightjar**

East Montalivet, South West Osborn, South Maret, Bigge. Uwins and Augustus.

Uncommon. Mostly seen hunting at dusk.

A12617 ♀ 93 g South West Osborn 28 June.

FAMILY ALCEDINIDAE

Alcedo azurea ruficollaris (Bankier) **Azure Kingfisher**

Scarce. One seen flying into mangroves on Augustus.

Also at mouth of Hunter River.

Dacelo leachii leachii Vigors & Horsfield **Blue-winged Kookaburra**

Sir Graham Moore, Boongaree, St Andrew and Kingfisher.

Scarce in eucalypt woodland.

Halycon chloris sordida Gould **Mangrove Kingfisher**

Scarce. Recorded once, a male collected on Kingfisher Island. It flew from mangroves into eucalypt woodland on the side of a hill.

The Western Australian Museum has only two specimens, the other is an unsexed bird from mangroves at Crab Creek, Broome.

Field observations of the Mangrove Kingfisher are often unreliable as it is easily confused with the smaller Sacred Kingfisher which also frequents mangroves. Measurements of the two Mangrove Kingfishers and three male Kimberley Sacred Kingfishers are presented for comparison. Bill measured to base of skull.

	Mangrove Kingfisher	Sacred Kingfisher
Bill	56, 60	43–48
Wing	104, 106	87–94
Tail	73, 76	57–65
Weight	70, 70	29–49
Length	260	200

The best diagnostic field characters for the Mangrove Kingfisher are the long bill and pure white underparts. The Sacred Kingfisher has a shorter bill, white throat, pale buff or rufous breast and lacks the light, bright blue rump of the Mangrove Kingfisher.

A12621 ♂ 70 g Kingfisher 13 July 1973.

Halcyon sancta sancta Vigors & Horsfield **Sacred Kingfisher**

Troughton (Bowdler Sharpe 1892), Sir Graham Moore, Browse, Fenelon, Borda, East Montalivet, Middle Osborn, South West Osborn, South Maret, Bigge, Coronation, Boongaree, Uwins, Darcy, Augustus, Heywood, St Andrew, Byam Martin, Kingfisher and Koolan.

Common. Mostly in or at edges of mangroves; also in semi-deciduous vine thicket.

See comments under preceding species.

FAMILY MEROPIDAE

Merops ornatus Latham **Black-tailed Bee-eater**

Sir Graham Moore, Hecla, Borda, Middle Osborn, South West Osborn, Carlia, Bigge, Coronation, Boongaree, Darcy, Champagny, Augustus, Byam Martin, Kingfisher and Melomys. Also at Anjo Point.

Moderately common in flocks of up to 14, mostly 3–7.

Open woodland or flying over islands.

FAMILY PITTIDAE

Pitta iris Gould **Rainbow Pitta**

South West Osborn and St Andrew. Also mouth of Hunter River.

Moderately common on South West Osborn. Uncommon on St Andrew. Confined to semi-deciduous vine thickets.

A12605 55 g Mouth of Hunter River 6 July.

A12606 ♀ 56 g South West Osborn 27 June.

A12607 ♂ 54 g South West Osborn 28 June.

FAMILY ALAUDIDAE

Mirafra javanica Horsfield **Singing Bushlark**

One bird, possibly this species, in small open area on Champagny.

FAMILY HIRUNDINIDAE

Hirundo nigricans nigricans Vieillot **Tree Martin**

Sir Graham Moore (? species), East Montalivet, Carlia (? species), South Maret, Katers, Bigge, Champagny, Augustus, Heywood, Byam Martin and Kingfisher.

Generally scarce but sometimes locally common (flock of 60 on Heywood).

Hirundo ariel (Gould) **Fairy Martin**

Scarce. Eight circling cliff face on Augustus; 5, possibly this species, on Carlia.

FAMILY CAMPEPHAGIDAE

Coracina novaehollandiae novaehollandiae (Gmelin) **Black-faced Cuckoo-shrike**

Sir Graham Moore, Borda, East Montalivet, Middle Osborn, South West Osborn, South Maret, Katers, Wollaston, Bigge, Coronation, Boongaree, Bat, Uwins, Champagny, Augustus, Heywood, St Andrew, Byam Martin, Kingfisher, Koolan and Melomys. Also at Anjo Point.

Common. Mostly in low woodland on basalt, laterite and sandstone. Sometimes in mangroves, rarely in low open-forest or low-closed forest. Seen in flocks of 1–12, some with juveniles. Seen moving north in June and July.

Coracina papuensis hypoleuca Gould **Little Cuckoo-shrike**

Sir Graham Moore, Middle Osborn, South West Osborn, Carlia, Boongaree, Uwins, Darcy, Augustus, St Andrew, Koolan and Melomys.

Moderately common. Mostly in low woodland on sandstone and in semi-deciduous vine thickets. Rarely in mangroves.

A11802 59 g Middle Osborn 13 June.

Lalage sueurii tricolor (Swainson) **White-winged Triller**

Boongaree, Uwins, Augustus, St Andrew and Byam Martin.

Scarce in low woodland. All but one of the sightings (15, some juveniles, heading north on Byam Martin on 11 July) were in groups of less than 4.

Lalage leucomela rufiventris (Gray) **Varied Triller**

Sir Graham Moore, Middle Osborn, South West Osborn, Carlia, Katers, Boongaree, Uwins, Darcy, Augustus and St Andrew.

Common in semi-deciduous vine thickets on the Osborns, uncommon elsewhere. Prefers low closed-forest and closed-scrub including semi-deciduous vine thickets, mangroves and creekside scrub; scarce in low woodland.

A11788 ♂ 30 g Augustus 17 May.

A11789 30 g Augustus 17 May.

A11800 ♀ 33 g Katers 10 June.

FAMILY PACHYCEPHALIDAE

Microeca tormenti Mathews **Brown-tailed Flycatcher**

Bigge, Boongarec and Augustus. Also at Anjo Point.

Scarce. Mostly in mangroves but occasionally in adjacent cadjeputs.

Breeding on Augustus (Hill 1911).

A12626 ♀ 10 g Boongaree 5 July.

A12627 ♂ 11 g Anjo Point 1 July.

Eopsaltria pulverulenta (Bonaparte) **Mangrove Robin**

Sir Graham Moore, Champagny and Augustus.

Scarce. Confined to mangroves.

Pachycephala caledonica melanura Gould **Mangrove Golden Whistler**

Sir Graham Moore, Hecla, Fenelon, East Montalivet, South West Osborn, Carlia, Katers, Bigge, Coronation, Boongaree, Uwins, Champagny and St Andrew.

Moderately common. Most seen in low woodland adjacent to mangroves and some in mangroves.

A11794 16 g Coronation 25 May.

A11628 19 g Carlia 28 June.

A12629 18 g South West Osborn 28 June.

Pachycephala rufiventris rufiventris (Latham) **Rufous Whistler**

Sir Graham Moore, South West Osborn, Katers, Coronation, Boongaree, Uwins, Darcy, Champagny, St Andrew and Byam Martin.

Moderately common. Mostly in low woodland, sometimes in closed-forest and low closed-forest (including mangroves).

Colluricincla megarhyncha parvula Gould **Little Shrike-thrush**

South West Osborn, Boongaree, Augustus and St Andrew. Also at Anjo Point and Hunter River mouth.

Scarce but locally common. Confined to closed-forest and low closed-forest (almost exclusively semi-deciduous vine thickets).

A11787 ♂ 43 g Augustus 18 May.

A11803 46 g South West Osborn 15 June.

Colluricincla woodwardi Hartert **Sandstone Shrike-thrush**

Borda, South West Osborn, Wollaston and Boongaree.

Uncommon among tumbled sandstone.

Colluricincla harmonica harmonica (Latham) **Brown Shrike-thrush**

Scarce. Two seen on Augustus and one on Coronation.

FAMILY MONARCHIDAE

Rhipidura rufifrons dryas Gould **Rufous Fantail**

East Montalivet, Middle Osborn, South West Osborn, Carlia, Katers and Boongaree.

Uncommon. Confined to low closed-forest and closed-scrub (mostly semi-deciduous vine thickets and creekside vegetation, also mangroves).

Rhipidura leucophrys leucophrys (Latham) **Willie Wagtail**

Fenelon, East Montalivet, Middle Osborn, South West Osborn, South Maret, Bigge, Coronation, Uwins, Champagny, Augustus, Heywood, St Andrew, Byam Martin and Kingfisher.

Moderately common in low woodland. Occasionally in low closed-forest (mangroves).

Rhipidura rufiventris isura Gould **Northern Fantail**

Sir Graham Moore, South West Osborn, Carlia, South Maret, Bigge, Coronation, Boongaree, Uwins, Darcy, Augustus and St Andrew.

Common. Almost always in closed-forest or low closed-forest; semi-deciduous vine thickets, mangroves and creekside vegetation; occasionally in low woodland.

Old nest found on South Maret.

A11785 ?♂ 11 g Augustus 12 May.

Myiagra ruficollis mimikae Ogilvie-Grant **Broad-billed Flycatcher**

Sir Graham Moore, Carlia, Boongaree, Augustus and Heywood.

Uncommon in mangroves.

Myiagra rubecula concinna Gould **Leaden Flycatcher**

Sir Graham Moore, Borda, East Montalivet, Middle Osborn, South West Osborn, Carlia, South Maret, Katers, Wollaston, Bigge, Coronation, Boongaree, Uwins, Darcy, Champagny, Augustus, Heywood, St Andrew, Byam Martin, Kingfisher and Koolan.

Common. Mostly in closed-forest and low closed-forest (including mangroves); occasionally in low woodland.

Myiagra inquieta nana Gould **Restless Flycatcher**

Coronation and Champagny.

Scarce. Single birds on both islands. Pools and edge of mangroves.

Myiagra alecto rufolateralis (Gray) **Shining Flycatcher**

Sir Graham Moore, South West Osborn, Carlia, Bigge, Coronation, Boongaree, Uwins, Augustus and St Andrew.

Uncommon in closed-forest and low closed-forest (mostly mangroves but sometimes semi-deciduous vine thicket and creekside vegetation a short distance from mangroves).

A11793 ♀ Coronation 25 May.

A12631 ♀ Carlia 28 June.

A12632 ♀ Carlia 28 June.

FAMILY GRALLINIDAE

Grallina cyanoleuca (Latham) **Magpie-lark**

Bigge, Coronation, Boongaree, Augustus and Koolan.

Common in town on Koolan. Scarce elsewhere.

FAMILY ORTHONYCHIDAE

Pomatostomus temporalis (Vigors & Horsfield) **Grey-crowned Babbler**

Scarce on Augustus (party of 4 seen, 2 other parties heard).

Open woodland on plateau.

FAMILY ACANTHIZIDAE

Gerygone magnirostris magnirostris Gould **Large-billed Flyeater**

Sir Graham Moore, South West Osborn, Carlia, Boongaree, Uwins and St Andrew.

Moderately common in mangroves.

Nest lined with fine grass about 1·6 m up *Bruguiera exaristata* on Sir Graham Moore. Bulk of nest was strips of seaweed looking like flood debris, the last few pieces of dangling nest held in position by spider's web. A few leaves had been worked into it. Nest illustrated in Johnstone (1975).

A12763 ♂ 8 g Carlia 28 June.

A12764 ♂ 7 g Sir Graham Moore 2 July.

Gerygone chloronota chloronota Gould **Green-backed Flyeater**

Sir Graham Moore, South West Osborn, Carlia, Coronation, Boongaree, Uwins, St Andrew and Byam Martin.

Also Anjo Point.

Fairly common in closed-forest and low closed-forest (mostly semi-deciduous vine thicket but also creek-side scrub and mangroves).

Breeding on Boongaree 4 July (nest over fresh water); and Uwins 8 July (nest with small strips of paper-bark, lined with fine grass; one egg.)

A11781 10 g Augustus 17 May.

A11782 Augustus 17 May.

Smicrornis brevirostris Gould **Weebill**

Scarce. One party calling from eucalypt on Augustus.

FAMILY MALURIDAE

Malurus dulcis rogersi Mathews **Lavender-flanked Wren**

Wollaston, Boongaree, Uwins and Augustus.

Moderately common. Confined to areas of rugged sandstone.

A11784 7 g Augustus 14 May.

A11799 ♂ 7·5 g Wollaston 11 June.

Malurus melanocephalus (Latham) **Red-backed Wren**

Boongaree. Also at Anjo Point.

Scarce. One in area of basalt on Boongaree.

FAMILY SYLVIIDAE

Megalurus timoriensis Wallace **Tawny Grassbird**

Moderately common on Adele; mainly in *Spinifex longifolius.*

A11801 ♀ 14 g Adele 18 June.

Cisticola exilis (Vigors & Horsfield) **Golden-headed Fantail-warbler**

Sir Graham Moore, Hecla and South West Osborn. Also Anjo Point.

Scarce. A total of 4 seen in rank grasses on laterite or basalt.

FAMILY DICAEIDAE

Dicaeum hirundinaceum hirundinaceum (Shaw) **Mistletoe-bird**

Sir Graham Moore, Borda, East Montalivet, Middle Osborn, South West Osborn, Carlia, South Maret, Katers, Wollaston, Bigge, Coronation, Boongaree, Bat, Uwins, Darcy, Champagny, Augustus, Heywood, St Andrew, Byam Martin, Kingfisher and Melomys.

Very common. Recorded on 22 of the 25 continental islands visited. Mostly in low woodland, occasionally in closed-forest. Juveniles seen.

FAMILY PARDALOTIDAE

Pardalotus striatus uropygialis Gould **Black-headed Pardalote**

Sir Graham Moore, Uwins, Boongaree, Darcy, Augustus and Melomys.

Uncommon in eucalypt woodland.

FAMILY ZOSTEROPIDAE

Zosterops lutea Gould **Yellow Silvereye**

Sir Graham Moore, Hecla, Fenelon, Borda, East Montalivet, South West Osborn, Carlia, South Maret, Katers, Wollaston, Bigge, Coronation, Boongaree, Uwins, Darcy, Champagny, Augustus, Heywood, St Andrew, Byam Martin, and Kingfisher.

Common in low closed-forest (mostly mangroves, sometimes semi-deciduous vine thickets).

Old nest found on South Maret.

FAMILY MELIPHAGIDAE

Lichmera indistincta indistincta (Vigors & Horsfield) **Brown Honeyeater**

Eclipse, Sir Graham Moore, Borda, East Montalivet, Middle Osborn, South West Osborn, Carlia, South Maret, Wollaston, Bigge, Coronation, Boongaree, Uwins, Darcy, Champagny, Augustus, Heywood, St Andrew, Byam Martin, Kingfisher, Koolan and Melomys.

Very common in all habitats.

Myzomela erythrocephala erythrocephala Gould **Red-headed Honeyeater**

Sir Graham Moore, Middle Osborn, Carlia, Bigge, Boongaree, Uwins, Augustus and St. Andrew.

Moderately common in mangroves.

Meliphaga albilineata (White) **White-lined Honeyeater**

Wollaston, Bigge and Boongaree. Also at mouth of Hunter River.

Moderately common. For habitat see Smith & Johnstone (1974).

A12624 ♂ 27 g Boongaree 4 July.

A12625 ♀ 23 g Boongaree 4 July.

Meliphaga virescens (Vieillot) **Singing Honeyeater**

Sir Graham Moore and Bigge.

Scarce in woodland.

Meliphaga plumula (Gould) **Yellow-fronted Honeyeater**

Scarce in creekside vegetation on Sir Graham Moore.

Meliphaga flavescens (Gould) **Yellow-tinted Honeyeater**
Uwins.

Moderately common in *Melaleuca leucadendron* and *Eucalyptus miniata* along creeks where adults were feeding young.

Stomiopera unicolor unicolor (Gould) **White-gaped Honeyeater**

South West Osborn, Carlia, Boongaree, Uwins and St Andrew. Also at Anjo Point.

Moderately common. Mostly in closed-forest or low closed-forest but sometimes in woodland.

Melithreptus albogularis Gould **White-throated Honeyeater**

Sir Graham Moore, South West Osborn, Carlia, Coronation, Boongaree, Uwins, Augustus and St Andrew.

Moderately common in low woodland.

Melithreptus gularis laetior Gould **Black-chinned Honeyeater**

Augustus and possibly Coronation.

Scarce. Edge of dense forest along watercourse.

Philemon citreogularis citreogularis (Gould) **Little Friarbird**

East Montalivet, Middle Osborn, Katers, Coronation, Darcy and Augustus.

Scarce along watercourses and in mangroves.

Philemon argenticeps argenticeps (Gould) **Silver-crowned Friarbird**

Sir Graham Moore, East Montalivet, Middle Osborn, South West Osborn, Carlia, Katers, Wollaston, Bigge, Coronation, Boongaree, Uwins, Darcy, Augustus, St Andrew, Koolan, Kingfisher and Melomys.

Common in areas of flowering eucalypts (particularly *E. miniata*). Moderately common in low closed-forest (semi-deciduous vine thickets and vegetation along watercourses).

Cissomela pectoralis (Gould) **Banded Honeyeater**

Sir Graham Moore and Boongaree.

Scarce in woodland.

Juveniles seen on Boongaree.

Ramsayornis fasciatus (Gould) **Bar-breasted Honeyeater**

Sir Graham Moore, Boongaree, Uwins and Augustus.

Scarce along watercourses.

Conopophila rufogularis (Gould) **Rufous-throated Honeyeater**

Boongaree and Uwins.

Scarce in low woodland.

Manorina flavigula (Gould) **Yellow-throated Miner**

Uncommon on Uwins, common on Koolan.

FAMILY PLOCEIDAE

Poephila bichenovii annulosa (Gould) **Double-bar Finch**

Middle Osborn, South West Osborn, Carlia, Coronation, Boongaree, Uwins and Koolan.

Generally scarce but locally common, usually along watercourses.

Nest with 5 eggs in dead tree over pool on Uwins, 7 June.

Lonchura castaneothorax castaneothorax (Gould) **Chestnut-breasted Finch**

Scarce; 40 drinking from freshwater pool on Coronation. Also Hecla.

FAMILY ORIOLIDAE

Oriolus sagittatus (Latham) **Olive-backed Oriole**

Sir Graham Moore, South West Osborn, Carlia, Coronation, Boongaree, Uwins, Darcy, Augustus, St Andrew and Kingfisher. Also at mouth of Hunter River.

Moderately common. Mostly in woodland, sometimes in closed forest and low closed-forest (semi-deciduous vine thicket and mangroves.).

Oriolus flavocinctus flavocinctus (King) **Yellow Oriole**

Mary, East Montalivet, South West Osborn, South Maret, Katers, Wollaston, Boongaree, Uwins, Augustus and St Andrew.

Moderately common in closed forest and low closed-forest, (semi-deciduous vine thicket); occasionally in woodland. Seen eating *Abrus* seeds.

A11795 ♀ East Montalivet 8 June.

Sphecotheres viridis flaviventris Gould **Figbird**

Scarce in closed-forest on South West Osborn.

FAMILY DICRURIDAE

Dicrurus megarhynchus bracteatus Gould **Spangled Drongo**

Sir Graham Moore, Borda, South West Osborn, Katers, Wollaston, Coronation, Boongaree, Augustus and St Andrew. Also at mouth of Hunter River.

Uncommon. Mostly at edges of closed forest and low closed-forest (semi-deciduous vine thicket). Sometimes in low woodland.

A11783 Augustus 18 May.

A11796 Wollaston 11 June.

A12608 85 g South West Osborn 27 June.

A12609 ♀ 86 g South West Osborn 29 June.

A12610 ♂ 80 g Boongaree 5 July.

FAMILY ARTAMIDAE

Artamus leucorhynchus (Linnaeus) **White-breasted Wood-swallow**

Sir Graham Moore, Uwins, Champagny, Augustus, Heywood and Koolan.

Common at wharf on Koolan (up to 15 in a flock); scarce elsewhere.

Artamus personatus (Gould) **Masked Wood-swallow**

Scarce. One flock of 15 high over Byam Martin.

Artamus cinereus melanops Gould **Black-faced Wood-swallow**

South West Osborn, Boongaree and Koolan.

Scarce in low woodland.

Artamus minor Vieillot **Little Wood-swallow**

Borda, Middle Osborn, South West Osborn, Carlia, Katers, Wollaston, Bigge, Coronation, Boongaree, Bat, Uwins, Augustus and Koolan. Also at mouth of Hunter River.

Moderately common in flocks up to 12; usually associated with cliffs.

FAMILY CRACTICIDAE

Cracticus torquatus argenteus Gould **Silver-backed Butcherbird**

Moderately common in *Melaleuca* along creeks on east side of Uwins.

A12619 ♂ 96 g Uwins 7 July.

A12620 ♀ 94 g Uwins 8 July.

Cracticus nigrogularis (Gould) **Pied Butcherbird**

Sir Graham Moore, Bigge, Boongaree, Uwins, Augustus, St Andrew, Kingfisher, Cockatoo and Koolan. Also Anjo Point.

Moderately common in low woodland.

Cracticus tibicen tibicen (Latham) **Magpie**

Scarce, one at Kuri Bay 1972.

FAMILY PARADISAEIDAE

Ptilonorhynchus nuchalis nuchalis Jardine & Selby **Great Bowerbird**

Sir Graham Moore, Middle Osborn, South West Osborn, Carlia, Katers, Wollaston, Bigge, Coronation, Boongaree, Uwins, Darcy, St Andrew and Koolan. Also at Anjo Point and mouth of Hunter River.

Common in low closed-forest (mangroves, semi-deciduous vine thickets and creekside scrub).

FAMILY CORVIDAE

Corvus orru salvadorii Finsch **Australian Crow**

Scarce on Augustus. Moderately common on both visits to Kuri Bay (4 in 1972 and 10 in 1973).

DISCUSSION

Winter visits by us recorded 146 species of birds in the Bonaparte Archipelago and nearby groups of islands. Records from other sources (see Introduction, this paper) make the total 151 species. Of these, the Tree Martin, and White-winged Triller are probably winter migrants from the south; and Red-tailed Black Cockatoo and Diamond Dove are possibly dry season visitors from the Kimberley mainland. Populations of presumed resident species such as the Black-faced Cuckoo-shrike, Black-tailed Bee-eater and Magpie-lark are probably augmented by winter visitors. A summer visit would add migratory species such as the Koel (*Eudynamys scolopacea*) and Dollarbird (*Eurystomus orientalis*).

There are four main habitats on the islands: semi-deciduous microphyll vine thickets associated with basalts; woodlands associated with sandstone; woodlands associated with basalts and laterites; and mangroves.

Semi-deciduous vine thickets in the Kimberley are only well developed on basalts within the 1 200 mm isohyet. They are essential for the Scrub Fowl, Red-crowned Pigeon, Rufous Owl, Rainbow Pitta, Cicada-bird and Yellow Figbird. Important features of vine thickets

are the high proportion of plants producing succulent fruits and the large quantities of leaf litter. Vine scrubs are also important for the Torres Strait Pigeon, Green-backed Warbler, Little Shrike Thrush, Yellow Oriole, Koel and Spangled Drongo. These birds also frequent other types of forest.

The richest insular semi-deciduous vine thickets occur below the sandstone mesas on South West Osborn and St Andrew Island. Only here have we recorded all of the Western Australian vine thicket (frugivorous) pigeons Although not recorded on the islands, both the Rufous Owl and Cicada-bird have been collected from vine thickets on the nearby mainland (Storr *et al.* 1975).

Rainfall tapers off rapidly north-east of the Osborns (see Burbidge *et al.* this publication). Sir Graham Moore, the only large island visited north-east of the Osborns has no semi-deciduous vine thickets. It was the only island where we recorded the Yellow-fronted Honeyeater, a species mainly associated with semi-arid country.

Woodland, the predominant habitat on all continental Kimberley islands, houses species such as the Rufous Whistler, Willie Wagtail, Pied Butcherbird and Mistletoe-bird. Such species were usually common and found on most islands. The Mistletoe-bird was probably the most common bird on the islands, being found on 22 of the 25 continental islands visited.

The dominant understories associated with woodland are of two types: those comprising hummock grasses on sandstone and those comprising bunch grasses on basalts or laterite. Rugged sandstones with their deep, lush hummock grasses are essential for the White-quilled Rock Pigeon, Lavender-flanked Wren, Brown-breasted Shrike Thrush and White-lined Honeyeater. Wollaston and Boongaree Islands have all these species but neither has the Black Grass Wren (*Amytornis housei*) which is present in similar sandstone habitat on the opposite mainland. However, these islands, which are only 1·5 km from the mainland, do have two other wrens which are also poor flyers—*Malurus dulcis* and *M. melanocephalus*.

Three species are probably dependent on tall bunch grasses. The Golden-headed Fantail Warbler was only recorded on Middle Osborn and Sir Graham Moore, the Red-backed Wren only on the basalt area of Boongaree and the Tawny Grassbird on Adele.

The discontinuous belt of mangroves along the Kimberley coast supports a rich bird fauna. Sixteen species of birds are confined to mangroves in Western Australia, and many species such as the Bar-shouldered Dove, Rufous Fantail and Brown Honeyeater visit mangroves to feed, nest or shelter. Tidal flats associated with mangroves provide habitat for wintering and resident wading birds.

The small blocks of mangroves scattered throughout the islands collectively have as many species as individual blocks of mangroves on the nearby mainland. Mangroves are essential for about 18 per cent of the avifauna on the islands. The richest stands are on Carlia and South West Osborn Islands, but even then the number of bird species is less than half that of large blocks on the opposite mainland.

ACKNOWLEDGEMENTS

We are grateful to Dr A. A. Burbidge for his notes, particularly those from islands we did not visit (Fenelon, Browse and Low Rocks).

Dr N. G. Marchant and Mr P. G. Wilson of the Western Australian Herbarium identified the plants. We would also like to thank Dr G. M. Storr for his criticism of the manuscript.

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PART V

AMPHIBIANS AND REPTILES

By L. A. SMITH[1] and R. E. JOHNSTONE[1]

INTRODUCTION

This paper is based mainly on specimens obtained during a biological survey of the major islands of the Bonaparte Archipelago and the Institut, Osborn and Sir Graham Moore Groups of islands. We also visited Koolan and Kingfisher Islands (northern end of Buccaneer Archipelago), St Andrew Island (St George Basin) and two oceanic islands (Browse and Adele). Brief visits were made to Kuri Bay (twice) and the Hunter River mouth. Three days were spent at Anjo Point (mainland opposite Sir Graham Moore Island). See Fig. 1 in Burbidge and McKenzie (this publication) for positions of islands. Co-ordinates of all islands except Condillac (14°06′S, 125°33′E) appear in Table 1 of Smith *et al.* (this publication).

The surveys were conducted in the winters of 1971–1973, six weeks being spent in the area in 1971 and 1972 and three weeks in 1973. All personnel helped with the collecting (see Burbidge and McKenzie, this publication, for itineraries of collectors). Most time was spent on Augustus (11 days over two visits), least time on Browse (about 1 hour). Smith *et al.* (this publication) give collecting localities on the larger islands. Storr (1974 a, b and c, 1975 and 1976) referred to island groups or used temporary names when listing material from Kimberley islands. Official names have since been settled on these islands by the Nomenclature Advisory Committee, Western Australian Department of Lands and Surveys. Names of Individual islands within groups are as follows: Heywood Islands (Heywood and Darcy), Kingfisher Islands (formerly Wood Islands, comprising Kingfisher Island and Melomys Island), Coronation Islands (Coronation Island). South East Osborn Island is now Carlia Island.

The following list gives the islands on which the species occur, number of specimens collected (in brackets) and where possible ecological data. No attempt is made to assess relative abundance, but numbers collected give some indication. Specimens collected on the surveys are lodged in the Western Australian Museum registered numbers R14072–74, 14076–80, 14141, R15830, R40439–74, R40480–82, R40499–501, R41271–509, R41703–10, R44008–44068, R44076–44179 and 57099–103. Sight records are asterisked.

LIST OF SPECIES

ANURA

FAMILY LEPTODACTYLIDAE **Ground Frogs**

Limnodynastes sp.

A *Limnodynastes* was collected on Bigge; it was too desiccated to identify to species.

FAMILY HYLIDAE **Tree Frogs**

"*Litoria latopalmata* Günther"

Freshwater pools on Bigge (4), seepages on Katers (1).

Litoria rubella (Gray)

Freshwater pools on Bigge (2).

REPITILIA

FAMILY CHELONIIDAE **Marine Turtles**

Turtle tracks were found on Bigge, Champagny and Heywood Islands.

Many hundreds of nests on Browse.

FAMILY GEKKONIDAE **Geckos**

Crenadactylus ocellatus naso Storr

Heywood (2).

Burnt from spinifex among sandstone.

Gehyra australis (Gray)

Sir Graham Moore (1) and Koolan (5).

On sandstone.

Gehyra nana Storr

Sir Graham Moore (7), South West Osborn (1), Bigge (1), Boongaree (1), Darcy (1), Champagny (4), Augustus (1), Heywood (2), St Andrew (1), Kingfisher (9) and Melomys (1).

Among sandstone boulders.

Gehyra pilbara Mitchell

Koolan (1).

Gehyra xenopus Storr

Borda (1), South West Osborn (5), Katers (3), Wollaston (1), Boongaree (2), Bat (1), Uwins (1), Darcy (5), Champagny (2), Augustus (2), St Andrew (1) and Byam Martin (2).

In rugged sandstones with numerous vertical faces and overhangs.

Heteronotia binoei (Gray)

Sir Graham Moore (12), Baudin (1), Carlia (1), Bigge (2), Coronation (3), Boongaree (2), Augustus (1), St Andrew (3), and Byam Martin (1).

Found in most habitats.

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Oedura marmorata Gray

Augustus (2).

On open, flat sandstone at night.

Oedura rhombifera Gray

Sir Graham Moore (1), Boongaree (2), Darcy (1), Augustus (1), St Andrew (2), Byam Martin (1) and Koolan (2).

Found in association with basalts and sandstones.

The specimen from Augustus was active in the daytime on basalt in the inter-tidal zone.

Pseudothecadactylus lindneri cavaticus Cogger

Boongaree (2).

In cave in sandstone during day.

FAMILY PYGOPODIDAE **Legless Lizards**

Delma borea Kluge

Coronation (1), Augustus (1), Heywood (1) and Koolan (2).

Associated with basalts and sandstone.

Delma sp.

The sloughed skin of a *Delma* was found on a sandy spit vegetated with *Spinifex longifolius* on Bigge.

Lialis burtonis Gray

Heywood (3) and Koolan (1).

Burnt from spinifex among sandstone.

FAMILY AGAMIDAE **Dragon Lizards**

Amphibolurus microlepidotus Glauert

Bigge (1).

Diporiphora bennettii bennettii (Gray)

Coronation (9), Darcy (2), Champagny (1), Augustus (6), and Koolan (4).

Associated with basalts and sandstones.

Diporiphora superba Storr

Boongaree (3).

This arboreal species was found in acacias among sandstones.

FAMILY SCINCIDAE **Skinks**

Carlia amax Storr

Darcy (1), Kingfisher (2) and Koolan (1).

Among sandstone and spinifex.

Carlia foliorum (DeVis)

Sir Graham Moore (1).

Carlia johnstonei Storr

East Montalivet (1), Middle Osborn (5), South West Osborn (8), Carlia (1), Katers (3), Bigge (5), Coronation (3), Boongaree (4), Uwins (2) Darcy (5), Augustus (22) and Heywood (2).

Mostly in semi-deciduous vine thickets but also in leaf litter on sandstone.

Carlia triacantha (Mitchell)

Sir Graham Moore (4), Baudin (1), South West Osborn (2), Carlia (1), Bigge (2), Coronation (2), Boongaree (2), Uwins (3), Darcy (1), Champagny (1), Augustus (1), Heywood (7), St Andrew (1) and Koolan (4).

Mostly in spinifex on sandstone but sometimes in leaf litter on basalts and sandstones.

Cryptoblepharus megastictus Storr

Middle Osborn (6) and South West Osborn (1). On basalt: tidal splash zone and creek margins.

Cryptoblepharus plagiocephalus (Cocteau)

Borda (1), Bigge (3), Boongaree (2), Augustus (1), and Kingfisher (5).

On trees.

Ctenotus burbidgei Storr

Darcy (1) and Augustus (4).

Specimen from Darcy on sand with *S. longifolius*; specimens from Augustus on open, flat sandstone with sparse spinifex.

Ctenotus inornatus (Gray)

Sir Graham Moore (13), Fenelon (3), Baudin (1), East Montalivet (3), South West Osborn (1), South Maret (1), Katers (8), Wollaston (2), Bigge (2), Coronation (8), Boongaree (6), Uwins (1), Champagny (2), Heywood (54) and Byam Martin (3).

This abundant species was found in all habitats.

Ctenotus tantillus Storr

Sir Graham Moore (1).

In a small sandy area among sandstone and spinifex.

Lerista walkeri (Boulenger)

Condillac (Boulenger 1891), Augustus (1).

Among sandstone boulders.

Morethia ruficauda ruficauda (Lucas & Frost)

Sir Graham Moore (2), Borda (1), Katers (1), Wollaston (1), Bigge (2), Boongaree (1) and Heywood (5).

On sandstone with spinifex.

Notoscincus ornatus wotjulum (Glauert)

Sir Graham Moore (1), South West Osborn (1), Katers (3), Wollaston (1), Bigge (1), Boongaree (1) and Augustus (1).

In leaf litter on basalts and sandstones. See Smith (1976) for comparison of behaviour and habitats of this and the nominate race.

Sphenomerphus isolepis (Boulenger)

Baudin (1), Bigge (1), Boongaree (1), Augustus (1), and Heywood (1).

FAMILY VARANIDAE **Goannas**

Varanus acanthurus subsp.

Sir Graham Moore (1), Augustus (1).

Varanus glauerti Mertens

Sir Graham Moore (1), South West Osborn (1), Bigge*, Uwins (1), Darcy (1), Champagny (1), Augustus (4), Heywood (1), St Andrew (1) and Byam Martin (1).

Among boulders and leaf litter at margins of watercourses and in semi-deciduous vine thickets. Mostly on basalt, sometimes sandstone.

Varanus glebopalma Mitchell

South West Osborn (1), Katers (1), Boongaree (1), Uwins (1), Byam Martin (1) and Koolan (1).

Among rugged sandstone.

Varanus gouldii (Gray)

Boongaree (1).

FAMILY TYPHLOPIDAE **Blind Snakes**

Typhlina polygrammica (Schlegel)

Bigge (1).

This, the first specimen from Western Australia, was collected under debris on a sandy spit vegetated with *S. longifolius*.

There are 22 scales around the body and the nasal cleft, which contacts the second labial, is produced well beyond the nostril on to the top of the head.

FAMILY BOIDAE **Pythons**

Liasis sp.

Baudin (1), Augustus (1), Heywood (1) and Koolan (1). The specimen from Heywood came from a sandstone overhang near a small pool.

This undescribed species lacks the bold back pattern of *Liasis childreni*.

Liasis mackloti (Duméril & Bibron)

St Andrew (1).

On basalt cliff at night.

Liasis olivaceous Gray

Heywood (2).

Both specimens from a sandstone overhang near a small pool.

Pythons which were either *L. mackloti* or *L. olivaceous* were seen near the splash zone on Middle Osborn and on sandstone scree on Augustus.

FAMILY COLUBRIDAE **Rear-fanged and Fangless Snakes**

Boiga fusca (Gray)

Koolan (1).

Cerberus australis (Gray)

Sir Graham Moore (1).

Swimming in open water near beach.

Dendrelaphis punctulatus (Gray)

Bigge* and Koolan (2).

FAMILY ELAPIDAE **Front-fanged Snakes**

Acanthopis antarcticus (Shaw)

Bigge (1) and Koolan (1).

Demansia olivacea olivacea (Gray)

Koolan (1)

Demansia papuensis melaena Storr

Koolan (1).

Pseudechis australis (Gray)

Sir Graham Moore (1), Boongaree* and Koolan (1).

In long grass near watercourses.

DISCUSSION

Except for Browse and Adele all islands visited during the surveys are continental islands ranging from 1 km to 32 km from the mainland.

Accordingly all species but one (*Typhlina polygrammica*) have been found on the adjacent mainland, hence the herpetofauna is typical of the subhumid north-west Kimberley, although islands such as Sir Graham Moore, Koolan and Kingfisher at the eastern and southern end of the arc of islands visited have species which are typical of more arid areas (e.g. *Gehyra pilbara* and *Ctenotus tantillus*).

Field work in the Prince Regent River Nature Reserve (Storr & Smith 1975) and the Mitchell Plateau area (Smith & Johnstone in prep.), has shown that there are about 80 species of frogs and reptiles in the humid north-west corner of the Kimberleys mainland. Seventeen of these species (or races of those species) are endemic to the area. Forty-five species of frogs and reptiles were recorded from the islands visited including 8 of the 17 endemics.

A majority of islands are wholly or mostly sandstone, and 6 of the 8 north-west Kimberley endemics, which occur on the islands, are inhabitants of sandstone areas. They are: *Gehyra nana*, *G. xenopus*, *Pseudothecadactylus lindneri cavaticus*, *Diporiphora superba*, *Ctenotus burbidgei* and *Lerista walkeri*. The other 2 taxa (*Carlia johnstonei* and *Cryptoblepharus megastictus*) are usually found on basalts but sometimes on sandstones.

Table 1 lists the number of representatives from each family for the Prince Regent River Nature Reserve, Mitchell Plateau area and islands visited. No family except the Typhlopidae is better represented on the islands than on the mainland. No island can be considered to be adequately collected for herptiles, hence it is impossible to say if a species' absence is real or not.

The aquatic herptiles are an exception. There are 19 species of frog, 2 species of tortoise and 1 species of crocodile on the nearby mainland but only 3 species of frog were collected from the islands, probably a significant difference as only a few islands appear to have permanent water.

TABLE 1

NUMBERS OF SPECIES OF EACH FAMILY AT THREE AREAS IN THE SUBHUMID NORTH WEST KIMBERLEY

Family	Prince Regent Reserve	Mitchell Plateau Area	Kimberley Islands
Crocodilidae	2	2	1
Leptodactylidae	4	5	1
Hylidae	9	11	2
Cheluidae	2	2	0
Gekkonidae	8	15	9
Pygopodidae	1	2	2
Agamidae	9	9	3
Scincidae	17	17	10
Varanidae	8	6	4
Typhlopidae	0	0	1
Pythonidae	2	2	3
Colubridae	2	3	3
Elapidae	3	7	6
Total	67	81	45

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PART VI

CONCLUSIONS AND RECOMMENDATIONS

by A. A. BURBIDGE[1] and N. L. McKENZIE[1]

CONCLUSIONS

Geologically the islands of the north-west Kimberley represent all the major strata of the adjacent mainland with the exception of bauxites which are not represented and laterites which are poorly represented. Most islands are composed of sandstone (King Leopold or Warton Sandstones) or basalt (Carson Volcanics).

Vegetation formations are varied. Open and low open-woodlands and low open and low closed-shrublands are widespread but a number of other formations were found, including tall closed-forest, low forest, low open-forest, low closed-forest (mangrove formations), low closed-woodland, woodland, grassland and sedgeland. Many areas of sparsely vegetated rock outcrops were also found. Of special interest are the areas of semi-deciduous vine thicket. South West Osborn has an area of particularly well developed vine vegetation which could classify as closed-forest. Other islands with vine thickets include Augustus, St Andrew, Uwins, Borda, Katers and Boongaree.

Twenty-two species of native mammal were recorded, all of which are known from the adjacent mainland. Some islands support high densities of three mammal species which, based on current knowledge, appear to be relatively uncommon or restricted in their distribution on the mainland, *viz: Petrogale burbidgei, Peradorcas concinna* and *Zyzomys woodwardi.* Some islands also support undisturbed populations of species which should persist indefinitely regardless of increased disturbance on the adjacent mainland. Elsewhere in Western Australia, islands support a number of species which are now rare or extinct on the mainland and there is no guarantee that a similar situation will not develop in the Kimberley.

Members of the survey parties recorded 146 species of birds on the islands and a further 5 species have been recorded by other observers. A number of vine thicket species were recorded, including the Scrub Fowl, Red-crowned Pigeon, Rainbow Pitta and Yellow Figbird. Sea bird breeding islands are scarce, only the following being known: Jones, Sand, Low Rocks, Warn, an un-named islet in Prince Frederick Harbour near the mouth of the Hunter River, and Adele.

Forty-five species of frogs and reptiles were recorded. All except one, a blind snake, have been recorded on the adjacent mainland. Seventeen species or subspecies are endemic to the north-west Kimberley and eight of these have been collected on the islands.

The biological surveys of the various islands were conducted under far from ideal conditions. The teams worked from small boats, had to traverse the islands on foot and could spend only a short time at one place. Consequently, the data presented are limited and further work will doubtless add species to the lists. Nevertheless, it is clear that the islands collectively harbour a wide variety of ecosystems typical of the humid north-west Kimberley and provide an area where these species can persist in the absence of interference from man and feral animals. Their protection will greatly enhance nature conservation in Australia.

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RECOMMENDATIONS

We believe that some of the more important islands and groups of islands should be set aside as Nature Reserves. Firstly, we believe that the islands adjacent to the Prince Regent River Nature Reserve are naturally part of the reserve and should be included in it. Accordingly we recommend:

1. **that Bat Island, the Coronation Islands and Boongaree Island be included in Reserve No. 27164.**

The Augustus group of islands are included in a reserve set aside for the Use and Benefit of Aborigines and are therefore not available for reservation as Nature Reserves. Augustus Island is particularly diverse and we recorded more species of mammal here than on any other island. St Andrew Island in St George Basin is another valuable area. Accordingly we recommend:

2. **that the Department of Fisheries and Wildlife bring to the notice of the Aboriginal Lands Trust the conservational value of islands in the Augustus Group and in St George Basin. Should they at any time no longer be required for Aborigines, consideration should be given to setting them aside as Nature Reserves.**

The islands in and adjacent to Montague Sound have a diverse flora and fauna. Bigge Island, the second largest island in the Kimberley, is especially interesting and supports large populations of two comparatively rare mammals *Petrogale burbidgei* and *Zyzomys woodwardi.* The rock wallaby also occurs on Katers Island and perhaps on Wollaston as well. The Maret and Montalivet Islands provide a sharp contrast in terms of geology, plant formations and fauna. Accordingly we recommend:

3. **that Bigge, Katers and Wollaston Islands, the Maret Islands, the Montalivet Islands and other small islands in the vicinity be declared a Class A Reserve for the Conservation of Flora and Fauna, vested in the Western Australian Wildlife Authority.**

The Osborn Islands in Admiraly Gulf are most diverse, providing a great variety of geology, flora and fauna. They are, in essence, a microcosm of the region. Semi-deciduous vine thickets are well developed on South West Osborn; Middle Osborn has woodlands on basalt and Borda is composed of rugged King Leopold Sandstones. In addition, Borda Island harbours a population of the Little Rock Wallaby (*Peradorcas concinna*)—the only island population of this species which can be protected by reservation. Accordingly we recommend:

4. **that the Osborn Islands (comprising Middle Osborn, South West Osborn, Carlia, Kidney, Steep Head, Borda and adjacent smaller Islands) be declared a Class A Reserve for the Conservation of Flora and Fauna, vested in the Western Australian Wildlife Authority.**

Low Rocks, in Admiralty Gulf, is an important seabird breeding site. It is at present a Class C Reserve but we believe it has sufficient importance to be recognised by Class A status. Accordingly we recommend:

5. that Reserve No. 33832 be proclaimed Class A.

Browse Island is undoubtedly one of the major marine turtle nesting islands of the Indian Ocean. We believe that it should receive legal protection. Accordingly we recommend:

6. that the purpose of Reserve 22697 be changed from Minerals—Phosphatic Rock to Conservation of Flora and Fauna and that it be declared Class A and be vested in the Western Australian Wildlife Authority. We further recommend that an Aquatic Reserve be declared under the Fisheries Act, extending from high water mark to one nautical mile seawards. This reserve should be Class A, for the protection of marine life and be vested in the Western Australian Wildlife Authority.

Adele Island is one of Australia's outstanding seabird breeding islands. It is owned by the Commonwealth of Australia and is therefore not available for reservation. Accordingly we recommend:

7. that the State Government explore with the Commonwealth Government means of returning Adele Island to State control. When this eventuates Adele Island should be declared a Class A Reserve for the Conservation of Flora and Fauna, vested in the Western Australian Wildlife Authority. Leases should be issued, if necessary, to protect the lighthouse, radio beacon and weather station.

All the islands along the north-west Kimberley coast have some conservational value. Some of those for which we have not made specific recommendations harbour interesting animals, e.g. Sir Graham Moore and Melomys Islands have populations of a Native Mouse (*Melomys*) about which little is known. We do not wish to see all islands in this remote part of Western Australia tied up by reservation. However, we are aware that future research may show additional islands to be of value. We believe some form of reservation is needed but this should be of a kind where future options can be kept open. Our recommendation follows those of the Environmental Protection Authority in relation to islands elsewhere in Western Australia. Accordingly we recommend:

8. that all islands off the Kimberley coast, not specifically mentioned above, and not already reserved for some other use, be declared Class B Reserves for the Conservation of Flora, vested in the Western Australian Wildlife Authority.