

**WILDLIFE
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Number **3**

A Biological Survey of
**THE PRINCE REGENT RIVER
RESERVE**

North-West Kimberley,
Western Australia.

in
August, 1974.

EDITED BY
Jenefer M. Miles
and
Andrew A. Burbidge.

1975



WESTERN AUSTRALIAN
WILDLIFE RESEARCH CENTRE
DEPARTMENT OF FISHERIES AND WILDLIFE
PERTH, WESTERN AUSTRALIA



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CONTENTS

		Page
PART I	HISTORY A. A. Burbidge	7
	Previous Expeditions	7
	Creation of the Reserve	8
	Background to this Expedition	9
	References	9
PART II	NARRATIVE J. M. Miles	11
	Introduction	11
	The Survey	12
	Acknowledgements	16
PART III	ENVIRONMENT J. M. Miles, K. F. Kenneally, A. S. George	17
	Introduction	17
	Geology	17
	Climate	18
	Classification of Habitat	18
	Description of Sites—	
	E1. Upper Prince Regent	18
	E2. Wulumara Creek	19
	E3. Bushfire Hill	19
	E4. Wyulda Creek	19
	E5. Enid Falls	20
	E6. Garimbu Creek	21
	W1. Blyxa Creek	21
	W2. King Cascade	23
	W3. Fern Gully	23
	W4. Mt. Trafalgar	23
	W5. Python Cliffs	23
	W6. Youwanjela Creek	24
	— Careening Bay	24
	Discussion	24
References	30	
Acknowledgement	30	
PART IV	FLORA A. S. George, K. F. Kenneally	31
	Introduction	31
	Fungi	31
	Lichens	32
	Ferns	32
	List of Plant Species—	
	Lichens	34
	Ferns	35
	Gymnospermae	37
	Monocotyledonae	37
Dicotyledonae	41	
Acknowledgements	68	

		Page
PART V	MAMMALS N. L. McKenzie, A. Chapman, W. K. Youngson	69
	Introduction	69
	Collecting Techniques	69
	Mammal Habitats—	
	King Leopold Sandstone	69
	Carson Volcanics	70
	Laterites	71
	Warton Sandstone	71
	Mangroves	71
	Results	71
	List of Species—	
	Marsupialia	71
	Rodentia	72
	Chiroptera	73
	Monotremata	73
	Carnivora	74
	Artiodactyla	74
	Discussion	74
	References	74
	Acknowledgements	74
PART VI	BIRDS G. M. Storr, R. E. Johnstone, J. Dell, L. A. Smith	75
	Introduction	75
	List of Species	75
	Discussion	82
	References	83
PART VII	AMPHIBIANS AND REPTILES G. M. Storr, L. A. Smith	85
	Introduction	85
	List of Species—	
	Anura	85
	Reptilia	85
	Discussion	88
PART VIII	FRESHWATER FISHES G. R. Allen	89
	Introduction	89
	List of Collecting Stations	89
	Results	90
	List of Species	90
	References	96
PART IX	MOLLUSC FAUNA B. R. Wilson, P. R. Smith	97
	Introduction	97
	List of Collecting Stations	97
	Results	99
	List of Land and Freshwater Mollusc Species—	
	Gastropoda	99
	Bivalvia	99
	List of Marine Mollusc Species—	
	Gastropoda	100
	Bivalvia	100
	Discussion	100
	References	100

										Page
PART X	INSECT FAUNA	W. J. Bailey, K. T. Richards	....	....	....	....	....	....	....	101
	Introduction		....	....	....	....	....	....	....	101
	Collecting Sites		....	....	....	....	....	....	....	101
	Methods		....	....	....	....	....	....	....	101
	Housing and Identification of Specimens		....	....	....	....	....	....	....	102
	List of Insect Species—									
	Blattodea	....	....	....	....	....	....	....	....	102
	Coleoptera	....	....	....	....	....	....	....	....	102
	Dermaptera	....	....	....	....	....	....	....	....	103
	Diptera	....	....	....	....	....	....	....	....	103
	Ephemeroptera	....	....	....	....	....	....	....	....	104
	Hemiptera	....	....	....	....	....	....	....	....	104
	Hymenoptera	....	....	....	....	....	....	....	....	105
	Lepidoptera	....	....	....	....	....	....	....	....	105
	Mantodea	....	....	....	....	....	....	....	....	107
	Neuroptera	....	....	....	....	....	....	....	....	108
	Odonata	....	....	....	....	....	....	....	....	108
	Orthoptera	....	....	....	....	....	....	....	....	108
	Phasmatodea	....	....	....	....	....	....	....	....	109
	Trichoptera	....	....	....	....	....	....	....	....	109
	Discussion									
	A. Diptera	....	....	....	....	....	....	....	....	109
	B. Lepidoptera	....	....	....	....	....	....	....	....	109
	C. Neuroptera, Trichoptera and Ephemeroptera	....	....	....	....	....	....	....	....	110
	D. Odonata	....	....	....	....	....	....	....	....	110
	E. Orthoptera	....	....	....	....	....	....	....	....	110
	References	....	....	....	....	....	....	....	....	111
	Acknowledgements	....	....	....	....	....	....	....	....	111
PART XI	CONCLUSIONS AND RECOMMENDATIONS		....	....	....	....	....	....	....	113
	Conclusions	....	....	....	....	....	....	....	....	113
	Recommendations	....	....	....	....	....	....	....	....	113
	Reference	....	....	....	....	....	....	....	....	114

TABLES

PART I	HISTORY									
	1. Small Reserves within Prince Regent Reserve	....	....	....	....	....	....	....	....	8
PART II	NARRATIVE									
	1. Names adopted for Reserve Features	....	....	....	....	....	....	....	....	12
PART III	ENVIRONMENT									
	1. Rainfall for West Kimberley....	....	....	....	....	....	....	....	....	17
	2. Structural Formations	....	....	....	....	....	....	....	....	18
	3. Summary of Plant Communities	....	....	....	....	....	....	....	....	29
PART V	MAMMALS									
	1. Entire Specimens of Terrestrial Mammal Species by Habitat	....	....	....	....	....	....	....	....	70
PART IX	MOLLUSC FAUNA									
	1. Land and Freshwater Species by Habitat	....	....	....	....	....	....	....	....	98

FIGURES

	Page
PART I HISTORY	
1. Baobab Tree Carved by Crew of <i>Mermaid</i>	8
PART II NARRATIVE	
1. Transporting Fuel and Equipment.....	11
2. Reserve, Showing Topography and Survey Sites	13
3. Helicopter Flight Plan	14
4. Helicopter at Fuel Dump	15
5. Enid Falls	15
6. Collecting Land Snails	16
7. Preparation of Bird Skin	16
PART III ENVIRONMENT	
1. Bushfire Hill—Woodland on Lateritic Plateau	20
2. Bushfire Hill—After Fire	20
3. Bushfire Hill—Woodland on Basaltic Slopes	20
4. Gandjal Creek—Rocky Bed With Pools	20
5. Blyxa Creek—Woodland	22
6. Blyxa Creek—Closed Grassland	22
7. Blyxa Creek—Open Woodland	22
8. Blyxa Creek—Fringing Woodland	22
9. Fern Gully—Woodland	25
10. Fern Gully—Looking into Gully	25
11. Fern Gully—Delta at Mouth	25
12. Fern Gully—Bank of Ferns	25
13. Mt Trafalgar—Base of Sandstone Cliff	26
14. Mt Trafalgar—Vine Thicket	26
15. Mt Trafalgar—Inside Vine Thicket	26
16. <i>Ficus hispida</i> in Vine Thicket	26
17. Mangroves and St George Basin—Mt Trafalgar	27
18. Mt Trafalgar—Woodland Below Vine Thicket	27
19. Mt Trafalgar—Summit Shrubland	27
20. Careening Bay—Open Forest Behind Beach	27
21. Mangroves Below Mt Trafalgar	28
22. Mangroves Below Mt Trafalgar	28
23. Mangrove Prop Roots on Prince Regent River	28
24. Mangrove Prop Roots Below Mt Trafalgar	28
PART IV FLORA	
1. Fern Gully— <i>Dicranopteris linearis</i> and <i>Lindsaea ensifolia</i>	33
2. <i>Schizaea dichotoma</i> in Fern Gulley	33
3. <i>Blyxa aubertii</i> at Blyxa Creek	33
4. Blyxa Creek—Aquatic and Semi-aquatic Vegetation	33
PART V MAMMALS	
1. Little Northern Native Cat—Boongaree Island	72
2. Common Rock-Rat—Beverley Springs Station	72
3. Red Flying Fox—Captured at WI	73

	Page
PART VI BIRDS	
1. Liane Scrub at E6	83
2. Landward Edge of Mangroves W4	83
3. Rufous Creek E5	83
4. Black Grass-wren Habitat E5	83
5. Open Country Near W6	84
6. Eucalypt Woodland Near W6	84
PART VII AMPHIBIANS AND REPTILES	
1. Creek at E6, Home of 12 Species of Frogs	88
2. <i>Litoria nasuta</i> at E6	88
PART VIII FISH	
1. <i>Nematalosa erebi</i> (E1)	90
2. <i>Neosilurus glencoensis</i> (E4)	91
3. <i>Anguilla bicolor</i> (W2)	91
4. <i>Craterocephalus worrelli</i> (E4)	92
5. <i>Nematocentris australis</i> (E4)	92
6. <i>Hephaestus fuliginosus</i> (Beverley Springs Station)	93
7. <i>Madigania unicolor</i> (E4)	93
8. Theraponid species A (E4)	93
9. Theraponid species B (E4)	94
10. <i>Glossogobius giurus</i> (E1)	94
11. <i>Mogurnda mogurnda</i> (E4)	95
12. <i>Hypseleotris simplex</i> (E4)	95
PART X INSECT AND FAUNA	
1. <i>Euconocephalus</i> sp. (Orthoptera: Tettigoniidae)	111
2. Sound analyses of two sympatric species of <i>Euconocephalus</i>	111
3. <i>Cressida cressida</i> (Fabricius)	112
4. <i>Melanitis leda bankia</i> (Fabricius)	112
5. <i>Antheraea eucalypti</i> Scott	112
6. <i>Gynacantha</i> sp.	112
COLOUR PLATES—CENTRE	
Prince Regent River at W2.	57
King Cascade	57
Near Top of King Cascade	57
Part of Gorge on Pitta Creek	57
Scaly-tailed Possum (<i>Wyulda squamicaudata</i>)	58
Knob-tailed Gecko (<i>Nephrurus asper</i>)	58
Careening Bay, Port Nelson	58
Mangroves in St George Basin	58
Brown Tree-Snake (<i>Boiga fusca</i>)	59
Black Grass-Wren (<i>Amytornis housei</i>)	59
Mt Trafalgar	59
Upper Prince Regent River Near E1.	59
Gorge on Pitta Creek Showing Helicopter	60
Wanjina Art, Malubirindji Cave, E2.	60
Marshwort (<i>Nymphoides ? hydrocharoides</i>), W1.	60
Blue Tiger Butterfly (<i>Danaus hamatus hamatus</i>)	60

Previous Publications in this Series were titled Fauna Bulletins—
 No. 1 Fauna Conservation in Western Australia, 1956. (Out of Print).
 No. 2 Bernier and Dorre Islands, 1962.

PART I

HISTORY OF THE PRINCE REGENT RIVER RESERVE

by A. A. BURBIDGE ¹

PREVIOUS EXPEDITIONS

The first European to chart the Kimberley coast was Abel Tasman, who mapped the area in 1644. Tasman's log of this voyage has been lost so it is not known where he landed. The next explorer to visit the Kimberley was William Dampier in the *Cygnets* in 1688. He returned in 1699 in the *Roebuck* but on neither occasion did he touch the coast in the vicinity of the Prince Regent River.

There are no records of further visits until the nineteenth century. In 1801, and again in 1803, the French Scientific Expedition under the command of Nicholas Baudin passed along the coast and Baudin named the Bonaparte Archipelago and many of its outlying islands. He would not approach close to the mainland on account of the large tides. In 1803 Matthew Flinders circumnavigated Australia in the *Investigator* but did not approach the coast in this region.

Thus it remained to Phillip Parker King to be the first to examine closely the coastline in the region of the Prince Regent River (King, 1827). King first visited the area in the cutter *Mermaid* in 1820. Among his crew was John Septimus Roe, who later became W.A.'s first Surveyor General, and Allan Cunningham the well known botanist and explorer. After exploring Prince Frederick Harbour the *Mermaid* was found to be leaking badly and King decided to careen her for repairs. This was done at Careening Bay, now part of the Prince Regent River Reserve, and the crew of the *Mermaid* were camped here from 22 September to 5 October 1820. During this time Cunningham made a collection of plants which included many species previously unknown to science and Careening Bay is an important type locality. He also traversed the country to the south of the Bay and climbed Mt Knight. After the repairs were complete, and while awaiting a high tide to refloat the *Mermaid*, King and Cunningham made an excursion to Bat Island off Cape Brewster. During the excursion they saw a native cat (*Dasyurus hallucatus*).

On 10 October 1820, the *Mermaid* entered St George Basin and while Cunningham and some of the crew explored its shores, King examined the Prince Regent River. After landing on the small island at the mouth of the river to take bearings, King proceeded upstream and discovered the cascade which enters the river from the south. After venturing a further three miles upstream the party returned to a small island (which King named Alligator Island) for the night and then returned to the *Mermaid*. King then left St George Basin and, as the *Mermaid* was still leaking, returned to Port Jackson.

In 1821 King returned in the brig *Bathurst* and on 23 July landed at Careening Bay searching for water.

The narrative here records the fact that a Baobab tree had been carved the previous year with the name of the *Mermaid* (Fig. 1). This inscription was rediscovered in 1973 by a Fisheries and Wildlife, W.A. Museum, W.A. Herbarium expedition. Since no water was available they proceeded to the Prince Regent River and on 27 July watered at the cascade. On the following day King moved upstream to examine more of the river. He explored as far as the junction between salt and fresh waters. The *Bathurst* remained in the Prince Regent area until 6 August.

The next visitor to this region was George Grey who explored the country between the Glenelg River and the Prince Regent River in 1837 and 1838 (Grey, 1841). Grey did not enter the country covered by the Prince Regent River Reserve. At the same time Wickham and Stokes in H.M.S. *Beagle* (Stokes, 1846) examined the adjacent coastline but only as far north as Port George IV from which they sighted Mt Trafalgar and Mt Waterloo.

The next documented visit to the reserve was by Joseph Bradshaw in 1892. This was the first of a series of visits by people interested in the pastoral potential of the West Kimberley. Bradshaw travelled on horse-back from Wyndham and provides some graphic descriptions of the country and the aborigines along the Prince Regent River. However, he apparently mistook the Roe River for the Prince Regent since on p. 100 he states "A curious feature of the Prince Regent River is that for more than fifty miles of its course it forms the line of demarcation between two distinct types of bedrock. On the eastern side the formation is basaltic while that on the west is sandstone" (Bradshaw, 1892). This description could not apply to the Prince Regent River. Bradshaw was the first to describe the small red aboriginal paintings which are now named after him.

In 1901 the Brockman exploring party visited what is now the reserve (Brockman, 1902). Members of the party included Dr F. M. House who acted as naturalist and C. Crossland who led another exploring trip in 1905. Brockman examined country at the headwaters of the Calder River, to the south of the Prince Regent River, in the vicinity of Mt Hann and along the Roe and Moran Rivers. It was during this trip that the type specimen of *Amytornis housei* (the Black Grass-Wren) was collected, although not in the Prince Regent River Reserve.

It is probable that a number of other expeditions into this area were conducted around the turn of the century. Thus Brockman reports "... near the mouth of the Calder River I met a prospecting party led by John Calder. They informed me that they had left Derby about 9 May, and having found a passage through the King Leopold Ranges had endeavoured without success to force their way through the ranges immediately south of the Prince Regent River" (p. 5).

¹ Western Australian Wildlife Research Centre, Department of Fisheries and Wildlife, Mullaloo Drive, Wanneroo, W.A. 6065.

In 1905 another trip led by C. Crossland again entered this country looking for good pastoral lands. A member of this trip was W. V. Fitzgerald who later wrote on the botany of the Kimberley (Fitzgerald, 1917). The last of the organised 'pastoral' expeditions was that of W. R. Easton in 1921 (Easton, 1922). A member of his party was the well known botanist C. A. Gardner who published an extensive work on specimens collected during the trip (Gardner, 1923). The Easton expedition travelled from Pt George IV Mission (Kunmunya) "easterly over rough sandstone wastelands which were seamed with deep fertile valleys running into St George Basin. We then struck into the Prince Regent River and endeavoured to find a crossing". After many attempts to cross the river they abandoned this plan and travelled south-easterly along the divide between the Prince Regent and Glenelg and Calder Rivers to the headwaters of the Drysdale.

The last documented visit to the reserve was by I. M. Crawford in 1963 who was studying aboriginal cave paintings (Crawford, 1968). In recent times the reserve has been visited by geologists and prospectors and by mapping teams from the Royal Australian Survey Corps. Biologists from the Department of Fisheries and Wildlife, W.A. Museum and W.A. Herbarium made brief visits in 1972 and 1973 while working on offshore islands.

CREATION OF THE RESERVE

The Prince Regent River Reserve was created by notice published in the *Government Gazette* of 10 April 1964, following the recommendations of the Western Australian Sub-Committee of the Australian Academy of Science Committee on National Parks (Anon., 1962).

The Sub-Committee stated in its report "without doubt, the Prince Regent River could become one of the world's outstanding and scenic natural history reserves". The newly created reserve was designated a Class C reserve, No. 27164, and was set aside for the purposes of Conservation of Flora and Fauna. Where the reserve abuts tidal waters it extends to low water mark. The total area of the reserve is approximately 633 825 hectares (1 565 000 acres) excluding a number of smaller reserves (see Table 1) which occur within its boundaries. By an order of Council published in the *Government Gazette* on the same date Reserve No. 27164 was vested in the Fauna Protection Advisory Committee of Western Australia. This Committee was replaced by the Western Australian Wild Life Authority which now holds the vesting order.

TABLE 1
DETAILS OF SMALL RESERVES OCCURRING WITHIN
THE PRINCE REGENT RIVER RESERVE BOUNDARIES
BUT EXCLUDED FROM IT

Reserve No.	Class	Purpose	Area (ha)	Vesting
8243	C	Excepted from sale	405	Not vested
8248	C	Excepted from sale	405	Not vested
8252	C	Excepted from sale	1 215	Not vested
21969	C	Use and benefit of aborigines	41	Aboriginal Lands Trust
21972	C	Use and benefit of aborigines (Nyimandum)	41	Aboriginal Lands Trust
21973	C	Use and benefit of aborigines (Purulba)	41	Aboriginal Lands Trust



Figure 1—Baobab (*Adansonia gregorii*) carved by the crew of the *Mermaid* in 1820. Photographed August 1974. Inscription reads "H.M.C. Mermaid 1820".

In 1969 a Reserves Advisory Council was appointed by the Government to examine the future of a number of Conservation Reserves. Following an aerial inspection of the Prince Regent River Reserve by some members of the Council it recommended to the Minister for Lands that the purpose of the reserve be changed from "Conservation of Flora and Fauna" to "National Park, Conservation of Flora and Fauna and Protection of Aboriginal Sites". The Council considered that the best interests of the community would be served by the W.A. Wild Life Authority relinquishing its vesting order over the Prince Regent River Reserve in favour of the National Parks Board of Western Australia for the following reasons:

1. The complexities of management of the Prince Regent River Reserve as revealed during an inspection by members of the Reserves Advisory Council.
2. In view of the fact that considerable finance will be required to allow for full utilization of the area for recreation, flora and fauna conservation and protection of aboriginal sites".

The vesting in the National Parks Board was to be subject to that Board undertaking to:

1. Confer on all matters of management of Reserve 27164 with the Western Australian Wild Life Authority and the Statutory Authority responsible for Aboriginal Sites.
2. Set up a Management Advisory Committee comprising two nominated representatives of the National Parks Board, the Western Australian Wild Life Authority and the Statutory Authority responsible for Aboriginal Sites.

At a meeting held on 16 March 1970, the W.A. Wild Life Authority agreed to relinquish its vesting order subject to the suggested conditions and the vesting order was forwarded to the Department of Lands and Surveys. However, the recommendation of the Reserves Advisory Council was not accepted by Cabinet, mainly because of the objections of the Mines Department that the area was prospective for uranium and diamonds.

In February 1971, the Department of Lands and Surveys advised the Department of Fisheries and Wildlife that consideration of the change in purpose had been deferred pending reference to the newly set up Department of Environmental Protection. However, nothing further eventuated and in May 1972, the W.A. Wild Life Authority asked for the return of the vesting order pending a final decision. The vesting order was returned in June 1972, and is still held by the W.A. Wild Life Authority.

In 1972 the Environmental Protection Authority set up a Conservation Through Reserves Committee to recommend a State-wide system of conservation reserves. The Committee's report, which was presented to the E.P.A. in 1974, did not include recommendations on the Kimberley since it felt that there was insufficient knowledge available to it at the time. The Committee has proposed that it examine the Kimberley during 1975.

BACKGROUND TO THIS EXPEDITION

Since 1971 the Department of Fisheries and Wildlife has organised a series of biological surveys in the high rainfall coastal strip of the North West Kimberley. These trips have been carried out by personnel from the W.A. Wildlife Research Centre in conjunction with the W.A. Museum and W.A. Herbarium.

During the winters of 1971, 1972 and 1973, the surveys were concentrated on the many offshore islands which lie between Kuri Bay and Kalumburu. By the completion of the 1973 trip almost all islands greater than 400 ha in extent had been examined. Offshore islands had been chosen as a first step for biological survey in this region because:

1. The Department of Fisheries and Wildlife's patrol and research vessels could be employed, thus overcoming some of the difficulty in traversing this region.
2. Further south in Western Australia some offshore islands contain animals now extinct or extremely rare on the Australian mainland, and it was considered that a similar condition might exist in the Kimberley.

When collating information collected on these series of surveys it became apparent that interpretation would be a problem because of the relative lack of data from the adjacent mainland. It was therefore decided to commence surveys of the mainland in 1974. An obvious place to conduct the first survey was the Prince Regent River Reserve because:

1. At the time it was the only major conservation reserve in the Kimberley.
2. It contains country basically similar to many of the offshore islands.

Accordingly, a request was made to the Western Australian Government, through the Department of Fisheries and Wildlife, for funds. When the Australian Biological Resources Study Interim Council announced that grants would be made for biological survey, and that one of the areas which the Council wished to support was studies of remote regions, application was made to them for additional finance.

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PART II

NARRATIVE OF THE SURVEY OF THE PRINCE REGENT RIVER RESERVE

by J. M. MILES¹

INTRODUCTION

The survey of the Prince Regent River Reserve began on the morning of 31 July 1974 when a forward party left the W.A. Wildlife Research Centre at Wanneroo in a Landrover and a four-ton truck. They were bound for Beverley Springs Station in the West Kimberley.

The departure of the two vehicles, laden with the equipment and food required to maintain fourteen people in the bush for eighteen days, marked the beginning of the first major biological survey of a reserve in the Kimberley. It was also the first step in the execution of a program which had taken more than seven months to organise.

The absence of vehicle tracks and the extremely rugged nature of the dominant sandstone country meant that a helicopter was essential if survey teams were to examine all the important habitats found on the reserve. Base camp, therefore, had to be close enough to the reserve for the helicopter to operate efficiently and had to be accessible by road so that fuel and other heavy gear could be trucked in prior to the arrival of the survey personnel.

On 4 August, the forward party drove into the Beverley Springs Station where, by prior arrangement, the base camp was to be set up in the married quarters near the station homestead, 85 km south of the southern boundary of the Prince Regent River Reserve.

The next five days were spent preparing the base camp. This included assembling the base radio and establishing a daily "sked" with the Department of Fisheries and Wildlife network in Perth, as well as carting thirty-six 44-gallon drums of helicopter fuel a further 64 km northwards over rugged station tracks to make a forward fuel dump near the junction of the Charnley River and Maurice Creek.

The previous wet season had been unusually long, and rainfall had been very high. Even as late as August the station track to the north was boggy in places and some creek crossings were so bad that makeshift bridges had to be constructed. Under such conditions the four-ton truck (carrying 18 drums of fuel) was only able to cover the first 27 km northwards, so the fuel had to be hauled the remaining 37 km by tractor and trailer, nine drums at a time (Fig. 1). During this operation the Landrover provided radio communication with base.

A chartered MacRobertson-Miller Airlines Twin-Otter aircraft, from Derby, landed at Beverley Springs early in the morning of 10 August. It brought the main survey party which had flown from Perth the previous night.

The twelve survey sites in the reserve (Fig. 2) had been chosen many months earlier and each was to be manned for six days. The sites had been selected from geological maps and colour air photographs to cover the range of habitats in the reserve. Within the limitations of the helicopter's landing ability it was hoped to place personnel as close as possible to the chosen sites.



Figure 1—Transporting fuel and equipment to the Forward Fuel Dump, Beverley Springs Station.

Very few features in the reserve had names so initial reference to sites was based on a numbering and lettering system: E1 to E6 were sites occurring in the eastern half of the reserve and W1 to W6 were sites in the western half.

In the weeks after the survey, application was made to the Nomenclature Advisory Committee of the Department of Lands and Surveys to name various features associated with these sites. The Committee's preference was for aboriginal names so, with the assistance of Dr Eric Vaszolyi of the Department of Aboriginal Affairs, it was possible to provide many names in the dialect of the Wunambal Tribe which, until recently, inhabited the area north of the Prince Regent River. The names adopted by the Nomenclature Advisory Committee have been listed in Table 1. No new name was proposed for site W4; it was named after the nearby Mt Trafalgar, originally named by King in 1820. An additional site called "Pitta Creek" will be mentioned later in this report.

¹ Western Australian Wildlife Research Centre, Department of Fisheries and Wildlife, Mullaloo Drive, Wanneroo, W.A. 6065.

TABLE 1
NAMES ADOPTED FOR FEATURES IN THE RESERVE

Site	Name	Origin or Meaning
E1	*Wulunge Chasm *Gundarara Creek *Malubirindji Cave *Womaramara Creek	Names associated with the aboriginal burial site near E1 Butterfly Creek
E2	*Wulumara Creek	Tortoise Creek
E3	Bushfire Hill *Gandjal Creek	A survey party experience Black-breasted Buzzard Creek
E4	Wyulda Creek	<i>Wyulda squamicaudata</i> —Scaly-tailed Possum
E5	Enid Falls.... Rufous Creek	Family Enidae of terrestrial snails Rufous Owl Creek
E6	*Garimbu Creek	Bandicoot Creek
W1	Blyxa Creek Quail Creek	<i>Blyxa aubertii</i> —new species of aquatic plant for W.A. Red-backed and King Quails collected
W2	King Cascade Cascade Creek	Discovered by P. P. King in 1820 The creek feeding King Cascade
W3	Fern Gully *Gariyeli Creek	Banks of ferns were found in gully Goanna (<i>Varanus gouldi</i>) Creek
W4	—	—
W5	Python Cliffs	Named for the Olive Python— <i>Liasis olivaceous</i>
W6	Youwanjela Creek	Ngarinyin tribal name for Black Grass-Wren

* Wunambal Tribal Name.

The survey party had the following division of responsibilities: A. S. George and K. F. Kenneally—plants; N. L. McKenzie, A. Chapman and W. K. Youngson—vertebrates, especially mammals; J. Dell and R. E. Johnstone—vertebrates, especially birds; L. A. Smith—vertebrates, especially reptiles and frogs; G. R. Allen—fishes; B. R. Wilson and P. R. Smith—molluscs; K. T. Richards and W. J. Bailey—insects; A. A. Burbidge and J. M. Miles—sharing base camp co-ordination and field duties; S. J. Miles—truckdriver, cook and general rouse about.

Fourteen people were maintained in the field during the survey. They were separated into the following four teams:

Team 1—B. R. Wilson, P. R. Smith and R. E. Johnstone who were to concentrate on sites with “rain forest” habitats.

Team 2—W. K. Youngson, L. A. Smith and K. F. Kenneally who were to collect at sites selected to represent habitats that were dominant in the reserve.

Team 3—N. L. McKenzie, J. Dell and A. S. George collecting at sites selected for the same reason as those of Team 2.

Team 4—A. A. Burbidge or J. M. Miles, A. Chapman and G. R. Allen who were to be placed at sites where they could concentrate on freshwater habitats.

The entomologists W. J. Bailey and K. T. Richards each spent nine days associated with Team 1 and nine days with Team 4.

Mr and Mrs A. G. Wells spent 13 days (15–28 August) in the reserve. They were working under a grant from the National Photographic Index of Australian Birds to photograph the Black Grass-Wren *Amytornis housei*. Although the Wells’ costs were met by the “Index” the Prince Regent River Survey provided helicopter time and lent them a two-way radio so communications with the base could be maintained.

The helicopter was an Alouette III, owned and operated by Airfast Helicopters Pty Ltd, and was capable of carrying a 410 kg payload when fully fuelled with 680 litres of “Jet A1”. It cruised at about 90 knots and could remain airborne for more than 2.5 hours without refuelling. The payload, of course, increased as fuel was used. For instance, with 200 l of fuel used, the helicopter could lift an additional 160 kg. These were the limitations around which the flight schedule of team shifts and resupplies had to be arranged. Efficient usage of helicopter time was essential to the budget.

Weight was such an important factor that food was pre-packaged in Perth and the schedule which was finally determined required that each team be resupplied every three days. Common resupply items included food for the following three days, drinking water if necessary, a recharged radio battery, concentrated formaldehyde, plant-press paper, and ammunition. On resupply days fresh meat, fruit and freshly baked bread supplemented the diet of teams. On every sixth day, not only were the teams resupplied, but they also had to be shifted to new sites.

The plant and animal specimens that had been collected as well as any gear which was no longer required in the field, such as empty water containers, used radio batteries and unburnable rubbish, were loaded into the helicopter during the resupply visits and taken back to base. This prevented aggregate team weight from gradually building up to a level where an extra flight would be needed to shift a team on a later “shift day”.

Part of the actual helicopter flight schedule has been reproduced in Fig 3. Because certain teams had to be shifted a day earlier than expected, due to the interference of a bushfire (see later), the proposed schedule described in the previous paragraphs had to be modified slightly.

Technical problems delayed the helicopter in Wyndham for three days so, between 10 August and 13 August, areas around the Beverley Springs Station homestead and Plain Creek Gorge (10 km west) were examined by team members and the portable transceivers which would accompany each team into the reserve were field tested.

THE SURVEY

On 12 August Teams 1 and 2 were transported by Land-rover to the forward fuel dump. At midday on 13 August the helicopter landed at Beverley Springs Station. During the afternoon Teams 3 and 4 were flown to the forward fuel dump (Fig. 4) where, along with Team 2, they were to spend the night. Later the same afternoon Team 1 was lifted into their first collecting site, E5, where they set up camp on the top of the picturesque

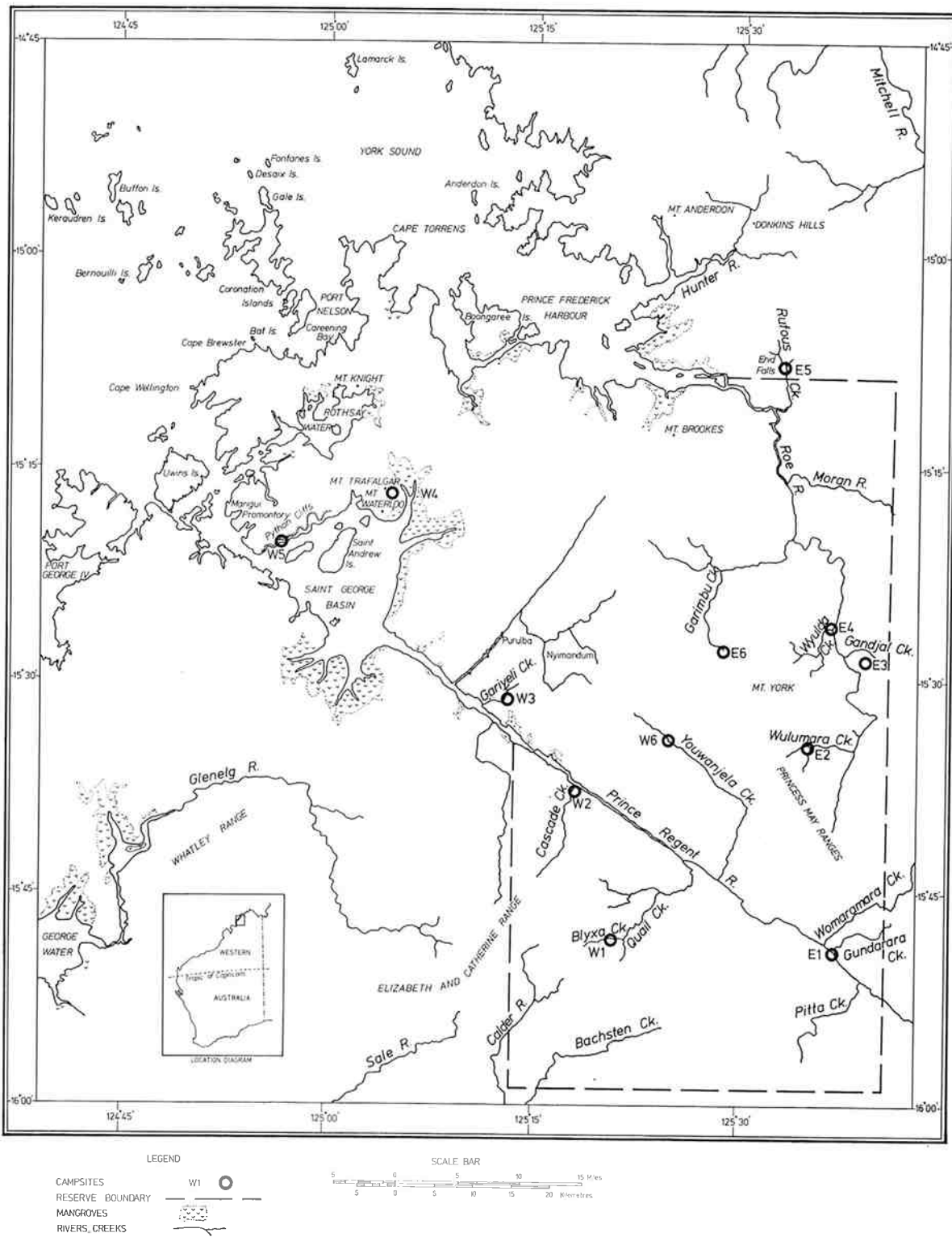


Figure 2—The Prince Regent River Reserve, showing topography and survey sites.

Figure 3

Extract from Helicopter Flight Plan

HELICOPTER SCHEDULE—DAY 10 22.8.74

Trip	Route	n miles	Time		Schedule
			hours	mins	
1.	NHS to FFD	26	0	17	Out of base with resupply gear + J. Miles.
2.	FFD to W1	33	1	12	Resupply W1 (1 jerry can water from base). Shift Wells from A to W6. Pick up Bailey at W6. Drop Miles and Bailey at E1. Back to FFD for refuelling.
	W1 to A	15			
	A to W6	9			
	W6 to E1	20			
	E1 to FFD	30			
					107
			1	27	
3.	FFD to E1	30	1	11	Resupply E1 and pick up Burbidge and Richards plus 3 jerry cans water for E6. Resupply E6 (drop 3 jerry cans water ready for when they shift to W5 on Saturday). Resupply W6 dropping Richards and picking up Wilson.
	E1 to E6	23			
	E6 to W6	8			
	W6 to FFD	45			
					106
			1	26	
4.	FFD to NHS	26	0	17	Back to base.

PREDICTED TOTAL HOURS FOR DAY 10 = 3 hours 27 mins.

ACTUAL HOURS FLOWN ON DAY 10 = 3 hours 40 mins.

HELICOPTER SCHEDULE—DAY 12 24.8.74

Trip	Route	n miles	Time		Schedule
			hours	mins.	
1.	NHS to FFD	26	0	17	3 jerry cans water on board for team 3 + drum fuel.
2.	FFD to W1	33	1	54	Drop drum fuel at W1. Pick up team 3 at W1 and shift to W3. Pick up team 2 (water already there) at E6 and drop at W5. Back to FFD (call for fuel at W1 only if essential—try to save for Trip 3 on Day 13).
	W1 to W3	16			
	W3 to E6	15			
	E6 to W5	34			
	W5 to FFD	72			
					170
			2	19	
3.	FFD to NHS	26	0	17	Back to base.

PREDICTED TOTAL HOURS FOR DAY 12 = 2 hours 53 mins.

ACTUAL HOURS FLOWN ON DAY 12 = 3 hours 5 mins.

Note: NHS = New Beverley Springs Homestead Airfield.

FFD = Forward Fuel Dump.

E1-W6 = Campsites.

* Extra time added for take-offs, landings and time on ground with motor running.

Enid Falls (Fig. 5). Many species of terrestrial snails of the family Enidae were collected in this area (Fig. 6).

On the following day (14 August) Teams 2, 3 and 4 were flown into the reserve and landed at E2, E3 and E4 respectively. By late in the afternoon the entomologists had been attached to Teams 1 and 4. The team at E3 was camped on top of a lateritised hill to the east of the upper Roe River. A bushfire, originating somewhere to the south-east, burnt through the area a few days after Team 3 arrived. The camp at E4 was near the junction of the upper Roe River and Wyulda Creek, one of its major tributaries.

On 15 August the helicopter transported Mr and Mrs Wells into the reserve. They were landed in rugged sandstone country as close as possible to the place where the Black Grass-Wren had been observed by the Bonaparte Archipelago Survey Expedition in 1973 (see Burbidge, this publication). This was on the northern side of the Prince Regent River valley almost opposite W2.

Each field team was in radio communication with base camp during a morning and evening "sked", and a listening watch was maintained by base from 6 a.m. to 10 p.m. in case of emergency. The "skeds" enabled teams to



Figure 4—The helicopter at Forward Fuel Dump.

transmit their resupply requirements to base the day before the helicopter was due and also provided an opportunity for teams to discuss their day-to-day findings.

On 16 August the first resupply trip was made to the four field teams, A. A. Burbidge was lifted into E4 and the first batches of specimens were returned to base. The specimens had been prepared in the field to prevent undue deterioration (Fig. 7).

The bushfire which had burnt through the area around E3 moved on to burn out the region around E2, so on 18 August, Team 2 was resupplied once more and shifted to E6 and Team 3 was resupplied and transferred to W1. This shift was one day ahead of schedule. The E6 campsite was located on Garimbu Creek which was flowing north-east to join the lower Roe River. W1, on the other hand, was on Blyxa Creek, high in the Prince Regent River catchment.

On the following day Team 1 was resupplied and transferred to W6 and Team 4 was resupplied and shifted to E1. E1 was on a large bend in the upper Prince Regent River. An aboriginal painting and burial site (colour illustrations) was located in a cave in a nearby gorge. Dr Eric Vaszolyi has since been able to locate the aboriginal custodian of the site who, after examining photographs of the area, supplied tribal names for some of the features. The gorge was called Wulunge by the Wunambal tribesmen, the creek flowing through it Gundarara and the aboriginal site itself Malubirindji. Wulunge Chasm opens into the north side of the Prince Regent River valley just upstream from the E1 campsite. While Team 1 were camped at W6 they regularly recorded the Black Grass-Wren. An aboriginal name for this bird is Youwanjela according to members of the Ngarinyin Tribe now at Beverley Springs Station.

Because there appeared to be no Black Grass-Wrens at their Prince Regent River site, the Wells Party was transferred to W6 during the resupply flight on 22 August. On the same flight J. Miles left base camp and joined the team at E1, and W. Bailey was shifted from W6 to E1. At this time A. Burbidge and K. Richards were picked up from E1; Richards to be shifted to W6

and Burbidge to return to base and take over survey co-ordination once more. On the same flight B. Wilson was withdrawn from W6 so he could attend an important engagement in Perth. On the way back to base Burbidge and Wilson were landed briefly in a deep canyon, some 10 km south of E1, where they saw a Rainbow Pitta (*Pitta iris*) in the fringing forests along the watercourse. This creek has been named Pitta Creek (colour illustrations).

Once more Team 2 was resupplied and shifted a day early (24 August) because of trouble with the bushfire. Their new site, W5, was on top of the spectacular Python Cliffs along the northern edge of the St George Basin. On the same flight Team 3 was resupplied and shifted to W3, on the lower Prince Regent River. During the following day (25 August), resupplies and shifts brought Team 1 to W4, below Mt Trafalgar (colour illustrations), and Team 4 to W2. The campsite at W2 was on top of the magnificent cascade (colour illustrations) discovered by Commander P. P. King during his exploration of the Kimberley coastline in 1820 (see Burbidge, this publication).

During the afternoon of 25 August, K. Richards was shifted from W6 to W4. En route, A. S. George was picked up from W3 and also shifted to W4 so that he could collect plants in the semi-deciduous microphyll vine-thickets around the base of Mt Trafalgar.

George returned to W3 on 28 August when all the teams were resupplied and the Wells Party was transported back to base. On 29 August a photographic survey of the Prince Regent River, St George Basin and Rothsay Waters was undertaken by some team members. Land-

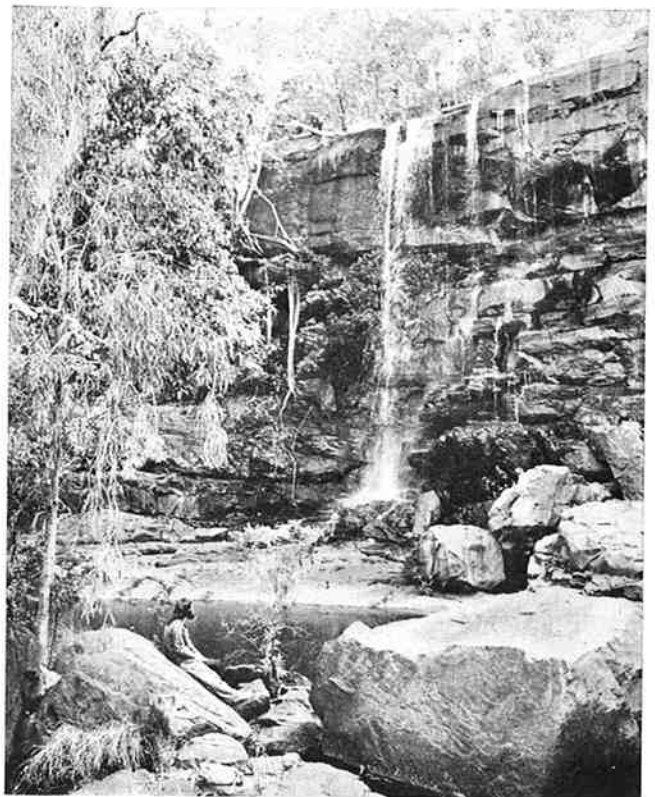


Figure 5—Enid Falls on Rufous Creek at E5.



Figure 6—Peter Smith collecting land snails near E5.



Figure 7—Ron Johnstone preparing a bird skin at the E5 campsite.

ings were made on the summit of Mt Trafalgar and at Careening Bay. During the next two days all teams were ferried back to Beverley Springs base camp. After a further day of packing gear and sorting specimens, the main survey party returned to Perth by air.

After finalising the operation, members of the forward party left Beverley Springs Station on 4 September. The Landrover reached Perth on 9 September and the truck, delayed in Carnarvon for one day, on 10 September.

ACKNOWLEDGEMENTS

On behalf of all members of the expedition the author expresses appreciation for the assistance given by John and Marion Nixon and family of Beverley Springs Station. We also appreciate the co-operation of the staff of Airfast Helicopters Pty Ltd—particularly Mr H. G. M. Grieve. Mr M. Gugeri of Gugeri Transport, Derby, and the Boy Scouts of Derby also gave valuable assistance. Mr N. L. McKenzie and Dr A. A. Burbidge helped in the preparation of this paper.

PART III

THE PRINCE REGENT RIVER RESERVE ENVIRONMENT

By J. M. MILES,¹ K. F. KENNEALLY,² and A. S. GEORGE²

INTRODUCTION

Most of the account of the Prince Regent River Survey is devoted to a description of the fauna. Here, in order to avoid repetition throughout the reports, we have attempted to form a composite picture of the physical environment (geology and climate) and the vegetation which make up the habitats and niches which support the different groups of animals described. We include in this paper only the most prominent floristic elements which may enable the reader to visualize the plant communities. A more complete flora list is presented and discussed in George and Kenneally (this publication).

GEOLOGY

The Prince Regent Lineament cuts north-west/south-east across an elevated region of rugged and deeply dissected sandstones known as the Prince Regent Plateau, a sub-province of the Kimberley Plateau Province (Williams and Sofoulis, 1971). The plateau slopes westwards; its general elevation is about 400 to 550 m in the south-east upland areas, and between 105 m and sea level along the shores of St George Basin.

The basin is a deep landlocked harbour bounded by precipitous cliffs and large expanses of tidal flats connected to the open sea by narrow straits. The grey mud, silt and silty sand of the tidal flats are Quaternary saline alluvium. The land to the west of the basin as well as the adjacent offshore islands such as Augustus

Island and the Champagne and Heywood Island groups are also included in the Prince Regent Plateau sub-province. They consist of Carpentarian Warton Sandstones up to 900 m thick over basalts of the Carpentarian Carson Volcanics. Inland from Saint George Basin are expanses of maturely dissected Carpentarian King Leopold Sandstones within which small erosional plains occur. These plains have been reduced to low relief following the complete removal of the Tertiary land surface (Stewart, Twidale and Bradley, 1960) leaving more mature regions of Quaternary residual sandy, ferruginous and black eluvial soils up to 10 m deep. The more extensive regions of Quaternary alluvial deposits which occur along creeks frequently coincide with these Quaternary eluvial plains. Although small regions of Carpentarian Hart Dolerite occasionally intrude in valleys in the King Leopold Sandstones they do not occur as frequently or as extensively as mapped by Williams and Sofoulis (1971) (see description of sites E1 and E5 below).

Sections of the Gibb Hills sub-province also occur within the Prince Regent River Reserve in an upland situation north-east of the Roe River. In contrast to the Prince Regent Plateau, the upland Gibb Hills, formed over Carpentarian Carson Volcanics of largely tholeiitic basalts with interbedded micaceous, feldspathic and quartz sandstones, have a subdued topography of rounded soil-covered hills and low cuestas with relief between 120 to 240 m. In the north-east the Hills are capped by scattered remnants of an old Tertiary lateritic surface, the southern extension of the Mitchell Plateau. It is probably continuous with a weakly lateritised surface on the higher parts of the Prince Regent Plateau (Williams and Sofoulis, 1971).

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TABLE 1
COMMONWEALTH BUREAU OF METEOROLOGY RAINFALL FIGURES FOR WEST KIMBERLEY

Location	Years	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Kuri Bay	1961-73	294	323	252	33	25	0	0	0	0	1	5	77	1 140
Mitchell Plateau	1968-73	289	388	365	35	15	0	0	0	8	57	171	190	1 436

Mean Monthly and Annual Rainfall (mm).

Location	1973 July	Aug.	Sept.	Oct.	Nov.	Dec.	1974 Jan.	Feb.	March	April	May	June
Kuri Bay	0	125	20	0	302	1 956	1 145	287	270	115	34	0
Mitchell Plateau	0	25	97	458	931	1 133	890	339	313	73	57	0

Monthly Rainfall (mm) for 1973-1974.

CLIMATE

The climate of the north Kimberley has been described by Köppen (1936) as tropical savannah with a distinct dry season in winter. Nearly all the rainfall is received in the five-month period November to March, although some rain is received fairly regularly in late October and early April (Slatyer, 1960). The remainder of the year is almost rainless, particularly the months of August and September. The establishment of gauges at Kuri Bay in 1961 and at Mitchell Plateau in 1968 by the Bureau of Meteorology has allowed a more accurate determination of annual rainfall for the area than that given by Slatyer in 1960. Table 1 indicates that most of the Prince Regent River Reserve receives an average of about 1 300 mm per annum. The 1973/74 summer rainfall was unusually heavy with most of the Reserve probably receiving around 4 000 mm during the months October 1973 to April 1974. When the survey party entered the Reserve in August 1974, most creeks were still flowing, although in a normal year many would have been dry.

Temperature and humidity recordings from the Kuri Bay and Mitchell Plateau stations indicate that maximum temperatures within the region remain in excess of 30°C even in the coolest months. Minimum temperatures likewise seldom fall below 13°C although in the inland areas lower recordings could be expected. Relative humidities (9 a.m. readings) range between 45 and 50% during May, June and July and gradually increase thereafter to reach a peak of 70% in February (Slatyer, 1960).

CLASSIFICATION OF HABITAT

Plant communities at each site studied in the Prince Regent River Reserve have been classified according to the simple two-dimensional table of Specht (1970), using the variables height and life form of dominant plants (tree, shrub or herb) and the projective area of ground covered by the foliage of dominant plants in the ecosystem. Table 2 summarizes the structural formations recorded in the reserve. Some confusion arose in the case of open-woodland and low open-woodland communities where the upper stratum of trees was very scattered and a hummock grassland or grassland community predominated. Specht's (1970) classification was strictly adhered to but it should be realized in these cases that the hummock grassland or grassland community was probably the major contributor to the general ecology of the area.

DESCRIPTION OF SITES

The basic geology and plant communities of each site visited in the reserve are described. Statistical sampling methods to determine the dominant plant species in these communities were not employed so we have chosen to include several visually prominent species for each stratum in this description. As botanists did not visit all sites (see George and Kenneally, this publication), the detail of botanical description varies from site to site.

The major collecting sites are roughly divided into those occurring in a band running the length of the Roe River along the eastern side of the reserve (E1 to E6) and those occurring in a north-west band running along the Prince Regent River and into St George Basin (W1 to W6) (see Fig. 2 in Miles, this publication). Careening Bay, which was visited during the 1973 Bonaparte Archipelago Expedition (see Burbidge, this publication) and briefly again during this survey, is also described.

E1 Upper Prince Regent

The E1 campsite (15° 49' S, 125° 37' E) was situated on the sandy bed of the upper Prince Regent River in the upstream arm of a prominent loop in the otherwise straight Prince Regent Lineament.

In this loop and extending downstream, King Leopold Sandstone forms the main river gorge with its high ramparts and steeply sloping scree sides surrounded by the elevated Prince Regent Plateau. The plateau supports a low eucalypt woodland with a ground cover of spinifex hummock grasses between large sandstone boulders. Along the base of the sandstone cliffs bordering the main river bed are fringing low closed-forests to low open-forests with Cadjeput trees (*Melaleuca* spp.) and palms (*Pandanus* spp.) in the upper stratum and "sorghum-type" grasses forming intermittent ground cover. An occasional very tall Cadjeput is emergent above the upper stratum. Along the scree slopes of the cliffs on the western side of the downstream section of the loop and in places downstream from the loop are localized areas of semi-deciduous microphyll vine thickets forming low closed-forests.

About 1 km downstream from the campsite the main river is joined by Womaramara Creek. This creek runs through picturesque deep sandstone ravines and gorges and is bordered by fringing low open-forest with Cadjeput (*Melaleuca* spp.) trees and *Pandanus* palms. Upstream from the campsite Gundarara Creek flows into

TABLE 2
STRUCTURAL FORMATIONS IN THE PRINCE REGENT RIVER RESERVE (after Specht, 1970)

Life form and height of tallest stratum	Projective foliage cover of tallest stratum			
	Dense (70-100%)	Mid-dense (30-70%)	Sparse (10-30%)	Very sparse (less than 10%)
Trees 10-30 m	Closed-forest Low closed-forest	Open-forest Low open-forest	Woodland	Open-woodland Low open-woodland
Trees 5-10 m			Low woodland	
Shrubs 2-8 m			Tall shrubland	
Herbs	Closed-grassland			

the Prince Regent River from the north through another deep sandstone gorge (Wulunge Chasm) and across a broad sandstone valley which extends north-east of the main river bed. The valley sandstones support a low eucalypt woodland with "sorghum-type" grasses forming ground cover. Upstream from Wulunge Chasm, Hart Dolerites form the bed of Gundarara Creek with its fringing low open-forests of Cadjeputs (*Melaleuca* spp.) and *Pandanus* spp. palms and "sorghum type" grasses, while the sides are high ramparts and steep scree slopes of King Leopold Sandstones dropping from the surrounding Prince Regent Plateau.

E2 Wulumara Creek

The E2 campsite (15° 34' S, 125° 36' E) was established on an outcrop of King Leopold Sandstone cut by a narrow, slow-flowing creek joining Wulumara Creek, a major tributary of the upper Roe River. Adjacent to the creek were several large, remnant, shallow (ca. 1 m) pools which form part of the creek system during the wet but become isolated during the dry. These pools support aquatic and semi-aquatic flora. To the west Quaternary residual eluvial soils overlie the sandstone forming a swamp which drains toward the creek. Interspersed with the swamp is a low eucalypt woodland.

The vegetation of the flat sandstone areas is a low woodland with *Eucalyptus latifolia* and *Eucalyptus polycarpa* in the upper stratum; *Grevillea pteridifolia*, *Petalostigma pubescens* and *Bossiaea bossiaoides* as shrubs; and grasses such as *Heteropogon contortus* and *Sclerandrium truncatiglume* forming a ground cover. The sandstone outcrops are generally low, massive, flat-topped and devoid of soil except for pockets accumulated in hollows and cracks. The vegetation of the outcrops is extremely poor, the rock crevices supporting *Ficus* spp. and the hummock grass *Plectrachne pungens*. The pockets of soil between the outcrops are characterised by a low woodland. The trees and shrubs include *Eucalyptus brachyandra*, *Santalum lanceolatum*, *Acacia plectocarpa*, *A. sericata*, *A. tumida*, *Petalostigma pubescens*, *Buchanania obovata*, *Gardenia* sp., *Cochlospermum fraseri*, *Triumfetta* spp., *Sarcostemma australe*, *Solanum* sp., *Bossiaea bossiaoides*, *Jacksonia thesioides* and *Stemodia lythrifolia*; *Flagellaria indica* and *Hoya* sp. occur as climbers and *Plectrachne pungens* (hummock grass) as ground cover.

The swamp complex of the residual eluvial soils consists of a closed-grassland community. The grasses include *Sclerandrium truncatiglume*, *Eriachne festucacea* and *Eriachne* aff. *pauciflora* and there are many small herbs including *Mitrasacme* spp., *Stylidium* spp., *Drosera* spp., *Byblis liniflora*, *Utricularia* spp. and *Thysanotus chinensis*. Scattered emergent *Eucalyptus houseana* and *Pandanus* sp. occur.

The alluvial deposits bordering the creeks and pools support fringing open-forests with an upper stratum of *Melaleuca leucadendron*, *M. viridiflora*, *Eucalyptus houseana* and *Pandanus* spp. Shrubs include *Jacksonia thesioides* and *Grevillea pteridifolia*, and the grasses *Sclerandrium truncatiglume* and *Eriachne festucacea*

form intermittent ground cover. Aquatic herbs, such as *Nymphoides ? hydrocharoides*, *N. ? parvifolia*, *Eriocaulon* spp. and *Myriophyllum* sp., occur in the creeks and pools.

E3 Bushfire Hill

The E3 site was situated on Carson Volcanics east of the upper Roe River. The campsite (15° 28' S, 125° 39' E) was on Bushfire Hill, a small lateritic mesa overlying the surrounding basalts. The junction of laterite and basalts could be clearly seen along the escarpment of the hill.

The vegetation on the laterite plateau is an open-forest or woodland (Figs. 1 and 2) formation with *Eucalyptus miniata*, *E. latifolia*, *E. tetradonta*, *E. nesophila*, *Erythrophleum chlorostachys* and *Terminalia discolor* in the upper stratum; *Cochlospermum fraseri*, *Grevillea heliosperma*, *Opilia amentacea*, etc., in the shrub layer and *Triodia* sp., *Plectrachne pungens*, *Themeda australis* and *Cymbopogon bombycinus* forming a ground cover of grasses. This formation grades into low woodland and low open-forest on the basalts (Fig. 3) with *Eucalyptus tetradonta*, *E. nesophila*, *E. foelscheana*, *Brachychiton* sp., *Ficus* sp. and *Canarium australianum* in the upper stratum; *Hakea arborescens*, *Grevillea mimosoides*, *Albizia lebbek*, etc., as shrubs; the climbers *Jacquemontia paniculata*, *Operculina* sp., and *Flagellaria indica*; and with *Cymbopogon procerus* and *Heteropogon contortus* and other grasses forming the ground cover.

Gandjal Creek to the north of Bushfire Hill is bordered by fringing low woodland to low open-forest (Fig. 4) with *Canarium australianum*, *Pandanus* sp. and *Eucalyptus bigalerita*, *Denhamia obscura*, *Mimusops elengi* and *Celtis philippensis* and ground cover of the grasses *Cenchrus elymoides*, *Heteropogon contortus* and *Sclerandrium truncatiglume*, with many herbs including *Ludwigia suffruticosa*, *Indigofera linifolia*, *Blumea tenella* and *Crotalaria juncea*.

E4 Wyulda Creek

The E4 campsite (15° 26' S, 125° 36' E) was situated on the junction of Wyulda Creek and the upper Roe River. To the west of the Roe River, King Leopold Sandstones support low open-woodland vegetation with *Eucalyptus* sp., *Owenia vernicosa*, *Ficus* sp. and *Acacia* sp. in the upper stratum and a ground cover of spinifex hummock grasses interspersed with areas of "sorghum-type" grasses. To the east of the Roe River, basalts support low woodlands again with *Acacia* sp., *Ficus* sp., *Owenia vernicosa* and *Eucalyptus* spp. in the upper stratum and "sorghum-type" grasses forming ground cover. Wyulda Creek and the Roe River are bordered by fringing open-forest with Cadjeputs (*Melaleuca* spp.) in the upper stratum, *Pandanus* palms in the understorey, and intermittent ground cover of "sorghum-type" grasses.

E5 Enid Falls

The E5 campsite (15° 07' S, 125° 33' E) was situated on the top of Enid Falls which drops from a plateau of King Leopold Sandstones into a deep gorge through which Rufous Creek flows southward to join the Roe



Figure 1—Bushfire Hill (E3)—woodland on lateritic plateau, dominated by *Eucalyptus miniata* with a ground cover of grasses.



Figure 3—Bushfire Hill (E3)—woodland on basaltic slopes, dominated by *Eucalyptus miniata* (right) and *E. tetradonta* (left-centre).



Figure 2—Bushfire Hill (E3)—lateritic plateau after fire. Open woodland with woodland in background. *Eucalyptus latifolia* on left and left-centre.



Figure 4—Gandjal Creek (E3)—rocky bed with pools. *Pandanus* sp. left-centre, *Mimosa elengi* right-centre.

River. The gorge is about 400 m wide (broadening southward) and is bordered by a high rampart of quartz sandstone for most of its length. Its sides are very steeply sloping screes of large angular blocks and boulders, many of which are heavily recrystallized quartzites with occasional blocks of dolerite in the talus.

The sandstone plateau above the gorge supports a low woodland vegetation of *Eucalyptus tetradonta*, *Buchania obovata*, *Denhamia obscura*, *Gardenia megasperma*, *Grevillea heliosperma* and *Terminalia ferdinandiana* with spinifex hummock grasses forming ground cover between sandstone boulders. Semi-deciduous microphyll vine thickets containing *Carallia brachiata* and

Myristica insipida form a low closed-forest on the screes of the gorge especially along its western side. At its north-east corner a small gully enters the main gorge with 100 m cliffs on either side and sandstone screes supporting semi-deciduous microphyll vine thickets. The gully opens behind into a deep ravine running north-east for 2 to 3 km.

Rufous Creek is formed by the junction of two major tributaries, one flowing in from the west and one from the north-north-west, at a point about 1 km north of Enid Falls. A little further north another small spring-fed stream joins the more northerly branch from the north-north-east. The spring runs out of a gully surrounded by quartz sandstone ridges into a dolerite based valley. Around the spring are fringing semi-deciduous microphyll vine thickets with many ferns not seen in the vine thickets of the main gorge. The dolerite floor of the valley supports a low eucalypt woodland with "sorghum-type" grasses forming the ground cover.

About 2 km due west of the Enid Falls campsite, the sandstone plateau opens into a deep gully about 80 m wide which runs in a south-westerly direction towards mud-flat plains at the edge of the Roe River. The gully is formed of sandstone screes supporting low closed-forests of semi-deciduous microphyll vine thickets. A small creek runs in the gully which opens out into cliffs with steep quartz sandstone scree slopes and occasional dolerite sills facing the Roe estuary. On the screes at the base of the cliffs are large areas of the semi-deciduous microphyll vine thickets strongly demarcated on their southern boundary from a low eucalypt open-woodland with "sorghum-type" grasses.

E6 Garimbu Creek

The E6 site was located on an area of residual eluvial soils with occasional emergent King Leopold Sandstone outcrops and bordered to the east by an elevated sandstone plateau. The campsite (15° 28' S, 125° 29' E) was on the junction of a small creek with Garimbu Creek which eventually flows into the Roe River. Within hours of arriving at E6, the surrounding area was completely burnt out by a bushfire. This made collecting difficult as most of the shrub and grass species were destroyed.

The creek, which had cut down to a depth of 4 m in the eluvial soil, had ceased to flow except for a few lateral seepage areas. Mainly narrow, the creek had, at certain places, widened and undercut its bank thus causing *Melaleuca leucadendron* and *Pandanus* spp. to fall into or across the stream bed. Where the stream had widened several sand banks had formed. These well developed alluvial deposits along the creek support fringing open-forests to open-woodlands with *Melaleuca leucadendron*, *M. viridiflora*, *Pandanus* sp., *Nauclera coadunata* and *Eucalyptus houseana* in the upper stratum and *Acacia tumida* and *Grevillea refracta* as shrubs. The reed *Phragmites karka* is common on the sand flats in the creek bed. Aquatic herbs such as *Eriocaulon* spp. are also present.

The residual eluvial soil plain supports a low forest to low woodland with *Eucalyptus miniata*, *E. tetradonta*, *E. confertiflora*, *E. latifolia*, *E. polycarpa* and *Hakea arborescens* in the upper stratum. The fire through

this region prevented extensive collection of understorey elements but the grass *Cymbopogon procerus* was identified from the ground cover. The sandstone outcrops in the plain also support low forest to low woodland but with a different species composition. The trees include *Eucalyptus miniata*, *E. polycarpa*, *Callitris intratropica* and *Gardenia megasperma* and the shrubs *Cochlospermum fraseri*, *Petalostigma pubescens*, *Calytrix microphylla*, *Acacia deltoidea* and *Acacia linarioides*. *Plectrache pungens* (hummock grass) forms a ground cover.

Rising abruptly from the eucalypt woodland the elevated sandstone scarp and plateau to the east of the campsite presented itself as an irregular line of angular blocks which had fallen away from the main cliff face. Because of the haphazard arrangement of the blocks the fire did not penetrate to any extent. Soil pockets among the sandstone blocks support tree species such as *Acacia delibrata*, *A. aulacocarpa*, *Canarium australianum*, *Denhamia obscura*, *Grevillea heliosperma* and *Sterculia viridiflora*. Shrub species include *Atylosia cinerea*, *Calytrix brachychaeta*, *Ervatamia orientalis*, *Ficus* spp., *Grevillea pteridifolia* and *Stenocarpus cunninghamii*. The only creeper encountered was *Tinospora smilacina* climbing over *Sterculia viridiflora*. The main grass species were *Plectrache pungens*, forming dense stands between the boulders, and *Cymbopogon procerus* which was more common on the scree slopes of the cliff face.

W1 Blyxa Creek

The W1 campsite (15° 48' S, 125° 20' E) was situated on Blyxa Creek which runs through an eluvial sandy soil plain to join with Quail Creek running through King Leopold Sandstones into the upper Prince Regent River.

The eluvial sandy soils support low woodland and low open-forest (Fig. 5) in which *Eucalyptus* species are dominant but with a number of other tree species also present. The eucalypts include *E. miniata*, *E. polycarpa* and *E. confertiflora*, while other trees are *Terminalia ? canescens*, *Buchanania obovata*, *Pandanus* sp., *Planchonella arnhemica* and *Petalostigma pubescens*. The Proteaceae are well represented in this formation by tall shrubs or small trees, including *Grevillea agrifolia*, *G. heliosperma*, *G. pteridifolia*, *G. refracta*, *Banksia dentata*, *Stenocarpus cunninghamii* and *Persoonia falcata*. The understorey is dominated by grasses but with an admixture of various shrubs, and the fern *Platyzoma microphyllum* is common.

Interspersed with the woodlands on damp flats are areas of closed-grassland (Fig. 6) containing numerous perennial and ephemeral grasses, sedges and herbs. The grasses and sedges were mostly vegetative at the time of our visit but several were collected in flower, including *Elytrophorus spicatus*, *Sacciolepis myosuroides* and *Fuirena ciliaris*. Many small herbs in flower made a colourful display in places. Prominent among them were species of the genera *Blumea*, *Drosera*, *Goodenia*, *Lobelia*, *Mitrasacme*, *Stylidium*, *Utricularia* and *Xyris* and of the family Scrophulariaceae. A number are either new species or new records for the State. Mimicry within and between genera was noted in several instances. A species of *Mitrasacme*, one of *Stylidium* and one of

Utricularia had superficially similar flowers while several *Lindernia* species were very similar to each other. On low sandstone hills near W1 are low woodlands (Fig. 7) with scattered trees of *Eucalyptus* sp., *Planchonella arnhemica*, *Gardenia* sp., *Owenia vernicosa*, *Ficus* sp. and *Xanthostemon paradoxus*. A spinifex (? *Plectrachne* sp.) is common and there are many low shrubs including species of *Acacia*, *Grevillea* and *Distichostemon*.

Low woodland to low open-forest occurs as fringing communities on alluvial deposits along the creeks (Fig. 8). Tree species include *Pandanus* spp. (2), *Eucalyptus houseana*, *Melaleuca viridiflora* and *Eugenia* sp., and among the shrubs *Acacia tumida*, *A. gardneri*, *Osbeckia australiana* and *Calytrix brachychaeta* are common. Ground cover is formed by herbs including *Eleocharis* spp. and *Phylidrum lanuginosum*, and the grasses *Eriachne festucacea* and *Ectrosia leporina*.



Figure 5—Blyxa Creek (W1)—woodland on sandy flats. Eucalypts are *E. miniata* broad-leaved trees are *Buchanania obovata*.



Figure 7—Blyxa Creek (W1)—low open-woodland on sandstone outcrops.



Figure 6—Blyxa Creek (W1)—closed-grassland on swamp flats.



Figure 8—Blyxa Creek (W1)—fringing woodland with *Eucalyptus houseana* (white bark), *E. miniata* (with dark stocking), *Pandanus* sp. and *Acacia tumida* (shrubs in understory).

W2 King Cascade

The W2 site was situated at King Cascade which is formed by the waters of Cascade Creek emptying as a tributary over a sandstone gorge into a small inlet off the southern side of the Prince Regent River. The elevated plateau of King Leopold Sandstones surrounding the Prince Regent River and Cascade Creek (the Prince Regent Plateau) supports a low open-woodland with *Owenia vernicosa* and *Eucalyptus* species in the upper stratum and spinifex hummock grasses forming the ground cover between large sandstone boulders.

The campsite (15° 37' S, 125° 18' E) was on Cascade Creek about 200 m upstream from King Cascade. This portion of the creek supports fringing open-forest to low open-forest with Cadjeput (*Melaleuca leucadendron*) trees and *Pandanus* palms in the upper stratum and intermittent ground cover of "sorghum-type" grasses. Upstream from the campsite the creek is bordered by grassland to open-grassland with *Eriachne festucacea* predominating and with occasional emergent *Melaleuca leucadendron* and *Eucalyptus* trees.

At the base of King Cascade a low closed-forest of mangroves borders the inlet leading out into the main Prince Regent River and continues some distance up two tributary creeks running east and west from the inlet in a secondary fault parallel to the main Prince Regent River fault. Where the tidal portion of these creeks meets the fresh water, the mangroves cease and fringing open-forests of Cadjeput (*Melaleuca leucadendron*) with a lush vine undergrowth line the creeks.

W3 Fern Gully

The W3 campsite (15° 31' S, 125° 13' E) was located on elevated King Leopold Sandstones of the Prince Regent Plateau just west of Gariyeli Creek which flows through Fern Gully. These sandstones support a low woodland (Fig. 9) vegetation with *Eucalyptus miniata*, *Gardenia ? resinosa*, *Owenia vernicosa*, *Terminalia ferdinandiana* and *Eugenia ? grandis* in the upper stratum; *Acacia platycarpa*, *A. aulacocarpa*, *A. translucens*, *Persoonia falcata*, *Verticordia cunninghamii* and *Grevillea heliosperma* in the shrub layer; and a ground cover of spinifex hummock grasses with *Triodia ? stenostachya* dominant but *T. ? pungens* also present.

Fringing closed-forests occur along the gully (Fig. 10) and follow Gariyeli Creek westwards to the junction of fresh water with the tidal delta (Fig. 11). *Calophyllum* sp., *Melaleuca leucadendron*, *Carallia brachiata*, *Randia cochinchinensis*, *Homalanthus populifolius* and *Myristica insipida* are present in the upper stratum with the fern species (Fig. 12) *Blechnum orientale*, *Dicranopteris linearis*, *Lindsaea ensifolia* (Fig. 1, George and Kenneally, this publication) and *Lygodium microphyllum* below. Low closed-forest of the mangrove species *Excoecaria agallocha*, *Xylocarpus granatum*, *Camptostemon schultzei*, *Bruguiera ? gymnorhiza*, *B. parviflora*, *B. exaristata*, *Aegiceras corniculatum* and *Ceriops tagal* occurs along the muddy banks of the delta and the Prince Regent River.

W4 Mt Trafalgar

The W4 campsite (15° 17' S, 125° 04' E) was located on Carson Volcanic basalts below the eastern face of Mt Trafalgar. A clear line of demarcation between the

Warton Sandstone plateau top of Mt Trafalgar, and the underlying basalts could be seen on this face. The flat quartz sandstone summit of Mt Trafalgar supports a tall shrubland (Fig. 19) of *Acacia* aff. *tumida*, *Eucalyptus* sp. and *Calytrix* spp. with a ground cover of *Triodia* sp. hummock grass. The basalts around the camp support a low woodland grading to low open-forest (Fig. 18) with *Eucalyptus confertiflora*, *E. foelscheana*, *E. tectifera*, *Adansonia gregorii*, *Buchanania obovata*, *Erythrophleum chlorostachys*, *Planchonia australis*, *Grevillea mimosoides*, *Randia cochinchinensis* and *Hakea arborescens* in the upper stratum and *Arundinella nepalensis* and *Heteropogon contortus* forming ground cover.

Semi-deciduous microphyll vine thickets form a low closed-forest on the scree slopes at the base of Mt Trafalgar (Figs. 13 and 14). This formation consists of trees and tall shrubs including *Paramygnia trimera*, *Cassine melanocarpa*, *Diospyros nitens*, *Citriobatus spinescens*, *Celtis philippensis*, *Albizia lebbek*, *Pouteria sericea*, *Ficus hispida* (Fig. 16), *Ficus* spp. and *Exocarpos latifolius* with many liane species (Fig. 15) including *Aristolochia indica*, *Capparis quiniflora*, *Cansjera leptostachya*, *Canavalia maritima* and *Adenia heterophylla*. Pockets of these vine thickets also occur to the east of the campsite between Mt Trafalgar and the low closed-forests of mangroves lining St George Basin (Figs. 17, 21, 22). The mangrove species at this site include *Ceriops tagal*, *Bruguiera exaristata*, *B. parviflora*, *Aegiceras corniculatum*, *Rhizophora stylosa* (Fig. 24), *Avicennia marina*, *Camptostemon schultzei* and *Lumnitzera ? racemosa*.

W5 Python Cliffs

The W5 site was located on Python Cliffs which follow the curvature of bays lining St George Basin on the south-east side of the Marigui Promontory. The cliffs are composed of Warton Sandstones over basalts of the Carson Volcanics. The campsite (15° 20' S, 124° 56' E) was situated on top of the cliff in the second small bay north-west of the south-east corner of the promontory which forms one side of the channel outlet from St George Basin to the sea.

Inland from the cliffs the rugged and deeply dissected sandstones of the promontory support a low open-woodland of *Eucalyptus miniata* and *E. perfoliata* with a dense ground cover of *Plectrarchne pungens* and *Triodia ? stenostachya* between massive blocks and outcrops. Other common tree species are *Buchanania obovata*, *Callitris intratropica*, *Gardenia megasperma*, *Persoonia falcata* and *Terminalia arostrata*. A species of *Livistona* and the Baobab (*Adansonia gregorii*) occur sporadically. In many places a tall shrubland with occasional emergent trees replaces the low open-woodland. Shrub species include *Acacia* aff. *gonocarpa*, *A. stigmatophylla* and *A. tumida* while common climbers are *Flagellaria indica* and *Hoya* sp. On the edge of the cliff a slightly different species composition includes *Xanthostemon* sp., *Tristania* sp., *Sterculia viscidula*, *Callitris intratropica* and *Calytrix conferta*.

A narrow valley of deep soil deposited over basalts directly beneath the cliff face supports a low closed-forest of semi-deciduous microphyll vine thickets. Numerous small sandstone boulders which have broken

away from the cliff are scattered amongst outcrops of basalt. Trees forming the upper stratum of the vine thickets are *Adansonia gregorii*, *Albizia lebbek*, *Alphitonia excelsa*, *Bombax ceiba* var. *leiocarpum*, *Alstonia actinophylla*, *Cassine* aff. *melanocarpa* and *Myristica insipida*. The climbers include *Abrus precatorius*, *Cynanchum* sp., *Flagellaria indica* and *Operculina* sp. The ferns *Schizaea dichotoma*, *Dicranopteris linearis*, *Lygodium microphyllum*, *Adiantum philippense*, *Lindsaea ensifolia* and *Cheilanthes* sp. occur in damp areas.

Descent from the cliff top into the vine thicket valley was by way of sandstone scree slopes flanking the sides of the bay. This was made easier on occasions by following dried creek beds cut into the underlying basalts of the scree slopes. On either side of these creek beds dense stands of *Myristica insipida* occur. The scree slopes in general support a low forest with tree species such as *Eucalyptus miniata*, *E. tectifera*, *Adansonia gregorii* and *Buchanania obovata* and numerous under-shrubs, e.g. *Acacia sericata*, *Solanum cataphractum*, *Pterocaulon sphacelatum* and *Helicteres rhynchocarpum*.

On the gentle slope of the seaward side of the valley a clearly defined boundary exists between the vine thickets and a zone of *Pandanus* spp. The *Pandanus* merge then with a low open-forest supported by sandstone over basalt. The tree species *Eucalyptus miniata*, *E. polycarpa*, *Albizia procera* and *Pandanus* sp. dominate. *Grevillea pyramidalis* and *Persoonia falcata* are common shrubs, and climbers include *Canavalia maritima*, *Abrus precatorius* and *Flagellaria indica*. This low forest continues eastwards to St George Basin which is lined by a fringing low closed-forest of the mangrove species *Aegiceras corniculatum* and *Rhizophora stylosa* growing in saline alluvium.

W6 Youwaljela Creek

The W6 campsite (15° 34' S, 125° 25' E) was situated in a north-west/south-east 300 m wide valley of King Leopold Sandstones through which Youwanjela Creek runs south-eastwards to meet a major tributary of the upper Prince Regent River. The banks of the creek support a fringing low open-forest with Cadjeputs (*Melaleuca* spp.), *Eucalyptus* spp. and *Pandanus* spp. in the upper stratum and a ground cover of tall "sorghum-type" grasses. The slopes of the valley consist of a series of steps made by strongly bedded sandstones supporting a low open-woodland of *Eucalyptus* spp., *Ficus* spp. and Baobab (*Adansonia gregorii*) trees with a ground cover of spinifex hummock grasses. The northern side is much steeper with several ridges along the lower parts and a high vertical rampart at the upper part. Under some of these ridges the vegetation becomes more dense with some vine thicket present.

About 0.3 km east of the main campsite a fissure occurs in the cliff through which a small stream passes, making a deep pool about 1.5 m wide between the vertical walls of the fissure. In front of the fissure is a V-shaped gully with semi-deciduous microphyll vine thickets forming a low closed-forest. Upstream from the main campsite about 1.5 km a major fork occurs in Youwanjela Creek. The Creek here is lined with Cadjeputs (*Melaleuca* spp.) and palms (*Pandanus* spp.) forming a fringing low open-forest with intermittent "sorghum-type" grass ground cover. The valley ridge on either side supports a low woodland of *Eucalyptus* spp. and *Acacia* sp. trees with spinifex hummock grasses. Following the northern fork of the creek a further 1 km upstream the gorge narrows and deepens with near vertical cliffs on both sides forming deep pools with several small waterfalls entering from both sides. Among the boulders are tall trees, while cascading from crevices in the wet seepage areas of the cliff face is the fern *Blechnum orientale*. The top of the gorge opens out again onto the sandstone Prince Regent Plateau.

Careening Bay

Careening Bay is a small bay on the mainland south of Coronation Island (15° 06' S, 125° 00' E). It has a sandy beach and is bounded on either side by basalt headlands of the Carson Volcanics. Behind the beach the land rises into a sandstone hillside dissected by a gully which opens on the seaward side into a small mangrove swamp.

The hillside supports an open-woodland (Fig. 20) of *Terminalia canescens*, *Eucalyptus latifolia*, *Atalaya* sp. and *Owenia* sp. Ground cover consists principally of *Sorghum australiense* and *Tephrosia phaeosperma*. Towards the beach *Cycas media*, *Pandanus* sp. and *Adansonia gregorii* are found.

The gully is bordered by dense liane woodland with an under-storey of numerous shrubs including species of *Glycosmis*, *Paramygnia* and *Exocarpus*.

The mangroves consist principally of *Avicennia*, *Ceriops* and *Rhizophora* with trees of *Camptostemon* on the landward side and small shrubs of *Aegialitis* towards the sea.

DISCUSSION

In the recently published volume on "Conservation of Major Plant Communities in Australia and Papua New Guinea" (Specht, Roe and Boughton, 1974) a summary of plant communities for the Prince Regent River Reserve was presented (Table 8.2, p. 546) and given a reliability rating of "fair". In summarizing our site descriptions we are now able to present an updated list of plant communities for the reserve (see Table 3).

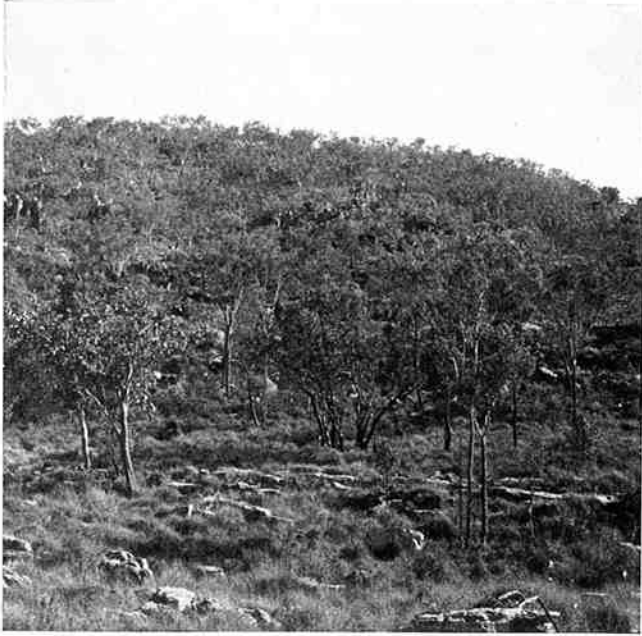


Figure 9—Fern Gully (W3)—woodland on rocky sandstone hills. Trees include *Eucalyptus miniata*, *Terminalia ferdinandiana* and *Buchanania obovata*, with some *Melaleuca ? nervosa* in depressions; spinifex is *Triodia ? stenostachya*.

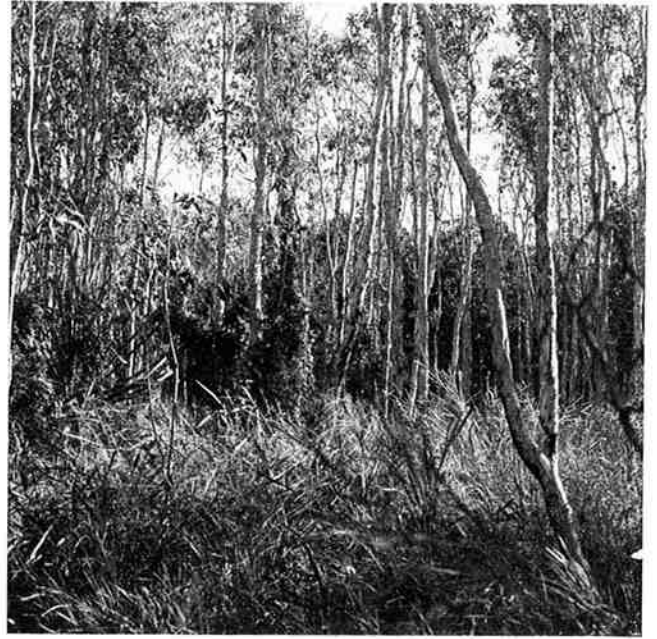


Figure 11—Fern Gully (W3)—delta at the mouth of Fern Gully. Low open-forest dominated by *Melaleuca* sp. with a dense ground cover of grasses; *Lygodium microphyllum* as a climber on some tree trunks. Mangroves in background.

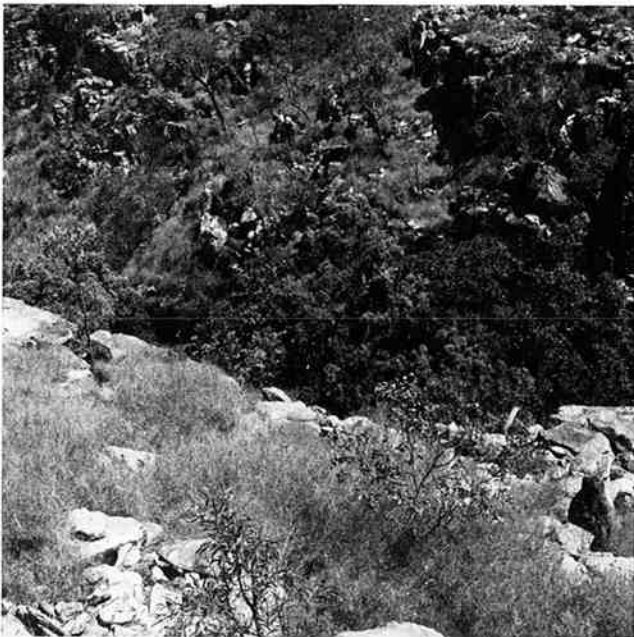


Figure 10—Fern Gully (W3)—looking into Fern Gully. Fringing closed-forest along valley floor, low woodland on slopes.



Figure 12—Fern Gully (W3)—bank of ferns on seepage area near creek; mainly *Blechnum orientale*, with some *Dicranopteris linearis*.

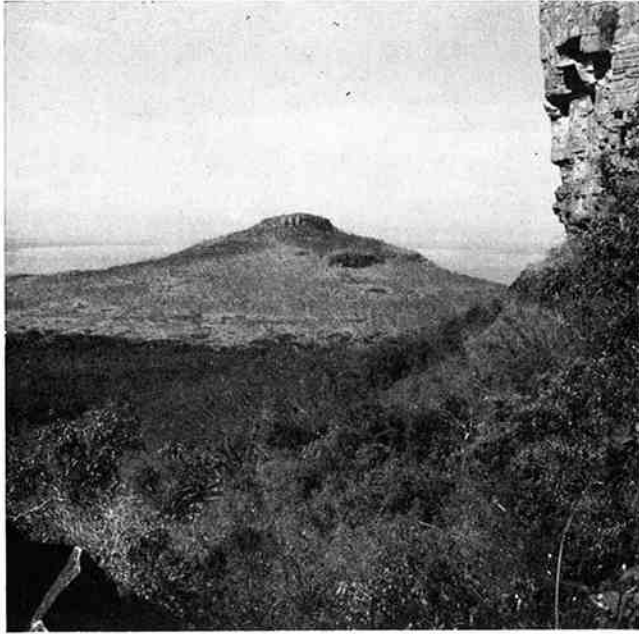


Figure 13—Mt Trafalgar (W4)—base of sandstone cliff with vine thicket below; Mt Waterloo in distance and St George Basin beyond.



Figure 15—Mt Trafalgar (W4)—inside the semi-deciduous vine thicket.



Figure 14—Mt Trafalgar (W4)—semi-deciduous vine thicket.



Figure 16—*Ficus hispida* L. f. (ASG 12722) in the vine thicket below Mt Trafalgar.

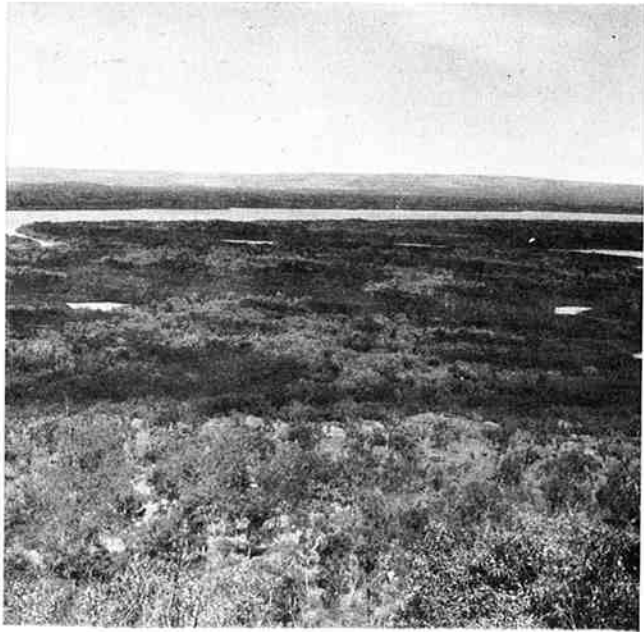


Figure 17—Mangroves and St George Basin below NE side of Mt Trafalgar (W4). Woodland on basaltic slope in foreground.



Figure 19—Mt Trafalgar (W4)—tall shrubland on summit, with *Acacia* sp. (ASG 12787, left), *Eucalyptus* sp. (ASG 12788, right) and *Triodia* sp. (ASG 12786).



Figure 18—Mt Trafalgar (W4)—woodland on basaltic slope below the vine thicket. Trees include *Adansonia gregorii*, *Hakea arborescens*, *Eucalyptus tectifera* and *E. foelscheana*.



Figure 20—Careening Bay—low open-forest on basaltic slope behind beach, with understorey of *Cycas media*.

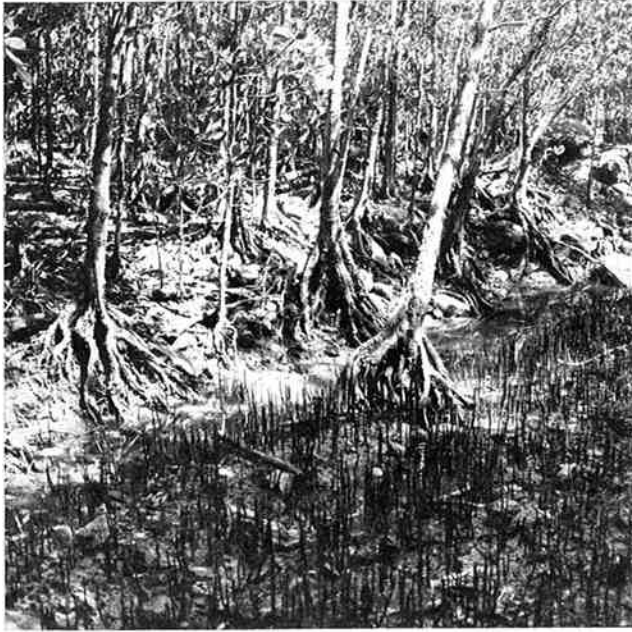


Figure 21—Mangroves below Mt Trafalgar (W4). Pneumatophores of *Avicennia marina* in foreground; *Bruguiera* sp. behind.



Figure 23—Prop roots of *Bruguiera* ? *gymnorhiza* on Prince Regent River near Fern Gully (W3).



Figure 22—Mangroves below Mt Trafalgar (W4). *Bruguiera* sp.



Figure 24—Prop roots of *Rhizophora stylosa* below Mt Trafalgar.

TABLE 3.
A SUMMARY OF PLANT COMMUNITIES FOUND IN THE PRINCE REGENT RIVER RESERVE
 (after Specht, Roe and Boughton, 1974)

<p>CONSERVATION AREA Prince Regent River F.F.R. (Res. No. 27164) Co. Wyndham-East Kimberley.</p> <p>Lat. 15° 16' S. Long. 125° 17' E Area: 633 825 ha Purpose: Wildlife Sanctuary</p> <p>R.I.: A</p> <p>PLANT COMMUNITIES</p> <p>Closed-forest <i>Calophyllum</i> sp., <i>Melaleuca leucadendron</i>, <i>Carallia brachiata</i>, <i>Myristica insipida</i>.</p> <p>Low closed-forest</p> <p>(1) <i>Melaleuca leucadendron</i>, <i>M. viridiflora</i>, <i>Pandanus</i> spp.</p> <p>(2) Semi-deciduous microphyll vine thicket. <i>Alstonia actinophylla</i>, <i>Albizia lebbek</i>, <i>Alphitonia excelsior</i>, <i>Bombax ceiba</i> var. <i>leiocarpum</i>, <i>Myristica insipida</i>.</p> <p>(3) Mangrove vegetation. <i>Aegiceras corniculatum</i>, <i>Bruguiera</i> spp., <i>Camptostemon schultzei</i>.</p> <p>(4) <i>Eucalyptus miniata</i>, <i>E. polycarpa</i>, <i>Albizia procera</i>.</p> <p>Open-forest <i>Melaleuca leucadendron</i>, <i>M. viridiflora</i>, <i>Eucalyptus houseana</i>, <i>Pandanus</i> spp.</p> <p>Low open-forest</p> <p>(1) <i>Melaleuca leucadendron</i>, <i>M. viridiflora</i>, <i>Pandanus</i> spp.</p> <p>(2) <i>Eucalyptus miniata</i>, <i>E. latifolia</i>, <i>E. tetradonta</i>, <i>E. nesophila</i>.</p> <p>(3) <i>Eucalyptus</i> ? <i>bigalerita</i>, <i>Canarium australianum</i>, <i>Pandanus</i> spp.</p>	<p>(4) <i>Eucalyptus miniata</i>, <i>E. polycarpa</i>, <i>Callitris intratropica</i>.</p> <p>Woodland</p> <p>(1) <i>Eucalyptus tetradonta</i>—<i>E. miniata</i> (2) <i>E. dichromophloia</i> (3) <i>E. polycarpa</i> (4) <i>E. camaldulensis</i></p> <p>Low woodland</p> <p>(1) <i>Eucalyptus latifolia</i>—<i>E. polycarpa</i> (2) <i>E. brachyandra</i>, <i>Pouteria sericea</i>, <i>Buchanania obovata</i> (3) <i>E. tetradonta</i>, <i>E. nesophila</i>, <i>E. foelscheana</i> (4) <i>E. ? bigalerita</i>, <i>Canarium australianum</i> (5) <i>Acacia</i> sp., <i>Ficus</i> spp., <i>Owenia vernicosa</i> (6) <i>E. tetradonta</i>, <i>E. miniata</i>, <i>E. confertiflora</i>, <i>E. latifolia</i>, <i>E. polycarpa</i> (7) <i>Sterculia viridiflora</i>, <i>Acacia delibrata</i>, <i>Canarium australianum</i>, <i>Santalum lanceolatum</i> (8) <i>E. houseana</i>, <i>Melaleuca viridiflora</i>, <i>Eugenia</i> sp. (9) <i>E. miniata</i>, <i>Gardenia resinosa</i>, <i>Owenia vernicosa</i></p> <p>Open-woodland <i>Melaleuca leucadendron</i>, <i>M. viridiflora</i>, <i>Eucalyptus houseana</i>, <i>Pandanus</i> spp.</p> <p>Low open-woodland</p> <p>(1) <i>Eucalyptus</i> spp., <i>Owenia vernicosa</i> (2) <i>E. foelscheana</i>, <i>E. confertiflora</i>, <i>E. tectiflora</i> (3) <i>E. miniata</i>, <i>E. perfoliata</i></p> <p>Tall shrubland</p> <p>(1) <i>Acacia</i> aff. <i>tumida</i>, <i>Calytrix</i> spp. (2) <i>Acacia stigmatophylla</i>, <i>A. aff. gonocarpa</i></p> <p>Closed-grassland <i>Eriachne festucacea</i>, <i>E. aff. pauciflora</i>, <i>Sclerandrium truncatiglume</i></p>
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Particular attention is drawn to two of these communities:—

1. Semi-deciduous microphyll vine thickets.

Webb (1959, 1968) coined this terminology to describe the depauperate rain forest formation similar to that we have found in the Prince Regent River Reserve at Enid Falls, Mt Trafalgar and Python Cliffs. This is a stunted vine forest formation in which the canopy closes at 3–9 m with mostly deciduous emergents to approximately 9–15 m. There are no dominants in the formation and many different families are represented by species ranging from slender shrubs to robust trees. A number of lianes scramble over the trees and rocks. Most of the species are evergreen but there is a proportion of deciduous trees and lianes (Figs. 13, 14, 15). Ground flora is sparse and there is a thick layer of fallen leaves.

Many species of the vine thickets are new records for W.A. Some collections have still not been identified. Visits during or just after the wet season would be necessary in order to collect the deciduous species which had no leaves, flowers or fruit at the time of our visit.

An interesting record from these vine thickets is the orchid *Dendrobium dicuphum* found on an unidentified deciduous tree. It is only the third collection of the species in Western Australia.

2. Mangroves.

Mangroves are a characteristic feature of tropical and sub-tropical coasts of Australia, and there are isolated occurrences on the southern coast. They prefer muddy tidal flats but occur sometimes on rocky

shores. They are extensive along the tidal reaches of the Prince Regent River, in St George Basin, in Rothsay Water and in Prince Frederick Harbour.

Species distribution in the mangroves is variable; in some areas there is distinct zonation while in others there is no obvious pattern. The species composition is quite rich and it is likely that several more species occur in the region since only a few areas were sampled. In St George Basin, below Mt Trafalgar, eight species were collected in an area of a few hectares.

Two species, *Bruguiera gymnorhiza* (Fig. 23) and *B. parviflora*, are new records for Western Australia.

Aquatic plants studied in the reserve also deserve special mention. At two sites, Blyxa Creek and Wulumara Creek, there were slow-moving streams with many pools containing an interesting aquatic flora. Sandstone rocks outcrop frequently along the banks or in the stream beds, and elsewhere the soil is sandy. Pools at the time of our visit were up to several metres deep.

Some species collected are true aquatics, being mostly submerged and depending on the water for support. They include *Blyxa aubertii* (a new generic record for Western Australia) (Fig. 3, George and Kenneally, this publication), *Aponogeton elongatus*, *Eriocaulon setaceum*, *Myriophyllum* sp. and *Utricularia* spp. Other species appear to survive for a while on wet banks after the water level drops. They include *Nymphoides* ? *hydrocharoides*, *N.* ? *parviflora* and *Limnophila chinensis*, all new records for Western Australia. At Mt Trafalgar, a stagnant pool at the base of the vine thicket contains a population of the aquatic grass *Pseudoraphis abortiva*. This species also appears to survive on the mud for a short while as the water level falls.

Another aquatic species which occurs in the collection of C. A. Gardner (1923) from the Prince Regent River is the recently described *Ondinea purpurea* (den Hartog, 1970). A relative of the water-lilies, it occurs in ephemeral streams. It has both submerged and floating leaves, and the small solitary flowers are purple and pink. This species was not collected on this expedition.

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PART IV

THE FLORA OF THE PRINCE REGENT RIVER RESERVE, NORTH-WESTERN KIMBERLEY, WESTERN AUSTRALIA.

By A. S. GEORGE¹ and K. F. KENNEALLY¹

INTRODUCTION

Of the thirteen sites visited during the 1974 biological survey of the Prince Regent River Reserve, seven were visited by us. These were E2, E3, E6, W1, W3, W4 and W5 (Fig. 2 in Miles, this publication). Collecting was thus possible in a wide range of geological and vegetational types. A brief visit was also made by one of us (A. S. George) to Careening Bay (CB), which had previously been visited by Mr P. G. Wilson in 1972 and 1973.

Although the expedition took place well into the dry season, the species collected totalled over 500 (some as yet unnamed). As far as possible plants were collected whether in flower, fruit or leaf only. A few, such as several ferns, were collected in a dormant condition. Only deciduous species without leaves or flowers at this season were passed by when it was impossible to match fallen leaves with plants. While the emphasis was on vascular plants, lichens and fungi were collected where possible and, being the first of these groups collected in the Kimberley, have proved of great interest.

Bushfires spreading through the reserve from the east burnt out the area around three camps, E2, E3 and E6. This greatly reduced the potential of these sites, although observations could be made on fire effects.

About 990 plant specimens were collected of which 50 were lichens and 30 fungi. Flowers and fruit of many species were preserved in formalin-acetic-alcohol. Many wood, bark and seed samples were taken. An extensive photographic record was made, both in colour and black-and-white, showing plant formations, individual species and flowers close-up.

Identification of some plants has proved difficult, especially where only vegetative material is available. About 40 specimens remain unidentified, some even as to family or genus. In some cases material has been identified or checked by specialists.

A list of the plants known from the reserve is provided below. It includes 502 taxa, of which 483 were collected on the expedition. Also included are the collections made by Mr P. G. Wilson of the W.A. Herbarium, at Careening Bay in 1972 and 1973 and on the Prince Regent River in 1973, as well as a few species collected in 1921 by the late C. A. Gardner. Of the taxa listed, 64 are new records for the Western Australia flora, and others are believed to be unnamed.

The 502 taxa include 19 fungi, 43 lichens, 19 ferns, 2 gymnosperms and 419 flowering plants.

It should be noted that our collections of taxa which are new records are not necessarily the first. A number were collected by Mr P. G. Wilson and Dr N. G. Marchant on expeditions to the Kimberley islands in 1972 and 1973, while several have been previously collected by others.

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The new records include three families and sixteen genera whose occurrence in W.A. has not previously been published. The families are Aristolochiaceae, Erythroxylaceae and Thunbergiaceae. The genera, with their families in brackets, are *Aegialitis* (Plumbaginaceae), *Aristolochia* (Aristolochiaceae), *Blyxa* (Hydrocharitaceae), *Boehmeria* (Urticaceae), *Calophyllum* (Clusiaceae), *Drynaria* (Polypodiaceae), *Drypetes* (Euphorbiaceae), *Erythroxylum* (Erythroxylaceae), *Glycosmis* (Rutaceae), *Jacquemontia* (Convolvulaceae), *Malaisia* (Moraceae), *Merremia* (Convolvulaceae), *Micromelum* (Rutaceae), *Paramignya* (Rutaceae), *Polyalthia* (Annonaceae), and *Thunbergia* (Thunbergiaceae).

The plants collected reaffirm conclusions of earlier workers that the Kimberley flora is typical of northern Australia and includes a large number of Malaysian elements. Southern Australian links are seen in such genera as *Jacksonia*, *Bossiaea*, *Lomandra*, *Verticordia* and *Persoonia*.

The list is divided into the following sections: fungi, lichens, ferns, cycads, monocots and dicots. The fungi are listed by collectors' numbers. In the lichens, species are listed alphabetically, while in the others the families, and within them genera and species, are alphabetical. New records for the State are marked with a dagger(†). Uncertain determinations are followed by collector's numbers, for easy reference if a supplementary flora list is published later.

FUNGI

The following notes were compiled by Mr R. N. Hilton Botany Department, University of Western Australia on the species of fungi collected. Some specimens have been examined by Mr N. E. M. Walters, C.S.I.R.O., Melbourne (cited as N.E.M.W.)

Colour cited from C. M. I. Raynor, "A Mycological Colour Chart", supplemented by British Fungus Flora Colour Identification Chart.

- ASG 12293 *Gloeophyllum concentricum* G. H. Cunn. det. N.E.M.W.; on *Eucalyptus ? miniata*, at E3. (Mr Walters comments that this is only the fifth time that this rare fungus has been collected.)
- ASG 12315 *Phellinus setulosus* (Lloyd) Imazeki det. N.E.M.W.; on *Eucalyptus tetradonta*. at E3.
- ASG 12368 *Poria* probably *carneo-lutea* det. N.E.M.W.; on dead wood, at E3.
- ASG 12373 *Pycnoporus coccineus* or *P. sanguineus*, which is recorded in the Australian tropics; on dead limb of *Eucalyptus tetradonta*, at E3.

- ASG 12374 *Osmoporus brunneo-leucus* (Berk.) G. H. Cunn. det. N.E.M.W.; on dead limb of *Eucalyptus tetradonta*, at E3.
- ASG 12379 *Trametes muelleri* as in Cunningham det. N.E.M.W.; on dead fallen log by creek, at E3.
- ASG 12380 *Trametes corrugata* (Pers.) Bres.; found loose on rocks by creek, at E3.
- ASG 12399 *Phellinus caryophylli* (Raciborski) G. H. Cunn. det. N.E.M.W.; on dead wood at base of *Grevillea pteridifolia*, at W1.
- ASG 12557 *Corticium caeruleum* (Schrad.) Fr. det. N.E.M.W.; on trunk of *Petalostigma pubescens*, at W1.
- ASG 12570A *Osmoporus brunneo-leucus* (Berk.) G. H. Cunn.; on dead *Eucalyptus* log, at W1.
- ASG 12570B *Poria* sp.; on dead *Eucalyptus* log, at W1.
- ASG 12581 *Phellinus setulosus* (Lloyd) Imazeki; on *Eucalyptus* sp. at W1.
- ASG 12710 *Schizophyllum commune* Fr.; on dead wood, at W4.
- ASG 12730 *Nectria* sp.; on *Rhizophora stylosa* (mangrove), at W4.
- ASG 12731 *Pseudofavolus tenuis* (Hook.) G. H. Cunn.; on *Rhizophora stylosa* (mangrove), at W4.
- ASG 12735 *Phellinus gilvus* (Schw.) Pat.; on *Camptostemon schultzii* (mangrove), at W4.
- ASG 12767 *Daldinia concentrica* (Fr.) Ces. & de Not.; on dead tree, at W4.
- ASG 12768 *Stereum* sp.; on dead tree, at W4.
- ASG 12769 *Trametes muelleri* as in Cunningham; on dead tree, at W4.
- ASG 12771 *Trichaptum cervina-gilvum* (Jungh.) G. H. Cunn. det. N.E.M.W.; on dead, fallen log, at W4.
- ASG 12772A *Pseudofavolus tenuis* (Hook.) G. H. Cunn. det. N.E.M.W.; on dead, fallen log, at W4.
- ASG 12772B *Corticium caeruleum* (Schrad.) Fr.; on dead, fallen log, at W4.
- ASG 12846 *Polyporus* sp.; on dead tree, at W3.
- KFK s.n. *Corticium caeruleum* (Schrad.) Fr.; on dead wood, at W5.
- KFK s.n. *Phellinus setulosus* (Lloyd) Imazeki; on *Eucalyptus miniata*, at E6
- KFK s.n. *Gloeoporus* sp. not *G. amorphus* det. N.E.M.W.; on dead wood, at E2.
- KFK s.n. *Pseudofavolus tenuis* (Hook.) G. H. Cunn.; on dead wood, at W5.
- KFK s.n. *Phellinus setulosus* (Lloyd) Imazeki; on dead wood, in rain-forest, at W5.
- KFK s.n. *Trichaptum cervino-gilvum* (Jungh.) G. H. Cunn.; in rain-forest, at W5.
- N. McKenzie *Daldinia concentrica* (Fr.) Ces. & de Not.; s.n. on dead, fallen tree, at E3.

LICHENS

Forty three species of lichens were collected, the first to be recorded for the Kimberley region. Four are probable new records for Australia, viz. *Anaptychia* ? *doming-*

ensis, *Chaenotheca melanophaea*, ? *Dimerella* sp. and *Microthelia micula*. Another seven are new records for Western Australia, viz *Arthrothelium interveniens*, *Buellia disciformis*, *Buellia subdisciformis*, *Parmelia dilatata*, *Parmelia praesorediosa*, *Parmelia tinctorum* and *Parmeliopsis hyperopta*. Several of the undescribed species are also new records for Western Australia. The species *Candellariella xanthostigma* and *Parmelia tinctorum* have a world wide distribution. *Ramalina ecklonia* is common in South Western Australia.

Lichens occur on both rocks and woody plants. All three major rock types—sandstone, basalt and laterite—support lichens. The sandstone undergoes exfoliation and this combined with other weathering processes tends to create fresh surface areas on which lichens can establish. Fifteen species of lichen were collected from one sandstone outcrop at E6. The other area rich in lichen species is the mangrove low closed-forest for which sixteen species are recorded, mainly on *Rhizophora stylosa*.

The following notes on the lichens collected in the reserve have been compiled by Mr N. Sammy, Botany Department, University of W.A.

The Australian representatives of the subgenera of the genus *Parmelia* are poorly known. Only the subgenera *Parmelia* and *Amphigymnia* have been monographed and even then only with the minimal representation from Australia. Most of the *Parmelia* species from the reserve will be new taxa.

The W.A. species called *Caloplaca fulgens* has been erroneously called *C. irrubescens* in the past. It is widely distributed on lateritic and granitic outcrops in the South-West.

Buellia disciformis has been recorded in Victoria on wood and probably has a wide distribution. One of the *Buellia* species compares favourably with *B. desertorum* which was described by Muell. Arg. from the Victoria Desert near Zanthus, east of Kalgoorlie, though the validity of this species is questionable.

FERNS

Although it was the dry season, 15 species of ferns were collected. Three have not previously been recorded for Western Australia—*Drynaria quercifolia*, *Lindsaea* ? *orbiculata* and *Schizaea dichotoma*—though the latter was collected by Gardner and misdetermined as *Psilotum nudum*.

The richest locality was at W3, where two deep gullies with permanent fresh streams support a narrow belt of closed-forest. Close to the creek banks, *Blechnum*, *Lygodium*, *Dicranopteris* and *Lindsaea ensifolia* are common. *Schizaea* and *Lindsaea* ? *orbiculata* are less frequent, the former growing in sandy pockets away from the stream and the latter on damp mossy banks. On rock faces are *Drynaria* (dormant at this season) and *Stenochlaena*. In crevices and soil pockets on dry rock faces occur *Cheilanthes tenuifolia* and *Selaginella*, both dry and dormant.

On the landward edge of the mangroves on the Prince Regent River near Fern Gully (W3) is a fine stand of *Acrostichum aureum*.

In the vine thicket at Python Cliffs (W5), a seepage area at the base of the cliff provides a habitat for *Lindsaea ensifolia*, *Lygodium* and *Schizaea*, with *Dicranopteris*, *Cheilanthes* sp. and *Adiantum* on the cliff face.



Figure 1—Fern Gully (W3)—*Dicranopteris linearis* (foreground) and *Lindsaea ensifolia* (behind).



Figure 2—*Schizaea dichotoma* in Fern Gully (W3).

Ferns were less frequent at the other sites. On sandy flats at W1 *Platyzoma microphyllum* is common. *Drynaria* was also found at E2, E3, E6 and W5.

Four species which have been collected previously in the Prince Regent River area are included in the list, making a total of 19 ferns recorded for the reserve.

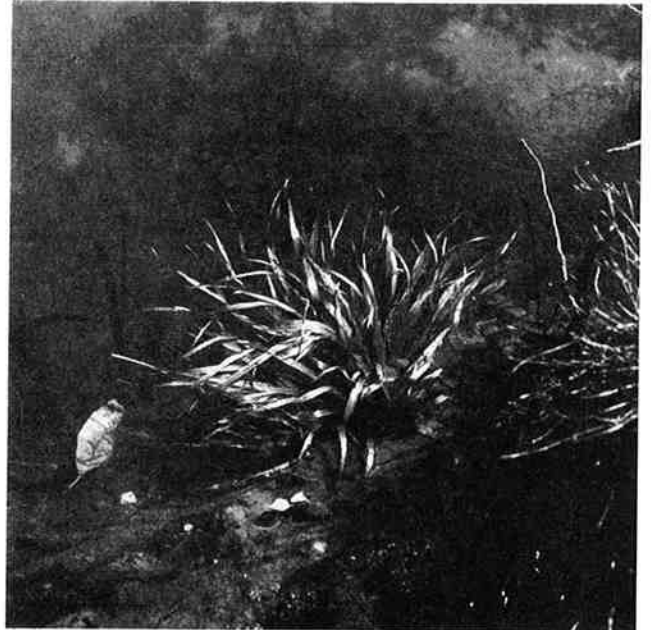


Figure 3—*Blyxa aubertii* in pool at Blyxa Creek (W1).



Figure 4—Blyxa Creek (W1)—aquatic and semi-aquatic vegetation. *Blyxa aubertii* lower left; *Nymphoides? hydrocharoides* bottom centre, *Eriocaulon* sp. lower right with *Phyllidrum lanuginosum* behind; the tall sedge in the centre is *Scirpus mucronatus* subsp. *robustus*.

LIST OF PLANT SPECIES

New records for W.A. are marked with a dagger (†)

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
LICHENS								
† <i>Anaptychia ? domingensis</i> (Ach.) Mass. ASG 12730 p.p., on <i>Rhizophora stylosa</i> .						X		
<i>Anaptychia</i> sp. ASG 12725, on dead <i>Ceriops tagal</i> .						X		
† <i>Arthrothelium interveniens</i> (Nyl.) Muell. Arg. ASG 12730 p.p., on <i>Rhizophora stylosa</i> .						X		
<i>Buellia ? desertorum</i> Muell. Arg. KFK 2215, 2223 p.p., on sandstone.			X					
† <i>Buellia disciformis</i> (Fr.) Mudd. ASG 12530, KFK 2222 p.p., on <i>Planchonella arnhemica</i> and sandstone.			X	X				
† <i>Buellia subdisciformis</i> (Leight) Vain. KFK 2222 p.p., on sandstone.			X					
<i>Buellia</i> sp. A KFK 2221, 2227 p.p., on sandstone.			X					
<i>Buellia</i> sp. B.... KFK 2211, 2227 p.p., on sandstone.			X					
<i>Buellia</i> sp. C KFK 2217, 2226 p.p., on sandstone.			X					
<i>Buellia</i> sp. D ASG 12298 p.p., on laterite. KFK 2223 p.p., on sandstone.		X	X					
<i>Caloplaca fulgens</i> Koerb. ASG 12298 p.p., on laterite. KFK 2214 p.p., on sandstone.		X	X					
<i>Caloplaca</i> sp. ASG 12332 p.p., on basaltic rocks.		X						
<i>Candellariella anthostigma</i> (Pers. ex Ach.) Lett..... ASG 12543 p.p., on <i>Banksia dentata</i> . ASG 12730 p.p., on <i>Rhizophora stylosa</i> . KFK 2205 on sandstone.			X	X		X	X	
† <i>Chaenotheca melanophaea</i> (Ach.) Zw. ASG 12730 p.p., on <i>Rhizophora stylosa</i> .						X		
<i>Dermatocarpon lachneum</i> (Ach.) A.L. Sm. ASG 12571 p.p., on sandstone rocks.				X				
<i>Dermatocarpon</i> sp. nov. ASG 12381, on basaltic rock. ASG 12670 on basaltic rock.		X				X		
†? <i>Dimerella</i> sp. ASG 12332 p.p., on basaltic rocks by creek. ASG 12645, on sandstone rocks.		X				X		
<i>Diploschistes</i> sp. KFK 2220, on sandstone.			X					
<i>Lecidea contigua</i> Fr. KFK 2223 p.p., on sandstone.			X					
<i>Lecidea</i> sp. ASG 12543 p.p., on <i>Banksia dentata</i> . ASG 12730 p.p., on <i>Rhizophora stylosa</i> . KFK 2226 p.p.			X	X		X		
<i>Lecidea</i> ? sp. nov. ASG 12580 p.p., on sandstone rocks.				X				

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Leptogium</i> sp. nov.						X		
ASG 12729, on <i>Ceriops tagal</i> .								
† <i>Microthelia micula</i> (Flot.) Koerb.						X		
ASG 12723, on <i>Ceriops tagal</i> .								
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
<i>Microthelia</i> sp.						X		
ASG 12770, on tree in vine thicket.								
<i>Ochrolechia geminipara</i> (Th.Fr.) Vain.						X		
ASG 12730, on <i>Rhizophora stylosa</i>								
KFK 2223, on sandstone.								
<i>Ochrolechia</i> sp.			X	X		X		
ASG 12580 p.p., on sandstone rocks.								
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
KFK 2212, on sandstone.								
<i>Pannaria</i> sp.				X				
ASG 12571 p.p., on sandstone rocks.								
† <i>Parmelia dilatata</i> Vain.						X		
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
† <i>Parmelia praesorediosa</i> Nyl.		X						
ASG 12298 p.p., on lateritic rocks.								
† <i>Parmelia tinctorum</i> Nyl.		X						
ASG 12301 p.p., on <i>Erythrophleum chlorostachys</i> .								
<i>Parmelia (Amphigymnia)</i> sp. nov.			X					
KFK 2206, on <i>Tristania</i> sp.								
<i>Parmelia (Melanoparmelia)</i> sp. A							X	
KFK 2214, p.p., on sandstone.								
<i>Parmelia (Parmelia)</i> sp. B			X					
KFK 2216, on sandstone.								
<i>Parmelia (Parmelia)</i> sp. C			X					
KFK 2220, on sandstone.								
<i>Parmelia (Xanthoparmelia)</i> sp. A			X					
KFK 2215, on sandstone.								
† <i>Parmeliopsis hyperopta</i> (Ach.) Nyl.		X						
ASG 12301 p.p., on <i>Erythrophleum chlorostachys</i> .								
<i>Pertusaria</i> sp.		X				X		
ASG 12298 p.p., on lateritic rocks.								
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
<i>Physcia aegilita</i> (Ach.) Nyl.						X		
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
<i>Physcia</i> ? sp. nov.						X		
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
<i>Ramalina ecklonia</i> (Spreng.) Mey. et Flot.						X		
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
<i>Xylographa</i> ? sp.				X				
ASG 12573, on <i>Banksia dentata</i> .								
Teloschistaceae						X		
ASG 12711, on sandstone rock.								
?Sp. nov., gen. nov.		X				X		
ASG 12301 p.p., on <i>Erythrophleum chlorostachys</i> .								
ASG 12730 p.p., on <i>Rhizophora stylosa</i> .								
PTERIDOPHYTA								
Ferns								
ADIANTACEAE								
<i>Adiantum philippense</i> L.		X					X	
Dormant; dead fronds persistent. In crevices of basalt rocks.								

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
BLECHNACEAE								
<i>Blechnum orientale</i> L. Common by creek and in seepages in valleys; some fronds fertile.					X			
<i>Stenochlaena palustris</i> (Burm. f.) Beddome Sterile; on sandstone, on shaded walls of valley.					X			
DENNSTAEDTIACEAE								
<i>Microlepia speluncae</i> (L.) Moore Gardner 1301, July 1921								
GLEICHENIACEAE								
<i>Dicranopteris linearis</i> (Burm. f.) Underwood Common in wet areas on valley floor; some fronds fertile.					X		X	
GYMNOGRAMMACEAE								
<i>Platyzoma microphyllum</i> R.Br. Common in sandy woodlands.				X				
LINDSAEACEAE								
<i>Lindsaea ensifolia</i> Swartz Common in sandy pockets on valley floors; some fronds fertile.					X		X	
† <i>Lindsaea ? orbiculata</i> Mett. Rare, on moss banks by creek; mostly sterile.					X			
OLEANDRACEAE								
<i>Nephrolepis</i> sp. P. G. Wilson 11469, King Cascade, 10 July 1973. Sterile. On damp sandstone cliff face.								
POLYPODIACEAE								
† <i>Drynaria quercifolia</i> (L.) J.Sm. Dormant; nest leaves persistent, fertile fronds fallen. In crevices of basalt rocks (E3); on sandstone rocks in valley (W3).	X	X	X		X		X	
<i>Microsorium scolopendria</i> (Burm.f.) Copeland Gardner 859, June 1921.								
PTERIDACEAE								
<i>Acrostichum speciosum</i> Willd. Large colony at land margin of mangroves; some fronds fertile.					X			
SCHIZAEACEAE								
<i>Lygodium microphyllum</i> (Cav.) R.Br. Prolific climber (up to 5 m) in wet areas in valley and on creek delta; some fronds fertile.					X		X	
† <i>Schizaea dichotoma</i> (L.) Sm. Colonies in sandy pockets on shaded valley floor; old fertile fronds present.					X		X	
SELAGINELLACEAE								
<i>Selaginella ciliaris</i> (Retz.) Spring..... Dry and dormant; in crevices on shaded sandstone walls.					X			

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
SINOPTERIDACEAE								
<i>Cheilanthes tenuifolia</i> (Burm.) Sw. Dry and dormant, in open-woodland of sandstone and basalt scree slope (W5); becoming dormant, on basaltic slope in woodland (E3); on sandstone walls (W3).		X			X		X	
<i>Cheilanthes vellea</i> (R.Br.) F.Muell. Dry and dormant, in grassy woodland on basalt slope.						X		
? <i>Cheilanthes</i> sp. ASG 12785, KFK s.n. Small dried-up fern in sandstone crevices; fronds hirsute.			X		X			
THELYPTERIDACEAE								
<i>Cyclosorus gongyloides</i> (Schkuhr.) Link. Gardner 956, June 1921.								
GYMNOSPERMAE								
CUPRESSACEAE								
<i>Callitris intratropica</i> Baker & Smith Tree to 5 m tall; on sandstone summits of Mt. Trafalgar (coll.) and Mt. Waterloo (obs.).			X			X	X	
CYCADACEAE								
<i>Cycas media</i> R.Br. Palm to 3 m tall, in woodland on sandy slope behind beach; fertile.								X
MONOCOTYLEDONAE								
AMARYLLIDACEAE								
<i>Crinum flaccidum</i> Herbert A single plant seen, in sandstone rock crevice of creek bed.				X				
APONOGETONACEAE								
<i>Aponogeton elongatus</i> F.Muell. ex Benth. Aquatic; only inflorescence emergent; fls yellow.				X				
ARECACEAE								
<i>Livistona</i> sp. KFK 2162 Palm to 4 m, trunk with remnants of leaf bases on lower half becoming cleanly abscised in upper part. Spadix yellow with yellow-green fls. Circumference of stem 28 cm, length of petiole 77 cm, leaf blade 70 cm long. On sandstone plateau.							X	
CENTROLEPIDACEAE								
<i>Centrolepis exserta</i> (R.Br.) R. & S. Ephemeral herb; fls reddish-brown. In sand near creek.	X			X				
COMMELINACEAE								
<i>Commelina ensifolia</i> R.Br. Sprawling perennial herb; fls bright blue. In rocky basaltic loam, by creek.		X						
CYPERACEAE								
<i>Cyperus ? aquatilis</i> B.Br. KFK 2102 Aquatic on edge of creek.			X					

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Cyperus cuspidatus</i> H.B.K. Small ephemeral herb; fls brown. In damp sand by creek.				X				
<i>Cyperus holoschoenus</i> R.Br. Erect sedge in black sandy clay on edge of remnant pools.	X							
<i>Eleocharis</i> sp. ASG 12575 Perennial sedge; fls over. Aquatic, on edge of pool.				X				
<i>Fimbristylis tetragona</i> R.Br. Caespitose perennial sedge; fls brown. In sandy wood- land near creek.	X			X				
<i>Fuirena ciliaris</i> (L.) Roxb. Fls green. In clay-loam, in closed-grassland.				X				
<i>Lipocarpa microcephala</i> Kunth. Fls greenish-brown. On creek banks	X			X				
<i>Scirpus mucronatus</i> L. subsp. <i>robustus</i> (Miq.) T. Koyama Rhizomatous sedge on edge of pools; stems triquet- rous.			X	X				
<i>Scleria</i> sp. KFK 2139 Caespitose sedge growing in crevices of sandstone cliff face.							X	
ERIOCAULACEAE								
<i>Eriocaulon ? cinereum</i> R.Br. ASG 12457, KFK 2103 Caespitose ephemeral herb; fls grey. On edge of pools	X			X				
<i>Eriocaulon setaceum</i> L. Aquatic herb, inflorescence emergent. In pools along creeks.	X			X				
<i>Eriocaulon</i> sp. ASG 12635, KFK 2044 ? Ephemeral herb; heads white. Aquatic, in running water.	X				X			
FLAGELLARIACEAE								
<i>Flagellaria indica</i> L. Strong liane, clinging by circinnate leaf apices; fls cream. On basalt and sandstone slopes in woodland.	X	X	X		X		X	
HAEMODORACEAE								
† <i>Haemodorum ? brevicaule</i> F. Muell. ASG s.n. A single plant seen, in sand near creek.				X				
<i>Haemodorum</i> aff. <i>parviflorum</i> Benth. ASG 12519 A single plant seen, in sand near creek; fls red.				X				
HYDROCHARITACEAE								
† <i>Blyxa aubertii</i> Rich. Aquatic; fls (white) emergent.				X				
LILIACEAE								
<i>Asparagus racemosus</i> Willd. Climber; fls white.								X
<i>Smilax australis</i> R.Br. Slender, erect perennial herb or shrub to 2 m; stems little-branched, bearing thorns. Among lateritic boulders, in open-forest.		X						
<i>Thysanotus chinensis</i> Benth. Herb with small rhizome, fls blue. In damp sandy- loam, in closed-grassland.	X			X				

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
? <i>Tricoryne</i> sp. ASG 12525 Perennial rhizomatous herb; in leaf only. In sandy woodland.				X				
ORCHIDACEAE								
<i>Cymbidium canaliculatum</i> R.Br. Epiphytic plant common in forks of Eucalypts at E6 and W5, rare at W1			X	X			X	
<i>Dendrobium dicuphum</i> R.Br. Only one plant seen, 5 m from ground in fork of deciduous tree (unidentified); in fruit. In vine thicket.						X		
PANDANACEAE								
<i>Pandanus</i> sp. ASG 12345 Tree to 5 m. In rocky basaltic loam by creek		X						
<i>Pandanus</i> sp. ASG 12411 Tree to 6 m. In sandy woodland near creek				X				
<i>Pandanus</i> sp. KFK 2041 Palm to 5 m; foliage bright green. In woodland, open-forest and fringing forest; occasional in wet closed-grasslands.	X							
<i>Pandanus</i> sp. ASG 12634 Tree to 10 m; fruit orange-brown on top, red below. In rocky sand in sandstone valley, near creek.					X			
<i>Pandanus</i> sp. KFK s.n. Palm to 5 m; fruit orange-red. In rocky sandstone fringing creek.			X					
PHILYDRACEAE								
<i>Philydrum lanuginosum</i> Banks & Solander ex Gaertn. Perennial herb 1 m tall with yellow corolla. At edge of pools and on damp banks.	X		X	X				
POACEAE								
<i>Arundinella nepalensis</i> Trin. Caespitose perennial grass to 2.5 m. By creek on basaltic slope, in woodland.						X		
<i>Cenchrus elymoides</i> F.Muell. Caespitose perennial grass. By creek on basaltic slope		X						
<i>Cymbopogon bombycinus</i> (R.Br.) Domin Caespitose perennial grass. On lateritic plateau, in open-forest.		X						
<i>Cymbopogon procerus</i> (R.Br.) Domin Caespitose perennial grass. Lateritic plateau, in open-forest (E3); sandstone summit of Mt Trafalgar (W4).		X	X			X		
† <i>Ectrosia leporina</i> Benth. Ephemeral grass with purple-maroon fls. In sand by creek.	X			X				
<i>Elytrophorus spicatus</i> Greene Ephemeral grass; fls bright green. In damp sandy-loam by creek.				X				
<i>Eragrostis ? interrupta</i> (R.Br.) Beauv. ASG 12401, 12404, 12558 Caespitose perennial grass; fls dull green. In sand near creek, in woodland.				X				
<i>Eragrostis</i> sp. ASG 12325 Fls pale purplish-green. In rocky basaltic loam by creek.		X						

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Eragrostis</i> sp. ASG 12712 Small ephemeral, on drying clay by pool at edge of vine thicket.						X		
<i>Eriachne festucea</i> F.Muell. Caespitose perennial grass; not in flower. Common in sand and around sandstone rocks in creek bed and on banks.	X			X				
<i>Eriachne</i> aff. <i>pauciflora</i> W. V. Fitzg. ASG 12400, 12578 KFK 2008 Perennial grass. On sand banks along creek.	X			X				
<i>Heteropogon contortus</i> (L.) Beauv. ex Roem. et Schultz Caespitose perennial grass; fruit aggregating in clusters after falling. Common in lateritic and basaltic loam, in open-forest and woodland.		X				X		
? <i>Ischaemum</i> ? <i>arundinaceum</i> F. Muell. ex Benth. ASG 12388, 12760 Caespitose perennial grass; in leaf only. Common along creek banks (W1) and in seepage area on basalt in open-forest (W4)				X		X		
<i>Iseilema filipes</i> S. T. Blake Caespitose perennial grass; fls green In rocky basaltic soil along creek.		X						
† <i>Panicum trichoides</i> Sw. Delicate ephemeral grass. In sheltered sandstone crevices in valley.					X			
<i>Phragmites karka</i> Trin. ex Steud. Stout perennial to 2 m, forming dense stands in alluvium of creek bed.			X					
<i>Plectrarchne pungens</i> (R.Br.) C. E. Hubb. Caespitose perennial grass; not in flower. On lateritic plateau in woodland (E3); in sandy woodland (W1).		X		X				
<i>Pseudoraphis abortiva</i> (R.Br.) Pilger Aquatic, in stagnant pool below Mt Trafalgar						X		
<i>Sacciolepis indica</i> (L.) Chase ? Perennial grass. In damp or wet sandy loam along creeks.				X	X			
<i>Sacciolepis myosuroides</i> (R.Br.) Hughes Ephemeral grass; fls purplish green. In clay-loam, at edge of closed grassland.			X					
<i>Sacciolepis</i> sp. ASG 12562 Ephemeral grass. On sandy bank by creek.				X				
<i>Sclerandrium truncatiglume</i> (F.Muell.) Stapf. & Hubb. Caespitose perennial grass; fls brown. In rocky basaltic loam by creek (E3); in sand and by sandstone rocks along creek (W1).	X	X		X				
† <i>Sorghum australiense</i> Garber & Snyder <i>Sorghum</i> ? <i>plumosum</i> (R.Br.) Beauv. ASG 12393 Caespitose perennial grass; fls brown. In sandy woodland and by creek.				X				X
<i>Thaumastochloa pubescens</i> (Domin.) Hubb. Ephemeral grass, mostly dead. On sandy banks along creek.				X				
<i>Themeda australis</i> (R.Br.) Stapf. Caespitose perennial grass. Common in woodland and open-forest.		X		X				
<i>Triodia</i> ? <i>pungens</i> (R.Br.) ASG 12781 Spinifex; caespitose perennial grass to 70 cm high, in leaf only; viscid, rather soft. On sandstone hills.					X			

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Triodia ? stenostachya</i> Domin ASG 12780, KFK s.n. Spinifex; in large clumps to 2 m high; viscid and rather soft. Very common on rocky sandstone hills.					X		X	
<i>Triodia</i> sp. ASG 12786 Spinifex; in large clumps to 1 m high, not viscid. Common on rocky sandstone summit of Mt. Trafalgar, in tall shrubland.						X		
? Genus ASG 12579 In sand by creek.				X				
XANTHORRHOACEAE								
<i>Lomandra</i> aff. <i>elongata</i> (Benth.) Ewart Dioecious, caespitose perennial herb; in fruit. In sand, in open woodland.				X				
XYRIDACEAE								
<i>Xyris complanata</i> (R. Br.) Caespitose perennial herb; fls yellow. In damp sand among sandstone rocks by creek, in fringing forest (W3); in seepage area on basaltic slope in open forest (W4); in sand near creek (W1).	X		X	X	X	X		
<i>Xyris ? oligantha</i> Steud. KFK 2004 Perennial herb; fls yellow, scapes twisted. In damp sand in closed-grassland.	X							
<i>Xyris pauciflora</i> Willd. Perennial herb; fls yellow. In damp sand along creek.	X		X	X				
<i>Xyris</i> aff. <i>pauciflora</i> Willd. KFK 2023 Perennial herb, fls yellow, scapes pink tinged. In damp sand in closed-grassland.	X							
† <i>Xyris ? pusilla</i> R. Br. KFK s.n. ? Perennial herb; fls yellow. In damp sand in closed-grassland.	X							
<i>Xyris</i> sp. ASG 12500, KFK s.n. Perennial herb; fls yellow. In damp sand by creek.	X			X				
DICOTYLEDONAE								
ACANTHACEAE								
<i>Dicliptera glabra</i> Dcne. Ephemeral; fls mauve. In open-woodland, in basaltic soil near creek (E3) and sandstone gully (CB).		X						X
† <i>Dicliptera</i> cf. <i>leonotis</i> Dalz. ex Clarke ASG 12284 Straggling ephemeral, in shelter of <i>Ficus</i> and shrubs, on basaltic slope.		X						
<i>Hypoestes floribunda</i> R. Br. var. <i>paniculata</i> Benth. Perennial herb 1 m. On basaltic slope in woodland.		X						
? Genus ASG 12819, KFK 2133 Scrambling ? perennial herb; fls white. On rocky sandstone slopes, in open-forest.					X		X	
AMARANTHACEAE								
<i>Achyranthes aspera</i> L. Ephemeral; in woodland on basaltic slope.		X						
<i>Alternanthera</i> sp. KFK 2153 Diffuse herb, fls white. In crevices of sandstone cliff. Not common.							X	

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Gomphrena canescens</i> R. Br. Ephemeral herb; fls deep pink. On rocky basaltic slope, in woodland.		X						
<i>Gomphrena flaccida</i> R. Br. Erect ephemeral herb, fls red-pink. In sandy woodland.			X	X				X
<i>Gomphrena</i> ? <i>parviflora</i> Benth. ASG 12577 Prostrate ephemeral herb; fls pink. On sandy bank by creek.				X				
<i>Ptilotus exaltatus</i> Nees. Ephemeral with large pink spikes; in open grassy areas in rocky soil, by mangroves.						X		
<i>Ptilotus</i> ? <i>polystachyus</i> (Gaud) F. Muell. ASG 12813 Ephemeral to 1.5 m, pale green fls, mostly over; on rocky sandstone hill, burnt 1-2 years previously.					X			
ANACARDIACEAE								
<i>Buchanania</i> ? <i>oblongifolia</i> W. V. Fitzg. ASG 12295 Erect shrub to 2 m; in leaf only. On lateritic plateau, in open-forest.		X						
† <i>Buchanania obovata</i> Engl. Tree to 8 m; bark rough, dark grey; fls cream, scented. In sand and on rocky sandstone and basaltic slopes, in open-forest and woodland.	X		X	X	X	X	X	X
ANNONACEAE								
† ? <i>Polyalthia</i> sp. ASG 12340, 12487, 12681 Liane; in leaf only. In rocky basaltic loam by creek (E3); on rocky sandstone hill, in low woodland; area burnt 2-3 years before (W1); in semi-deciduous vine thicket (W4).		X		X		X		
APIACEAE								
<i>Trachymene</i> aff. <i>hemicarpa</i> (F. Muell.) Benth. ASG 12471, 12551. Slender, openly-branched ephemeral herb to 1.5 m; in fruit. On rocky sandstone hills in woodland and low woodland; area burnt 2-3 years before.				X	X			
APOCYNACEAE								
<i>Alstonia actinophylla</i> (A. Cunn.) K. Schum. Erect tree to 15 m; bark very corky and fissured. Scattered occurrences in vine thicket (W5); on rocky sandstone hills in woodland (W3).					X			X
<i>Alstonia</i> ? <i>linearis</i> Benth. ASG 12804 Shrub 3-4 m; in leaf only. On rocky sandstone summit of Mt Trafalgar, in tall shrubland.						X		
<i>Carissa ovata</i> R. Br. Small shrub; in leaf only. Among sandstone rocks, in woodland.					X			
<i>Ervatamia orientalis</i> (R. Br.) Turrill. Erect, straggly bush to 1.5 m on sandstone.			X					
? <i>Parsonsia</i> sp. ASG 12718 Liane. At edge of semi-deciduous vine thicket.					X			

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>?Parsonsia</i> sp. ASG 12611 Creeper, ± prostrate; in leaf only. In sandy loam, in open-forest by creek.					X			
<i>Wrightia saligna</i> (R. Br.) F. Muell. ex Benth. Shrub 4 m; bark corky. In leaf only. In semi-deciduous vine thicket.						X		
<i>?Wrightia</i> sp. ASG 12369 Tree 10 m with latex; bark flaky, grey; fruit dark green, mottled. On basaltic slope in woodland.		X						
AQUIFOLIACEAE								
<i>Ilex arnhemensis</i> (F. Muell.) Loes. Tree 8 m with smooth grey bark; by creek in deep gully, in sandstone.					X			
ARISTOLOCHIACEAE								
† <i>Aristolochia ? indica</i> L. ASG 12766 Strong liane, in fruit. In vine thicket.						X		
ASCLEPIADACEAE								
<i>Cynanchum</i> sp. KFK 2168 Common climber in vine thicket. In fruit only.							X	
<i>Hoya</i> sp. ASG 12639, 12800, KFK 2188, s.n. Succulent-ldv perennial, scrambling over sandstone rocks.	X		X		X	X	X	
<i>? Marsdenia</i> sp. ASG 12737 ± prostrate creeper; in leaf only. In rocky basaltic soil in woodland near mangroves.						X		
<i>Sarcostemma australe</i> R. Br. Leafless, many-stemmed shrub, with latex. In rocky basaltic or sandstone soil.	X	X				X		
ASTERACEAE								
<i>Blumea diffusa</i> Benth. Sprawling ephemeral herb; fls yellow. In damp grasslands.	X			X				
<i>Blumea mollis</i> (D. Don) Merr. Straggling herb, stem woody; fls dull pink. On basaltic slope, in open-woodland.		X						
† <i>Blumea saxatilis</i> Zoll. et Mar. Ephemeral herb; fls yellow. In damp clay-loam at edge of closed-grassland (W1); in seepage area (now dry) on basaltic slope in open-forest (W4).				X		X		
† <i>Blumea tenella</i> DC. Aromatic ephemeral herb; fls yellow. In rocky basaltic loam by creek (E3); on sandy bank near creek (W1).		X		X				
<i>Pluchea rubelliflora</i> (F. Muell.) Robinson Ephemeral herb. In open, rocky area by mangroves.					X			
<i>Pterocaulon verbascifolium</i> (Benth.) F. Muell. Short lived perennial herb to 1 m. In woodland on basaltic slopes.		X				X		
<i>Pterocaulon sphacelatum</i> (Labill.) F. Muell. ?Perennial herb to 1 m. On sandstone talus in open-forest below cliff (W5); on rocky slope in open woodland (W4).						X	X	

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Vernonia</i> sp. ASG12289 ? Perennial herb to 1m. On basaltic slope, in woodland.		X						
<i>Vittadinia</i> sp. ASG 12294 Straggling perennial herb with pale mauve rays; on rocky lateritic plateau, in woodland.		X						
AVICENNIACEAE								
<i>Avicennia marina</i> (Forsk.) Vierh. Mangroves with pneumatophores; lvs dull green, pale beneath.						X		
BARRINGTONIACEAE								
<i>Planchonia australis</i> (F. Muell.) Kunth. Many-stemmed shrub to 1 m, or tree to 7 m with grey fissured bark; lvs turning red before falling; fls white, scented. In rocky sandstone or basaltic soil, in woodland.		X		X		X	X	X
BOMBACACEAE								
<i>Adansonia gregorii</i> F. Muell. Baobab, leafless at time of visit; on basalt slopes (W4) and sandy flat (CB).						X	X	X
<i>Bombax ceiba</i> L. var. <i>leiocarpum</i> A. Robyns Emergent deciduous tree of vine thicket, leafless at time of visit. Fls deep red.						X	X	
<i>Camptostemon schultzei</i> Masters Mangrove with straight trunk to 20 m, bark grey, somewhat rough; lvs dull, pale green, paler on lower surface.					X	X		X
BORAGINACEAE								
<i>Trichodesma zeylanicum</i> (N. L. Burman) R.Br. Perennial herb to 2 m; fls blue. On sandstone scree slope, in semi-deciduous vine thicket.						X		
BURSERACEAE								
<i>Canarium australianum</i> F. Muell. Tree 10 m, fruits large, green. On sandstone.			X					X
† <i>Garuga floribunda</i> Dcne. PGW s.n.								X
BYBLIDACEAE								
<i>Byblis liniflora</i> Salisb. Glandular-pubescent herb, in flower and fruit; fls pink, cream outside. At edge of closed-grassland.	X			X				
CAESALPINIACEAE								
<i>Caesalpinia globulorum</i> Bakh. et van Royen Seeds deep olive green with faint black concentric markings. Seeds commonly collected by Bower Birds as decoration around bower.	X							
<i>Cassia mimosoides</i> L. Slender shrub to 1 m, in leaf only. On basaltic slope, in woodland.		X						
<i>Cassia oligoclada</i> F. Muell. Shrub 1 m; fls yellow. In damp black loam over sandstone rocks on hillside, in low woodland.					X			

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Cassia venusta</i> L. Erect perennial herb 1.5 m. On rocky sandstone hill, in low woodland.				X				
<i>Erythrophleum chlorostachys</i> (F. Muell.) Baill. Shrub or tree to 10 m; on lateritic plateau, in woodland (E3); on sandstone hill in low woodland (W1); on sandstone scree in woodland (W4).		X		X		X		
<i>Lysiphyllum cunninghamii</i> (Benth.) DeWit. Tree 12 m. On sandstone scree slope, in semi-deciduous vine thicket.						X		
CAPPARIDACEAE								
† <i>Capparis quiniflora</i> DC. Climber or scrambling shrub, with hooked spines; in semi-deciduous vine thicket.						X	X	
<i>Capparis ? quiniflora</i> DC. ASG 12281 Erect shrub to 3 m; on basaltic slope in woodland.		X						
CARYOPHYLLACEAE								
<i>Polycarphaea</i> aff. <i>staminodina</i> F. Muell. ASG 12560 Ephemeral herb; fls whitish. On sand bank by creek.				X				
CELASTRACEAE								
† <i>Cassine melanocarpa</i> (F. Muell.) O. Kuntze Shrub or tree to 8 m with smooth grey bark; fls yellowish; fruits pale to dark green, shining. On sandstone scree slope in semi-deciduous vine thicket.						X	X	
<i>Denhamia obscura</i> (A. Rich.) Meisn. Shrub or tree 3-10 m; bark grey, smooth or becoming tessellated at base. In rocky basaltic loam along creek (E3); on sandstone scree slope in semi-deciduous vine thicket, and on sandstone summit of Mt Trafalgar in tall shrubland (W4).		X	X		X	X		
<i>Cleome tetrandia</i> Banks ex. DC. Straggling herb (? perennial); fls yellow with red markings, mostly over. On sand bank near creek.				X				
CLUSIACEAE								
† <i>Calophyllum</i> sp. Tree to 20 cm, with grey fissured bark; new lvs red, mature lvs dark green, shining. By creek in deep sandstone gully, in fringing closed-forest.					X			
COCHLOSPERMACEAE								
<i>Cochlospermum fraseri</i> Planch. Openly-branched shrub to 4 m, lvs mostly fallen; fls yellow streaked with orange, with faint sweet scent. On lateritic plateau in open-forest (E3); on basaltic slope in woodland (W4), in sandy woodland (W1); sandstone (E2, E6, W5).	X	X	X	X		X	X	
COMBRETACEAE								
<i>Lumnitzera ? racemosa</i> Willd. ASG 12738 Mangrove; shrub to 4 m, buttressed. On tidal mud flats.						X		
† <i>Terminalia ? arostrata</i> Ewart & Davies KFK 2191 Shrub or small tree. On sandstone .							X	

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Terminalia ? canescens</i> (DC.) Radlk. Shrub or small tree 3-6 m; bark flaky; lvs silvery green. On lateritic plateau, in open-forest (E3); among sandstone rocks by swamp flat, in low woodland (W1); on basaltic slope in woodland (W4).		X		X		X		X
<i>Terminalia discolor</i> F. Muell. Small tree 5 m; bark ± smooth, grey. Edge of lateritic plateau, in open-forest.		X						
<i>Terminalia ferdinandiana</i> Exell. Spreading tree 8 m; fruit pale yellow. On rocky sandstone hill, in low woodland.					X			
CONVOLVULACEAE								
<i>Ipomoea eriocarpa</i> R. Br. Slender climber; fls pink. In seepage area (now dry) on basaltic slope, in open-forest.						X		X
<i>Ipomoea nil</i> (L.) Roth. Climber; old fls pink. Edge of lateritic plateau, in open-forest.		X						
† <i>Jacquemontia paniculata</i> (Burm.f.) Hall.f. Twining perennial, fls pale blue. In thicket on basaltic slope.		X						X
† <i>Merremia quinata</i> (R. Br.) Ooststr. Climbing perennial. In rocky basaltic soil.		X						
<i>Merremia tridentata</i> (L.) Hall.f. var <i>hastata</i> (Hall.f.) Ooststr.								X
<i>Operculina</i> sp. ASG 12276, KFK s.n. Ephemeral climber, in fruit only. In thicket on basaltic slope (E3).		X					X	
CUCURBITACEAE								
<i>Cucumis melo</i> L. var. <i>agrestis</i> Naud. Fruit pale green with darker green stripes.								X
DILLENIACEAE								
† <i>Hibbertia tomentosa</i> R. Br. Perennial herb, ± prostrate. In sandy woodland.				X				
<i>Hibbertia</i> sp. ASG 12598 Perennial herb. On rocky sandstone hill, in low woodland.					X			
DROSERACEAE								
<i>Drosera burmannii</i> Vahl. Herb with small rosette of reddish lvs and tiny white fls. In sand or sandy-loam near creek and on swamp flats, in woodland or closed-grassland.	X			X				
<i>Drosera indica</i> L. Weak perennial herb with pink, orange or white fls. On damp swamp flats in closed-grassland.	X			X				
<i>Drosera petiolaris</i> R. Br. ex DC. Perennial herb with rosette; fls white. In closed-grassland on swamp flats or woodland at W1; in dense grass under woodland in slight depression on basaltic slope at W4.	X			X		X		

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Drosera</i> sp. nov. ASG 12533, KFK 2014 Perennial herb developing a long stem with terminal rosette, and bright pink fls in racemes. In grassland on damp swamp flats.	X			X				
EBENACEAE								
<i>Diospyros ? ferrea</i> (Willd.) Bakh. ASG 12748, 12774 Shrub or small tree 2-4 m high. In low open-forest on basaltic slope, and in vine thicket.						X		
<i>Diospyros nitens</i> W. V. Fitzg. Tree to 12 m with smooth or somewhat rough dark grey bark; lvs dark green, glossy, paler beneath. In semi-deciduous vine thicket.						X		
EHRETIACEAE								
<i>Ehretia</i> sp. ASG 12292 Erect shrub to 2.5 m. In woodland on basaltic slope.		X						
ERYTHROXYLACEAE								
† <i>Erythroxylum ellipticum</i> R. Br. Shrub 1-2 m; in leaf only. On sandstone summit of Mt Trafalgar, in tall shrubland.						X		
EUPHORBIACEAE								
<i>Bridelia</i> sp. ASG 12807 Shrub to 1.5 m. In tall shrubland on sandstone summit of Mt Trafalgar.						X		
† <i>Drypetes</i> sp. ASG 12653, 12675.... Tree to 8 m. In semi-deciduous vine thicket.						X		
<i>Excoecaria agallocha</i> L. Mangrove with latex in stems; lvs pale green, dull.					X			
<i>Glochidion disparipes</i> Airy Shaw Shrub 1 m; male fls pale yellow. In shelter of lateritic boulders at edge of plateau, in open-forest.		X						
<i>Homalanthus populifolius</i> (Reinw.) Grah. Shrub or tree 6-12 m tall with roughish grey bark; lvs ± bright green, not shining; stems with latex; fruit green, turning dull red. In closed-forest and low closed-forest along stream in gully and on delta.					X			
<i>Petalostigma pubescens</i> Domin. Small tree to 5 m with rough, dark grey bark and orange fruit. In sandy loam, in woodland and low open-forest.	X		X	X				X
<i>Phyllanthus minutiflorus</i> F. Muell. Small ephemeral herb. In sandy woodland, near creek.				X				
<i>Phyllanthus</i> sp. ASG 12685 Slender perennial herb to 40 cm. Among sandstone boulders in vine thicket, at base of high cliff.						X		
<i>Poranthera microphylla</i> Brongn. Ephemeral, with white fls. In sandy woodland near creek.				X				
<i>Ricinocarpus rosmarinifolius</i> A. Cunn. ex Benth. Slender openly-branched shrub to 1 m among <i>Triodia</i> clumps in woodland, on rocky sandstone hills.					X			

SPECIES	SITE							CB
	E2	E3	E6	W1	W3	W4	W5	
GENTIANACEAE								
<i>Canscora diffusa</i> R. Br. Slender ephemeral herb; fls pink. Among basalt rocks in sheltered niches by creek (E3).		X					X	
GOODENIACEAE								
<i>Goodenia ? paniculata</i> Sm. KFK 2019, ASG 12539 Ephemeral herb to 40 cm with panicles of yellow fls. In sand and clay-loam in closed-grassland and woodland.	X			X				
<i>Goodenia ? sepalosa</i> F. Muell. ex Benth. ASG 12777 Sprawling ephemeral herb; fls yellow. In seepage area (now dry) in basaltic soil with woodland.						X		
<i>Goodenia</i> sp. PGW s.n. Decumbent plant, fls yellow.								X
HALORAGIDACEAE								
† <i>Haloragis chinensis</i> (Lour.) Merr. Straggling perennial herb; fls red. In damp clay-loam in <i>Eucalyptus-Melaleuca</i> woodland.				X				
<i>Haloragis leptotheca</i> F. Muell. Perennial herb to 40 cm. In sandy woodland near creek.				X				
<i>Haloragis</i> sp. ASG 12415 Ephemeral herb. In sandy loam in woodland near creek.				X				
<i>Myriophyllum</i> sp. KFK 2067 Aquatic on edge of pool. Not common.	X							
HYPERICACEAE								
<i>Hypericum gramineum</i> Forst. ?Ephemeral herb; fls yellow. On sandy creek banks.				X				
LAURACEAE								
<i>Cassytha</i> sp. KFK s.n. Only sterile specimens collected.	X		X					X
<i>Cryptocarya ? glaucescens</i> R. Br. ASG 12637, 12831, 12838, KFK 2092 Tree 8-12 m; bark dark grey; lvs shining. In rocky sandstone gully, by creek, in fringing forest (W3).			X		X	X		
<i>Cryptocarya</i> sp. ASG 12671 Tree 8 m; bark grey; fls pale green-cream, fruit green. In semi-deciduous vine thicket.						X		
LENTIBULARIACEAE								
† <i>Utricularia albiflora</i> R. Br. Minute herb with white fls. In damp clay-loam, in grassland near creek.				X				
<i>Utricularia chrysantha</i> R. Br. Slender herb with bright yellow fls. Common in damp or wet sand and clay-loam, on creek banks and in closed-grassland.	X			X				
<i>Utricularia kimberleyensis</i> C. A. Gardn. Fls mauve. On wet banks in grassland.	X							
† <i>Utricularia uliginosa</i> Vahl. Aquatic herb; inflorescence only emergent; fls white with pale blue-grey centre. In pools of creek.				X				

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Utricularia</i> sp. ASG 12507 Aquatic herb; fls cream-white, throat yellow, with yellow lines ending in pale purple spots on lower lip; calyx brownish purple. In pools of creek.				X				
<i>Utricularia</i> sp. ASG 12514 Small herb with bright yellow fls. At edge of pools.				X				
<i>Utricularia</i> sp. ASG 12535 Small herb; fls horizontal, solitary, white with mauve spur. In damp clay-loam, in grassland near creek.				X				
<i>Utricularia</i> sp. ASG 12538 Slender herb; fls solitary or few, orange-brown outside, purple inside with yellow centre. In damp clay in closed-grassland.				X				
<i>Utricularia</i> sp. KFK 1995 Free-floating aquatic, in residual pools on sandstone.	X							
LONGANIACEAE								
<i>Mitrasacme connata</i> R. Br. Erect ephemeral herb 20 cm; fls white with orange centre. In black-mud beside pools.	X							
<i>Mitrasacme</i> aff. <i>constricta</i> F. Muell. ASG 12395 Erect ephemeral herb; fls cream inside, pale brown outside; in sandy loam in grassland, near creek.				X				
<i>Mitrasacme foliosa</i> C. A. Gardn. ? Perennial herb; fls white, pale pink outside. In sand, in open-woodland near creek.	X			X				
<i>Mitrasacme</i> aff. <i>nudicaulis</i> Rein. ASG 12440 Ephemeral herb; fls white. In sandy loam in woodland.				X				
<i>Mitrasacme</i> sp. ASG 12413, KFK 2006 Ephemeral herb, fls white with yellow centre. In sand, in woodland near creek.	X			X				
<i>Mitrasacme</i> sp. ASG 12414, KFK 2064 Sprawling ephemeral herb; fls white. In sand in woodland, and in clay-loam in grassland.	X			X				
<i>Mitrasacme</i> sp. ASG 12418, KFK 2074 Erect ephemeral herb; fls white, aggregated. In sand, in woodland by creek.	X			X				
<i>Mitrasacme</i> sp. KFK 2024. Small herb with basal rosette and white fls. In damp sand, not common.	X							
<i>Strychnos lucida</i> R. Br. Shrub to 4 m with several stems. At edge of vine thicket.						X		X
LORANTHACAEAE								
<i>Amyema bifurcata</i> (Benth.) Tiegh. On <i>Eucalyptus miniata</i> . Foliage orange-green, fls red.							X	
<i>Amyema miquelii</i> (Lehm. ex Miq.) Tiegh. On <i>Eucalyptus tetradonta</i> . Fls pendulous, orange-red.		X						
<i>Amyema sanguineum</i> (F. Muell.) Dans. var. <i>pulcher</i> (Ewart) Barlow On <i>Eucalyptus miniata</i> . Fls red.					X		X	
<i>Decaisnina signata</i> (F. Muell. ex Benth.) Tiegh. On <i>Gardenia</i> sp. (W1), <i>Ficus</i> sp. (W4), <i>Banksia dentata</i> (E2).	X			X		X		

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Dendrophthoë acacioides</i> (A. Cunn. ex Benth.) Tiegh. Fls red or orange-red. On <i>Acacia sericata</i> (E2), <i>A. aulacocarpa</i> (W3), <i>Grevillea pteridifolia</i> and <i>Acacia</i> sp. (W1).	X			X	X			
† <i>Dendrophthoë odontocalyx</i> (F. Muell. ex Benth.) Tiegh. Fls orange. On deciduous unidentified tree.						X		
LYTHRACEAE								
† <i>Ammania indica</i> Lam. Ephemeral herb; fruit red. In damp, rocky creek bed in low woodland on basaltic slope.						X		
<i>Ammania multiflora</i> Roxb. Ephemeral herb; fls green, fruit red. In rocky creek bed.		X						
<i>Rotala diandra</i> (F. Muell.) Kochne Ephemeral herb on damp, sandy creek banks.				X				
† <i>Rotala roxburghiana</i> Wight Ephemeral herb. In damp clay-loam, in closed-grassland.	X			X				
MALVACEAE								
<i>Abutilon</i> sp. ASG 12763, PGW s.n. Much-branched, spreading shrub to 2 m; fls deep yellow. On sandstone scree in vine thicket (W3).					X			X
<i>Gossypium costulatum</i> Tod. <i>Hibiscus geranioides</i> A. Cunn. Perennial herb 20 cm, straggling. On sandy banks near creek.				X				X
<i>Hibiscus</i> ? <i>spinulosus</i> (W. V. Fitzg.) F. D. Wilson. ASG 12834 Perennial herb to 3 m; fls bright pink. In black clay-loam among sandstone rocks, in open-woodland.					X			
<i>Hibiscus</i> ? <i>zonatas</i> F. Muell. ASG 12475 Shrub 1 m; in leaf only; thorns on stem. On rocky sandstone hills, in low woodland.				X				
<i>Sida rhombifolia</i> L. ? Ephemeral herb, in fruit. On rocky sandstone hill, with low woodland; area burnt 2-3 years before.				X				
<i>Thespesia populneoides</i> (Roxb.) Kostesky								X
MELASTOMATACEAE								
<i>Osbeckia australiana</i> Naud. Perennial herb to 1 m; fls deep pink, stamens yellow. On damp creek banks.	X			X	X			
<i>Melastoma malabathricum</i> L. Shrub in leaf only. In sandy-loam near creek.					X			
MELIACEAE								
<i>Owenia vernicosa</i> F. Muell. Shrub or tree to 8 m with flaky bark. On rocky sandstone hills.				X	X		X	
<i>Xylocarpus granatum</i> Koen. Mangrove; tree to 20 m with stout, straight trunk, somewhat buttressed; lvs bright green, shining; fls pale green-cream with pink centre.					X			

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
MENISPERMACEAE								
<i>Tinospora smilacina</i> Benth. Sprawling liane, in leaf only (E3); flowering (white) but leafless (E6). On lateritic plateau, in woodland (E3); on sandstone outcrop (E6).		X	X					
? Genus ASG 12643 Strong liane; in leaf only. In semi-deciduous vine thicket.						X		
? Genus ASG 12765 Liane; in leaf only. In semi-deciduous vine thicket.						X		
MENYANTHACEAE								
† <i>Nymphoides ? hydrocharoides</i> (F. Muell.) Kuntze Aquatic herb; lvs floating on surface, fls emergent, yellow. In pools of creek.	X			X				
† <i>Nymphoides ? parvifolia</i> (Griseb.) Kuntze Aquatic herb; lvs floating on surface, fls emergent, white. In pools of creek.	X							
MIMOSACEAE								
<i>Acacia aulacocarpa</i> A. Cunn. ex Benth. Erect, rather open shrub to 4 m; bark grey-brown, smooth. On sandstone hills, in woodland.			X		X			
† <i>Acacia brevifolia</i> Benth. Openly-branched shrub to 2 m. On rocky sandstone hill.				X				
<i>Acacia delibrata</i> A. Cunn. ex Benth. Shrub or small tree to 10 m; bark flaky; pods viscid. On rocky sandstone hills, in woodland.			X		X			
<i>Acacia deltoidea</i> A. Cunn. ex Don Shrub, much branched, to 2 m; stems smooth. On quartzite outcrops.			X					
<i>Acacia dunnii</i> (Maiden) Turrill Shrub to 3 m with very large phyllodes and pods; stems glaucous. In sandy woodland.				X				
<i>Acacia gardneri</i> Maiden & Blakely Shrub to 4 m, stems glaucous. In sand or sandy-loam, on creek banks.					X	X		
<i>Acacia</i> aff. <i>gonocarpa</i> F. Muell. KFK 2160 Erect, bushy shrub ± 2 m. Common on sandstone outcrops. In pod only.								X
<i>Acacia hemignosta</i> F. Muell. Shrub 1-2.5 m with corky bark, little-branched. On lateritic plateau, in woodland.		X						
<i>Acacia</i> aff. <i>linaroides</i> Benth. ASG 12477, KFK 2078 Sprawling, viscid shrub to 1.5 m tall x 2 m broad. On sandstone hills, with <i>Triodia</i> and scattered trees; area burnt 2-3 years before.			X	X				
† <i>Acacia nuperrima</i> E. G. Baker Sprawling shrub 40 cm tall. In sandy woodland.				X				
<i>Acacia</i> aff. <i>pallida</i> F. Muell. ASG 12307 Shrub 1 m with thick stem and corky bark; stipules spinescent. On lateritic plateau, in woodland.		X						
<i>Acacia platycarpa</i> F. Muell. Shrub to 5 m; bark grey, smooth becoming rough. On rocky sandstone hills, in woodland.				X				

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Acacia plectocarpa</i> Benth. Shrub to 6 m, bark deeply fissured. Pods viscid, shiny, but not sticky.	X							
<i>Acacia ? retinervis</i> Benth. KFK 2179 Shrub 2 m, foliage glaucous. In <i>Eucalyptus</i> woodland.							X	
<i>Acacia sericata</i> A. Cunn. ex Benth. Shrub 2-4 m; bark grey, in flat flakes, brown beneath. On lateritic plateau, in woodland (E3); on rocky sandstone hill (W1).	X	X		X			X	
<i>Acacia stigmatophylla</i> A. Cunn. ex Benth. Shrub to 2 m; bark grey, ± smooth. On rocky sandstone hills, in woodland.					X		X	
<i>Acacia suberosa</i> A. Cunn. ex Benth. Shrub to 3 m with thick stem and corky bark. On basaltic slope, in low woodland.						X		X
<i>Acacia translucens</i> A. Cunn. ex Hook. Spreading shrub to 2 m. In shallow sand on sandstone hills, in low woodland.					X			
<i>Acacia tumida</i> F. Muell. ex Benth. Shrub to 4 m; bark grey-brown, ± smooth. In sandy woodland.	X		X	X			X	
<i>Acacia</i> aff. <i>tumida</i> ASG 12787 Slender, openly-branched shrub to 4 m; branchlets glaucous. Sandstone summit of Mt Trafalgar, in tall shrubland.						X		
<i>Acacia</i> sp. ASG 12484 Spreading shrub 3 m. On sandstone hills.				X				
<i>Albizia lebbek</i> (Willd.) Benth. Shrub to 3 m, on basaltic slope in woodland (E3). Spreading tree to 15 m with dark, fissured bark, in vine thicket (W4).		X				X	X	
<i>Albizia procera</i> Benth. Erect tree 15 m, bark smooth whitish. In eucalypt woodland fringing vine thicket (W5).							X	X
MORACEAE								
<i>Ficus hispida</i> L.f. Cauliflorous tree to 10 m, with latex; branchlets hollow; fruit in large sprays, green turning yellow. On sandstone scree, in vine thicket.						X	X	
<i>Ficus leucotricha</i> Miq. Tree 7 m, with smooth bark. Fruit yellow/green, silky hairy. In rocky sandstone gully, in low woodland above creek (W3).	X				X			
<i>Ficus obliqua</i> Forst.f. Erect tree to 4 m; fruit yellow-green. On sandstone plateau.			X					
<i>Ficus opposita</i> Miq. Shrub to 4 m, with latex; lvs scabrous, shining above; fruit green, turning brown. On basaltic slope in woodland (E3); on sandstone scree in semi-deciduous vine thicket (W4).		X				X		
<i>Ficus platypoda</i> A. Cunn. Spreading shrub or small tree to 6 m; fruit yellow. Fairly common on rocky sandstone hills in woodland (E6, W1, W4); at edge of lateritic plateau (E3).		X	X	X		X		

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Ficus platypoda</i> A. Cunn. var. <i>minor</i> Benth. Openly-branched, smooth-barked tree to 7 m. In semi-deciduous vine thicket.						X		
<i>Ficus racemosa</i> L. Spreading tree 20 m; fruit pale green, turning yellow-orange. On basaltic slope, in clearing in woodland.		X						
† <i>Ficus tinctoria</i> Forst.f. Large shrub; fruit brown. In semi-deciduous vine thicket.						X		
<i>Ficus virens</i> Ait. Spreading tree to 5 m. On sandstone cliff face.			X					
<i>Ficus</i> sp. KFK 2025, ASG 12482 Spreading shrub or tree to 4 m; fruit yellow, eaten by Bower Bird (<i>Chlamydera nucalis</i>) at E2. On rocky sandstone outcrops and hills.	X			X				
<i>Ficus</i> sp. ASG 12816 Shrub 70 cm, with linear-oblong lvs. Around sandstone rocks, in woodland.					X			
† <i>Malaisia scandens</i> (Lour.) Planch. Liane with latex, in leaf only. In rocky basaltic loam on slope above creek (E3); on sandstone scree in vine thicket (W4).		X				X		
MYRISTICACEAE								
<i>Myristica insipida</i> R. Br. Tree to 10 m; lvs shining above, pale and dull below; bark dark grey, ± rough; fruit pale green, becoming yellow. In fringing closed-forest along creek.					X			X
MYRSINACEAE								
<i>Aegiceras corniculatum</i> (L.) Blance. Mangrove; much-branched shrub to 4 m with "knuckle" roots; lvs ± dull green; fls white. Muddy (sometimes rocky) tidal flats.					X	X		X
MYRTACEAE								
<i>Calytrix achaeta</i> F. Muell. Spindly shrub to 2 m with small crowded lvs, fls cream. On lateritic plateau, in woodland and low woodland.		X						
<i>Calytrix brachychaeta</i> F. Muell. Shrub to 1.5 m; lvs ± bright green; fls cream or white. In rocky sandstone by creek (W1); on summit of Mt Trafalgar (W4); and sandstone cliff face (E6).			X	X		X		
<i>Calytrix conferta</i> A. Cunn. Shrub 1-4 m; fls pink with red stamens. In rocky sandstone soil, in woodland (W3), at base of cliff and on summit of Mt Trafalgar (W4), and sandstone cliff edge (W5).					X	X		X
<i>Calytrix microphylla</i> A. Cunn. Spindly shrub to 3 m, fls pink. Common on sandstone.			X					
<i>Eucalyptus bigalerita</i> F. Muell. Tree to 15 m with smooth cream bark. In rocky basaltic loam along creek.		X						

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Eucalyptus brachyandra</i> F. Muell. Tree to 6 m; bark rough, lvs soft. Crevices of sandstone outcrops (E2, E6).	X		X					
<i>Eucalyptus confertiflora</i> F. Muell. Bloodwood tree to 10 m; lower bark rough, upper smooth. In sand, in woodland near creek (W1); on sandstone talus slope in open-forest, at edge of vine thicket (W4).				X			X	
<i>Eucalyptus foelscheana</i> F. Muell. Bloodwood tree to 10 m; lower bark brown, flaky, upper smooth. On basaltic slopes, in woodland (E3) and open-forest (W4).		X				X		
<i>Eucalyptus houseana</i> W. V. Fitzg. ex Maiden Tree 20–30 m; bark smooth, white, becoming pale grey-brown before exfoliating; new bark cream. In sand or sandy-loam along creek banks.	X		X	X	X			
<i>Eucalyptus latifolia</i> F. Muell. Spreading tree to 12 m; lower bark rough, upper smooth, cream. On lateritic plateau, in woodland.	X	X	X					X
<i>Eucalyptus miniata</i> A. Cunn. ex Schau. Tree to 18 m; lower bark rough, fibrous, dark brown, upper smooth, cream; fls bright orange. In woodland and open-forest, on lateritic plateau (E3); sandy flats (W1), sandstone hills (E6, W3, W5).		X	X	X	X		X	
<i>Eucalyptus nesophila</i> Blakely Bloodwood tree to 15 m; bark rough. On lateritic plateau, in open-forest.		X						
<i>Eucalyptus papuana</i> F. Muell. Tree 6 m; bark grey, smooth, becoming white.							X	
<i>Eucalyptus perfoliata</i> R. Br. Tree to 6 m; depauperate, rough barked species. On sandstone.							X	
<i>Eucalyptus polycarpa</i> F. Muell. Bloodwood tree to 12 m; bark rough. Among sandstone rocks by swampy flat, in open-woodland.	X		X	X			X	
<i>Eucalyptus tectiflora</i> F. Muell. Tree to 10 m; bark rough, grey. Common on balastic slopes, in woodland and open-forest.						X	X	
<i>Eucalyptus tetradonta</i> F. Muell. Tree to 18 m; bark stringy, grey; fls white. On lateritic plateau and basaltic slopes, in woodland and open-forest.		X	X					
<i>Eucalyptus</i> sp. ASG 12788 Bloodwood; shrub with several stems to 4 m; bark flaky. On sandstone summit of Mt Trafalgar, in tall shrubland.						X		
<i>Eucalyptus</i> sp. ASG 12839 (“Migum”) Straggly tree to 5 m; bark white, smooth. In sandstone rocks at edge of valley.					X			
<i>Eugenia ? grandis</i> (Blume) Wight ASG 12624 Tree to 8 m; bark rough, grey. On rocky sandstone hill, in woodland.					X			
† <i>Eugenia</i> aff. <i>tierneyana</i> F. Muell. ASG 12536 Tree 18 m; bark ± smooth, grey; in bud. In sand on creek bank.				X				

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Melaleuca leucadendron</i> (L.) L. Paperbark tree to 30 m. In open-forest along creek banks.	X		X		X			
<i>Melaleuca ? nervosa</i> (Lindl.) Cheel ASG 12462 Tree 10 m; bark ± fibrous, fls pale green. Near sandstone outcrop at edge of swamp flat, in low woodland.				X				
<i>Melaleuca viridiflora</i> Soland. ex Gaertn. Paperbark tree 10–20 m; in fruit. On sandy creek banks (W1); in seepage area on basaltic slope in open-forest (W4).	X		X	X		X		
<i>Tristania</i> sp. KFK 2148 Spreading bushy shrub. On sandstone cliff edge.								X
<i>Verticordia cunninghamii</i> Schau. Shrub to 5 m; bark rough; fls cream. In sand or among sandstone rocks, in low woodland.	X		X	X	X			
<i>Xanthostemon paradoxus</i> F. Muell. Tree 5–6 m; among sandstone rocks on low hills with low woodland (W1) and in tall shrubland summit of Mt Trafalgar, (W4).				X		X	X	
ONAGRACEAE								
<i>Ludwigia parviflora</i> Roxb. Erect ephemeral herb. In damp clay, in closed-grassland.				X				
<i>Ludwigia suffruticosa</i> (L.) Walt. Perennial herb 1 m; fls yellow. In rocky basaltic loam along creek.		X						
OPILIACEAE								
† <i>Cansjera leptostachya</i> Benth. Liane; fruit orange. In semi-deciduous vine thicket.						X		
<i>Opilia amentacea</i> Roxb. Shrub 1–4 m with several stems or scrambling; may become shrub with thick corky bark; lvs bright green. On lateritic plateau in open-forest (E3); on sandstone summit of Mt Trafalgar, in tall shrubland (W4).		X				X		
PAPILIONACEAE								
<i>Abrus precatorius</i> L. Ephemeral climber, dead but with fruit at time of visit. Among basalt rocks near creek.		X						X
<i>Atylosia cinerea</i> F. Muell. ex. Benth. Shrub to 1.5 m. On rocky sandstone hill with low woodland; area burnt within previous 2–3 years.			X	X				
<i>Atylosia lanceolata</i> W. V. Fitzg. Very slender shrub to 2.5 m; with yellow fls. In open-forest on basaltic slope.		X						
<i>Atylosia</i> sp. nov. ASG 12608 Climber with yellow fls. Among rocks by creek, in woodland not far from mangroves.					X			
<i>Bossiaea bossiaeooides</i> (A Cunn. ex Benth.) A. B. Court Sprawling leafless shrub to 80 cm with flat stems; fls yellow. In sandy woodland and on sandstone outcrops.	X		X	X				X

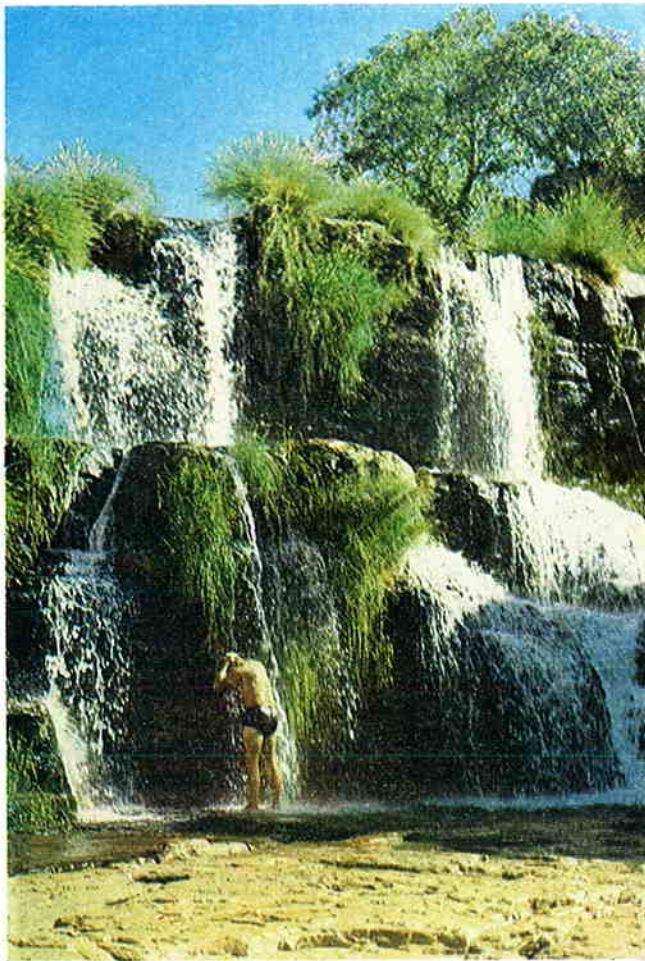
SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Canavalia maritima</i> (Aubl.) Thou. Climber; fls pink, inverted, sweetly scented. In woodland thicket on basaltic slope (E3) and in vine thicket (W4 and W5).		X				X	X	
<i>Crotalaria alata</i> Hamilt. Ephemeral herb with yellow fls. On sand bank in woodland by creek.				X				
† <i>Crotalaria calycina</i> Schranck. Ephemeral herb to 50 cm, in fruit. In rocky, basaltic soil by creek.		X						
<i>Crotalaria juncea</i> L. Ephemeral herb with yellow fls. In rocky, basaltic soil by creek.		X						
<i>Crotalaria laburnifolia</i> L. Slender shrub to 1.7 m with yellow fls. In rocky loam, in fringing open-forest along creek.						X		
<i>Daviesia reclinata</i> A. Cunn. ex Benth. Rather straggling shrub to 70 cm, with yellow fls. In sand over sandstone, in woodland.				X				
† <i>Desmodium ? heterophyllum</i> DC. ASG 12561 p.p. Prostrate ephemeral herb. On sand bank by creek.				X				
<i>Desmodium trichostachyum</i> Benth. Prostrate ephemeral herb. On sand bank by creek.				X				
<i>Dicerma biarticulatum</i> (L.) DC. Erect herb (? ephemeral) 1 m. In basaltic loam, in seepage area (now dry), with open-forest.						X		
<i>Erythrina vespertilio</i> Benth. Small tree to 4 m, lvs fallen; fls orange-red. In laterite or basaltic soil at edge of plateau, with woodland.		X						
<i>Indigofera hirsuta</i> L. Straggling ephemeral herb; fls orange-pink. On sand bank by creek.				X				
<i>Indigofera linifolia</i> Retz. Ephemeral herb. In rocky basaltic soil near creek.		X						
<i>Indigofera</i> sp. ASG 12309 Erect perennial herb to 40 cm. In basaltic soil in woodland.		X						
<i>Jacksonia thesioides</i> A. Cunn. ex Benth. Small slender shrubs ± 3 m growing alongside creeks.	X		X					
<i>Jacksonia</i> sp. ASG 12445 Sprawling shrub; calyx red, corolla yellow. In sand, in woodland.				X				
<i>Jacksonia</i> sp. ASG 12524 Erect shrub 1-2 m, not in flower. In sand, in woodland.				X				
<i>Psoralea badocana</i> Benth. Perennial herb 1-3 m; fls pink. On rocky basalt slopes, in low woodland		X				X		
<i>Psoralea virens</i> W. V. Fitzg. ? Ephemeral herb to 2 m; fls pink, in seepage area (now dry), in basaltic loam with woodland						X		
<i>Rhynchosia</i> aff. <i>minima</i> DC. ASG 12287 Small liane with glandular hairs; fls yellow. In low woodland on basaltic slope.		X						
<i>Tephrosia phaeosperma</i> F. Muell. Slender herb to 1 m (? ephemeral); fls deep pink. In basaltic soil, in dense grass near creek in woodland.						X		



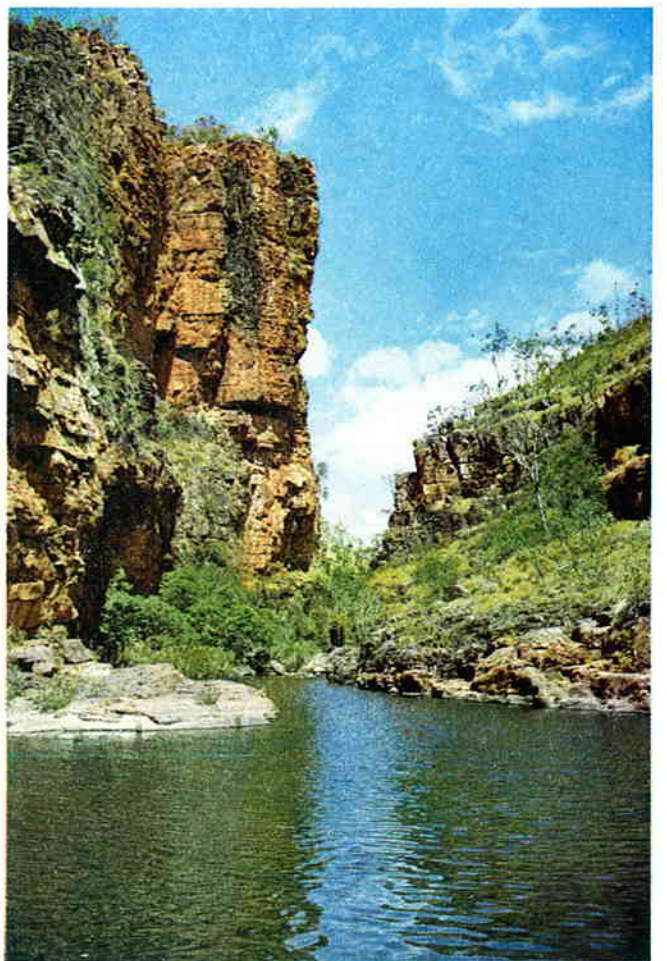
Prince Regent River at W2. Entrance to Cascade Creek at Right.



King Cascade where Cascade Creek falls into the Prince Regent River.



Near the top of King Cascade.



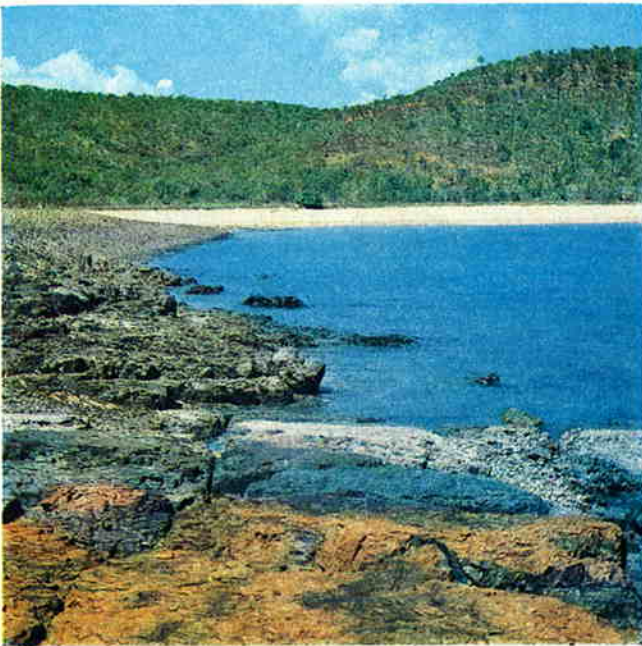
Part of the gorge on Pitta Creek.



Scaly-tailed Possum (*Wyulda squamicaudata*).



Knob-tailed Gecko (*Nephrurus asper*).



Careening Bay, Port Nelson.



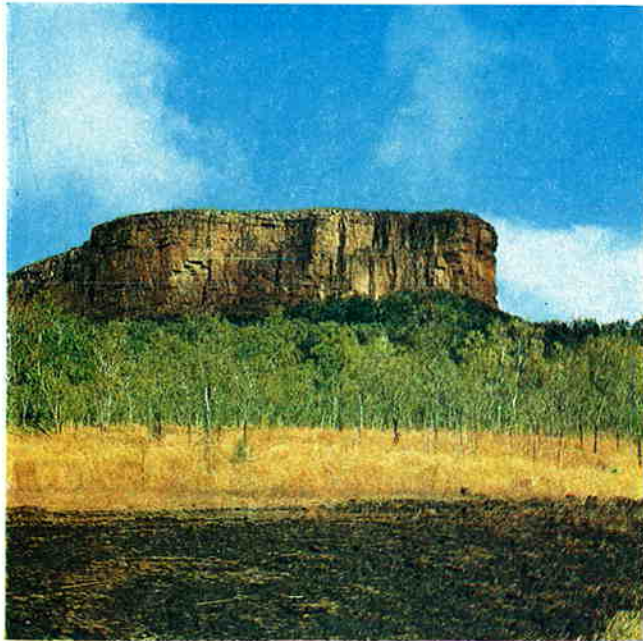
Mangroves in St George Basin.



Brown Tree-Snake (*Boiga fusca*).



Black Grass-Wren (*Amytornis housei*).



Mt Trafalgar looking North-west.



Upper Prince Regent River near E1.



Gorge on Pitta Creek. Note helicopter.



Wanjina Art in Malubirindji Cave, Wulunge Chasm, Gundarara Creek, E2.



A Marshwort (*Nymphoides ? hydrocharoides*) ASG 12508 at W1.



The Blue Tiger Butterfly (*Danaus hamatus hamatus*).

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Tephrosia</i> aff. <i>polyzyga</i> F. Muell. ASG 12473 Open shrub 70 cm tall. On rocky sandstone hill, among <i>Triodia</i> and scattered low trees; area burnt several years previously.				X				
<i>Tephrosia</i> sp. ASG 12472 Perennial herb 70 cm. On rocky sandstone hill, among <i>Triodia</i> and scattered low trees; area burnt several years previously.				X				
<i>Tephrosia</i> sp. ASG 12755 p.p. Slender herb to 1 m; fls deep pink. In basaltic soil, in dense grass near creek in woodland.						X		
<i>Tephrosia</i> sp. ASG 12806 Shrub 1 m. In tall shrubland on sandstone summit of Mt Trafalgar.						X		
? Genus ASG 12630, KFK 2176, KFK s.n. Slender shrub 1 m. In woodland on rocky sandstone hills.	X		X		X		X	
? Genus ASG 12550 Sprawling perennial herb, in old fruit. In sandy woodland near creek.				X				
PASSIFLORACEAE								
<i>Adenia heterophylla</i> (Bl.) Koord. subsp. <i>australis</i> (DC) de Wilde Liane. In semi-deciduous vine thicket.						X		
<i>Passiflora foetida</i> L. Slender liane with tendrils; lvs soft, \pm bright green. On basaltic slope, in woodland (E3); on swampy delta in woodland (W3).		X				X		
PITTOSPORACEAE								
<i>Citriobatus spinescens</i> (F. Muell.) Druce Many-stemmed shrub to 6 m. In semi-deciduous vine thicket.						X		
PLUMBAGINACEAE								
<i>Aegialitis annulata</i> R. Br.								X
PORTULACACEAE								
<i>Calandrinia quadrivalvis</i> F. Muell. Ephemeral herb; lvs succulent, fls deep, bright pink. In sand, in woodland near creek.	X			X				
† <i>Portulaca clavigera</i> Geesink								X
PROTEACEAE								
<i>Banksia dentata</i> L.f. Tree to 6 m; bark \pm rough; lvs dark green above, pale below; in young fruit. On damp sandy flats, in woodland and low woodland.	X		X	X				
<i>Grevillea agrifolia</i> A. Cunn. ex Benth. Shrub to 5 m; bark rough, dark brown; in fruit. In sand, in woodland.	X			X				
<i>Grevillea heliosperma</i> R. Br. Tree 5–8 m; bark rough, dark grey; in fruit. In low woodland or low open-forest, on lateritic plateau (E3), in sand (W1), on rocky sandstone hills (E6 and W3).		X	X	X	X			

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Grevillea mimosoides</i> R. Br. Erect, little-branched shrub to 3 m; bark corky; fls cream. On basaltic slopes in woodland.		X				X		
<i>Grevillea pteridifolia</i> Knight Shrub or tree to 5 m. On sandy loam flats, in low woodland.	X		X	X				
<i>Grevillea pyramidalis</i> A. Cunn. ex R. Br. Erect shrub 1-4 m; bark exfoliating in stiff brown flakes. On lateritic plateau in open-forest (E3); on sandstone summit of Mt Trafalgar in tall shrubland (W4).		X				X	X	
<i>Grevillea refracta</i> R. Br. Erect shrub to 3 m; fls red (W1); in fruit (W4). In sandy woodland (W1); on basaltic slope in woodland (W4).			X	X		X	X	
<i>Grevillea wickhami</i> Meisn. Spreading shrub 2 m; fls red. On rocky sandstone hills, in low woodland.				X				
<i>Hakea arborescens</i> R. Br. Slender tree to 5 m; bark corky; in fruit. On basaltic slope, in woodland.		X	X			X		
<i>Persoonia falcata</i> R. Br. Small tree to 5 m; bark brown, flaky; fls yellow. In sandy woodland (W1); on rocky sandstone hill, in woodland (W3 and W5).			X	X	X		X	
<i>Stenocarpus cunninghamii</i> R. Br. Shrub or small tree 2-5 m; in leaf only. On rocky sandstone hill, in low woodland (W1); in sandy woodland (W1); on sandstone scree at base of cliff of Mt Trafalgar (W4); sandstone scree slope (E6).				X		X	X	
RHAMNACEAE								
<i>Alphitonia excelsa</i> (Fenzl.) Benth. Slender, open shrub 3-4 m; fruit dry, black, shining. Bark (when freshly removed) with strong liniment odor. On steep slope of rocky sandstone valley (W3) and on edge of liane forest (W5).					X		X	
<i>Cryptandra intratropica</i> W. V. Fitzg. Slender shrub to 1 m; lvs grey-green; fls pale yellow. In rocky sandstone soil, at foot of cliff and on summit of Mt Trafalgar.						X	X	
RHIZOPHORACEAE								
<i>Bruguiera exaristata</i> Ding Hou Mangrove; tree with buttressed trunk; lvs shining; fls cream, anthers brown. On muddy tidal flats.					X	X		
<i>Bruguiera ? gymnorhiza</i> (L.) Lam. ASG 12618 Mangrove; tree to 20 m with proproots; lvs shining. On muddy tidal flats.					X			
† <i>Bruguiera parviflora</i> (Roxb.) Wright and Arn. Mangrove; tree to 15 m, buttressed; lvs shining; fls green. On muddy tidal flats.					X	X		
<i>Carallia brachiata</i> (Lour.) Merrill Shrub or tree 4-8 m; fls greenish cream. In rocky sand in fringing forest along creek.					X		X	

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Ceriops tagal</i> (Perr.) C. B. Robinson Mangrove; tree to 8 m; lvs ± bright green, shining. On muddy tidal flats.					X	X		X
<i>Rhizophora stylosa</i> Griff. Mangrove; tree with arching proproots. On muddy tidal flats.						X	X	X
RUBIACEAE								
<i>Borreria australiana</i> Specht Ephemeral herb; fls white, mostly over. In sand, in woodland near creek.				X				
<i>Gardenia ? keartlandii</i> Tate ASG 12314 Shrub 1 m; bark red-brown, somewhat rough. On lateritic plateau, in open-forest.		X						
<i>Gardenia megasperma</i> F. Muell. Tree to 5 m, branches gnarled; fruit large, ovoid, green; lvs mainly clustered at ends of branches. On sandstone.			X				X	
<i>Gardenia ? resinosa</i> F. Muell. ASG 12584, 12805 Shrub or small tree 2–6 m; fruit green. In rocky sand- stone soil, in woodland (W3) and on summit of Mt Trafalgar in tall shrubland (W4).					X	X		
<i>Gardenia</i> sp. ASG 12517 Tree 5m; bark rough, dark. On sandstone outcrop by creek, with low woodland.				X				
<i>Nauclea coadnata</i> J. E. Sm. Tree 5m, bark rough, lvs mainly clustered at ends of branches. Along creek bed, not common.			X					
<i>Oldenlandia galioides</i> (F. Muell.) F. Muell. Small ephemeral herb; fls white. In sandy woodland near creek (W1); in drying clay near pool below vine thicket (W4); and forming tangled mats in swampy grassland (E2).	X			X		X		
<i>Oldenlandia scleranthoides</i> (F. Muell.) Jackson Prostrate ephemeral herb; fls pale pink. On sand banks near creek.				X				
† <i>Pavetta granitica</i> Bremek.								X
† <i>Randia cochinchinensis</i> (Lour.) Merr. Tree to 6 m, sometimes many-stemmed; bark smooth, grey. On rocky sandstone slope, in open-forest (W3); on basaltic slope in woodland (W4).					X	X		
RUTACEAE								
† <i>Glycosmis pentaphylla</i> (Retz.) DC. Shrub 4–5 m. In semi-deciduous vine thicket.						X		X
† <i>Micromelum minutum</i> (Forst.f.) W. & A. Shrub 4 m; fruit green. In semi-deciduous vine thicket.						X		
† <i>Paramignya trimera</i> (Oliv.) Burkill Shrub or tree to 8 m; bark smooth; lvs shining; fls yellow-green, sweetly scented. In semi-deciduous vine thicket.						X		X
SANTALACEAE								
<i>Exocarpos latifolius</i> B. Rr. Shrub or tree 2–10 m; fls reddish-brown. In semi- deciduous vine thicket.						X		

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Santalum lanceolatum</i> R. Br. Spindly tree to 3 m, fls white. In crevices of sandstone outcrops.	X						X	
SAPINDACEAE								
<i>Atalaya ? salicifolia</i> Blume ASG 12271, ASG 12703, PGW s.n. Shrub 2-4 m, in leaf only On basaltic slope in woodland (E3); on sandstone scree over basalt, at edge of vine thicket (W4).		X				X		X
<i>Atalaya ? variifolia</i> (F. Muell.) F. Muell. ex Benth. Shrub 1 m. At edge of lateritic plateau, in open-forest.		X						
<i>Distichostemon hispidulus</i> (Endl.) Baill. Spreading shrub to 1.5 m; in fruit. On rocky sandstone hills, in low woodland or woodland.				X	X		X	
<i>Dodonaea</i> sp. Shrub 2-5 m; lvs somewhat viscid; in leaf only. Among sandstone rocks in vine thicket, and on summit of Mt Trafalgar in tall shrubland.						X		
SAPOTACEAE								
<i>Mimusops elengi</i> L. Much-branched, spreading tree 4-9 m; grey bark. Among basalt rocks along creek (E3). Tree 15 m; bark grey, ± tessellated. In rocky sandstone soil near mangroves (W3).		X			X			X
<i>Planchonella arnhemica</i> (F. Muell.) van Royen Tree 5-9 m; bark corky; fruit brownish-green. In sand or sand over limestone, in open-forest or low woodland.				X				
<i>Pouteria sericea</i> (Ait.) Bachr. Usually a shrub 1.5-5 m, sometimes with several stems and much-branched; fls cream (seen only at W3). Among lateritic boulders in woodland (E3); on sandstone (E6); on basaltic slope in woodland (W4); on rocky sandstone summit of Mt Trafalgar, in tall shrubland (W4); on rocky sandstone slope of valley (W3); in the vine thicket below Mt Trafalgar it occurs as a tree to 10 m, with rough grey bark.	X	X			X	X		X
SCROPMULARIACEAE								
<i>Buchnera linearis</i> R. Br. Straggling herb, growing among hummock grasses on sandstone.							X	
<i>Buchnera ramosissima</i> R. Br. Ephemeral herb to 1.5 m; fls white. On rocky sandstone hills, in low woodland or woodland.				X	X			
<i>Buchnera</i> sp. ASG 12422 Ephemeral; fls pale pink to mauve. In sand, in woodland by creek.				X				
<i>Hemiarrhena plantaginea</i> Benth. Ephemeral herb with rosette; fls blue to pale purple. In sand, in woodland near creek.	X			X				
<i>Ilysanthes</i> sp. KFK 2048 Ephemeral herb with rosette; fls blue with white throat. In wet sand near creek.	X							

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
† <i>Limnophila chinensis</i> (Osbeck) Merr. Perennial herb, aquatic or on damp sand; fls pink. Along creek.				X				
<i>Lindernia lobelioides</i> (F. Muell.) F. Muell. Ephemeral herb; fls bright purple. In damp clay- loam, in closed grassland.	X			X				
† <i>Lindernia subulata</i> R. Br. var. <i>glanduligera</i> Specht. Sprawling ephemeral herb; fls purple. In damp clay- loam, in closed-grassland.				X				
<i>Lindernia</i> sp. ASG 12434 Ephemeral herb; fls mauve, purple in throat. In damp clay-loam, in closed-grassland.				X				
<i>Mimulus uvedaliae</i> Benth. Ephemeral herb; fls purple, eye yellow and white. In clay-loam, at edge of closed-grassland.				X				
<i>Stemodia</i> ? <i>flaccida</i> W. V. Fitzg. Aromatic ephemeral herb; fls white. In crevices of sandstone rock walls, in valley.					X			
<i>Stemodia lythrifolia</i> F. Muell. Aromatic ephemeral herb; fls pale purple, mostly over. On lateritic plateau, in open-forest (E3); in sandy woodland (W1); on sandstone (E6 and W5).		X	X	X			X	
<i>Striga curviflora</i> Benth. ? Ephemeral herb, fls pale lilac. On damp sand bank near residual pools.	X							
SOLANACEAE								
<i>Solanum cataphractum</i> A. Cunn. ex Benth. Spindly shrub to 70 cm on sandstone scree slope (W5); on sandstone summit of Mt Trafalgar, in tall shrubland (W4).							X	
<i>Solanum</i> sp. KFK 2063 Spindly shrub to 0.5 m, fls blue/mauve. In crevices of sandstone outcrops.	X							
<i>Solanum</i> sp. ASG 12490 Spreading, openly branched-shrub 1.5 m; fls pale purple. On rocky sandstone hill, in open-woodland, area burnt 2-3 years before.				X				
<i>Solanum</i> sp. ASG 12632, 12832 Spreading shrub 70 cm; fls pale purple. On rocky sandstone hills, in woodland.					X			
<i>Solanum</i> sp. ASG 12835 Shrub to 1.5 m; fls pale mauve. In damp clay-loam, in hollow on sandstone hillside, and on creek delta.					X			
STACKHOUSIACEAE								
<i>Stackhousia viminea</i> Sm. Slender ephemeral, fls yellow. In sandy woodland (W1) and on basaltic slope in woodland (W4).				X		X		
STERCULIACEAE								
<i>Brachyhiton diversifolium</i> R. Br. Erect tree 7-13 m; bark grey, tessellated; light green leaves; old fruit present. On basaltic slope, in open- forest (E3); common alongside creek (E6).		X	X					

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Brachychiton</i> sp. ASG 12821 Tree 7 m, lvs fallen; bark rough, corky; fls pale red. On rocky sandstone slope, in woodland.					X			
<i>Helicteres rhynchocarpa</i> W. V. Fitzg. Erect spindly herb ± 2 m growing on the sandstone scree slope.							X	
<i>Helicteres</i> sp. ASG 12687, 12794 Spreading shrub 1-3 m, in leaf only. On scree slope among tall scrub at foot of cliff, and on sandstone summit of Mt Trafalgar, in tall shrubland.						X		
<i>Sterculia viridiflora</i> W. V. Fitzg. Erect, deciduous tree growing among sandstone boulders. Fls pink around edge, other parts green.			X					
<i>Sterculia viscidula</i> W. V. Fitzg. Spreading tree 5 m, lvs fallen; fls glandular-pubescent, deep pink-red. On rocky basaltic slope, in woodland.						X		
<i>Waltheria indica</i> L. ? Perennial herb; fls yellow. On sandy banks by creek.				X				
STILAGINACEAE								
<i>Antidesma ghaesembilla</i> Gaertn. Shrub 1 m; fls greenish-cream, turning pink. In rocky basaltic loam by creek (E3).		X						X
STYLIDIACEAE								
† <i>Stylidium ceratophorum</i> O. Schwartz Erect basally rosetted annual with deep orange fls. Common on wet, sandy banks.	X							
<i>Stylidium floodii</i> F. Muell. Ephemeral herb; fls bright pink. Common in sandy woodlands.	X			X				
<i>Stylidium</i> aff. <i>floodii</i> F. Muell. ASG 12468 Fls pale pink, with red markings on upper apices and on outside. In sandy woodland.				X				
<i>Stylidium multiscapum</i> O. Schwartz Erect, basally rosetted ephemeral herb; fls magenta, mottled outside. Common on wet sandy banks.	X			X				
<i>Stylidium muscicola</i> F. Muell. Delicate ephemeral; fls pink. In sheltered sandstone crevices in valley.					X			
<i>Stylidium</i> aff. <i>muscicola</i> F. Muell. ASG 12547 Ephemeral herb; fls cream outside, pink inside with the upper lobes white. In damp clay loam, in grass- land.				X				
<i>Stylidium pachyrrhizum</i> F. Muell. Ephemeral herb with large fleshy basal rosette. Upper corolla lobes reduced, white; lower lobes magenta; appendages with orange spot.	X							
<i>Stylidium rotundifolium</i> R. Br. Basally rosetted ephemeral herb; fls pale mauve with yellow throats, yellow outside. In damp clay-loam, in closed-grassland.	X			X				
<i>Stylidium</i> aff. <i>rotundifolium</i> R. Br. ASG 12501 Ephemeral herb; fls white with pale pink margins and yellow throats. On edge of pools along creek.				X				

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
<i>Styliidium rubriscapum</i> W. V. Fitzg. Perennial herb with red stem; fls pink upper lobes red-tipped. In sandy-loam, in closed-grassland.				X				
<i>Styliidium</i> sp. ASG 12424 Ephemeral herb; fls creamy-white outside, lower petals pink inside, upper white. In clay-loam, in closed-grassland.				X				
THUNBERGIACEAE								
† <i>Thunbergia</i> ? <i>arnhemica</i> F. Muell. ASG 12370 Slender liane; fls white, mostly over. In basaltic loam, in thicket in woodland.		X						
TILIACEAE								
<i>Corchorus sidoides</i> F. Muell. Shrub 70 cm, in fruit. On rocky sandstone hill, in low woodland; area burnt 2-3 years before.				X				
<i>Grewia polygama</i> Roxb. Small shrub to 50 cm, in leaf only. Edge of lateritic plateau, in woodland; area burnt 2-3 years before.		X						X
? <i>Grewia</i> sp. ASG 12631 Woody shrub 2.5 m; in leaf only. On rocky sandstone hill, in woodland.					X			
<i>Grewia</i> sp. ASG 12693 Openly branched shrub to 3 m; in leaf only. On sandstone scree, at edge of vine thicket.						X		
† <i>Triumfetta</i> ? <i>denticulata</i> Benth. KFK 2031, ASG 12836 Much branched shrub from ground 1-3 m; fls yellow; fruits in terminal fascicles breaking off when touched. On sandstone hills.	X				X			X
<i>Triumfetta</i> ? <i>micrantha</i> F. Muell. ASG 12493 Shrub to 1 m. On rocky sandstone hill, in low woodland; area burnt 2-3 years before.				X				
<i>Triumfetta</i> sp. KFK 2032 Spindly shrub ± 1 m with large hairy fruits. On sandstone.	X							
? <i>Triumfetta</i> sp. ASG 12476 Shrub 1.5 m; in leaf only. On rocky sandstone hill, in open-woodland; area burnt 2-3 years before.				X				
<i>Triumfetta</i> sp. ASG 12629 Perennial herb 1 m. On rocky sandstone hill, in woodland.					X			
ULMACEAE								
<i>Celtis philippensis</i> Blanco Scrambling shrub. In rocky basaltic loam, by creek (E3). Tree 15 m, buttressed, with smooth grey bark. In vine thicket (W4).		X				X		X
<i>Trema aspera</i> (Brongn.) Blume Shrub 2 m.								X
URTICACEAE								
† <i>Boehmeria</i> ? <i>glomerulifera</i> Miq. Weak straggly plant 30 cm high.								X

SPECIES	SITE							
	E2	E3	E6	W1	W3	W4	W5	CB
VERBENACEAE								
<i>Clerodendrum floribundum</i> R. Br.						X		
Shrub 5 m; in fruit. By vine thicket.								
<i>Clerodendrum ? ovalifolium</i> (A. Juss.) Bakh. KFK 2136							X	X
Straggly bush growing in crevices of sandstone cliff face.								
<i>Vitex glabrata</i> R. Br.								X

New records for W.A. are marked with a dagger (†).

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PART V

MAMMALS OF THE PRINCE REGENT RIVER RESERVE, NORTH-WEST KIMBERLEY, WESTERN AUSTRALIA.

By N. L. McKENZIE,¹ A. CHAPMAN² and W. K. YOUNGSON¹

INTRODUCTION

Mammals were collected on the Prince Regent River Reserve as part of the biological survey undertaken in August 1974. Twelve collecting sites were selected (see Miles, Kenneally and George, this publication) to cover major botanical and geological formations in the reserve. The list of species includes identifications of mammals collected and lodged in the Western Australian Museum (accession numbers : M 12237-M 12412), sight records, and identifications based on scats, skulls and other fragments.

One monotreme, twelve marsupials, ten native rodents and ten chiropterans were recorded and these included an undescribed species of *Pseudomys*. *Canis familiaris dingo* was present. The marsupials included five Macropodidae, one Phalangeridae, one Petauridae, two Peramelidae and two Dasyuridae. Among the bats were three species of Megachiroptera and seven of Microchiroptera. Two feral species were recorded; *Bos taurus* and *Felis catus*. Several dolphins were observed in the estuary of the Prince Regent River but they were not identified.

COLLECTING TECHNIQUES

Four field teams were operating simultaneously and each spent five or six nights at three different sites. Each team had 20 kill-traps, 20 small live-traps and, on average, 8 large live-traps. These were set for approximately five nights at each site. The two sizes of treadle-type live-traps were 8 x 10 x 33 cm and 17 x 17 x 50 cm respectively. The kill-traps were conventional steel rat-traps. A universal bait based on peanut butter and oats was used, although meat was substituted in some circumstances.

Head-torches were used for spotlighting at night, and caves, crevices and hollow trees were examined during the day. Predator scats were collected and all mammal sightings recorded. Most Megachiroptera were shot in their roosts in trees although two were mist-netted. Microchiroptera were shot at dusk and at night in open areas such as watercourses and bogs although one was collected in a cave and another was mist-netted.

Mammals were measured, preserved and their habitats described in the field. The breeding condition of female specimens was assessed by laboratory dissection. Stomach contents of *Dasyurus hallucatus* and *Canis familiaris dingo* were examined.

MAMMAL HABITATS

The geology and vegetation of the reserve has been described elsewhere, as has the habitat variability of the different camp-sites (see Miles, Kenneally and George, this publication). From these descriptions it is possible to distinguish fourteen habitats in which mammals were systematically collected. These are summarised below using the geological abbreviations of Williams and Sofoulis (1971).

KING LEOPOLD SANDSTONES (Pkl, Qa and Czs).

1. **Sandy Plateau Woodlands.** Quaternary residual sands of relatively uneroded regional divides supported low woodlands to low open-forests of *Eucalyptus* trees over *Sorghum*. Occasional isolated sheets of exposed sandstone were present.
2. **Bog Complexes on Plateaux.** Bog complexes of native grasses and small herbs grew on expanses of swampy alluvials which occurred on the regional divides mentioned in the previous habitat.
3. **Plateau Creek Formations.** Narrow strips of fringing low open-forests to low woodlands, including *Eucalyptus*, *Pandanus*, *Acacia* and native grasses, grew along creeks on regional divides.
4. **Sandstone Gully Formations.** Fringing closed-forests to open-woodlands along gullies in rugged sandstone country where sandstone rock formed the bed and banks of the watercourses. Species included Cadjeput species complex, *Pandanus*, and *Ficus* with small patches of leaf-litter and native grasses underneath. At higher levels, where the gullies were shallower, *Plectrachne* actually intruded into the watercourses. Trees, mainly *Ficus* and *Pandanus*, were patchy or sparse. At its highest levels this habitat eventually merged with plateau creek formations. E2 was on such a transition.
5. **Vine Thicket.** Semi-deciduous vine thickets as low closed-forests were found in gorges and below steep cliffs.
6. **River Fringing Formations.** A narrow strip of fringing closed-forests to fringing woodlands of *Melaleuca*, *Pandanus* and some *Eucalyptus* grew along the watercourses between rugged sandstone ridges. This habitat included areas (ca. 20-30 m wide) of closed native grassland which formed intermittent ground cover where there was deep sandy alluvium along the banks of the watercourses.
7. **Rugged Boulder Country.** Rugged slopes, hills, plateaux and cliff areas of dissected sandstone supported low open-forests to low open-woodlands

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with a *Plectrache* understorey. Upperstorey elements varied in their dominance between *Eucalyptus*, *Owenia* and *Acacia* with *Ficus* and *Adansonia* sometimes present.

8. **Valley Woodlands.** Flat and gently sloping sandy soils were found in the large river valleys. These supported low *Eucalyptus* woodlands over *Sorghum* grasses. Isolated sandstone boulders and small patches of *Plectrache* were sometimes present.

Valley woodlands ranged from less than 100 m wide at E1 to more than 5 km wide at E6.

CARSON VOLCANICS (Pkc).

9. **Vine Thickets.** Semi-deciduous vine thickets occurred as low closed-forests on the steep slopes beneath the sheer cliffs of Mt Trafalgar (W4) and under the Python Cliffs at W5. *Bombax*, *Albizia*, *Ficus* and creepers were some of the common plants.

TABLE 1

NUMBERS OF TERRESTRIAL MAMMAL SPECIES COLLECTED AS ENTIRE SPECIMENS TABULATED AGAINST THE HABITATS IN WHICH THEY WERE COLLECTED.

Habitats	Species															
	<i>Petrogale brachyotis</i>	<i>Peradorcas concinna</i>	<i>Wyulda squamicaudata</i>	<i>Isoodon m. macrourus</i>	<i>Isoodon auratus</i>	<i>Dasyurus hallucatus</i>	<i>Antechinus affn. macdonnellensis</i>	<i>Mesembriomys macrurus</i>	<i>Conilurus penicillatus</i>	<i>Zyzomys woodwardi</i>	<i>Zyzomys argurus</i>	<i>Rattus tunneyi</i>	<i>Melomys</i> sp.	<i>Pseudomys nanus</i>	<i>Pseudomys delicatulus</i>	<i>Pseudomys</i> sp.
1. Sandy Plateau Woodlands (Czs).														2	1	
2. Bog Complexes on Plateaux (Czs)						1										
3. Plateau Creek Formations (Czs)																
4. Sandstone Gully Formations (Pkl)		2				4				8	1					
5. Vine Thickets (Pkl)																
6. River Fringing Formations (Qa)				7						9	21	2	4	2		
7. Rugged Boulder Country (Pkl)....	2	1	1		4	3	2		5	25			1	1		
8. Valley Woodlands (Qa)										1			2	1	1	
9. Vine Thickets (Pkc)					3	1		3		1						
10. River Fringing Formations (Pkc)				2							3		1			
11. Low Woodlands (Pkc)					1	1			1		6		1			
12. Mesa Low Open-Forest (Tp)										1			1			
13. Rugged Boulder Country (Pkw)																
14. Low Closed Forests (Qc)																

10. **River Fringing Formations.** Open-forests to open-woodlands of Cadjeput species complex, *Eucalyptus*, *Terminalia*, *Pandanus* and patches of native grassland occurred in fringing communities along the banks of the watercourses.
11. **Low Woodlands.** This habitat covered most of the Carson Volcanics. It consisted of rounded hills and gently sloping country covered with deep brown soil supporting low woodlands to low open-forests of *Eucalyptus* over usually dense *Sorghum* about 1 m high. Near W4 there were areas of emergent *Eucalyptus* in *Sorghum* grassland.

LATERITES (Tp).

12. **Mesa Low Open-Forest.** A small lateritised mesa on Carson Volcanics supported a low open-forest of *Eucalyptus* under which were native grasses. Small patches of *Plectrachne* occurred in occasional clearings. Around the edge of the plateau were break-aways with massive laterite boulders.

WARTON SANDSTONE (Pkw).

13. **Rugged Boulder Country.** Rugged plateaux, cliffs and boulder-strewn slopes on Warton Sandstone

which supported a low open-woodland of *Eucalyptus* and some *Acacia* over *Plectrachne*. It intruded as scree slopes into the vine forest of the Carson Volcanics at W5 and on top of Mt Trafalgar it supported *Acacia* over *Plectrachne*.

MANGROVES (Qc).

14. **Low Closed Mangrove Forests.** On tidal mud flats in the estuaries of the Prince Regent and Roe Rivers; in sheltered bays and inlets such as St George Basin and along the coast.

RESULTS

An annotated list of species is presented below. In Table 1 the number of specimens of each species is plotted against the habitat in which they were recorded. It is important to note that equal collecting effort was not made in the different habitats because some, such as the Hart Dolerites and the Warton Sandstones, were of comparatively limited extent. Most of the collecting was limited to habitats of the dominant King Leopold Sandstone and Carson Volcanics.

LIST OF SPECIES

MARSUPIALIA

FAMILY MACROPODIDAE

Macropus robustus Gould. **Euro.**

Two skulls were collected at E1, one from a freshly dead animal. Large macropods thought to be *M. robustus* were seen at many sites.

Macropus antilopinus (Gould). **Antelope Kangaroo.**

Several individuals were sighted at E6 in valley woodlands. The species was also seen on Beverley Springs Station.

Macropus agilis (Gould). **Sandy Wallaby.**

A skull was collected at E4 where individuals were sighted in valley woodlands and river fringing formations.

Petrogale penicillata (Griffith). **Brush-tailed Rock-Wallaby.**

This species was sighted twice during a brief daytime visit to the top of Mt Trafalgar. The animals were in an area of rugged Warton Sandstone plateau with *Acacia* over *Plectrachne*.

Petrogale brachyotis Gould. **Short-eared Rock-Wallaby.**

One sub-adult male and one female with a 48 g pouch young were shot on rugged boulder country on the side of the valley at E4 on 18 August 1974. A small group of 3 or 4 was observed near W2 in similar habitat.

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

One male and one female were shot at dusk on the edge of a pool at the head of a sandstone gully formation near

E2. Another female (1.3 kg) with a pouch young (48 g) was shot at 2030 hrs. on 18 August 1974. It was in the same locality and habitat as the *P. brachyotis* from E4.

At sites where both *P. concinna* and *P. brachyotis* were present, the former were seen more often. *P. concinna* was also sighted at E5, W2 and W6.

FAMILY PHALANGERIDAE

Wyulda squamicaudata Alexander. **Scaly-tailed Possum** (see colour illustrations).

An adult male was shot at 2100 hrs near E4 in a *Eucalyptus* tree on an area of rugged boulder country.

FAMILY PETAURIDAE

Petropseudes dahli (Collett). **Rock-haunting Ringtail.**

A partial skull was found in a Bower Bird's bower near E1.

FAMILY PERAMELIDAE

Isodon macrourus macrourus (Gould). **Brindled Bandicoot.**

Four males and three females were collected in grasslands in river fringing formations at E6 and W6. One male and one female were also captured in this formation near the junction of Maurice Creek and the Charnley River on Beverley Springs Station. This type of habitat occurred on both Carson Volcanics and King Leopold Sandstones where the creek banks consisted of deep sandy alluvial soils.

Groups of up to six animals were flushed from isolated clumps of grass in an area at E6 which had been burnt.

Isoodon auratus (Ramsay). **Golden Bandicoot.**

Five males and three females were collected from W2, W4, W5 and E4 in vine thickets and low woodlands on Carson Volcanics and in rugged boulder country on King Leopold Sandstones. These habitats were different from that of *I. m. macrourus*.

One female (450 g) from W2 (25 August 1974) had two pouch young. Another (310 g) from W5 (28 August 1974) was lactating.

FAMILY DASYURIDAE

Dasyurus hallucatus Gould. **Little Northern Native-Cat** (Fig. 1).

Nine males and one female were collected from W2, E2, W4, E4, W5 and E5 in river fringing formations and rugged boulder country on King Leopold Sandstones, in vine thickets and low woodlands on Carson Volcanics and in rugged boulder country of Warton Sandstones.

At some sites where *D. hallucatus* was common, it was seen during the day as well as the night. The female (250 g) from W2 (26 August 1974) had eight new-born pouch young.



Figure 1—*Dasyurus hallucatus*, the Little Northern Native-Cat. Boongaree Island.

Antechinus affin. *macdonnellensis* (Spencer). **Red-eared Antechinus.**

One male and one female were trapped in rugged boulder country at E4 and W2.

RODENTIA

FAMILY MURIDAE

Rattus tunneyi Geoffrey. **Tunney's Rat.**

Twenty males and ten females were collected from E1, E3, E5, E6, W3 and W4. One male was also captured near the junction of Maurice Creek and the Charnley River on Beverley Springs Station. Most came from deep sandy alluvial soils with dense native grasses in river fringing formations of King Leopold Sandstones and in the analogous habitat in Carson Volcanics. Others came from low woodlands in Carson Volcanics and sandstone gully formations.

The extensive, apparently communal, burrow systems of this species were found in deep soils at E6, E5, E3 and W4. At these sites the animal was very common.

Hydromys chrysogaster Geoffroy. **Water Rat.**

Partial specimen collected from E1.

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

One male, one female and one specimen which could not be sexed (due to damage) were trapped in a strip of vine thicket at W5.

Conilurus penicillatus (Gould). **Brush-tailed Tree-Rat.**

A specimen was trapped in low woodland near W4. It was partially eaten and could not be sexed.

Zyzomys argurus (Thomas). **Common Rock-Rat** (Fig. 2).

Twenty-one males and twenty-three females were collected from E1, E3, E5, E6, W2, W3, and W6 in rugged boulder country, sandstone gully formations, river fringing formations and valley woodlands of King Leopold Sandstone country and in mesa low open-forest of a laterite breakaway. Most were captured on or near rugged boulder country. Despite extensive trapping this species was not recorded on Carson Volcanics. Ten were pregnant (weight range: 37.5—61.0 g) with between 1 and 3 (mode : 3) foetuses.



Figure 2—*Zyzomys argurus*, the Common Rock-Rat. Beverley Springs Station.

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

Three males and three females were collected from E4, W2, W5 and W6. Most were collected in rugged boulder country of King Leopold Sandstones but a single specimen came from a Warton Sandstone scree slope which intruded into a vine thicket at W5. One female (158 g) collected at E4 on 18 August 1974 had two foetuses.

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

Three males and two females were collected from E4, E5 and E2 in sandy plateau woodland, river fringing formations, rugged boulder country and valley woodlands in King Leopold Sandstones.

Pseudomys nanus (Gould). **Western Chestnut Native-Mouse.**

Six males and four females were collected from E3, E5, E6 and W1. Two males were captured near the junction of Maurice Creek and the Charnley River on Beverley Springs Station. This species was collected in sandy plateau woodlands, river fringing formations, valley woodlands and rugged boulder country on King Leopold Sandstones, in river fringing formations and low woodlands on Carson Volcanics and in mesa low open-forest on laterite.

Pseudomys (*sensu lato*) sp.

A pregnant female was collected in valley woodlands at E4. It is probably an undescribed species (A. Baynes, pers. comm.).

Melomys sp. **Mosaic-tailed Rat.**

One male and one female were trapped in dense native grasses on black soils in a river fringing formation at E4. The taxonomy of *Melomys* is in need of revision.

CHIROPTERA

FAMILY VESPERTILIONIDAE

Miniopterus schreibersii (Kuhl). **Bent-wing Bat.**

One male and one female were shot at night while they were flying over a pool fringed by *Pandanus*, *Eucalyptus* and *Melaleuca* in an open-woodland formation near E2.

Eptesicus pumilis caurinus Thomas. **Little Bat.**

One male was collected in a small cave in the Prince Regent River valley near W1.

Two additional specimens of Kimberley *Eptesicus*, collected on the reserve, are distinguishable from *Eptesicus pumilis caurinus* by a larger body form and pale pelage characteristics (D. J. Kitchener, pers. comm.).

One was a male and the other was too damaged to be sexed. Both were collected near W3 at dusk. One was flying along a stream in a sandstone gully and the other flying over rugged sandstone.

Chalinolobus gouldii (Gray). **Gould's Wattled Bat.**

One female was shot at dusk as it flew along a creek near W1. Fringing the creek were *Pandanus*, *Eucalyptus* and *Melaleuca*.

Chalinolobus nigrogriseus rogersi Thomas. **Hoary Bat.**

One male was shot at dusk along the same creek as the *C. gouldii*. One female was shot at dusk in a clearing in a vine thicket near W5.

Myotis adversus (Horsfield). **Large-footed Myotis.**

One female was shot at 2100 hrs while it was flying around a pool in a sandstone gorge at E1.

Nycticeius greyi (Gould). **Little Broad-nosed Bat.**

One male and six females were collected from E1, E3, W1 and W5. One was mist-netted and five were shot along creeks. Another was shot on top of Python Cliffs at W5.

FAMILY EMBALLONURIDAE

Taphozous flaviventris Peters. **Yellow-bellied Sheath-tailed Bat.**

Two males and one female were shot late at night (2200–2300 hrs) over a bog near W1.

FAMILY PTEROPIDAE

Pteropus scapulatus Peters. **Red Flying Fox** (Fig. 3).

One male was mist-netted at night along Blyxa Creek (W1).



Figure 3—*Pteropus scapulatus*, the Red Flying Fox. Captured at W1.

Pteropus alecto Temminck. **Black Flying Fox.**

Three males and two females were collected from E4, W1, W3 and W6. They were roosting in melaleucas and mangroves and feeding in fig trees. One was mist-netted on the same night and in the same net as *P. scapulatus*.

Macroglossus lagochilus Matschie. **Northern Blossum Bat.**

One male was flushed from ground-level and later shot in mangroves near W2.

MONOTREMATA

FAMILY TACHYGLOSSIDAE

Tachyglossus aculeatus (Shaw). **Echidna.**

Characteristic scats were collected among sandstone boulders near E1, E6 and W1. Echidna spines were also identified in the gut contents of an estuarine shark (*Carcharias leucas*) captured in the Prince Regent River near W2.

CARNIVORA

FAMILY CANIDAE

Canis familiaris dingo Meyer. **Dingo.**

Dingoes were seen at W1, E2, E4, E5 and E6. Two were shot. One had an *Isoodon m. macrourus* in its mouth. Scats collected at different sites yielded *Pseudomys nanus* and *Rattus tunneyi* bone material.

FAMILY FELIDAE

Felis catus (Linnaeus). **Feral Cat.**

One feral cat was seen at E3 and another at W1.

ARTIODACTYLA

FAMILY BOVIDAE

Bos taurus (Linnaeus). **Feral Cattle.**

Single and groups of up to ten cattle were encountered at E1, E2 and W1. They were seen in valley woodlands and river fringing formations. The sandy banks of Blyxa Creek (W1) were severely trampled. Well defined pads radiated through the bog complexes and sandy plateau woodlands at W1 and E2.

DISCUSSION

Knowledge of the Kimberley mammal fauna is inadequate. Extensive collections are available only from a few areas and the taxonomy of certain groups is obscure. No mammals have previously been collected from the Prince Regent River Reserve although, in the West Kimberley, important collections have been made at Kalumburu, Wotjulum and on the coastal islands.

At least fifty-five species of native mammal are known from the Kimberley. A total of thirty-three native species were recorded during this survey and although further survey work would almost certainly extend the list, representatives of all families of terrestrial Kimberley mammals were collected. Macropods, bandicoots and rodents are particularly well represented.

The bat fauna is probably more diverse than the annotated list indicates because among the nineteen specimens of microchiropterans collected there were eight different species. *Taphozous georgianus*, *Hipposideros ater* and *H. stenotis*, known from the nearby islands of the Bonaparte Archipelago and other sites in the West Kimberley, probably also occur on the Prince Regent River Reserve. The Sugar Glider, *Petaurus breviceps*, which was captured in Rugged Boulder Country (Pkw) on nearby Augustus Island in 1972, probably also occurs on the reserve.

This is the first time that most of these species, including *Wyulda squamicaudata* which is endemic to the Kimberley Region, have been recorded on a conservation reserve in Western Australia. *Conilurus penicillatus* and *Petropseudes dahli* are known in Western Australia from only a few specimens. Similarly *Myotis adversus* and *Macroglossus lagochilus* are only known in Western

Australia from a few localities in the Kimberley; the former only from Mt Caroline and the latter only from Sunday Island. These two species of bat are distributed through New Guinea, the Indo-Malay Archipelago and parts of Australia.

Mr A. Baynes has supplied the following comments on the probably undescribed species of *Pseudomys*. "Although superficially similar to *Pseudomys delicatulus*, specimen M 12315 is larger (head and body about 75 mm as against 60 mm or less) and has a larger skull. I consider that it probably represents a Kimberley population of a form obtained in Arnhem Land by Mr J. H. Calaby, which he proposes to describe shortly in a C.S.I.R.O. Wildlife Research Survey Report".

Very few ecological observations are made because the survey lasted only eighteen days, it was restricted to the dry season, and many species are only represented by a few specimens.

The presence of three species of rock-wallabies is probably due to the structure of the huge area of rugged King Leopold and Warton Sandstone country. This type of country provides excellent rock-wallaby habitat. The deep caves and crevices would provide the temperature stability and shelter required by these animals (Ride, 1970). The absence of similar country on the Cobourg Peninsula probably explains why these animals were not recorded by Calaby and Keith (1974). The two *Zygomys* species were also recorded in habitats derived from rugged sandstone country (Table 1) and were similarly not recorded from the Cobourg Peninsula.

The two species of bandicoot appeared to be occupying different habitats and *Rattus tunneyi* was mainly restricted to areas of deep soil in fringing formations along creeks and rivers.

Breeding females were only detected in seven of the species but this figure is conservative because samples of some species included few animals and no histological techniques were applied.

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PART VI
**BIRDS OF THE PRINCE REGENT RIVER
RESERVE, NORTH-WEST KIMBERLEY,
WESTERN AUSTRALIA.**

By G. M. STORR,¹ R. E. JOHNSTONE,¹ J. DELL² and L. A. SMITH¹

INTRODUCTION

This paper is based mainly on data gathered during a biological survey of the Prince Regent River Reserve in August 1974. Sites visited are described fully in Miles, Kenneally and George (this publication) and a map showing their position and reference codes (E1 to E6, W1 to W6) appears in Miles (this publication). Johnstone was responsible for the gathering of information from sites E5, W4 and W6 and at Careening Bay, Dell from sites E3, W1 and W3, and Smith from sites E2, E6 and W5. We are indebted to Dr A. A. Burbidge for notes on the birds of E4 and E1, and to Dr G. R. Allen for counts of psittacids at E1 and W2. Also used are Johnstone's, Dell's and Smith's brief notes from Careening Bay in June 1973 and the lower Prince Regent River in July 1973 and Johnstone's brief notes from St George Basin in May 1972, all taken during expeditions to the Bonaparte Archipelago (see Burbidge, this publication).

In the list of species we present the following data:

- (1) The sites from which each species was recorded.
- (2) The number of specimens collected (these are lodged in the Western Australian Museum under registered numbers A 12633-12639, 13099-13183).
- (3) Relative abundance.
- (4) Habitat preferences.
- (5) The phrase "breeding reported" when nests or other indications of breeding were found on the Reserve.
- (6) Taxonomic notes.

LIST OF SPECIES

FAMILY CASUARIIDAE

Dromaius novaehollandiae (Latham). **Emu.**
Recorded at E2 and E6.
A single bird (or its tracks) was noted on two occasions.
The Emu is scarce on the Reserve, as elsewhere in the Kimberley.

FAMILY PHALACROCORACIDAE

Phalacrocorax melanoleucos (Vieillot). **Little Pied Cormorant.**
Recorded at E1, E4 and W6.
A few on the larger watercourses.

Anhinga novaehollandiae (Gould). **Australian Darter.**
Recorded at E1 and lower Prince Regent River.
Single birds on the Prince Regent.

FAMILY ARDEIDAE

Ardea sumatrana Raffles. **Great-billed Heron.**
Recorded at St George Basin.

A single bird in 1972 in mangroves at foot of Mt Trafalgar.

Ardea novaehollandiae Latham. **White-faced Heron.**
Recorded at E2.

A single bird, possibly transient.

Butorides striatus stagnatilis (Gould). **Mangrove Heron.**
Recorded at St George Basin and lower Prince Regent River (vicinity of King Cascade).
Moderately common. Mangroves.

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

Recorded on lower Prince Regent River (upstream to about King Cascade).

Moderately common. Both dark and white phases present.

Nycticorax caledonicus hilli Mathews. **Nankeen Night Heron.**

Recorded at E1 and W6.

A few observed on the larger watercourses.

Ixobrychus flavicollis (Latham). **Black Bittern.**

Recorded at E1, E2, E4, W1 and W6. One specimen.
Moderately common. Watercourses lined with cadjeputs and pandanus. Breeding reported.

FAMILY THRESKIORNITHIDAE

Threskiornis moluccus moluccus (Cuvier). **White Ibis.**
Recorded at W4 and lower Prince Regent River (near King Cascade).
Single birds on mudflats at low tide.

FAMILY ACCIPITRIDAE

Hamirostra melanosternon (Gould). **Black-breasted Buzzard.**

Recorded at E1, E3, E5, W3 and lower Prince Regent River (12 km from mouth).

In ones and twos, including a bird patrolling in front of a fire.

Milvus migrans affinis Gould. **Black Kite.**

Recorded at Careening Bay.

A single bird noted in 1973.

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Haliastur indus girrenera (Vieillot). **Brahminy Kite.**
Recorded at E1, W3, W5, St George Basin and lower Prince Regent River.
Moderately common. Mainly about mangroves.

Haliastur sphenurus (Vieillot). **Whistling Kite.**
Recorded at E2, E4, E5, E6, W1 and W4.
Moderately common. Breeding reported.

Accipiter fasciatus didimus (Mathews). **Australian Goshawk.**
Recorded at W1 and W6.
Locally common (e.g. at W1, where two pairs were nesting), but generally scarce. Breeding reported.

Accipiter cirrocephalus cirrocephalus (Vieillot). **Collared Sparrowhawk.**
Recorded at E2, E3, E4 (? species), E5, E6 and W6.
Moderately common at E5, but generally scarce. Breeding reported.

Aquila audax (Latham). **Wedge-tailed Eagle.**
Recorded at E4, E5 and mouth of Prince Regent River.
Uncommon. Breeding reported.

Haliaeetus leucogaster (Gmelin). **White-breasted Sea Eagle.**
Recorded at W4 and St George Basin.
Uncommon.

Pandion haliaetus cristatus (Vieillot). **Osprey.**
Recorded at Careening Bay.
Scarce on mainland coast. (More plentiful about the adjacent islands.)

FAMILY FALCONIDAE

Falco hypoleucos Gould. **Grey Falcon.**
Recorded at E3.
A grey hawk pursued by a Pied Butcherbird along the edge of a breakaway almost certainly belonged to this species.

Falco berigora Vigors & Horsfield. **Brown Falcon.**
Recorded at E2, E6 and W1.
Uncommon. Seen in ones and twos, especially at front of fires. All birds were very dark.

FAMILY MEGAPODIIDAE

Megapodius freycinet tumulus Gould. **Scrub Fowl.**
Recorded at E5, W4 and W5.
Uncommon. Closed-forests about the lower Roe drainage and on shores of St George Basin. Breeding reported.

FAMILY PHASIANIDAE

Coturnix ypsilophora australis (Latham). **Brown Quail.**
Recorded at E5, E6, W4 and Careening Bay. Seven specimens.
Locally common. Long grass, especially along water-courses; also fern undergrowth in small patch of closed-forest. Breeding reported.

Coturnix chinensis lineata (Scopoli). **King Quail.**
Recorded at W1. Three specimens.
About 10 birds inhabiting *ca* 25 ha of bog complex which they shared with a similar number of *Turnix maculosa*. Breeding reported.

FAMILY TURNICIDAE

Turnix maculosa (Temminck). **Red-backed Quail.**
Recorded at W1. Three specimens.
About 10 birds inhabiting *ca* 25 ha of bog complex which they shared with a similar number of *Coturnix chinensis*. Breeding reported.

Turnix castanota (Gould). **Chestnut-backed Quail.**
Recorded at E3.
Five quail found on grassy laterite plateau probably belonged to this species; the birds were nearly as large as Brown Quails, and they had been making the semi-circular scratchings characteristic of *Turnix* spp.

FAMILY GRUIDAE

Grus rubicunda (Perry). **Brolga.**
Recorded at E2, E6, W1 and W4.
Uncommon. Watercourses, swamps, bog complexes and mangroves.

FAMILY RALLIDAE

Eulabeornis castaneiventris castaneiventris Gould. **Chestnut Rail.**
Recorded at W4, St George Basin and lower Prince Regent River (upstream almost to King Cascade).
Moderately common, but only in extensive stands of mangroves.

FAMILY SCOLOPACIDAE

Numenius phaeopus variegatus (Scopoli). **Whimbrel.**
Recorded on lower Prince Regent River.

FAMILY BURHINIDAE

Burhinus grallarius (Latham). **Southern Stone-curlew.**
Recorded at E4, W1, and W4. One specimen.
Uncommon.

Esacus magnirostris (Vieillot). **Beach Stone-curlew.**
Recorded at St George Basin.
Uncommon.

FAMILY LARIDAE

Sterna bengalensis Lesson. **Lesser Crested Tern.**
Recorded on lower Prince Regent River.

FAMILY COLUMBIDAE

Ducula spilorrhoa spilorrhoa (Gray). **Torres Strait Pigeon.**
Recorded at E1, E2, E3, E4, E5, W3, W5, and W6. One specimen.
Moderately common, mainly in ones and twos, one party of five. Mainly closed-forest; also *Ficus* and other fruiting trees in thickets among sandstone, and

occasionally open-forest (cadjeputs and eucalypts). Breeding reported.

Geopelia humeralis (Temminck). **Bar-shouldered Dove.**
Recorded at E1, E3, E5, W3, W4, W5, W6 and Careening Bay.

Common on coast and major watercourses, mainly in mangroves and closed-forest; scarce or absent in higher parts of Reserve.

Geopelia striata placida Gould. **Peaceful Dove.**
Recorded at E1, E2, E4, E5, E6, W1, W4, W6, Careening Bay and Prince Regent River (27 km from mouth). Locally common (e.g. at E2 and W1) but generally uncommon. Mainly along watercourses; also in grassland regenerating after fire. Breeding reported.

Geopelia cuneata (Latham). **Diamond Dove.**
Recorded at W1.
Moderately common on Blyxa Creek. Possibly only a dry-season visitor to the Reserve.

Chalcophaps indica longirostris Gould. **Green-winged Pigeon.**
Recorded at E5, W3 and W6.
Common at W3 (where up to a dozen birds were seen together), but scarce elsewhere. Closed-forest with fruiting trees.

In this subspecies there is no sexual dimorphism, females as well as males having a purple head and mantle, blackish tail, and white patch near bend of wing.

Petrophassa albipennis Gould. **White-quilled Rock Pigeon.**
Recorded at E1, E4, E5, E6, W1, W3, W5 and W6. Three specimens.

Common. Sandstone. Breeding reported.
These birds are much darker than those of east Kimberley.

Geophaps smithii blaauwi Mathews. **Partridge Pigeon.**
Recorded at E2, E5 and E6. One specimen.
Locally common in flocks of up to 10 birds but generally uncommon. Burnt ground with regenerating spinifex, and short grass on quartzite ridges.
This subspecies, characterized by yellow orbital skin, is restricted to north-west Kimberley.

FAMILY PSITTACIDAE

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

Recorded at E1, E2, E3, E4, E5, E6, W1, W2, W3, W5, and W6.

Locally common, mainly in pairs, also in flocks of up to 20. Mainly in flowering eucalypts (*E. miniata* and river gums), also in closed-forest with flowering *Albizia* and in an isolated *Ficus*.

Trichoglossus versicolor Lear. **Varied Lorikeet.**
Recorded at E1, E2, E3, E4, E5, W1, W2 and W6.
Locally common, e.g. at E3. Both on plateaux and along watercourses.

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

Recorded at E1, E2, E3, E4, E5, E6, W1, W2, W5 and W6.

Locally common. Mainly in *Eucalyptus miniata* woodland; also along watercourses. Breeding reported.

Cacatua galerita (Latham). **Sulphur-crested Cockatoo.**
Recorded at E1, E4, E5, W2, W5 and W6.

Moderately common in gorges. River fringing forest (cadjeputs) and closed-forest.

Cacatua tenuirostris sanguinea Gould. **Little Corella.**
Recorded at E1, E2, E4, E5, E6, W1, W3, W6 and St George Basin.

In 1974 moderately common, mainly in pairs and small flocks (largest party 17), mainly along watercourses. In 1972 thousands seen in mangroves and adjacent trees at foot of Mt Trafalgar.

Aprosmictus erythropterus (Gmelin). **Red-winged Parrot.**
Recorded at E1, E2, E3, E4, E5, W1, W2, W3, W5 and W6.

Moderately common, mainly in ones and twos, also in flocks of up to nine. Open and closed-forests and flowering shrubs (*Cochlospermum* and *Grevillea*) in open-woodland.

Platyercus venustus (Kuhl). **Northern Rosella.**
Recorded at E2, E3, E5, W1, W3, W5 and W6.
Uncommon, in ones and twos. Eucalypts (cabbage gums and *E. miniata*). Breeding reported.

Melopsittacus undulatus (Shaw). **Budgerigah.**
Recorded at E4.
Two flocks of ca 10 seen along the Roe River. Probably only a dry-season visitor to the Reserve.

FAMILY CUCULIDAE

Cuculus pallidus (Latham). **Pallid Cuckoo.**
Recorded at E2 and W1.
Scarce but (judging from persistence of calling) probably resident.

Cacomantis variolosus dumetorum (Gould). **Brush Cuckoo.**
Recorded at E1 and W3.
Scarce. Observed once on a watercourse and once in sandstone.

Centropus phasianinus macrourus Gould. **Pheasant Coucal.**
Recorded at E1, E2, E4, E5, E6, W1, W3, W4, W5 and W6.
Moderately common. Mainly in long grass and pandanus beside watercourses; also in sandstone and on plateaux.

FAMILY STRIGIDAE

Tyto sp.

Recorded at W4 and W6.

An owl of the genus *Tyto* seen on single occasions at two localities was believed because of its size to belong to *T. alba*. Judging from the few specimens available to Mees (1964), *T. novaehollandiae* is the common *Tyto* of north-west Kimberley.

Ninox rufa rufa (Gould). **Rufous Owl.**

Recorded at E5. Two specimens.

Two juveniles collected in closed-forest on Rufous Creek, though able to fly, retained much white down among their plumage. There was an adult nearby.

Ninox connivens connivens (Latham). **Winking Owl.**

Recorded at E2, E5, E6, W3, W4 and W6. Two specimens.

Probably the commonest owl on the Reserve. Often heard at night; also observed roosting by day in dense vegetation (closed-forest and mangroves).

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

Recorded at E1, E2, E3, E4, E6, W1, W3, W4, W5 and W6.

Relative abundance uncertain, but heard at all but one of the stations.

FAMILY PODARGIDAE

Podargus strigoides phalaenoides Gould. **Tawny Frog-mouth.**

Recorded at E5, W1 and W6.

Possibly common, though only observed a few times.

FAMILY AEGOTHELIDAE

Aegotheles cristatus leucogaster Gould. **Owlet Nightjar.**

Recorded at E5 and W1.

Single birds calling on several nights.

FAMILY CAPRIMULGIDAE

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

Recorded at E2 and W6.

Single birds heard on two nights.

FAMILY ALCEDINIDAE

Alcedo azurea ruficollis (Bankier). **Azure Kingfisher.**

Recorded at E1, E2, E5, W1, W3 and W6. Two specimens.

Uncommon. Freshwater streams.

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

Recorded at E1, E2, E3, E4, E6, W1, W3, W4, W5, and W6.

Moderately common. Both in open-woodlands of plateaux and denser vegetation of gorges.

Halcyon pyrrhopygia Gould. **Red-backed Kingfisher.**

Recorded at E6 and W5.

Scarce. Open-woodlands of sandstone plateaux.

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

Recorded at E5, W1, W4, W5 and W6.

Uncommon. Mainly freshwater streams; also mangroves.

FAMILY MEROPIDAE

Merops ornatus Latham. **Australian Bee-eater.**

Recorded at E1, E2, E3, E4, E5, E6, W1, W3, W4 and W6. Common. Apart from a few sightings of presumed passage migrants (especially a flock of 50 flying southwards) the birds were usually in ones and twos and seemed to be resident. Mainly along watercourses; also on plateaux.

FAMILY PITTIDAE

Pitta iris Gould. **Rainbow Pitta.**

Recorded at E5, W4 and W5. Two specimens.

Uncommon. The more luxuriant closed-forests.

FAMILY HIRUNDINIDAE

Hirundo nigricans nigricans Vieillot. **Tree Martin.**

Recorded at W1, W4, W5 and St George Basin.

Three flocks seen on single occasions in 1974 and a flock feeding over mangroves in 1972.

FAMILY CAMPEPHAGIDAE

Coracina novaehollandiae novaehollandiae (Gmelin).

Black-faced Cuckoo-shrike.

Recorded at E1, E2, E3, E5, E6, W1, W3, W4, W5 and Careening Bay.

Common. All kinds of wooded country. Some of the birds seemed to be passage migrants on way back to southern Australia.

Coracina papuensis hypoleuca (Gould). **White-breasted Cuckoo-shrike.**

Recorded at E2, E3, E4, E5, E6, W1, W3, W4, W5, W6 and Careening Bay.

Common. In all kinds of wooded country: mangroves, closed-forest, river fringing forest (cadjeputs, etc.) and *Eucalyptus miniata* woodland.

Coracina tenuirostris tenuirostris (Jardine). **Cicada-bird.**

Recorded at E5 and W4. One specimen.

Scarce (only two birds seen). The more luxuriant closed-forests.

Kimberley males differ from east Australian males only in their slightly shorter bill; in this respect Melville Island birds, judging from data in Keast (1958), are intermediate. We therefore merge *C. melvillensis* in the nominate subspecies.

Lalage sueurii tricolor (Swainson). **White-winged Triller.**
Recorded at E5, E6, W1 and W6.

Apart from two migratory flocks, it was uncommon and only seen in ones and twos. Both along watercourses and on plateaux. At W1 on 23 August a flock of more than 60 birds, including some males in nuptial plumage, was moving through trees along a creek in a generally easterly direction; later on the same day a flock of 27 was flying south-westwards through the woodland.

Lalage leucomela rufiventris (Gray). **Varied Triller.**
Recorded at E1, E4, E5, W4, W5, W6 and Careening Bay. Two specimens.

Moderately common. Closed-forest and thickets of *Ficus* and other fruiting trees at foot of sandstone cliffs and along watercourses.

Male specimens from north-west Kimberley conform to Keast's (1958) description of this subspecies.

FAMILY MUSCICAPIDAE

Poecilodryas superciliosa cerviniventris (Gould). **Buff-sided Robin.**

Recorded at E5 and W4. One specimen.
Scarce. Along small watercourses.

Eopsaltria pulverulenta leucura Gould. **Mangrove Robin.**
Recorded at W4 and Careening Bay.

Common in the extensive mangroves at foot of Mt Trafalgar.

Microeca tormenti Mathews. **Brown-tailed Flycatcher.**
Recorded at W4.

Scarce (observed only once). Tall whipstick mangroves at foot of Mt Trafalgar.

Microeca leucophaea leucophaea (Latham). **Brown Flycatcher.**

Recorded at E3, E6, W1 and W5.
Uncommon. Mainly woodland.

FAMILY PACHYCEPHALIDAE

Pachycephala caledonica melanura Gould. **Black-tailed Whistler.**

Recorded at W3 and W4. Three specimens.
Common. Mainly mangroves; also one (a plain-coloured bird) in closed-forest.

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

Recorded at E2, E3, E5, E6, W1, W3, W4, W5, W6 and Careening Bay. One specimen.
Common. Most kinds of wooded country, but especially the more open formations, e.g. *Eucalyptus miniata* woodland of plateaux. Breeding reported.

Pachycephala lanioides Gould. **White-breasted Whistler.**
Recorded at W4. One specimen.

Scarce. Only observed in the mangroves at foot of Mt Trafalgar.

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

Recorded at E5, W4, W5 and Careening Bay. Two specimens.

Common in closed-forest on Rufous Creek, but only moderately common in other closed-forests.

Colluricincla woodwardi Hartert. **Brown-breasted Shrike-thrush.**

Recorded at E6, W3, W4, W5, W6 and Prince Regent River (27 km from mouth). Two specimens.

Moderately common. Sandstone cliffs and boulders.

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

Recorded at E2 and E5.

Scarce (single birds noted on three occasions).

FAMILY RHIPIDURIDAE

Rhipidura rufifrons dryas Gould. **Rufous Fantail.**

Recorded at Careening Bay. One specimen.

Only observed in dense mangroves along a tidal creek.

Rhipidura fuliginosa phasiana DeVis. **Grey Fantail.**

Recorded at W4.

Moderately common in the extensive mangroves at foot of Mt Trafalgar.

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

Recorded at E1, E2, E3, E4, E6, W1, W6 and Careening Bay.

Locally common but generally less plentiful than the Northern Fantail. Mainly along watercourses.

Rhipidura rufiventris isura Gould. **Northern Fantail.**

Recorded at E1, E2, E3, E4, E5, E6, W1, W3, W4, W5 and Careening Bay.

Common. Closed-forest, river fringing forest (*Melaleuca*, *Terminalia*, *Ficus*, etc.), thickets of *Ficus* on sandstone cliffs, and open *Eucalyptus miniata* forest. Breeding reported.

FAMILY MONARCHIDAE

Myiagra rubecula concinna Gould. **Leaden Flycatcher.**

Recorded at E1, E3, E4, E5, E6, W3, W4, W5, W6, Careening Bay and Prince Regent River (27 km from mouth).

Common. Mainly closed-forest, river fringing forest (*Pandanus*, *Terminalia*, *Ficus*, etc.), and thickets at foot of sandstone cliffs.

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

Recorded at W3 and W4. Two specimens.
Uncommon. Mangroves.

Myiagra inquieta nana (Gould). **Restless Flycatcher.**

Recorded at E1, E2, E4 and W1.

Moderately common. Along watercourses.

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

Recorded at W3, W4, W6 and Careening Bay. Two specimens.

Moderately common. Mainly in mangroves; also in ferny undergrowth of *Terminalia* scrub in deep damp gully, and at freshwater pool on edge of vine scrub.

FAMILY GRALLINIDAE

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

Recorded at E1, E2, E4, E6, W1, W6 and mouth of Prince Regent River.

Common on the upper Prince Regent at E1 but only moderately common about water elsewhere. Breeding reported.

FAMILY TIMALIIDAE

Pomatostomus temporalis rubeculus (Gould). **Red-breasted Babbler.**

Recorded at W1.

A party of four in *Eucalyptus miniata* woodland, and a pair in cadjeputs beside the bog complex.

FAMILY ACANTHIZIDAE

Gerygone olivacea flavigasta (Diggles). **White-throated Warbler.**

Recorded at E3. One specimen.

Scarce; only one bird seen, feeding in *Terminalia* trees along a watercourse.

Gerygone fusca levigaster Gould. **Buff-breasted Warbler.**

Recorded at W4. One specimen.

Only one bird seen, it was in mangroves (prop-rooted and whipstick species at foot of Mt Trafalgar) shared with *G. magnirostris*.

Gerygone chloronotus chloronotus Gould. **Green-backed Warbler.**

Recorded at E5, W3, W4, W5, W6 and Careening Bay. Three specimens.

Moderately common. Mainly closed-forest and vine scrub; also cadjeputs along watercourses. Breeding reported.

Gerygone magnirostris magnirostris Gould. **Large-billed Warbler.**

Recorded at W3, W4 and Careening Bay. Nine specimens.

Common. Mangroves (prop-rooted and whipstick species). Breeding reported.

Smicronis brevirostris (Gould). **Weebill.**

Recorded at E2, E3, E5, E6, W1, W3 and W4.

Moderately common. Open eucalypt woodland.

FAMILY MALURIDAE

Amytornis housei (Milligan). **Black Grass-wren.**

Recorded at E4, E5, W1, W3, W6 and Prince Regent River (27 km from mouth). Five specimens.

Moderately common. Heavily dissected sandstone with spinifex (*Triodia* and *Plectrachne*) and shrubbery.

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

Recorded at E2, E4, E5, W3, W5, W6 and Prince Regent River (27 km from mouth).

Common. Mainly in sandstone; seen once in mangroves and once on a watercourse. Breeding reported.

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

Recorded at E2, E3, E5, E6, W1, W3, W4, W5, W6 and Careening Bay.

Common. Mainly in long grass and shrubbery, (*Pandanus*, etc.) beside watercourses; rarely in spinifex.

FAMILY SYLVIIDAE

Megalurus timoriensis Wallace. **Tawny Grassbird.**

Recorded at Careening Bay.

One seen on grassy slope.

Cinclorhynchus mathewsi Iredale. **Rufous Songlark.**

Recorded at W1. One specimen.

Only one bird seen; it flew from grassy bank of watercourse into a dead tree.

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

Recorded at E3, E5, E6, W1, W3, W4, W6 and Careening Bay. Two specimens.

Common. Mainly in long grass growing beside watercourses, at edge of mangroves and on basalt; also in ferny undergrowth of closed-forest.

FAMILY NEOSITTIDAE

Neositta chrysoptera leucoptera (Gould). **White-winged Sittella.**

Recorded at E3, E5, W1 and W4.

Moderately common at W1 but uncommon elsewhere; in flocks up to ten. Mainly open eucalypt woodland (especially *E. miniata*); also river gums.

FAMILY CLIMACTERIDAE

Climacteris melanura melanura Gould. **Black-tailed Tree-creeper.**

Recorded at E5 and E6.

Scarce. Observed twice in open eucalypt woodland and once in closed-forest.

FAMILY DICAIEIDAE

Dicaeum hirundinaceum hirundinaceum (Shaw). **Mistle-toe-bird.**

Recorded at E2, E5, E6, W1, W3, W4, W5, W6 and Careening Bay.

Common. All kinds of wooded country.

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

Recorded at E1, E2, E4, E5, E6, W1, W3 and W6.

Common. Mainly along watercourses. Breeding reported.

FAMILY ZOSTEROPIDAE

Zosterops lutea Gould. **Yellow Silvereye.**

Recorded at W3, W4 and Careening Bay.

Common, in flocks of up to 15 birds. Mainly in mangroves; commonly in adjacent closed-forest.

FAMILY MELIPHAGIDAE

Lichmera indistincta indistincta (Vigors & Horsfield).

Brown Honeyeater.

Recorded at E1, E2, E3, E5, E6, W1, W3, W4, W5, W6, Careening Bay and Prince Regent River (27 km from mouth).

Common. All wooded habitats (including mangroves and closed-forest), especially those with flowering trees and shrubs (*Albizia*, *Grevillea*, etc.).

Myzomela erythrocephala erythrocephala (Latham). **Red-headed Honeyeater.**

Recorded at W3, W4 and W5.

Common. Mangroves.

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

Recorded at E5, E6, W3, and W6. One specimen.

Common. Mainly thickets of *Ficus* etc., growing on sandstone cliffs. Breeding reported.

Meliphaga virescens (Vieillot). **Singing Honeyeater.**

Recorded at Careening Bay.

One seen in mangroves in 1973.

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

Recorded at E2, E5, E6, W1, W3, W5, and W6. Six specimens.

Very common at W1 and E2; scarce to common elsewhere. Mainly river fringing forest (river gums, cadjeputs and pandanus). Breeding reported.

Meliphaga unicolor unicolor (Gould). **White-gaped Honeyeater.**

Recorded at E2, E3, E5, E6, W1, W3, W4, W5, W6 and Prince Regent River (27 km from mouth).

Locally common but generally uncommon. Densely or moderately densely wooded habitats, e.g. river fringing forest, closed-forest and mangroves.

Melithreptus albogularis Gould. **White-throated Honeyeater.**

Recorded at E2, E3, E5, E6, W1, W3, W4, W5, W6 and Careening Bay. Two specimens.

Common. All kinds of wooded country, especially *Eucalyptus miniata* and cadjeputs. Breeding reported.

Melithreptus gularis laetior Gould. **Golden-backed Honeyeater.**

Recorded at E2 and W1. One specimen.

Scarce.

Entomyzon cyanotis albipennis (Gould). **Blue-faced Honeyeater.**

Recorded at E5 and W1.

Scarce. Waterside eucalypts and edge of closed-forest.

Philemon citreogularis citreogularis (Gould). **Little Friar-Bird.**

Recorded at E2, E5, E6, W1 and W5.

Common at W1 and E2; scarce elsewhere. Mainly river fringing forest.

Philemon argenticeps argenticeps (Gould). **Silver-crowned Friar-Bird.**

Recorded at E1, E3, E4, E5, E6, W3, W4, W5 and W6. One specimen.

Common. All habitats with flowering and fruiting trees, including closed-forest, river fringing forest and *Eucalyptus miniata* woodland on sandstone plateau. Breeding reported.

Ramsayornis fasciatus fasciatus (Gould). **White-breasted Honeyeater.**

Recorded at E2, E5, E6, W3 and W6. One specimen.

Moderately common. Mainly in closed-forest and waterside trees and shrubs (*Eucalyptus*, *Melaleuca* and *Pandanus*). Breeding reported.

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

Recorded at E2, W1, W4, and W6.

Common at W1 in flocks of up to 30 birds; scarce elsewhere. Mainly river fringing forest (river gums and cadjeputs).

Cissomela pectoralis (Gould). **Banded Honeyeater.**

Recorded at E2, E3, E5, W1, W3 and W6.

Uncommon. Open eucalypt woodland (flowering cabbage gums and *E. miniata*) and river fringing forest (cadjeputs and river gums).

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

Recorded at E5, E6, W5 and W6.

Uncommon. Eucalypt woodland.

FAMILY ESTRILDIDAE

Neochmia phaeton phaeton (Hombron & Jacquinot). **Crimson Finch.**

Recorded at E1, E2, E4, E5, W1 and W6. One specimen.

Moderately common. Pandanus and long grass along watercourses and in swamps. Breeding reported.

Poephila bichenovii annulosa (Gould). **Black-ringed Finch.**

Recorded at E2, E4, E5, E6, W4, W5, W6 and Careening Bay.

Locally common but generally uncommon. Mainly along watercourses and edge of mangroves. Breeding reported.

Poephila acuticauda (Gould). **Long-tailed Finch.**

Recorded at E2, E6 and W1.

Common at W1; uncommon elsewhere. Long grass and pandanus along watercourses, in swamps and in damp patches in woodland. Breeding reported.

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

Recorded at E5 and W4. One specimen.

Uncommon. Long grass beside watercourses; also drinking and bathing at freshwater spring in mangroves.

FAMILY ORIOLIDAE

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

Recorded at E5, E6, W5 and W6. One specimen.

Moderately common. Mainly closed-forest; also river fringing forest (eucalypts and cadjeputs) and thickets at foot of sandstone cliffs.

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

Recorded at E5, W3, W4, W5 and Careening Bay. Two specimens.

Moderately common. Closed-forest, mangroves and thickets at foot of sandstone cliffs.

Sphecotheres viridis flaviventris Gould. **Yellow Figbird.**

Recorded at E5 and E6.

Moderately common at E5; scarce at E6. Mainly closed-forest; also visiting an isolated *Ficus*.

FAMILY DICRURIDAE

Dicrurus bracteatus Gould. **Spangled Drongo.**

Recorded at E5, W3, W4 and W6. One specimen.

Moderately common. Mainly closed-forest; also thickets of *Ficus* and other fruiting trees at foot of sandstone cliffs.

FAMILY ARTAMIDAE

Artamus cinereus melanops Gould. **Black-faced Wood-Swallow.**

Recorded at E6 and W1.

Moderately common at W1 in open-woodland; rare elsewhere.

Artamus minor Vieillot. **Little Wood-Swallow.**

Recorded at E2, E5, W4, W6, Careening Bay and Prince Regent River (27 km from mouth).

Locally common (e.g. at Mt Trafalgar) in flocks of up to 20 birds. Mainly about cliffs. Despite its patchy distribution, it is the dominant aerial insectivore of the Reserve.

FAMILY CRACTICIDAE

Cracticus torquatus argenteus Gould. **Silver-backed Butcher-Bird.**

Recorded at E1, E5, W1, W3, W4, and W6. Two specimens.

Moderately common at E1, E5 and W6; scarce elsewhere. Mainly river fringing forest (cadjeputs); also closed-forest. Breeding reported.

Cracticus nigrogularis (Gould). **Pied Butcher-Bird.**

Recorded at E1, E2, E3, E4, E5, E6, W1, W3, W4, W5 and W6.

Moderately common. Mainly open *Eucalyptus miniata* woodland on sandstone plateaux; it is outnumbered on watercourses by its congener.

FAMILY PTILONORHYNCHIDAE

Chlamydera nuchalis nuchalis (Jardine & Selby). **Great Bower-bird.**

Recorded at E1, E2, E3, E5, E6, W1, W3, W4, W5, W6 and Careening Bay.

Locally common. Closed-forest, thickets of *Ficus* at foot of cliffs and in sandstone and mangroves.

FAMILY CORVIDAE

Corvus orru ceciliae Mathews. **Australian Crow.**

Recorded at E1, E2, E4, E5, E6, W1, W5 and W6. Uncommon.

DISCUSSION

Despite our spending so little time on the Reserve we feel that very few passerine birds were missed, apart from the White-breasted Wood-Swallow (*Artamus leucogaster*), which has been found on nearby Uwins Island. However, we expect many more non-passerine species will be added to the list. For example three species have been found on continental islands lying only 1-4 km off the Reserve, namely the Rose-crowned Pigeon (*Ptilinopus regina ewingii*) on St Andrew Island, the Bronzewing Pigeon (*Phaps chalcoptera*) on Uwins Island, and the Square-tailed Kite (*Lophoictinia isura*) on Boongaree Island. The Peregrine Falcon (*Falco peregrinus*) was recorded in 1837 by Sir George Grey in the Glenelg River country immediately to the west of the Reserve. A summer visit would add migratory species like the Koel (*Eudynamis scolopacea*) and Dollar-bird (*Eurystomus orientalis*). More work on coasts should add considerable numbers of Laro-limicolae. Visits to swamps could add waterfowl (such visits were planned in 1974 but were prevented by bushfires).

Its avifauna clearly places the Reserve in the subhumid zone of north-west Kimberley, a region that shares many plants and animals with the wet north-west corner of the Northern Territory. These two regions are separated by the relatively dry country around the head of Joseph Bonaparte Gulf. Nevertheless most of the birds shared by the two regions undergo little or no geographic variation, e.g. the pigeons *Ducula s. spilorrhoa*, *Ptilinopus regina ewingii* and *Chalcophaps indica longirostris*; the campephagids *Coracina t. tenuirostris* and *Lalage leucomela rufiventris*; and the oriolids *Oriolus f. flavocinctus* and *Sphecotheres viridis flaviventris*.

The foregoing birds are all primarily inhabitants of closed-forest. Among the birds of other habitats we find examples of considerable taxonomic divergence between north-west Kimberley and Arnhem Land. The Partridge Pigeons (respectively *Geophaps s. blaauwi* and *G. s. smithii*) and the Lavender-flanked Wrens (*Malurus dulcis rogersi* and *M. d. dulcis*) are subspecifically distinct; while the sandstone-inhabiting grass-wrens (*Amytornis housei* and *A. woodwardi*) are specifically distinct.

The semi-arid zone of east and south Kimberley differs from north-west Kimberley not only in lacking certain species of the closed-forests and other habitats, but also in having birds that are scarce or absent in the sub-humid zone. On the Prince Regent River Reserve, dry-country birds were best represented at site W1. Here alone were found the Diamond Dove (*Geopelia cuneata*), Red-breasted Babbler (*Pomatostomus temporalis rubeculus*) and Rufous Songlark (*Cinclorhamphus rufescens*).

Not found on the Reserve but occurring on Beverley Springs Station immediately south of the Reserve were the following dry-country or open-country birds:

Plumed Pigeon (*Geophaps p. plumifera*), Crested Pigeon (*Ocyphaps lophotes*), Nankeen Kestrel (*Falco c. cenchroides*), Galah (*Cacatua roseicapilla*), Cockatiel (*Nymphicus hollandicus*), Black-eared Cuckoo (*Chrysococcyx osculans*), Singing Bushlark (*Mirafra javanica*), Ground Cuckoo-Shrike (*Coracina maxima*), Pictorella Finch (*Lonchura pectoralis*) and Magpie (*Cracticus t. tibicen*).

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Figure 1—Liane scrub at foot of cliff at E6.



Figure 2—Landward edge of mangroves at W4.



Figure 3—Rufous Creek at E5.



Figure 4—Black Grass-wren habitat at E5.



Figure 5—Open country near W6.



Figure 6—Eucalypt woodland near W6.

PART VII
AMPHIBIANS AND REPTILES OF THE PRINCE
REGENT RIVER RESERVE, NORTH-WESTERN AUSTRALIA

By G. M. STORR¹ and L. A. SMITH¹

INTRODUCTION

This paper is based mainly on collections made as part of a biological survey of the Prince Regent River Reserve in August 1974. Thorough collections were made at twelve sites (E1 to E6, W1 to W6, see Miles, this publication), and a few specimens are listed for Careening Bay, visited in June 1973, and for a site 27 km upstream from the mouth of the Prince Regent River which was visited in July 1973. All specimens are lodged in the Western Australian Museum under registered numbers R43959, 44000-44007, 46665-46792, 46796-47246, 47274-47281 and 47288-47294.

In the species accounts we seldom assess relative abundance, but some indication of it can be deduced from the number of specimens collected (given in brackets after each locality). Where no number follows a locality, the record is based on field observation only.

Though 13 species of frogs were collected, none was breeding; hence the lack of meaningful ecological data. Most of the 54 species of reptiles were inactive, but some idea of preferred habitat was usually obtained. Fig. 1.

LIST OF SPECIES

ANURA

FAMILY LEPTODACTYLIDAE. Ground Frogs.

Crinia signifera Girard".

Recorded at E2 (7) and E6 (7).

This is a granular-bellied frog.

Crinia sp.

Recorded at E6 (1) and W2 (1).

This is a smooth-bellied species and slightly larger than its congener.

Limnodynastes ornatus (Gray).

Recorded at E6 (2).

Uperoleia sp.

Recorded at E6 (4).

FAMILY HYLIDAE. Tree Frogs.

Litoria bicolor (Gray).

Recorded at E6 (1).

Litoria caerulea (White).

Recorded at E1 (1).

Litoria coplandi (Tyler).

Recorded at E1 (6), E2 (14), E3 (2), E4 (1), E5 (1), E6 (1), W2 (2) and W6 (8).

"*Litoria latopalmata* Gunther".

Recorded at E2 (3) and E6 (16).

Litoria meiriana (Tyler).

Recorded at E1 (3), E2 (1), E4 (1), E5 (1), E6 (1), W2 (4) and W6 (2).

Litoria nasuta (Gray). Fig. 2.

Recorded at E2 (5), E5 (1), E6 (7) and W1 (3).

"*Litoria peronii* (Tschudi)".

Recorded at E2 (2) and E6 (9).

Litoria rubella (Gray).

Recorded at E6 (1).

Litoria wotjulumensis (Copland).

Recorded at E1 (2), E2 (6), E3 (4), E4 (2), E5 (3), E6 (24), W2 (4), W3 (2), and W6 (2).

REPTILIA

FAMILY CHELUIDAE. Side-necked Turtles.

Chelodina rugosa Ogilby.

Recorded at E1 (1), E2, E4 (5) and W6 (1).

Emydura australis (Gray).

Recorded at E1 (3) and E2 (2).

FAMILY GEKKONIDAE. Geckos.

Gehyra sp.

Recorded at E5 (1), E6 (7) and W5 (3).

These small geckos were found under sandstone boulders.

Gehyra sp.

Recorded at E1 (2), E2 (8), E5 (2) and W5 (4).

This large species was found on vertical sandstone faces at night.

Heteronotia binoei (Gray).

Recorded at E3 (5), E5 (1), E6 (4), W5 (1) and Careening Bay (1).

Under lateritic and sandstone boulders.

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Heteronotia spelea (Kluge).

Recorded at W3 (1) and W6 (2).

Two under sandstone boulders; one on a vertical sandstone wall. These specimens, the first from north-west Kimberley, are similar to those from east Kimberley.

Nephrurus asper Gunther.

Recorded at E2 (1).

In open sandstone country at night.

Oedura lesueurii rhombifera Gray.

Recorded at W3 (3) and W5 (1).

Under sandstone rocks among leaf litter and spinifex.

Oedura marmorata Gray.

Recorded at E2 (1) and W3 (1).

In open sandstone country at night.

Pseudothecadactylus lindneri cavaticus Cogger.

Recorded at E1 (1).

On a tree trunk in a rocky gorge.

FAMILY PYGOPODIDAE. Legless Lizards.

Lialis burtonis Gray.

Recorded at E6 (3).

Under sandstone boulders.

FAMILY AGAMIDAE. Dragon Lizards.

Amphibolurus microlepidotus Glauert.

Recorded at W2 (1), W3 (1) and Prince Regent River (1).

In sandstone/spinifex; one was on a branch of a dead tree. In life one specimen (R 46962) was vivid orange-red around eyes and gape and on legs and tail; it was greyish yellow elsewhere.

Dr G. J. Caughley, who is revising the *A. barbatus* species-group, tells us that *microlepidotus* is a full species. It is restricted to north-west Kimberley.

Chelosania brunnea Gray.

Recorded at W1 (1).

In open grassy woodland within 50 m of a watercourse.

Chlamydosaurus kingii Gray.

Recorded at E2 (1) and W1 (1).

In open-woodland.

To the above localities can be added Careening Bay, where Allan Cunningham collected the type specimen in October 1820.

Diporiphora albilabris albilabris Storr.

Recorded at E3 (4) and W1 (1).

Among sandstone along watercourses.

Diporiphora bennettii bennettii (Gray).

Recorded at E2 (5), E3 (5), E4 (3), E5 (3), E6 (12), W1 (20), W3 (3), W4 (1), W5 (2) and W6 (2).

Mainly in sandstone/spinifex country; also in grass beside watercourses. This is clearly the dominant agamid on the Reserve, as elsewhere in north-west Kimberley.

Diporiphora bilineata margaretae Storr.

Recorded at E6 (4).

Under sandstone boulders.

Diporiphora superba Storr.

Recorded at E1 (1), E4 (1), E5 (1), and Prince Regent River (1).

In sandstone/spinifex.

Physignathus gilberti gilberti (Gray).

Recorded at E1 (2), E2 (6), E3 (1), E4 (6), E5 (1), E6 (2), W1 (8) and W2 (1).

Confined to margins of watercourses.

FAMILY SCINCIDAE. Skinks.

Carlia amax Storr.

Recorded at E3 (5), E6 (5), W2 (1) and W5 (6).

Mostly under lateritic and sandstone boulders; also in leaf litter beneath closed-forest.

Carlia foliorum (DeVis).

Recorded at E3 (1) and W1 (2).

Two in open grassy woodland; one in sandstone/spinifex.

Carlia johnstonei johnstonei Storr.

Recorded at E5 (1), W3 (2) and Careening Bay (2).

Mainly in leaf litter in gorges; also in sandstone/spinifex.

Carlia triacantha (Mitchell).

Recorded at E1 (1), E2 (1), E3 (1), E4 (6), E6 (20), W2 (3), W4 (1) and W5 (3).

All specimens in sandstone/spinifex.

Cryptoblepharus plagiocephalus (Cocteau).

Recorded at E1 (3), E2 (1), E4 (1), E6 (3), W1 (1), W2 (1), W3 (1), W6 (1) and Careening Bay (1).

On trunks of trees, mainly in *Eucalyptus* woodland.

Ctenotus inornatus (Gray).

Recorded at E1 (3), E2 (2), E3 (3), E4 (5), E6 (1), W1 (4), W2 (2), W3 (2), W4 (10), W5 (2), W6 (1) and Careening Bay (1).

This highly successful species was found in most habitats: sandstone/spinifex, lateritic boulders, grassy *Eucalyptus* woodland, and long grass on sandy loam.

Ctenotus mastigura burbidgei Storr.

Recorded at E5 (2), E6 (10), W2 (1) and W3 (1).

Under sandstone boulders.

Ctenotus robustus Storr.

Recorded at W1 (1).

In long grass on sandy loam.

Lerista walkeri (Boulenger).

Recorded at E3 (3), E5 (2), E6 (5) and W6 (1).

All specimens from under sandstone boulders. These are the first specimens taken on the Kimberley mainland. In some the frontoparietals were fused; in others they were paired.

Menetia greyii Gray.

Recorded at E3 (1).

Under a lateritic boulder.

Morethia taeniopleura ruficauda (Lucas & Frost).

Recorded at E1 (1), E2 (1) and E6 (9).

Under sandstone boulders and in dry leaf litter in sandstone/spinifex.

Notoscincus ornatus wotjulum (Glauert).

Recorded at E3 (1), E6 (11), W3 (2) and W4 (1).

In sandstone/spinifex, especially under sandstone boulders; also in *Eucalyptus* woodland on lateritic plateau.

Omolepida sp.

Recorded at W6 (1).

In sandstone/spinifex. This is the second known specimen of this large skink; the first was collected by W. H. Butler at Kalumburu (190 km to the north-east).

Proablepharus tenuis (Broom).

Recorded at E5 (1).

In sandstone/spinifex.

Sphenomorphus isolepis isolepis (Boulenger).

Recorded at E5 (3), E6 (7) and W6 (1).

All specimens from under sandstone boulders.

Sphenomorphus sp.

Recorded at E6 (1).

Under a small rock at edge of pool in watercourse.

This small skink differs in several respects from *S. brongersmai* Storr, including the extension of the black dorsolateral streak back on to the tail.

Tiliqua scincoides (Shaw).

Recorded at W5 (1).

In sandstone/spinifex.

FAMILY VARANIDAE. **Goannas.**

Varanus acanthurus Boulenger.

Recorded at E3 (1).

Among large lateritic boulders.

Varanus glauerti Mertens.

Recorded at E5 (1), W3 (1) and W5 (4).

In closed-forest and riverine forest.

Varanus glebopalma Mitchell.

Recorded at E2 (1), E5 (1), E6 (2), W2 (1), and W3 (3).

In sandstone/spinifex, especially the more rugged King Leopold Sandstone.

Varanus gouldii (Gray).

Recorded at W3 (1).

In sandstone/spinifex with *Eucalyptus miniata*.

Varanus mertensi Glauert.

Recorded at E1 (2), E2, W2 (2), W4 and W6 (1).

In fresh water.

Varanus mitchelli Mertens.

Recorded at W1 (1).

On a watercourse.

Varanus tristis (Schlegel).

Recorded at W1 (1).

In open-woodland with some *Pandanus*.

Varanus sp.

Recorded at E6 (5).

Under sandstone boulders.

This small, handsomely coloured species is an undescribed member of the *V. acanthurus* species-group.

FAMILY BOIDAE. **Pythons.**

Liasis olivaceus Gray.

Recorded at E6 (1) and W5.

One among massive sandstone boulders; the other in *Eucalyptus* woodland. Gut contents of specimen: a young Brown Quail (*Coturnix ypsilophora*).

Python spilotos (Lacépède).

Recorded at E6 (1) and W4 (1).

One 4 m up in eucalypt in woodland; the other in canopy of mangroves. These are the first specimens from the Kimberley Division.

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

Boiga fusca (Gray).

Recorded at E3 (2).

Among lateritic boulders in *Eucalyptus* woodland.

Dendrelaphis punctulatus (Gray).

Recorded at E5 (1), W1 (1) and W6 (1).

Two on margins of watercourses; one in a rocky gully.

To the above localities can be added Careening Bay, where James Hunter collected the type specimen.

FAMILY ELAPIDAE. **Front-fanged Snakes.**

Acanthophis antarcticus (Shaw).

Recorded at W5 (1).

In sandstone/spinifex.

Demansia psammophis olivacea (Gray).

Recorded at W5 (1) and Careening Bay (1).

In grassy woodland.

Pseudechis australis (Gray).

Recorded at E5 (1), W1 (1), and W4 (2).

In grassy *Eucalyptus* woodland; also in leaf litter beneath closed-forest.

FAMILY CROCODYLIDAE. **Crocodiles.**

Crocodylus johnstoni Krefft.

Recorded at E1, E2, E4 (1), E6, W2 (1) and W6.

In freshwater river-pools. A female (total length 95 cm) had 6 eggs in the oviduct.

Crocodylus porosus Schneider.

Recorded at W2 and St George Basin.

On 26 May 1972 R. E. Johnstone (pers. comm.) saw 15 crocodiles up to 2 m long in St George Basin; 10 of them were counted during a 3 km spot-light run in the launch.

On 12 September 1820 John Septimus Roe saw 12 "alligators" on the Roe. A month later Lieutenant King's party recorded an "alligator" when rowing up the Prince Regent River.

DISCUSSION

Despite the short time spent on the Prince Regent River Reserve and its restriction to the winter months, the surprisingly high number of 67 species was recorded. Certain families must be completely or nearly completely listed, namely the Hylidae, Cheluidae, Agamidae, Varanidae and Crocodylidae; and only a few more species of Gekkonidae and Scincidae can be expected. However, all snake families are poorly represented in this collection, and the final count of species should be at least double the number at present listed for the Reserve.

The herpetofauna of the Reserve is strong in taxa characteristic of the subhumid zone of north-west Kimberley and the far north of the Northern Territory. The disjunction of these two regions by the semi-arid Ord and Victoria River drainages has resulted in some

taxonomic divergence. Representative forms often differ subspecifically, e.g. *Diporiphora a. albilabris* in Kimberley and *D. a. sobria* in the Territory, *D. b. bennettii* in Kimberley and *D. b. arnhemica* in the Territory, *D. bilineata margaretae* in Kimberley and *D. b. bilineata* in the Territory, and *Carlia j. johnstonei* in Kimberley and *C. j. grandensis* in the Territory. Some north-west Kimberley species have not yet been found in the Territory, e.g. the agamids *Amphibolurus microlepidotus* and *Diporiphora superba*.

Other characteristics of the herpetofauna of the Reserve are the strong representation of the predominantly Torresian genera *Litoria*, *Diporiphora*, *Carlia* and *Varanus* and the absence or paucity of predominantly Eremaean genera like *Diplodactylus*, *Tympanocryptis* and *Ctenotus* and of the predominantly southern genera *Amphibolurus* and *Lerista*.



Figure 1—Creek at E6, home of 12 species of frogs.



Figure 2—*Litoria nasuta*, one of the frogs at E6.

PART VIII

**A PRELIMINARY CHECKLIST OF THE FRESHWATER FISHES
OF THE PRINCE REGENT RIVER RESERVE
NORTH-WEST KIMBERLEY, WESTERN AUSTRALIA**

By GERALD R. ALLEN¹

INTRODUCTION

The freshwater fishes of northern Western Australia are poorly documented. Most of the streams of this vast area remain uncollected. Notable exceptions include collections made by Mees (1963) in the Fortescue River System and McKay (1971) in the Ord River. In addition, a number of streams were sampled by D. Rosen and G. Nelson of the American Museum of Natural History, assisted by W. H. Butler, during 1969. Their collections remain largely unreported. The present paper includes a list of fishes taken in the Prince Regent River Reserve, Kimberley District, Western Australia, during August 1974, as part of a general biological survey conducted by the Western Australian Department of Fisheries and Wildlife (for background information see introductory papers in this volume by Burbidge; Miles; and Miles, Kenneally and George).

Most of the fishes were procured by the author at three main sites within the Reserve. The general habitat at these localities was fairly uniform consisting mostly of quiet, slow flowing pools of variable size with depths to about 3-4 m interspersed with short sections of rapids. Smaller tributaries tended to be faster flowing with occasional waterfalls up to 10 m in height. All the streams contained clear water with mainly sandstone or sandy bottom and several varieties of aquatic plants.

The collection sites on the upper Roe River (E4) and upper Prince Regent River (E1) were approximately 70-80 km upstream from the sea. The width of these streams at this point averaged about 15-20 m. The site on the lower Prince Regent River (W2) was located on Cascade Creek, a small fast flowing tributary which plunges into the main river via the spectacular King Cascade. A number of brackish water fishes were collected below the Cascade in a mangrove-lined inlet. This location is approximately 40 km upstream from St George Basin and is subjected to a tidal fluctuation of about 6 m. The main river at this point is about 300-400 m wide. It is emphasized that the above observations were made during the dry season and the volume of water in the streams is considerably increased during the wet season.

LIST OF COLLECTING STATIONS

E4-1. Upper Roe River (approximately 15° 26' S, 125° 37' E), 14 August 1974; G. Allen and A. Chapman. Collection made with 40 m seine over sandstone bottom at depths to 1 m; water fresh and clear.

E4-2. Upper Roe River, 14 August 1974; G. Allen. Collection made along edge of river with head torch and small dipnet at 8.00 p.m. over sandstone bottom; water fresh and clear.

E4-3. Upper Roe River, 15 August 1974; G. Allen and A. Chapman. Collection made in side channel (approximately 10 m wide) of main river with 30 m seine over sandstone bottom at depths to 2 m, water fresh and clear.

E4-4. Wyulda Creek, about 2 km above junction with Roe River, 17 August 1974; G. Allen. Collection made in quiet pool (approximately 10 x 60 m) with 1 kg of derris powder over sandstone and mud bottom at depths to 2 m; water fresh and clear.

E4-5. Upper Roe River, 18 August 1974; G. Allen. Collection made in large, slow flowing pool with 1 kg of derris powder over sandstone bottom at depths to 2 m; water fresh and clear.

E1-1. Upper Prince Regent River (approximately 15° 49' S, 125° 37' E), 19 August 1974; G. Allen.

Collection made along edge of stagnant pool with small dipnet over mud bottom; water fresh and murky.

E1-3. Upper Prince Regent River, 20 August 1974; G. Allen.

Collection made along edge of stagnant pool with head torch and small dipnet at 8.00 p.m. over mud bottom; water fresh and murky.

E1-4. Gundarara Creek, about 2 km above junction with Prince Regent River, 21 August 1974; G. Allen. Collection made in quiet pool with 0.5 kg of derris powder over sandstone bottom at depths to 2 m; water fresh and clear.

E1-5. Upper Prince Regent River, 24 August 1974; G. Allen.

Collection made along edge of stagnant pool with small dipnet over mud bottom; water fresh and murky.

W1-1. Blyxa Creek (approximately 15° 48' S, 125° 20' E), 20 August 1974; N. McKenzie, J. Dell and A. George.

Collection made with dipnet over rock bottom; water fresh and clear.

¹ Department of Fishes, Western Australian Museum, Francis Street, Perth, W.A. 6000.

W2-1. Cascade Creek (approximately 15° 38' S, 125° 18' E), about 1 km above King Cascade, 25 August 1974; G. Allen.

Collection made in small scattered pools with dipnet over sandstone bottom at depths to 0.5 m; water fresh and clear.

W2-2. Prince Regent River, inlet at base of King Cascade, 26 August 1974; G. Allen.

Collection made near base of waterfall at extreme low tide with 1 kg of derris powder over mud bottom at depths to 1 m; water brackish and muddy.

W2-3. Small un-named creek about 1 km above junction with King Cascade Inlet, 27 August 1974; G. Allen.

Collection made in small pool (ca 2 x 10 m) just above extreme high tide level with 0.5 kg of derris powder over sandstone bottom at depths to 0.5 m; water fresh and clear.

W2-5. Prince Regent River, inlet at base of King Cascade, 29 August 1974; G. Allen.

Collection made with hook and line, and dipnets over mud bottom at depths to 4 m; water brackish and muddy.

W2-6. Prince Regent River, inlet at base of King Cascade, 31 August 1974; G. Allen.

Collection made at extreme low tide with 2 kg of derris powder over mud bottom at depths to 2 m; water brackish and muddy.

W6-1. Youwanjela Creek (approximately 15° 34' S, 125° 25' E), 21 August 1974; B. Wilson.

Collection made with 0.5 kg of derris powder over rock bottom at depths to 1 m; water fresh and clear.

RESULTS

A total of 35 species belonging to 21 families was collected. The majority of species were taken from the brackish water inlet below King Cascade. Fourteen species were collected in clear freshwater; these include: *Nematalosa erebi*, *Neosilurus glencoensis*, *Anguilla bicolor*, *Craterocephalus worrelli*, *Nematocentris australis*, *N. ogilbyi*, *Ambassis agrammus*, *Hephaestus fuliginosus*, *Madigania unicolor*, theraonid species A and B, *Glossogobius giurus*, *Mogurnda mogurnda*, and *Hypseleotris simplex*. The un-named theraonids represent new species (one a new genus) which will be described by the author in a future publication.

An annotated list of the species is presented below. An abbreviated reference is given for the original description of each species followed by a list of the material collected and general remarks. Specimens are deposited at the Western Australian Museum, Perth (abbreviated WAM in the subsequent text). Standard length (SL) measurements are given, except total length (TL) is used for eels and plotosid catfishes and pre-caudal length (PCL) for sharks. A small representative collection of the freshwater species has been deposited at the Australian Museum, Sydney and is not included in this report.

The author gratefully acknowledges the assistance of Dr D. F. Hoese for his provisional identification of *Hypseleotris* and Dr J. M. Thompson kindly identified the Mugilidae.

LIST OF SPECIES

FAMILY CARCHARHINIDAE. Requiem Sharks.

Carcharhinus leucas (Muller and Henle).

Carcharias leucas Muller and Henle, *Syst. Besch. Plagiostomen*: 42 (1841); type locality, Antilles.

W2-5 (WAM P25037-002), 1 specimen, 640 mm PCL. One additional specimen, 960 mm PCL, caught with hook and line from the inlet at base of King Cascade, but later discarded. Circumtropical distribution, frequently ascending the lower reaches of rivers.

FAMILY CLUPEIDAE. Herrings.

Nematalosa erebi (Günther). Fig. 1

Chatoessus erebi Günther, *Catalogue Fishes Brit. Mus.* 7: 407 (1868); type locality, eastern Australia.

E1-4 (WAM P25032-003), 4 specimens, 110-130 mm SL.

Many small schools of up to 20-30 individuals observed in pools grazing on algae over rock bottom at the upper Prince Regent River and Gundarara Creek. Distributed throughout New Guinea and Australia. Freshwater.

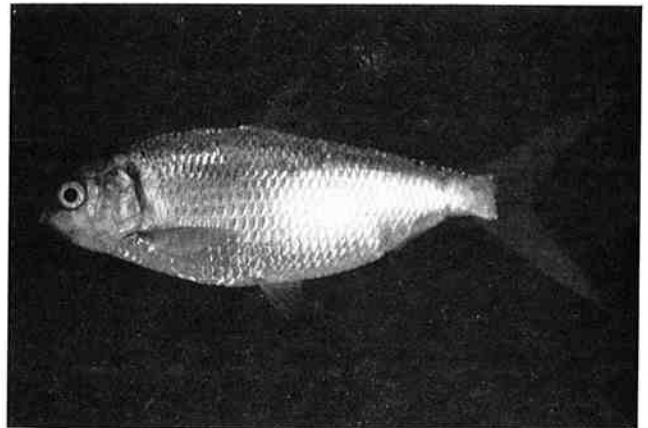


Figure 1—*Nematalosa erebi*, 130 mm SL (E1).

FAMILY ENGRAULIDAE. Anchovies.

Thryssa hamiltoni (Gray).

Thryssa hamiltoni Gray (In Hardwicke), *Illustrations of India Zoology* 2: pl. 92 (1832-34); type locality unknown.

W2-2 (WAM P25035-004), 1 specimen, 83 mm SL.

W2-6 (WAM P25038-007), 5 specimens, 70-85 mm SL.

Common in brackish water at King Cascade. Distributed along the coast of south-east Asia from Burma to China; Philippines, Indonesia and northern Australia.

Stolephorus indicus (van Hasselt).

Engraulis indicus van Hasselt, *Algemeene Konst-en Letter-bode* 1, No. 21: 329 (1823); type locality, Java.

W2-2 (WAM P25035-005), 1 specimen, 45 mm SL.

A widespread species in the tropical Indo-West Pacific, frequently ascending tidal rivers.

FAMILY ARIIDAE. Fork-tail Catfishes.

Arius australia Günther

Arius australis Günther, *Proc. Linn. Soc. Lond.* **103** (1867); type locality, Hunter River, New South Wales.

W2-2 (WAM P25035-001), 6 specimens, 68-105 mm SL.

Common and easily caught with hook and line at brackish inlet below King Cascade. One specimen (210 mm SL) also collected outside reserve in freshwater at Plain Creek Gorge, Beverley Springs Station. Distributed in streams of northern New South Wales, Queensland, Northern Territory and Western Australia.

FAMILY PLOTOSIDAE. Eel-tail Catfishes.

Neosilurus glencoensis (Rendahl). Fig. 2

Copidoglanis glencoensis Rendahl, *Medd. Zool. Mus. Krist.* **5**: 170 (1922); type locality, Daly River and Glencoe, Northern Territory.

E4-3 (WAM P25027-001), 5 specimens, 100-115 mm TL.

E4-4 (WAM P25028-004), 8 specimens, 62-115 mm TL.

E4-5 (WAM P25029-005), 2 specimens, 90 and 120 mm TL.

E1-4 (WAM P25032-007), 2 specimens, 110 and 135 mm TL.

W6-1 (WAM P25040-005), 26 specimens, 41-90 mm TL.

Apparently common in freshwater streams throughout the reserve. Occurs in north-western Western Australia and Northern Territory.

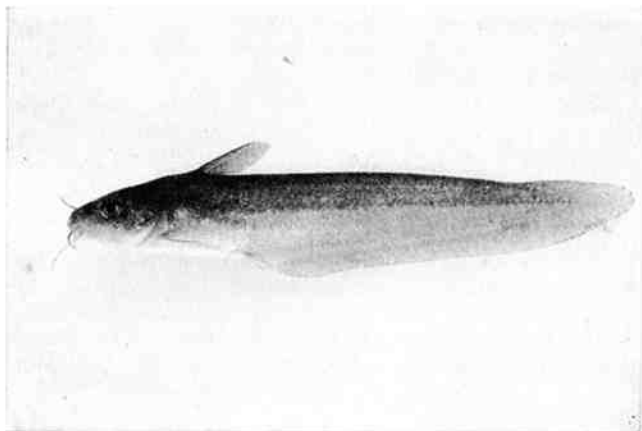


Figure 2—*Neosilurus glencoensis*, 115 mm TL (E4).

FAMILY ANGUILLIDAE. Freshwater Eels.

Anguilla bicolor McClelland. Fig. 3

Anguilla bicolor McClelland, *Calcutta Journ. Nat. Hist.* **5**: 178 (1844); type localities, north-western Australia, India, Africa and East Indies.

W2-3 (WAM P25036-002), 1 specimen, 565 mm TL.

One additional individual observed near location where above specimen captured. Widespread in the tropical Indo-West Pacific. Spawns in the sea, but spends most of the life cycle in freshwater.

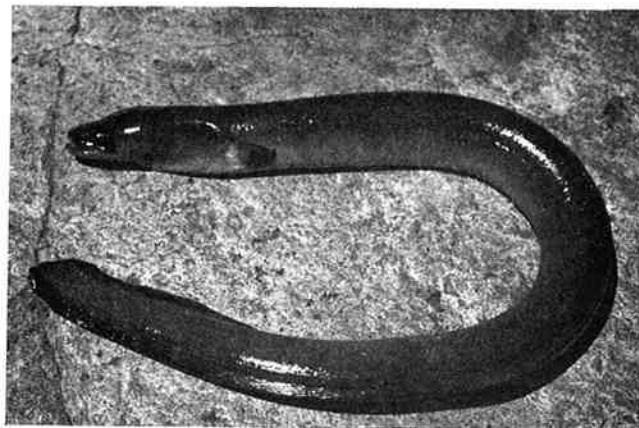


Figure 3—*Anguilla bicolor*, 565 mm TL (W2).

FAMILY BELONIDAE. Needlefishes.

Strongylura strongylura (van Hasselt).

Belone strongylura van Hasselt, *Algemeene Konst-en Letter-bode* 2, No. 35: 130 (1823); type locality, Batavia Java.

W2-6 (WAM P25038-005), 1 specimen, 221 mm SL.

Common in brackish water inlet below King Cascade. Widespread in the tropical Indo-West Pacific, frequently entering estuaries.

FAMILY HEMIRAMPHIDAE. Halfbeaks.

Zenarchopterus buffonis (Valenciennes).

Hemiramphus buffonis Valenciennes, *Hist. Nat. Poiss.* **19**: 48 (1846); type locality, Pulo-Pinan.

W2-6 (WAM P25038-006), 2 specimens, 45-170 mm SL.

Common in brackish water inlet below King Cascade. Distribution includes India, Andaman Islands, Malaysia, Indonesia, Philippines, New Guinea and northern Australia. Found in the sea, estuaries and rivers.

FAMILY MUGILIDAE. Mulllets.

Mugil subviridis Cuvier and Valenciennes.

Mugil subviridis Cuvier and Valenciennes, *Hist. Nat. Poiss.* **11**: 115 (1836); type locality, Malabar.

W2-6 (WAM P25038-002), 14 specimens, 19-112 mm SL.

Abundant in brackish inlet below King Cascade. Many large adults observed, although only juveniles collected. Distribution includes India, Ceylon, Andaman Islands, Malaysia, Indonesia, Philippines, New Guinea and northern Australia. Sea and estuaries.

Valamugil buchanani (Bleeker).

Mugil buchanani Bleeker, *Verh. Bat. Gen.* **25**: 99 (1853); type locality, Bengal.

W2-6 (WAM P25038-012), 1 specimen, 46 mm SL.

Only one juvenile collected with a school of *Mugil subviridis* in brackish water below King Cascade. Widely distributed in south-east Asia and Northern Australia.

FAMILY ATHERINIDAE. **Silversides.**

Craterocephalus worrelli Whitley. Fig. 4

Craterocephalus worrelli Whitley, *Rec. Austr. Mus.* **22**: 86 (1948); type locality, Mataranka, Roper River system, Northern Territory.

E4-4 (WAM P24028003), 6 specimens, 28–36 mm SL.

E4-5 (WAM P25029-003), 14 specimens, 22–45 mm SL.

Collected and observed only in the upper Roe River and Wyulda Creek. Found in freshwaters of New Guinea, Northern Territory and north-western Western Australia.

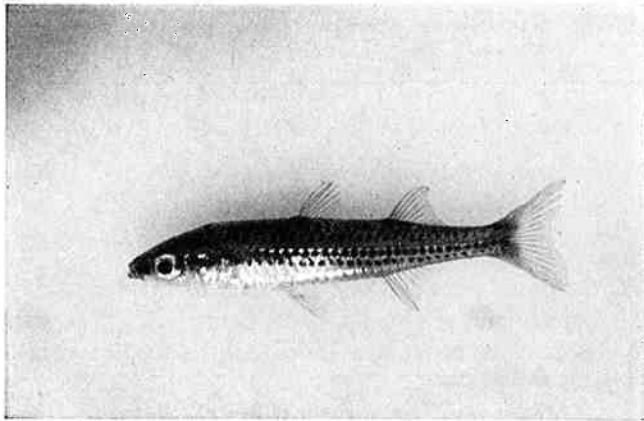


Figure 4—*Craterocephalus worrelli*, 36 mm SL (E4).

FAMILY MELANOTAENIIDAE. **Rainbowfishes.**

Nematocentris australis (Castelnau). Fig. 5

Neoatherina australis Castelnau, *Res. Fish. Austr. (Vict. Office. Rec. Philad. Exhib.)*: **32** (1875); type locality, Western Australia.

E4-1 (WAM P25025-001), 35 specimens, 40–58 mm SL.

E4-4 (WAM P25028-005), 27 specimens, 28–63 mm SL.

E4-5 (WAM P25029-004), 27 specimens, 25–60 mm SL.

W1-1 (WAM P25041-001), 51 specimens, 14–53 mm SL.

W2-3 (WAM P25036-001), 71 specimens, 30–68 mm SL.

W6-1 (WAM P25040-001), 17 specimens, 32–46 mm SL.

The most common freshwater fish found in the reserve. Abundant in streams and stagnant pools. Apparently confined to north-western Western Australia.

Nematocentris ogilbyi (Weber).

Melanotaenia ogilbyi Weber, *Notes Leyden Mus.* **32**: 230 (1911); type locality, Lorentz River, New Guinea.

W2-1 (WAM P25034-001), 41 specimens, 19–47 mm SL.

Collected and observed only in Cascade Creek above King Cascade where it co-occurs with the less abundant *Mogurnda mogurnda*. It is interesting to note that this species replaces *N. australis* which was found in every stream that was sampled in the reserve except Cascade Creek. Known from the Merauke River system, New Guinea and the Kimberley District, Western Australia.

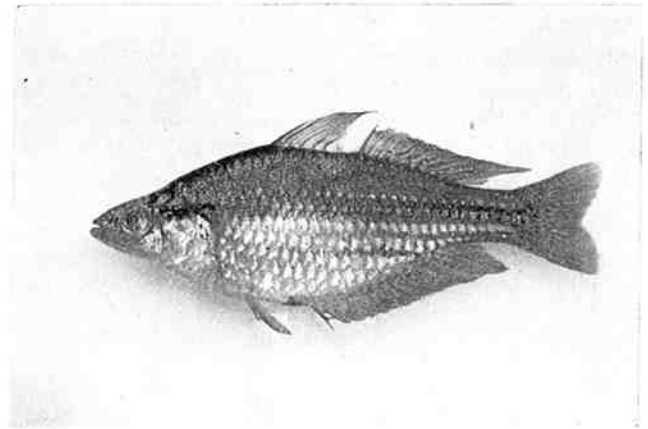


Figure 5.—*Nematocentris australis*, 60 mm SL (E4).

FAMILY CENTROPOMIDAE. **Glassfishes.**

Ambassis agrammus Günther.

Ambassis agrammus Günther, *Ann. Mag. Nat. Hist. ser. 3*, **20**: 57 (1867); type locality, Cape York, Queensland.

E1-1 (WAM P25030-001), 15 specimens, 15–35 mm SL.

E1-5 (WAM P25033-001), 44 specimens, 16–28 mm SL.

Collected and observed only in stagnant pool (approximately 30 x 40 m) adjacent to camp E1 on the upper Prince Regent River. Apparently nocturnal, congregating in large numbers during the day among clumps of vegetation. Distributed in freshwater streams of northern Australia and New Guinea.

Ambassis interrupta Bleeker.

Ambassis interrupta Bleeker, *Nat. Tijdschr. Ned. Indie* **3**: 696 (1852); type locality, Ceram, Indonesia.

W2-2 (WAM P25035-006), 5 specimens, 23–28 mm SL.

W2-3 (WAM P25036-004), 1 specimen, 45 mm SL.

W2-6 (WAM P25038-009), 63 specimens, 19–48 mm SL.

Common at brackish inlet below King Cascade. Distribution includes Andaman Islands, Malaysia, Indonesia, Philippines and New Guinea. Inhabits coastal waters, frequently ascending tidal rivers. The Prince Regent specimens represent a new record for Australia.

Lates calcarifer (Bloch).

Holocentrus calcarifer Bloch, *Naturgeschichte der Australischen Fische* **4**: 100 (1790); type locality, Japan.

No specimens were collected, but one individual (approximately 100 cm TL) observed in shallow water along a mangrove-lined shore at brackish inlet below King Cascade. Widespread along the southern coast of Asia from the Persian Gulf to southern China and Japan. Also occurs in Malaysia, Indonesia, New Guinea and northern Australia.

Psammoperca waigiensis (Cuvier).

Labrax waigiensis Cuvier, *Hist. Nat. Poiss.* **2**: 83 (1828); type locality, Waigiou.

W2-6 (WAM P25038-008), 1 specimen, 263 mm SL.

Only one specimen observed and collected. Widely distributed along the coast of south-east Asia from India to China, Malaysia, Indonesia, Philippines, New Guinea and northern Australia.

FAMILY CARANGIDAE. Jacks.

Caranx sexfasciatus Quoy and Gaimard.

Caranx sexfasciatus Quoy and Gaimard, Voyage autour du monde . . . sur l'Uranie et la Physicienne . . . Zoologie: 358 (1824); type locality, Papous Islands.

No specimens were collected, but several individuals (approximately 100 mm SL) observed schooling with *Toxotes chatareus* at brackish inlet below King Cascade. Widespread in the tropical Indo-West Pacific. Marine, but frequently entering estuaries.

FAMILY THERAPONIDAE. Perches or Grunters.

Hephaestus fuliginosus (Macleay). Fig. 6

Therapon fuliginosus Macleay, Proc. Linn. Soc. N.S.W. 8: 201 (1883); type locality, upper Burdekin River near Charters Towers, Queensland.

E1-3 (WAM P25031-004), 2 specimens, 108 and 145 mm SL.

E1-4 (WAM P25032-004), 5 specimens, 78-185 mm SL.

Collected and observed only on the upper Prince Regent River where it was abundant, but also taken outside the reserve at Plain Creek Gorge, Beverley Springs Station. Distributed in the streams running east from the Great Divide in northern Queensland and also in the streams of north-western Western Australia.



Figure 6—*Hephaestus fuliginosus*, 140 mm SL, Plain Creek (Beverley Springs Station). The enlarged lips of this specimen are an aberrant feature.

Madigania unicolor (Günther). Fig. 7

Therapon unicolor Günther, Catalogue Fishes Brit. Mus. 1: 277 (1859); type locality, Mosquito Creek near Carling Downs, and Gwydir River, New South Wales.

E4-2 (WAM P25026-001), 1 specimen, 53 mm SL.

E4-4 (WAM P25028-002), 1 specimen, 120 mm SL.

E4-5 (WAM P25029-001), 9 specimens, 47-120 mm SL.

E1-4 (WAM P25032-006), 1 specimen, 75 mm SL.

Common at most freshwater localities in the reserve. Also taken from small streams at Beverley Springs Station. Occurs only in northern Australia.

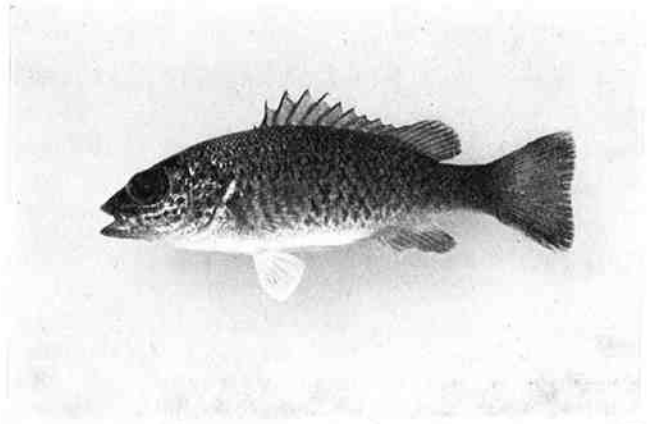


Figure 7—*Madigania unicolor*, 95 mm SL (E4).

Theraponid species A. Fig. 8

E4-1 (WAM P25025-002), 1 specimen, 38 mm SL.

E4-2 (WAM P25026-003), 5 specimens, 35-53 mm SL.

E4-3 (WAM P25027-003), 6 specimens, 35-43 mm SL.

E4-4 (WAM P25028-001), 7 specimens, 37-58 mm SL.

E4-5 (WAM P25029-002), 39 specimens, 35-72 mm SL.

E1-4 (WAM P25032-005), 10 specimens, 30-50 mm SL.

W6-1 (WAM P25040-002), 25 specimens, 33-116 mm SL.

An apparently undescribed species, possibly referable to the genus *Hephaestus*. It particularly differs from most known theraponids on the basis of the low lateral-line count. Counts for five specimens, 84-115 mm SL, as follows: dorsal rays XI, 10½ anal rays III, 7½ (one with 6 soft rays); tubed lateral-line scales 30 to 32; gill rakers on first arch 19 to 20. Colour of adults in preservative dark greyish-brown except white ventrally and black on dorsal portion of head; basal half of soft dorsal, anal and caudal fins blackish, outer half pale or slightly dusky; axil of pectoral fin prominently black. Apparently a small species; two of the largest specimens, 113 and 115 mm SL, are females with eggs. Common in most of the streams that were sampled.

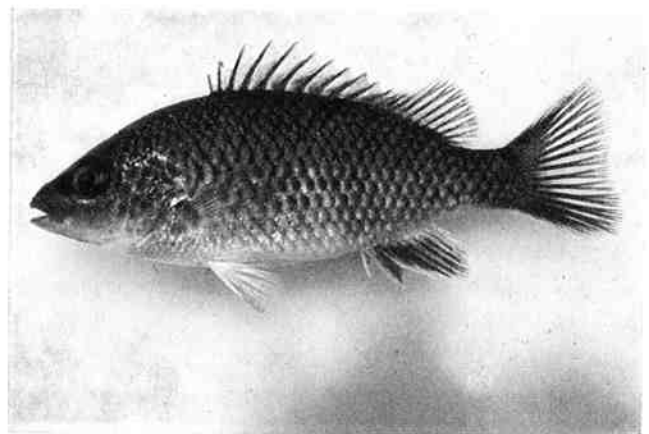


Figure 8—Theraponid species A, 53 mm SL (E4).

Theraponid species B. Fig. 9

E4-2 (WAM P25026-002), 2 specimens, 47 and 110 mm SL.

E4-3 (WAM P25027-002), 1 specimen, 130 mm SL.

E4-4 (WAM P25028-006), 2 specimens, 98 and 100 mm SL.

E4-5 (WAM P25029-006), 19 specimens, 43-125 mm SL.

E1-3 (WAM P25031-005), 3 specimens, 59-68 mm SL.

W6-1 (WAM P25040-003), 4 specimens, 120-145 mm SL.

This species apparently represents an undescribed genus. The salient features include an elongate body, shortened dorsal spines, a peculiar pointed snout, lower jaw flattened with lower lip greatly reduced, teeth of jaws triserial and movable, those of outer row exposed when jaw is closed. Counts for five specimens, 108-140 mm SL, as follows: dorsal rays XI, 12 to 13 (one with XII, 12); anal rays III, 8 (one with III, 9); tubed lateral-line scales 48 to 51; gill rakers on first arch 25 to 28. Colour of adults in preservative uniformly blackish or dark grey except whitish ventrally. Small juveniles pale with one or two faint longitudinal stripes on sides and dark blotch on anal fin. Extremely common in the upper Roe River, but only small juveniles seen in the upper Prince Regent River. Feeds on benthic algae.

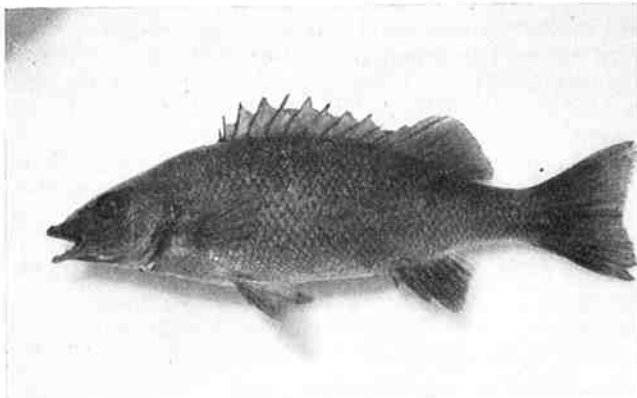


Figure 9—Theraponid species B, 125 mm SL (E4).

FAMILY GERRIDAE. Silver Biddies.

Leiognathus equulus (Forsskal).

Scomber equula Forsskal, *Descriptiones Animalium* 58 (1775); type locality, Red Sea.

W2-6 (WAM P25038-004), 3 specimens, 41-51 mm SL.

Collected and observed only in brackish water below King Cascade. Widespread in the tropical Indo-West Pacific, frequently found in estuaries and tidal rivers.

FAMILY TOXOTIDAE. Archerfishes.

Toxotes chatareus (Hamilton-Buchanan).

Coius chatareus Hamilton-Buchanan, Account of the Fishes found in the River Ganges and its branches: 101 and 370 (1878); type locality, Ganges River, India.

W2-5 (WAM P25037-001), 4 specimens, 30-125 mm SL.

In spite of much searching, archerfishes were not collected or observed in the freshwater streams of the reserve. This species was taken from brackish water below King Cascade where there is considerable mangrove growth. An undescribed species of *Toxotes* was collected outside the reserve at Plain Creek Gorge, Beverley Springs Station. *T. chatareus* is distributed along the south-east coast of Asia from India to China. It also inhabits Malaysia, Indonesia, New Guinea and northern Australia. Occurs in brackish and freshwater.

FAMILY SCATOPHAGIDAE. Scats.

Scatophagus argus (Linnaeus).

Chaetodon argus Linnaeus, *Systema Nat.* ed. 12, 1: 464 (1766); type locality, India.

No specimens collected, but observed in brackish water below King Cascade. A common inhabitant of mangrove-bordered estuaries in northern Australia. Also occurs in Malaysia, Indonesia, Melanesia (except Fiji), and along the coast of south-east Asia from India to China.

FAMILY GOBIIDAE. Gobies.

Glossogobius giurus (Hamilton-Buchanan). Fig. 10

Gobius giurus Hamilton-Buchanan, Account of the Fishes found in the River Ganges and its branches: 51 and 366 (1822); type locality, Ganges River, India.

E1-3 (WAM P25031-001), 1 specimen, 65 mm SL.

E1-4 (WAM P25032-001), 10 specimens, 65-85 mm SL.

Collected and observed only in freshwater of the upper Prince Regent River and its tributaries. Widespread in the tropical Indo-West Pacific. Marine and freshwater.

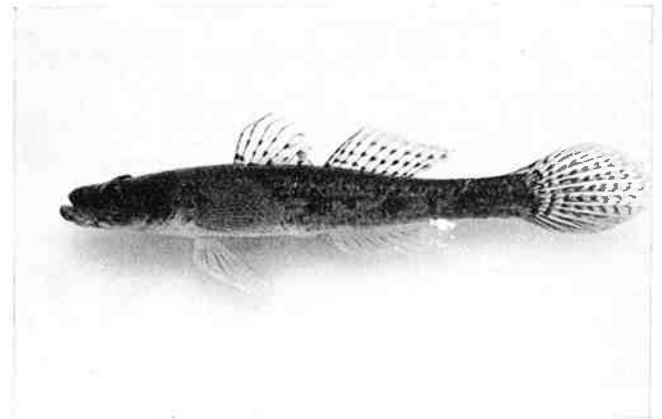


Figure 10—*Glossogobius giurus*, 88 mm SL (E1).

Mogurnda mogurnda (Richardson). Fig. 11
Eleotris mogurnda Richardson, Voy. Erebus and Terror: 4 (1844); type locality, Port Essington, Northern Territory.

E4-4 (WAM P25028-008), 1 specimen, 36 mm SL.

E1-3 (WAM P25031-003), 1 specimen, 34 mm SL.

W1-1 (WAM P25041-002), 2 specimens, 43 and 49 mm SL.

W2-1 (WAM P25034-002), 4 specimens, 33-42 mm SL.

Only juveniles were collected. The adults, which are reported to reach 170 mm TL, were not seen. Found in freshwater streams of the Aru Islands, New Guinea and northern Australia.



Figure 11—*Mogurnda mogurnda*, 36 mm SL (E4).

Hypseleotris simplex? (Castlenau). Fig. 12

Eleotris simplex Castlenau, *Proc. Linn. Soc. N.S.W.* 3: 49 (1878); type locality, Norman River, Queensland.

E4-4 (WAM P25028-007), 18 specimens, 17-33 mm SL.

E1-3 (WAM P25031-002), 1 specimen, 34 mm SL.

E1-4 (WAM P25032-008), 13 specimens, 23-48 mm SL.

W2-3 (WAM P25036-003), 35 specimens, 13-37 mm SL.

W6-1 (WAM P25040-004), 14 specimens, 23-38 mm SL.

This species, tentatively identified as *H. simplex*, was common in all the freshwater streams which were sampled. Recorded previously from Queensland and the Northern Territory.

Periophthalmus keolreuteri (Pallas).

Gobius keolreuteri Pallas, *Spicilegium Zool.* 8: (1770); type locality unknown.

W2-2 (WAM P25035-002), 4 specimens, 32-47 mm SL.

This species, which was noted as being abundant at the base of King Cascade by the explorer Phillip King (1827) in July 1821, was seen in large numbers at the same locality during the present expedition. Widespread in the tropical Indo-West Pacific. Brackish and saltwater.

Prionobutis microps (Weber).

Pogoneleotris microps Weber, *Nova Guinea 5 Zool.* 2: 258 (1908); type localities, Tawarin and Merauke Rivers, New Guinea.

W2-6 (WAM P25038-001), 6 specimens, 91-162 mm SL.

Collected and observed only in brackish water below King Cascade. Known from brackish and freshwaters of New Guinea and northern Australia.



Figure 12—*Hypseleotris simplex*, 30 mm SL (E4).

FAMILY GOBIOIDIDAE. Eel Gobies.

Brachyamblyopus coecus (Weber).

Taenioides coecus Weber, Siboga Exped. Fische: 486 (1913); type locality, Sumbawa, Indonesia.

W2-2 (WAM P25035-003), 4 specimens, 47-67 mm SL.

W2-6 (WAM P25038-010), 1 specimen, 49 mm SL.

These blind gobies were collected at extreme low tide, buried (about 40-50 cm deep) in soft mud at the base of King Cascade. Known from Indonesia and northern Australia. A new record for Western Australia, although Whitley (1962) recorded the genus from there.

FAMILY SOLEIDAE. Soles.

Aseraggodes klunzingeri (Weber).

Paradachirus klunzingeri Weber, *Nova Guinea 5*, 2: 250 (1908); type localities, Merauke and Lorentz Rivers, New Guinea.

W2-6 (WAM P25038-011), 1 specimen, 30 mm SL.

Inhabits brackish and freshwaters of New Guinea and northern Australia.

FAMILY TETRAODONTIDAE. Pufferfishes.

Chelonodon patoca (Hamilton-Buchanan).

Tetrodon patoca Hamilton-Buchanan, Account of the Fishes found in the River Ganges and its branches: 7 (1822); type locality, Ganges River, India.

No specimens collected, but one individual observed in brackish water at inlet below King Cascade. Widespread in the tropical Indian Ocean and far western Pacific, frequently entering estuaries and ascending rivers.

Takifugu meraukensis (de Beaufort).

Sphoeroides meraukensis de Beaufort, *Beaufortia* 5: 53 (1955); type locality, Merauke River, New Guinea.

W2-6 (WAM P25038-003), 1 specimen, 113 mm SL.

Collected and observed only in brackish water below King Cascade. Previously recorded only from New Guinea. New record for Australia.

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PART IX

A REPORT ON THE MOLLUSC FAUNA OF THE PRINCE REGENT RIVER RESERVE, NORTH-WEST KIMBERLEY, WESTERN AUSTRALIA

By B. R. WILSON¹ and P. R. SMITH¹

INTRODUCTION

The land snail collection of the Western Australian Museum indicates that the South-West Division and the Kimberley Division have been the two main centres of snail speciation in Western Australia. Iredale (1939) described the Kimberley land snail fauna from collections made from a few coastal islands and areas in the Napier, Barrier and Oscar Ranges. At least 50 species have been collected to date, but many of these are only represented by fragmentary specimens.

A great diversity of species of the family Camaenidae predominate in the Kimberley land snail fauna. Other groups having zoogeographic significance are the endodontoid families, the Helicarionidae, Chondrinidae, Enidae and Subulinidae. These groups appear to have Western Pacific or South-East Asian affinities.

Of particular interest in the Kimberley are small patches of "rain forest" vegetation. A field collecting trip made by Museum personnel in 1973 to rainforest in the Mitchell Plateau yielded snails of a new genus and species of the primitive family Enidae. Formerly, only one other species of this family was known to occur in Australia.

The freshwater snails of the Kimberley are also of special interest because of their potential as vectors for parasitic diseases such as schistosomiasis and paragonimiasis. No species known to be vectors of schistosomiasis have yet been found in the Kimberley, but snails closely related are present.

This survey of the Prince Regent River Reserve provided an opportunity for a more intensive study of the molluscan fauna of rain forest areas which have been classified according to Specht, Roe and Boughton (1974) as low closed-forests and closed-forests of semi-deciduous microphyll vine thickets (see Miles, Kenneally and George, this publication). It also provided the opportunity to make a general survey of a region as yet unaffected by modern man.

LIST OF COLLECTING STATIONS

Intensive collecting was carried out by the authors at three sites in the reserve. These sites were E5 (Enid Falls), W6 (Youwanjela Creek), and W4 (Mt Trafalgar) (see Fig. 2 in Miles, this publication). Additional material was collected by team members at several other sites in the reserve. Collections were also made in fresh water creeks on Beverley Springs Station south of the reserve between latitudes 16° 17' S and 16° 35' S and between longitudes 125° 28' E and 125° 40' E. Although major interest was focussed on land and freshwater molluscs, a small collection of marine molluscs was made from the mangroves lining St George Basin at the W4 site.

The three major collecting sites were divided into a number of sampling stations based on distinguishing geological and vegetational features with grid references taken from the Australia 1:250 000 "Prince Regent" map SD 51-16, Edition 2, Series R502, printed by the Royal Australian Survey Corps, 1967.

E5-1. Small gully entering at north-east corner of the main gorge below Enid Falls (grid reference 348:086), 14 August 1974 and 16 August 1974; B. Wilson and P. Smith. Collections made on quartz-sandstone scree supporting a low closed-forest of semi-deciduous microphyll vine thickets.

E5-2. East side of main gorge below Enid Falls (grid reference 348:086), 14 August 1974; B. Wilson and P. Smith. Collection made in poorly developed semi-deciduous vine thickets on quartz-sandstone scree.

E5-3. Campsite on top of Enid Falls (15° 07' S, 125° 33' E; grid reference 347:087), 14 to 18 August 1974; B. Wilson and P. Smith. Collections made in low eucalypt woodlands with spinifex hummock grasses on quartz-sandstone ridges.

E5-4. West slope of main gorge below Enid Falls (grid reference 348:086), 15 August 1974; B. Wilson and P. Smith. Collection made in dense semi-deciduous microphyll vine thickets on quartz-sandstone scree.

E5-5. West slope of main gorge below Enid Falls (grid reference 348:085), 15 August 1974; B. Wilson and P. Smith. Collection made in dense semi-deciduous microphyll vine thickets on deep soil in quartz-sandstone rocks near the bank of Rufous Creek.

E5-6. Eastern side of deep gully about 2 km due west of Enid Falls campsite (grid reference 344:085), 17 August 1974; B. Wilson and P. Smith. Collection made in low closed-forest of semi-deciduous microphyll vine thickets in red soil on quartz-sandstone.

E5-7. Below opening of deep gully about 3 km west of Enid Falls campsite (grid reference 343:085), 17 August 1974; B. Wilson and P. Smith. Collection made in low open eucalypt woodland with "sorghum-type" grasses on quartz-sandstone and with quartz-sandstone outcrops.

E5-8. Steep scree below western rampart of deep gully 2-3 km west of Enid Falls campsite (grid reference 343:084), 17 August 1974; B. Wilson and P. Smith. Collection made in dense semi-deciduous microphyll vine thickets on quartz-sandstone with occasional dolerite sills.

E5-9. West slope of valley of northern tributary of Rufous Creek about 1.5 km north of Enid Falls campsite (grid reference 346:088), 18 August 1974; B. Wilson and P. Smith. Collection made in low eucalypt woodland with "sorghum-type" grasses in very dry deep brown soil on dolerite.

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E5-10. Spring feeding the northern tributary of Rufous Creek about 1.5 km north of Enid Falls campsite (grid reference 346:089), 18 August 1974; B. Wilson and P. Smith. Collection made in fringing semi-deciduous microphyll vine thicket on quartz-sandstone ridges above dolerite valley floor.

W6-1. Valley slope on north side of Youwanjela Creek near main campsite (15° 34' S, 125° 25' E; grid reference 332:032), 19 August 1974; B. Wilson and P. Smith. Collection made in low open eucalypt woodland with spinifex hummock grasses on strongly bedded sandstone cliffs.

W6-2. V-shaped gully in front of south facing fissure in cliff about 300 m east of main campsite (grid reference 332:033), 20 August 1974; B. Wilson and P. Smith. Collection made in small area of semi-deciduous microphyll vine thickets on quartz-sandstone.

W6-3. Eastern bank of northern tributary of Youwanjela Creek at junction about 1.5 km west of main campsite (grid reference 331:034), 21 August 1974; B. Wilson and P. Smith. Collection made in low eucalypt woodland with spinifex hummock grasses on low west facing quartz-sandstone ridge.

W6-4. On northern tributary 1 km upstream from junction with Youwanjela Creek (grid reference 331:034), 21 August 1974; B. Wilson and P. Smith. Collection made around deep pools between sandstone cliffs supporting low eucalypt woodland with spinifex hummock grasses and cascading ferns amongst sandstone boulders.

W6-5. Valley slopes on south side of Youwanjela Creek near main campsite (grid reference 332:032), 23 August 1974; P. Smith. Collection made in low open eucalypt woodland with spinifex hummock grasses on quartz-sandstone cliffs.

W6-6. Rock outcrops in flat country close to creek bed west of main campsite (grid reference 331:033), 23 August 1974; P. Smith. Collection made in low open eucalypt woodland with spinifex hummock grasses on sandstone.

W4-1. Scree slopes below eastern face of Mt Trafalgar (grid reference 291:068) near main campsite (15° 17' S, 125° 04' E), 26 August 1974; P. Smith. Collection made in semi-deciduous microphyll vine thickets on large sandstone boulders overlying basalts.

W4-2. Approximately 200 m from base of the Mt Trafalgar main rampart (grid reference 291:068), 26 August 1974; P. Smith. Collection made in shallow

TABLE 1
LAND AND FRESHWATER MOLLUSC SPECIES PLOTTED AGAINST THE HABITAT TYPES IN WHICH THEY WERE COLLECTED

Species	Habitat Types			
	Low closed-forest / closed-forest semi-deciduous vine thickets	Low open-woodland / low woodland with <i>Eucalyptus</i> spp. and spinifex	Low open-woodland / low woodland with <i>Eucalyptus</i> spp. and sorghum	Freshwater Pools
<i>Austropeplea tomentosa</i>				X
<i>Pleuropoma walkeri</i>	X	X	X	
<i>Australbinula</i> sp.	X			
<i>Themapupa anapacifica</i>	X		X	
<i>Amimopina</i> sp.	X	X	X	
<i>Austrosuccinea</i> sp.			X	
Punctid sp. A	X*	X		
Punctid sp. B	X*			
<i>Stenopylis coarctata</i>	X			
<i>Westracystis tentus</i>	X	X	X	
<i>Eremopeas</i> sp.	X		X	
<i>Xanthomelon</i> sp.	X	X		
<i>Rhagada</i> sp.		X		
<i>Baudinella</i> sp. A	X		X	
<i>Baudinella</i> sp. B		X		
<i>Setobaudinia</i> sp.	X		X	
Camaenid sp. A	X	X	X	
Camaenid sp. B		X		
Camaenid sp. C	X	X	X	
Camaenid sp. D	X	X	X	
Camaenid sp. E	X	X	X	
Camaenid sp. F	X	X		
Camaenid sp. G	X	X	X	
Camaenid sp. H	X	X		
Camaenid sp. I	X+	X		
Camaenid sp. J		X		
Camaenid sp. K		X		
<i>Velesunio angasi</i>				X
<i>V. wilsonii</i>				X

* Arboreal species.

+ W6-2 only—small localized area of semi-deciduous microphyll vine thickets surrounded by low eucalypt woodland with spinifex hummock grasses.

freshwater pool at the edge of semi-deciduous microphyll vine thickets.

W4-3. Rampart above scree slopes of Mt Trafalgar (grid reference 291:068), 27 August 1974; P. Smith. Collection made in low eucalypt woodland with "sorghum-type" grasses on sandstone.

W4-4. Scree slopes of Mt Trafalgar (grid reference 291:068), 27 August 1974; P. Smith. Collection made around large sandstone boulders at junction of low woodland and semi-deciduous microphyll vine thickets.

W4-5. Scree slopes of Mt Trafalgar (grid reference 291:068), 28 August 1974; P. Smith. Collection made in dead tree with peeling bark in the semi-deciduous microphyll vine thickets.

W4-6. St George Basin east of Mt Trafalgar (grid reference 292:068), 29 August 1974; P. Smith. Collection made in low closed-forest of mangroves, marine.

In summary five major habitat types can be distinguished amongst these sampling stations:

1. Low closed-forests to closed-forests of semi-deciduous microphyll vine thickets on quartz-sandstones frequently with deep soils and leaf litter.
2. Low open-woodlands to low woodland with eucalypts and spinifex hummock grasses on sandstones.
3. Low open-woodlands to low woodland with eucalypts and "sorghum-type" grasses on sandstones (except E5-9, deep brown soil on dolerite).

4. Freshwater.

5. Marine.

RESULTS

The total number of molluscs recorded in the reserve included twenty-six species of land snail, one species of freshwater snail and two species of freshwater mussel. Eight species of marine mollusc were collected in the mangroves at W4 but this collection was by no means exhaustive. The Beverley Springs collections included four species of freshwater snail: *Austropeplea tomentosa* (Pfeiffer), *Isidorella* sp., *Gyraulus* sp. and *Ferrissia* sp. Of the twenty-six species of land snail collected in the reserve, sixteen belong to the family Camaenidae. Only five camaenids could be identified to the generic level. The ten non-camaenid species belonged to eight families with four species identifiable to species level and four to generic level. Work on species identifications is continuing and later publications will include complete species lists and descriptions of new species. The collections are deposited in the Western Australian Museum's Mollusc Collection.

Land and freshwater species and the stations at which they were collected are listed below. Table 1 presents these species plotted against the four major land and freshwater habitat types. The marine species from W4-6, the mangroves at St George Basin east of Mt Trafalgar, are listed separately.

LIST OF LAND AND FRESHWATER MOLLUSC SPECIES

GASTROPODA

FAMILY LYMNÆIDAE

Austropeplea tomentosa (Pfeiffer): W4-2.

FAMILY HELICINIDAE

Pleuropoma walkeri (Smith): E5-1, E5-5, E5-6, E5-7, W6-1, W6-2, W4-1, W4-4 and W4-5.

FAMILY CHONDRINIDAE

Australbinula sp.: W4-1.

FAMILY PUPILLIDAE

Themapupa anapacifica Iredale: E5-1, E5-9.

FAMILY ENIDAE

Amimopina sp.: E5-1, E5-2, E5-3, E5-4, E5-5, W4-1, W4-4 and W4-5.

FAMILY SUCCINEIDAE

Austrosuccinea sp.: E5-9.

FAMILY PUNCTIDAE

Punctid sp. A: E5-1, E5-6, E5-8 and W6-1.

Punctid sp. B cf. *Philalanka* sp.: E5-8.

Stenopylis coarctata (Moellendorf): W4-1.

FAMILY HELICARIONIDAE

Westracystis tentus Iredale: E5-1, E5-2, E5-4, E5-5, E5-6, E5-7, E5-8, E5-10, W6-1, W6-2, W6-5, W4-1 and W4-4.

FAMILY SUBULINIDAE

Eremopeas sp.: E5-1, E5-2, E5-4, E5-6, E5-7, E5-8, E5-9 and E5-10.

FAMILY CAMAENIDAE

Xanthomelon sp.: E5-3 and E5-6.

Rhagada sp. cf. *R. construa* Iredale: E5-3.

Baudinella sp. A: E5-1, E5-4, E5-7, E5-8 and E5-10.

Baudinella sp. B: W6-1.

Setobaudinia sp.: E5-1, E5-6, E5-9, E5-10, W4-1 and W4-4.

Camaenid sp. A: W6-1, W4-1 and W4-4.

Camaenid sp. B: W6-1.

Camaenid sp. C: E5-1, E5-2, E5-3, E5-6, E5-7, E5-9, W6-1 and W6-2.

Camaenid sp. D cf. *Torresitrachia* sp.: E5-1, E5-2, E5-4, E5-6, E5-7, E5-8 and W6-1.

Camaenid sp. E cf. *Torresitrachia* sp.: E5-1, E5-2, E5-3, E5-4, E5-6, E5-7, E5-8, E5-9, E5-10, W6-3 and W6-5.

Camaenid sp. F: E5-3, E5-6, W6-1, W6-2 and W6-6.

Camaenid sp. G: E5-3, W4-1 and W4-4.

Camaenid sp. H: E5-1, E5-3, E5-4, E5-6, E5-8 and E5-10.

Camaenid sp. I: W6-1, W6-2, W6-3, W6-4 and W6-5.

Camaenid sp. J cf. *Hadra* sp.: W6-1.

Camaenid sp. K cf. *Quistrachia* sp.: W6-1.

BIVALVIA

FAMILY HYRIIDAE

Velesunio angasi (Sowerby): E1

V. wilsonii (Lea): E1

LIST OF MARINE MOLLUSC SPECIES

GASTROPODA

FAMILY NERITIDAE

Nerita lineata (Gmelin).

FAMILY LITTORINIDAE

Littorina undulata Gray.

FAMILY POTAMIDIDAE

Terebralia sulcata (Bruguière).

Cerithidia obtusa. (Lamarck).

FAMILY MURICIDAE

Pterynotus permaestus (Hedley).

FAMILY ELLOBIIDAE

Cassidula angulifera (Petit).

Ellobium aurisjudae (Linne).

BIVALVIA

FAMILY CORBULIDAE

Corbulid sp.

DISCUSSION

It is too early to attempt a zoogeographic interpretation of the results of this field project but several general comments may be relevant. Firstly the predominance of the camaenids is confirmed. This group includes many

large snails occurring in great abundance in a wide variety of habitats. They are an important component in the diet of many small vertebrates. The small collection we made includes a number of new genera and species. Although some species are habitat specific others range widely from very dry quartzite and quartz-sandstone outcrops on high ground to shaded gullies and gorges where there is a deep soil and leaf litter.

The second major impression is the absence of a major arboreal element in the rain-forest snail fauna. Only two truly arboreal species were found (punctid species A and B). *Amimopina* sp. and *Pleuropoma walkeri* were often found under bark on tree trunks but also live in rock crevices and under stones and they can hardly be regarded as arboreal. With these exceptions the snails of the rain-forest areas are burrowing, rock-clinging or leaf-litter animals and appear to be dry-adapted. There is no evidence of a relict fauna of wet-adapted snails in the small patches of rain-forest. To exemplify this we may cite the case of the succineid species. Members of this family elsewhere in the world generally inhabit swamps or very wet places. The Prince Regent species is found on the driest and hottest hills adhering to the underside of stones during the dry season.

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PART X

**A REPORT ON THE INSECT FAUNA OF THE
PRINCE REGENT RIVER RESERVE, NORTH-WEST
KIMBERLEY, WESTERN AUSTRALIA.**

By WINSTON J. BAILEY¹ and KEVIN T. RICHARDS²

INTRODUCTION

The insect fauna listed in this report was collected in the Prince Regent River Reserve in August, 1974 during the dry northern winter period. Insect activity is normally highest in this region during the hot, wet summer months of November to April. However, due to late and heavy summer rains providing an abundance of green vegetation, insect activity was surprisingly high. Collections accentuated the marked seasonality of certain populations considered typical of this environment.

The predominance of certain insect orders and families in the collection reflected the conspicuousness of certain groups as well as the collecting methods used. Added to this was the comparatively short time at each collecting station (3-5 days), resulting in only a cursory sampling.

COLLECTING SITES

Insect collections were made at six of twelve major collecting sites described in Miles, Kenneally and George (this publication). These were:

E1 (15° 49' S, 125° 37' E), Upper Prince Regent

E4 (15° 26' S, 125° 36' E), Wyulda Creek/Roe River

E5 (15° 07' S, 125° 33' E), Enid Falls

W2 (15° 37' S, 125° 18' E), King Cascade

W4 (15° 17' S, 125° 04' E), Mt Trafalgar

W6 (15° 34' S, 125° 25' E), Youwanjela Creek

Material collected at two sites on Beverley Springs Station (Beverley Springs Homestead 16° 32' S, 125° 27' E and Plain Creek Gorge 16° 32' S, 125° 23' E), 85 km south of the Prince Regent River Reserve, is also included in the list below. In the collection the Reserve and Station specimens are clearly demarcated by label data.

METHODS

A. General collection was carried out using standard techniques of netting, beating and sweeping of vegetation and hand collecting.

B. Lure traps

1. Steiner traps

Two modified plastic Steiner fruit fly traps were used at each site. One trap contained a piece of

fibreboard, as used in the commercial "Dak Pot" traps, which is impregnated with a mixture of cue-lure, 1-(p-acetoxyphenyl)-butan-3-one and Willison's lure, 1-(p-hydroxyphenyl)-butan-3-one as the attractant and maldison as the killing agent. Both lures attract male fruit flies, particularly of the *Dacus* group. The other trap contained a cottonwool wick soaked in trimedlure, tert-butyl-4-chloro-2-methyl-cyclo-hexane-1-carboxylate, which provided the attractant; the killing agent was lindane dusted lightly on the floor of the trap. Trimedlure is used mainly to detect the presence of Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann).

2. Blowfly traps

These traps fitted the classic pattern for blowfly traps but had been slightly modified by Mr N. Monzu (Department of Zoology, University of W.A.). Pieces of fresh meat or carcasses were placed in these traps at the commencement of each stay and the traps were emptied periodically throughout the 5 days. The traps were placed in small troughs of water to prevent ants from entering. Despite these precautions, ants of various genera including tree ants, *Oecophylla* sp., were a constant menace.

3. Malaise trap

A Malaise-type trap constructed of green nylon mesh measuring 2 m wide x 1 m deep x 1.5 m high (at front) and 2 m (at rear) was used at sites E4, E1, W6 and W4. The trap was suspended between trees by means of nylon cord.

4. Light trap

A mercury vapour lamp was run from a Honda generator at each site after nightfall. A Philips 160 watt lamp, type 575028/56 was suspended in front of a white linen sheet. Insects were collected from the sheet periodically and killed in cyanide jars. The position of the light in respect of elevation varied from site to site. In the Enid Falls site (E5), the light was suspended at the highest part of the gorge, some 100 m above the valley floor. In the E1 site, (Upper Prince Regent River) the light was at river level. Such differences in geographical position and elevation precluded any possibility of between-site comparison of night catches. The influence of wind on this method of trapping was marked; night catches were extremely low in conditions of a moderately strong breeze, particularly in exposed

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positions. The moon became full towards the end of the survey and this also reduced the number of flying insects captured at light. Certain moths, particularly amongst the Sphingidae and Saturniidae, demonstrated a high degree of synchrony in flight time and this could have resulted in the complete loss of a sample from an area if the trap was not being manned during that period.

C. Sound recordings

Various night singing tettigoniids and gryllids were recorded for reference and eventual classification. A Uher 4000 Report tape recorder with a Beyer MB215 microphone was used with a tape speed of 19.05 cm. Location was usually made aurally and recordings were made with a microphone distance of within 200 cm. The insect was then hand caught. A more detailed analysis of these results will appear in later publications.

HOUSING AND IDENTIFICATION OF SPECIMENS

The collection has been initially sorted and curated by the staff of the Western Australian Department of Agriculture. Each specimen has been labelled with a specific Prince Regent River Reserve or Beverley Springs Station label and housed in the Department of Agriculture collection where continued determination of the material will be carried out. Some of the initial identifications have been made by direct comparison with a collection of material from the east Kimberley, particularly Kununurra and the Ord River, as documented in the fauna list provided for this area (Richards, 1968). Unusual material is being sent to the particular specialists. Holotypes of new species will be lodged in the Australian National Insect Collection, Canberra, and paratypes at both the Western Australian Museum and the Western Australian Department of Agriculture. Members of the subfamily Copiphorinae (Orthoptera: Tettigoniidae) are currently on loan to the University of Western Australia pending a revision of the group.

Approximately 4 000 specimens were collected during the survey. For ease of reference, the check list of the material has been arranged in alphabetical, rather than phylogenetic order throughout all taxa. The number in brackets indicates the number of species in that genus which, so far have not been determined, or the number of species which it has not been possible to determine to generic level.

Numbers without brackets refer to undescribed catalogued specimens held in the A.N.I.C. Capital letters following Orthoptera species indicate designated categories in the A.N.I.C.

LIST OF INSECT SPECIES

BLATTODEA

BLABERIDAE

Calolampra sp.
? gen. ? sp.

BLATTELLIDAE

? gen. ? spp. (8)

BLATTIDAE

Anamesia fulvornata Tepper
Anamesia serrata Princis
Cosmozosteria trifasciata (Tepper)
Megazosteria patula (Walker)
Platyzosteria circumducta (Walker)

COLEOPTERA

BOSTRYCHIDAE

Bostrychopsis jesuita (Fabricius)

BRUCHIDAE

Bruchus sp.

BUPRESTIDAE

Cisseis sp.
Cyphogastra pistora (Castelnau & Gory)
Habroloma australis Macleay
Merimna atrata Hope

CARABIDAE

Carenum sp.
Chlaenius sp.
Craspedophorus sp.
? gen. ? spp. (7)

CERAMBYCIDAE

Coleococtus sp.
Coptocercus sp.
Phoracantha semipunctata (Fabricius)
Platymopsis sp.
Thoris erubifera Pascoe
Uracanthus sp.
? gen. ? spp. (3)

CHRYSOMELIDAE

Aspidomorpha sp.
Aulacophora hilaris (Boisduval)
Aulacophora spp. (2)
Haltica spp. (3)
Paropsis spp. (7)
Phyllocharris sp.
Poneridia spp. (2)
? gen. ? spp. (7)

COCCINELLIDAE

Coccinella arcuata Fabricius
Henosepilachna vigintioctopunctata (Fabricius)
Orcus sp.
? gen. ? spp. (5)

CURCULIONIDAE

Myllocerus sp.
Polyphrades spp. (4)

DYTISCIDAE

Cibister sp.
 ? gen. ? spp. (6)

ELATERIDAE

Agrypnus spp. (2)
Conoderus sp.
Lanelater sp.

GYRINIDAE

Gyrinus sp.

HYDROPHILIDAE

Sternolophus spp. (2)
 ? gen. ? sp.

LYCIDAE

Metriorrhynchus sp.

MELOIDAE

Zonitus sp.
 ? gen. ? spp. (2)

SCARABAEIDAE

Aphodius lividus Olivier
Colpochila testaceipennis Macleay
Heteronyx spp. (12)
Liparetrus sp. ? n.
Maechidius kurantus Britton
Neodon occidentalis (Macleay)
Onthophagus glabratus Hope
Onthophagus muticus Macleay
Sciton sp. n.

SILPHIDAE

Necrodes sp.

STAPHYLINIDAE

? gen. ? spp. (3)

TENEBRIONIDAE

Chalcopteroides spp. (2)
Gonocephalus sp.
Hypaulax sp.

DERMAPTERA**LABIDURIDAE**

? gen. ? spp. (2)

DIPTERA**ASILIDAE**

Bathypogon sp.

BOMBYLIIDAE

Anthrax incompta Walker
 ? gen. ? spp. (4)

CALLIPHORIDAE

Chrysomya mallochii Theowald
Chrysomya rufifacies (Macquart)
Dichaetomyia johannis Pont
Lucilia cuprina (Wiedemann)
Microcalliphora varipes (Macquart)

CERATOPOGONIDAE

Culicoides ornatus Taylor

CULICIDAE

Aedes (Ochlerotatus) vigilax (Skuse)
Anopheles (Anopheles) bancroftii Giles
Anopheles (Cellia) meraukensis Venhuis
Anopheles (Cellia) novaguinensis Venhuis

DOLICHOPODIDAE

? gen. ? sp.

DROSOPHILIDAE

Drosophila serrata Malloch
Leucosphenga sp.

HIPPOBOSCIDAE

? gen. ? sp.

MUSCIDAE

Musca terraereginae Johnston & Bancroft
Musca vetustissima Walker
 ? gen. ? spp. (6)

OTITIDAE

? gen. ? sp.

PYRGOTIDAE

Epicerella sp.

SARCOPHAGIDAE

? gen. ? spp. (4)

SIMULIIDAE

Simulium (Morops) sp. n.

STRATIOMYIDAE

Odontomyia sp.

SYRPHIDAE

? gen. ? sp.

TABANIDAE

Dasybasis ? pseudopalpalis (Ferguson & Hill)
Ectenopsis (Ectenopsis ?) sp. n.
Mesomyia (Pseudotabanus) lunulata (Bigot)
Scaptia (Myioscaptia ?) sp. n.
Tabanus concolor Walker
Tabanus townsvilli Ricardo

TACHINIDAE

? gen. ? spp. (5)

TEPHRITIDAE

Dacus (Daculus) newmani (Perkins)
Dacus (Strumeta) bryoniae (Tryon)
Dacus (Strumeta) tenuifascia (May)
Dacus (Strumeta) sp. n.
 ? gen. ? sp. (Trypetinae)

THEREVIDAE

? gen. ? sp.

TIPULIDAE

? gen. ? sp.

EPHEMEROPTERA**BAETIDAE**

Clocon sp.

LEPTOPHLEBIIDAE

Jappa sp.

HEMIPTERA**BELOSTOMATIDAE**

Lethocerus spp. (2)

CERCOPIDAE

Eoscarta carnifex (Fabricius)
 ? gen. ? sp.

CICADELLIDAE

Alseis osborni Kirkaldy
Batrachomorphus spp. (2)
Cicadella parthaon Kirkaldy
Cicadella perkinsi Kirkaldy
Cicadella spectra Distant
Cicadella sp.
Exitianus plebeius (Kirkaldy)
Idiocerus leurensis Evans
Linnavuoriella australis (Evans)
Macroceps darwinensis Evans
Scaphoideus festivus Matsumura
Tartessus fulvus (Walker)
Thymbris sp. n.
Tumocerus varius Evans

CIXIIDAE

? gen. ? sp.

CORIXIDAE

? gen. ? sp.

CYDNIDAE

Geotomus spp. (3)

DERBIDAE

? gen. ? sp.

EURYBRACHIDAE

? gen. ? spp. (3)

EURYMELIDAE

Ipoella sp. n.

FLATIDAE

? gen. ? spp. (4)

FULGORIDAE

? gen. ? sp.

GERRIDAE

? gen. ? spp. (3)

LYGAEIDAE

Dieuches notatus (Dallas)
Dysdercus sp.
Germalus sp.
Graptostethus diffusus (Walker)
Neolethaeus sp.
 ? gen. ? sp.

MACHAEROTIDAE

Pectinariophyes stalii (Spanberg)
Polychaetophyes serpulidia Kirkaldy

MEMBRACIDAE

? gen. ? sp.

MIRIDAE

? gen. ? spp. (4)

NABIDAE

? gen. ? sp.

NAUCORIDAE

Naucoris australicus Stal

NEPIDAE

Laccotrephes tristis (Stal)
 ? gen. ? spp. (2)

NOTONECTIDAE

? gen. ? spp. (3)

PENTATOMIDAE

Anaxileus vesiculosus (Herrich-Schaffer)
Antestiopsis sp.
Aspideurus sp.
Basicryptus interruptus (Westwood)
Caystrus sp.
Cephaloplatys explanatus Gross
 cf. "*Cuspicona*" *splendidula* Distant
Eumecopus nigriventris Dallas
Ippatha sp. n.
Macromolus nervosus Dallas
Novatilla virgata (Dallas)
Oechalia schellenbergii (Guerin-Meneville)
Piezodorus hybneri (Gmelin)
Theseus modestus Stal
Vitellus sp.
 ? gen. ? sp. (2)

- PLATASPIDAE
? gen. ? sp.
- PSYLLIDAE
? gen. ? sp.
- REDUVIIDAE
Oncocephalus confusus Reuter
Pirates ephippiger White
Pirates lyrco Stal
Poecilosphrodus sp.
? gen. ? spp. (19)
- RICANIIDAE
? gen. ? spp. (3)
- SCUTELLERIDAE
Choerocoris paganus (Fabricius)
- HYMENOPTERA**
- ANTHOPHORIDAE
Amegilla sp.
- APIDAE
Trigona sp.
- BRACONIDAE
Iphiaulax sp.
? gen. ? spp. (2)
- CHALCIDIDAE
? gen. ? sp.
- CHRYSIDIDAE
Pyria sp.
? gen. ? spp. (2)
- COLLETIDAE
? gen. ? spp. (3)
- EUMENIDAE
Abispa ephippium (Fabricius)
Eumenes ? arcuatus (Fabricius)
Eumenes campaniformis (Fabricius)
- FORMICIDAE
? gen. ? spp. (Ponerinae) (2)
? gen. ? spp. (8)
- ICHNEUMONIDAE
Enicospilus spp. (2)
? *Mesostenus* sp.
Xanthopimpla sp.
? gen. ? sp.
- MEGACHILIDAE
Chalicodoma sp.
- MUTILLIDAE
Ephutomorpha sp.
- POMPILIDAE
Cryptocheilus sp.
Phanagenia sp.
? gen. ? sp.
- SCOLIIDAE
Campsomeris radula (Fabricius)
Scolia ? verticalis (Fabricius)
Trisciloa ferruginea (Fabricius)
- SPHECIDAE
Cerceris spp. (2)
Notogonia spp. (2)
Pison sp.
- TIPHIIDAE
Thynnus sp.
? gen. ? sp.
- VESPIDAE
Polistes bernardii Le Guillou
- XYLOCOPIDAE
Xylocopa bryorum Fabricius
- LEPIDOPTERA**
- AMATIDAE
Amata heptaspila (Turner)
Amata pactolina (Walker)
- ARCTIIDAE
Argina cribraria (Clerck)
Cretonotis gangis (Linnaeus)
Habrochroma sp.
Hemonia micrommata (Turner)
Lambula pleuroptycha Turner
Manulea dorsalis (Walker)
Pallene quadrilineata (Pagenstecher)
Rhodogastria crokeri (Macleay)
Rhodogastria rubripes (Walker)
Utetheisa lotrix (Cramer)
Utetheisa pulchelloides (Hampson)
- COSMOPTERIGIDAE
? *Cosmopterix* sp.
- COSSIDAE
Xyleutes spp. (4)
- EPIPLEMIDAE
Lobogethes interrupta Warren
- GELECHIIDAE
Apatetris sp.
- GEOMETRIDAE
Arhodia lasiocamparia Guenee
Boarmia sp.
Chloroclystis insigillata (Walker)
Cleora repetita Butler
Cleora sp.

- Comostola idioides* Lucas
Comostola laesaria Walker
Crypsiphona occultaria (Donovan)
Diastictis odontias Lower
Eois albicostata Walker
Eois sp.
Eucrotes iocentra Meyrick
Gelasma albicosta (Walker)
Gelasma rhodocosma Meyrick
Gelasma sp.
Gnamptoloma aventiaria (Guenee)
Hemitheia insularia Guenee
Hyposidra janiaria Guenee
Nearcha staurotis Meyrick
Nearcha sp.
Oenochroma pallida Warren
Oenochroma phyllomorpha (Lower)
Pingasa emiliaria (Guenee)
Pingasa erebata Walker
Problepsis cana Hampson
Scopula sp.
Terpna quadrilinea (Lucas)
Zeheba sp.
 ? gen. ? spp. (Ennominae) (4)
 ? gen. ? sp. (Sterrhinae)
 ? gen. ? sp.
- HESPERIIDAE**
- Hesperilla sexguttata sela* (Waterhouse)
Ocybadistes hypomeloma vaga (Waterhouse)
Pelopidas lyelli lyelli (Rothschild)
Telicota augias argilus Waterhouse
Telicota colon argeus (Plotz)
- HYPSIDAE**
- Hypsa dama* (Fabricius)
- LASIOCAMPIDAE**
- Crexa* sp.
- LIBYTHEIDAE**
- Libythea geoffroyi genia* Waterhouse
- LIMACODIDAE**
- Ecnomoctena brachyopa* (Lower)
Parasoidea paroa (Turner)
- LYCAENIDAE**
- Candalides gilberti* Waterhouse
Catochrysops panormus platissa (Herrich-Schaffer)
Euchrysops cnejus cnidus Waterhouse & Lyell
Famegana alsulus alsulus (Herrich-Schaffer)
Jamides phaseli (Mathew)
Nacaduba biocellata biocellata (C. & R. Felder)
- LYMANTRIIDAE**
- Acyphas* sp.
Euproctis niphobola Turner
Euproctis spp. (4)
Orgyia australis Walker
Porthesia lutea (Fabricius)
 ? gen. ? sp.
- NOCTUIDAE**
- Acantholipes australis* Lower
Adisura dulcis Moore
Agrotis munda Walker
Antarchaea laevis Swinhoe
Anua disjungens (Walker)
Anua persimacula (Lucas)
- Barasa cymatistis* Meyrick
Canthylidia eodora (Meyrick)
Caradrina maculatra Lower
Chalciope hyppasia Cramer
Characoma vallata (Meyrick)
Ctenoplusia lectula (Walker)
Dermaleipa orbifera Walker
Ericcia sp.
Eriopus maillardi Guenee
Erygia apicalis Guenee
Eublemma dimidalis (Fabricius)
Eublemma glaucochroa Turner
Eublemma parva (Hubner)
Eublemma ragusana (Freyer)
Eublemma versicolor (Walker)
Euclidisema alcyona (Druce)
Euplexia dolorosa (Walker)
Grammodes cooma Swinhoe
Grammodes oculicola Walker
Heliothis assulta Guenee
Heliothis punctigera Wallengren
Hypena sp.
Hypenodes lithina Swinhoe
Hypolispa leucopolia Turner
Hyposada hydrocampta (Guenee)
Leucania abdominalis (Walker)
Leucania spp. (2)
 “*Leucania*” *scotti* (Butler)
Mocis frugalis (Fabricius)
Mocis trifasciata (Stephens)
Nagia linteola (Guenee)
Nanaguna breviscula Walker
Othreis materna (Linnaeus)
Pandesma submurina Walker
Pantylidia capistrata Lucas
Paracrama iconica (Walker)
Parallelia hercodes (Meyrick)
Pericyma cruegeri (Butler)
Plecoptera juba (Swinhoe)
Rhesala imparata Walker
Selepa celtis Moore
Speiredonia revolvens Walker
Spodoptera litura (Fabricius)
Spodoptera mauritia (Boisduval)
Westermannia argentata Butler
Zophochroa sp.
 ? gen. ? sp. (Eutelinae)
 ? gen. ? sp. (Hypeninae)
 ? gen. ? sp. (Sarrothripinae)
 ? gen. ? sp.
- NOLIDAE**
- Nola bifascialia* (Walker)
Nola elaphropasta (Turner)
Nola maculifera (Turner)
Nola sp.
 ? gen. ? sp.
- NOTODONTIDAE**
- Epicoma argentata* Walker
Epicoma barnardi (Lucas)
Epicoma sp.
Teara sp.
- NYMPHALIDAE**
- Acraea andromacha andromacha* (Fabricius)
Danaus affinis affinis (Fabricius)

Danaus chrysippus petilia (Stoll)
Danaus hamatus hamatus (W. S. Macleay)
Euploea core corinna (W. S. Macleay)
Euploea sylvester pelor (Doubleday & Hewitson)
Euploea darchia darchia (W. S. Macleay)
Hypocysta adiante antirius Butler
Hypolimnas bolina nerina (Fabricius)
Melanitis leda bankia (Fabricius)
Polyura pyrrhus sempronius (Fabricius)
Precis orithya albicincta (Butler)
Ypthima arctoa arctoa (Fabricius)

OCOPHORIDAE

Garrha sp.
Scorpiopsis sp.

PAPILIONIDAE

Cressida cressida (Fabricius)
Papilio demoleus sthenelus (W. S. Macleay)

PIERIDAE

Appias paulina ega (Boisduval)
Catopsila pomona pomona (Fabricius)
Catopsila scylla etesia (Hewitson)
Delias argenthona argenthona (Fabricius)
Elodina perdita perdita (Miskin)
Eurema hecabe phoebus (Butler)
Eurema herla (W. S. Macleay)
Eurema sana (Butler)
Eurema smilax (Donovan)

PSYCHIDAE

Clania variegata Snellen
Clania sp.

PYRALIDAE

Agrotera amathealis (Walker)
Agrotera glycyphanes Turner
Aulacodes sp.
Cataclysta sp.
Catomola funerea Walker
Cirrhochrista brizoalis (Walker)
Cirrhochrista punctulata Hampson
Conoprora ecista Turner
Criophthona celaenophaes Turner
Dichocrocis punctiferalis (Guenee)
Entephria meritalis (Walker)
Endotricha puncticostalis (Walker)
Epipaschia sp.
Etiella chrysoporella Meyrick
Euclasta maceratalis Lederer
Heterobela triglochis Turner
Hymenoptychis sordida (Zeller)
Macalla sp.
Marasmia trapezalis Guenee
Margaronia excelsalis Walker
Margaronia pulverulentalis Hampson
Margaronia suralis Lederer
Margarosticha australis Felder
Maruca testulalis (Geyer)
Metasia acharis Meyrick
Myriostephes crocobapta Turner

Nomophila australica Munroe
Nymphula spp. (2)
Orthaga trissosticha Turner
Salebria ferrorubella (Walker)
Sameodes cancellalis Zeller
Strepsinoma sp.
? *Surattha* sp.
Sylepta adipalis Lederer
Sylepta chrysoplasta Meyrick
Syntonarcha iriastis Meyrick
Terastia meticulosalis Guenee
Uresiphita ornithopteralis Guenee
? gen. ? spp. (Epipaschiinae) (2)
? gen. ? spp. (Phycitinae) (2)
? gen. ? spp. (Pyraustinae) (3)

SATURNIIDAE

Antheraea eucalypti Scott

SPHINGIDAE

Chromis erotus (Cramer)
Deilephila placida placida (Walker)
Herse convolvuli (Linnaeus)
Psilogramma menephron (Cramer)
Theretra clotho Drury
Theretra silhetensis intersecta (Butler)

STENOMATIDAE

Agriophara sp.

THYRIDIDAE

Striglina centiginosa Lucas
? gen. ? sp.

TIMYRIDAE

Crocantbes characotis Meyrick
Crocantbes zonodesma Lower
Crocantbes sp.
" *Lecithocera* " sp.
? gen. ? sp.

TORTRICIDAE

? gen. ? sp. (Olethreutinae)

XYLORYCTIDAE

Cryptophasa spp. (3)
Maroga leptopasta Turner
Maroga setiotricha Meyrick
Xylorycta candescens Lower

YPONOMEUTIDAE

Atteva niphocosma Turner
Lactura sp.
Yponomeuta paurodes Meyrick

MANTODEA

AMORPHOSCELIDAE

Gyzomantis sp.
? gen. ? spp. (2)

MANTIDAE

Archimantis sp.
Mantis sp.
Othodera spp. (2)
Tenodera spp. (2)
 ? gen. ? spp. (2)

NEUROPTERA**HEMEROBIIDAE**

Notiobiella sp.

CHRYSOPIDAE

Chrysopa sp.
Italochrysa sp.

MANTISPIDAE

Austromantispa imbecella Gerst.
Mantispa sp.

MYRMELEONTIDAE

Acanthaclisis sp.
Glenoleon roseipennis Tillyard
Glenoleon sp.
Myrmeleon pictifrons Gerst.
Myrmeleon sp.

ODONATA**AESHNIDAE**

Anax sp. n.
Gynacantha sp. "n"

COENAGRIONIDAE

Argiocemis rubescens Selys
Austroagrion exclamationis Campion
Pseudagrion ignifer Tillyard

LESTIDAE

Austrolestes insularis Tillyard

LIBELLULIDAE

Diplacodes bipunctata (Brauer)
Diplacodes haematodes (Burmeister)
Nannodiplax rubra Brauer
Nannophlebia sp. poss. "m"
Neurothemis stigmatizans stigmatizans (Fabricius)
Orthetrum caledonicum (Brauer)
Orthetrum migratum Lieftnick
Trapezostigma loewi (Brauer)

PROTONEURIDAE

Notoneura sp. "l"
Notoneura sp. n.

ORTHOPTERA**ACRIDIDAE**

Acrida conica (Fabricius)
Aiolopus thalassinus (Fabricius)

Aretza sp.

Austracris guttulosa (Walker)
Desertaria sp.
Erythropomala amaena (Walker)
Gesonula mundata (Walker)
Goniaea furcifera (Walker)
Goniaea vocans (Fabricius)
Heteropternis obscurella (Blanchard)
Macrolopholia sp.
Macrotona lineosa (Walker)
Peakesia straminea Sjostedt
Pycnostictus seriatus Saussure
Rectitropis sp.
Stenocatantops angustifrons (Walker)
Stenocatantops vitripennis (Sjostedt)
Sumbilvia sp. 10
Sumbilvia sp. 11
Valanga irregularis (Walker)
 gen. n. 12 sp. 4 (Catantopinae)
 gen. n. 15 sp. 7 (Catantopinae)
 gen. n. 15 sp. 8 (Catantopinae)
 gen. n. 15 sp. 10 (Catantopinae)
 gen. n. 15 sp. 11 (Catantopinae)
 gen. n. 59 sp. 1 (Catantopinae)

EUMASTACIDAE

? gen. sp. A (Morabinae)

GRYLLIDAE

Cardiodactylus spp. (2)
 ? *Cephalogryllus* sp.
Hemiphonus? tuberculifrons Chopard
Madasumma sp.
Modicogryllus lepidus Walker
Muneicus sp.
Nemobius sp.
Oecanthus? rufescens Serville
Teleogryllus? commodus (Walker)

GRYLLOTALPIDAE

Gryllotalpa? africana Linnaeus

TETTIGONIIDAE

Conocephalus spp. (3)
Euconocephalus spp. (2)
Nicsara sp. 1
Nicsara sp.
Phaneroptera? brevis Serville
Polichne angustiloba Brunner
Polichne sp. 11
Torbia sp.
 gen. 10 sp. 2 (Agraeiini)

TETRIGIDAE

Paratettix femoralis Bolivar
Paratettix nigrescens Sjostedt
 gen. n. 107 sp. 1 (Metrodorinae)

PHASMATODEA

PHASMATIDAE

Hyrtacus spp. (3)
? gen. ? spp. (2)

TRICHOPTERA

CALAMOCERATIDAE

Anisocentropus latifascia (Walker)
Anisocentropus sp. nn.

HILICOPSYCHIDAE

Helicopsyche sp.

HYDROPSYCHIDAE

Cheumatopsyche modica (McLachlan)

LEPTOCERIDAE

Triplectides magna (Walker)
Triplectides cf. *volda* Mosely & Kinimins

PHILOPOTAMIDAE

Chimarra uranka Mosely

DISCUSSION

A. Diptera

Larvae of a hitherto undescribed species of *Simulium* (sub-gen. *Morops* Enderlain) were numerous in fast flowing water at all sites, particularly at the upper parts of King Cascade and at the upper Prince Regent River site (E1). Although not collected in the Reserve, adults were later bred out for identification purposes.

Bushflies, *Musca vetustissima* Walker were abundant at the Beverley Springs homestead where there were numerous cattle, but generally sparse in the Reserve. It was noted that at the approach of an extensive bushfire from pastoral land east of E4, large numbers of bushflies appeared around the camp site; there seemed to be little doubt of the correlation between an increase in flies and the fire. *Musca terraereginae* Johnson & Bancroft was collected from the Roc River/Wyulda Creek site (E4).

Mosquitos were relatively scarce on the sandstone area and certainly not in nuisance proportions. *Aedes vigilax* (Skuse) was abundant in the mangrove swamps beneath King Cascade. *Anopheles meraukaensis* Venhuis was present in relative abundance at the Beverley Springs homestead. Unidentified species were found breeding in pools at the top of Enid Falls.

Sandflies, *Culicoides ornatus* Taylor (Ceratopogonidae) were noticeable at E1 and were at nuisance level in some sites, particularly at Mt Trafalgar and on the King Leopold Sandstones at E4.

Tabanids, mainly *Mesomyia* (*Pseudotabanus*) *lunulata* (Bigot), were present in reasonable numbers, particularly on the upper parts of the Prince Regent River at E1.

The first record of *Drosophila serrata* Malloch for north-west Australia was made in this survey. The species is known to occur throughout Northern Territory and in Indonesia.

The related genus *Leucosphenga* (Drosophilidae) was abundant in the mangrove swamps at King Cascade and was noted at Beverley Springs homestead. In the latter site it appeared to be 'swarming' in a deep hole some 30 cm across. This curious occurrence could not be explained as the hole appeared in pasture land used for growing sorghum.

The orange-bodied calliphorid, *Dichaetomyia johannis* Pont, was abundant in the rock gorges and during the morning would appear in large swarms on the rock faces. They were occasionally found in the blowfly traps with two *Chrysomya* species, *C. mallochi* Theowald and *C. rufifacies* (Macquart), and *Microcalliphora varipes* (Macquart). The Australian sheep blowfly, *Lucilia cuprina* (Wiedemann), was unexpectedly found at Mt Trafalgar; this is an introduced species and one of the important primary flies attacking sheep. Numerous members of the Sarcophagidae were caught in the traps from all sites. Fruit flies (Tephritidae) were collected at most sites in the lure traps. Although, as would be expected, no specimens of Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) were recorded, representatives of four species of *Dacus* were obtained. These included a new species, which was trapped at the E1 site (Upper Prince Regent River). No specimens of important pest species of *Dacus*, such as *D. dorsalis* Hendel, *D. cucurbitae* Coquillett, *D. musae* (Tryon) and *D. frauenfeldi* Schiner were recorded. There is a considerable danger that economically important species could be introduced into northern Australia in fruit brought in by fishermen from Indonesia and other neighbouring countries.

B. Lepidoptera

Cressida cressida (Fabricius), commonly known as the big greasy butterfly, Fig. 3 was present in small numbers in the vine thickets at the base of Mt Trafalgar. One capture and numerous sightings were also made in the coastal strip of vine thicket south-west of Enid Falls (E5) where they were seen flying with the distasteful nymphalid, *Acraea andromacher andromacher* (Fabricius), the glass-wing butterfly. Both had a clear gliding flight pattern over the tree canopy, coming down in ravine paths and clearings. This is reminiscent of the mimicry between certain papilionid species and danaines. Danaine species in relative abundance were the common crow, *Euploea core corinna* (W. S. Macleay), and the Darwin brown crow, *Eulopea darchia darchia* (W. S. Macleay). These two butterfly species were frequently found together in gorges and around rock faces with a third, similar species *Euploea sylvester pelor* Doubleday & Hewitson. *E. c. corinna* formed large and spectacular aggregations at some of the sites, notably E5 and in the mangrove area of King Cascade. At Enid Falls (E5) they would rest on the rock faces cryptically hidden with closed wings. The black and white tiger butterfly, *Danaus affinis affinis* (Fabricius) was uncommon at most sites but would occasionally be seen with *E. c. corinna*. In the mangrove swamps at King Cascade, *D. a. affinis*

was more numerous than the *Euploea* species. The spectacular blue tiger, *Danaus hamatus hamatus* (W. S. Macleay) (see colour illustration) occurred with the *Euploea* species at most sites but in relatively low numbers and mainly confined to areas of heavy shade. The principal food plants of the larvae of these danaine butterflies are members of the family Asclepiadaceae which were not unexpectedly found at the sites. Comparison with previous records of Kimberley butterflies (Warham, 1957; Koch, 1957; Koch and van Ingen, 1969) provides some interest with respect to the distribution of nymphalids. Collections on Koolan Island, approximately 160 km south-west of the Prince Regent, showed the presence of *E. s. pelor* and *D. s. affinis* but no records of the more widespread *E. c. corinna* and *D. h. hamatus*. The collection of *D. h. hamatus* in this locality extends the range of this subspecies from the east Kimberley, according to distribution data provided by Common & Waterhouse (1972). Mention should be made of the libytheid, *Libythea geoffroyi genia* Waterhouse, when discussing the mimetic species of the nymphalids. *L. g. genia* was captured in a ravine area south-west of Enid Falls (E5) with numerous *Euploea* spp. The flight pattern was somewhat different in that it tended to have short flights between trees rather than the longer sustained flight of the Danainae, however the colour patterning was strikingly similar to small specimens of *Euploea*.

Hypolymnas bolina nerina (Fabricius) the common eggfly butterfly, was present at most sites but in low numbers. Koch and van Ingen (1969) found it on Koolan Island which must be the most westerly known limit of its distribution.

Most of the pierid butterflies collected have known ranges from northern Australia, however it is expected that the range of many of these species is at the western limit in the west Kimberley. Some species of the family Lycaenidae ("blues", "coppers") have shown an extension of range to the Kimberley, such as *Candalides gilberti* Waterhouse which was previously known only from Northern Territory. The distribution of *Jamides phaseli* (Mathew) was previously only known to be north-eastern Australia and Northern Territory. *Famegana alsulus alsulus* (Herrich-Schaffer) is known from north-west Australia but this appears to be the first record west of the east Kimberley.

The distribution of *Ocybadistes hypomeloma vaga* (Waterhouse) and *Hesperilla sexguttata sela* Waterhouse, two species of hesperiids (skipper butterflies) is also extended. Two species of *Telicota* were taken, namely *T. augias argilus* Waterhouse and *T. colon argeus* (Plotz). Both these butterflies have a known distribution from north-west Australia.

Amongst the moths collected during the survey, the most prominent family groups represented were Noctuidae (about 58 species), Pyralidae (44) and Geometridae (33). Microlepidoptera were not well represented in the collection. This could be explained by the fact that, under the unique collecting conditions of the survey, it was found almost impossible to collect and handle such small and delicate material.

C. Neuroptera, Trichoptera and Ephemeroptera

Neuropterons (lacewings) were not common at any of the sites, however, the material has been shown to include a number of undescribed species (Riek, pers. comm.). Trichopterons (caddis-flies) were more plentiful and readily taken at lights. Specimens of an attractive dark coloured *Anisocentropus*, collected at sites E4, E5 and W2 proved to be a new species. A further member of this group, *A. latifascia* (Walker) was found at E1 and E4; this genus has not been recorded previously from Western Australia. Only two species of Ephemeroptera (mayflies) were collected, the larger *Jappa* sp. being the more common but was only taken at light.

D. Odonata

Two new species of odonates (dragonflies, damselflies) were collected during the survey, an *Anax* at site E1 and a *Notoneura* at E4, W2 and W6. According to Dr J. A. L. Watson (Australian National Insect Collection, Canberra) the *Anax* is neither of the species recorded from Australia, nor is it a species known from New Guinea and islands westwards towards the Lesser Sunda Is. Three undescribed species, *Gynacantha* sp. "n", *Nannophlebia* sp. "m" and *Notoneura* sp. "l" were also recorded. The species code letters used here are those assigned by Watson (1974) and indicate the initial letter of the manuscript names under which the species are placed in the A.N.I.C. The *Nannophlebia* sp. which was collected at sites E1, E4 and W6 has previously only been recorded from the Northern Territory (Watson, 1974). The *Gynacantha* species of dragonfly (Fig. 6) was taken from caves at E1, E4 and E5 where it was present during the day in large numbers, resting on the cave ceiling. It was noted flying at dusk. Distribution of this species is restricted to Northern Territory and the Kimberley. *Neurothemis stigmatizans stigmatizans* (Fabricius), an attractive dragonfly with reddish-brown pigmented wings was by far the most abundant species in the Reserve, particularly along the river and stream banks.

E. Orthoptera

Thirty species of Acrididae (short-horned grasshoppers) were collected during the survey. According to Dr K. H. L. Key (Division of Entomology, CSIRO, Canberra) about nine of these are undescribed including four species not represented in the A.N.I.C.

In the Tettigoniidae (long-horned grasshoppers), *Phaneroptera* ? *brevis* Serville was the most abundant species and readily collected at light.

Male nymphs of ? *Cephalogryllus* sp. were collected in sandbanks at the freshwater site E1. These unusually large crickets formed single burrows to a depth of 15-20 cm at the water's edge.

Recordings of two sympatric species of the genus *Euconocephalus* (Tettigoniidae) (Figs. 1 and 2) were made at the Beverley Springs homestead site; one of these also occurred at E5 and W6. The two species could be separated on the basis of song and from the structure of the male stridulatory apparatus. Only two females were captured and it is anticipated that differences between the

species will not be reflected in female morphometrics. This pattern in the Copiphorinae is present in the Ethiopian genus *Homorocoryphus*, and in the New World genus *Neoconocephalus*. The family is being subject to revision at present and information from this survey will be used in this work. Other tettigoniids recorded included two species of *Conocephalus*, the males again being separable by song and by the presence of bright orange terminal segments in the male of one species.

Grylloidea were numerous in all the sites visited and many of the song patterns were recorded. The mole cricket, *Gryllotalpa ? africana* Linnaeus was also recorded from the W6 site and it was present at E5. It is anticipated that the sound patterns of mole crickets should play a major part in their taxonomy. At present the systematics of these insects is under review.

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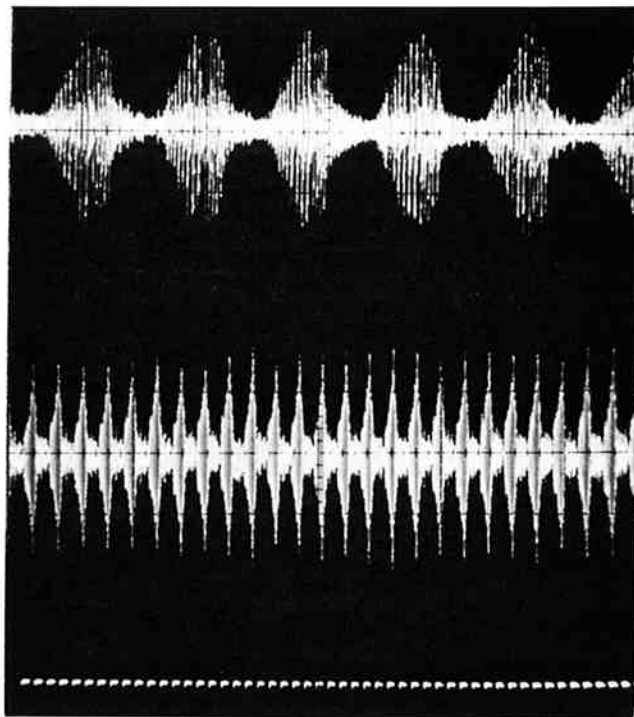


Figure 1 (left)—*Euconocephalus* sp. (Orthoptera : Tettigoniidae), a nocturnal bushcricket.

Figure 2 (above)—Sound analyses of two sympatric species of *Euconocephalus*. Both species are morphologically similar but have distinctive song patterns. The upper trace shows the sound produced by the opening and closing of the wings (6 movements shown, 42 per sec.) of one species and the lower trace (26 movements, 200 per sec.) the second species.

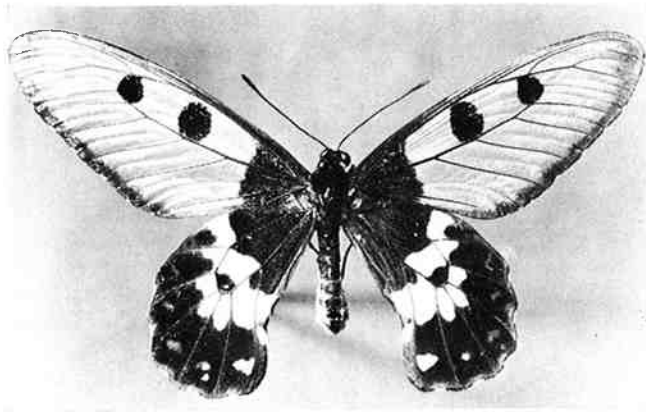


Figure 3—Male big greasy butterfly, *Cressida cressida* (Fabricius). The forewings are transparent and the wingspan is approximately 12cm. Main colouring is black and white but with bright red areas on the abdomen and red spots on the hindwings. The larvae feed on *Aristolochia* spp.

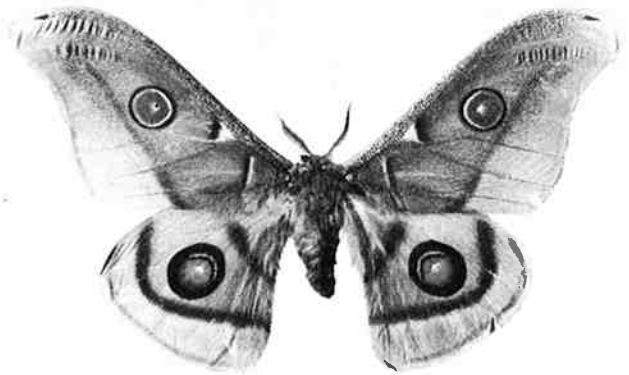


Figure 5—The emperor gum moth, *Antheraea eucalypti* Scott. Wingspan of this saturniid is about 11 cm. The general colour is brown, the eyespots on the hindwings being yellow with a circling of black. The larvae feed on *Eucalyptus* foliage. Although only found at the Enid Falls site, this species probably ranges throughout the Reserve.

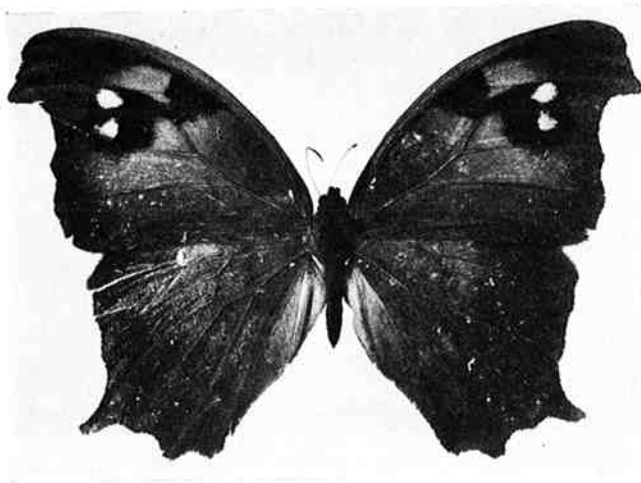


Figure 4—The evening brown butterfly, *Melanitis leda bankia* (Fabricius). When disturbed, it flies erratically but usually only for a short distance. Once settled to the ground or on a rock, it is extremely difficult to see, due to its cryptic colouring of brown and orange and its irregular shape

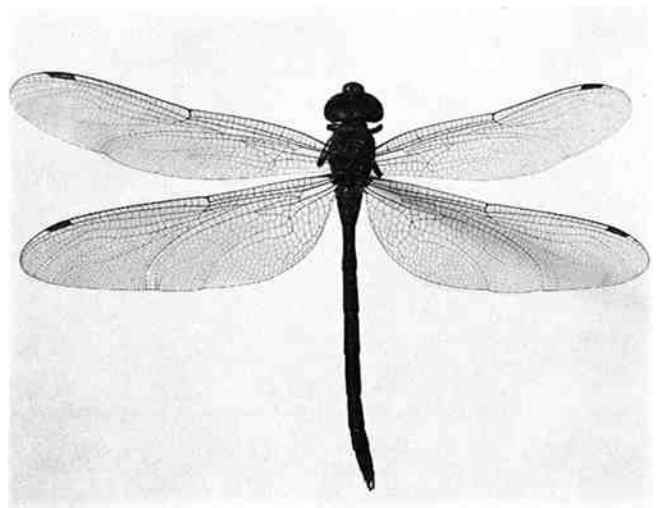


Figure 6—This dragonfly, *Gynacantha* sp., rests during the day in great numbers on cave ceilings. It was noted flying at dusk. Dragonflies were plentiful in the Reserve, particularly along stream and river banks.

PART XI

CONCLUSIONS AND RECOMMENDATIONS

By A. A. BURBIDGE¹

CONCLUSIONS

The Prince Regent River Reserve is indeed one of the world's outstanding and scenic natural history reserves.

The country today appears to be little changed from that seen by King in 1820 and 1821. The only obvious changes have been the departure of the aborigines and the arrival of limited numbers of feral cattle and cats. Europeans have visited the reserve from time to time, but because of the topography, these visits have been mainly limited to the coastline. Little sign of these visits remains. Indeed, the two rusty food cans found on top of Mt Trafalgar were the only evidence of European man seen by expedition members.

The scenery within the reserve ranges from generally barren and monotonous uneroded volcanic rocks and sandstones to the extremely rugged and forbidding eroded sandstones along the watercourses and coastline. It includes vertical cliffs, gorges over 100 m deep, picturesque streams and spectacular waterfalls (see colour illustrations).

Biologically the reserve appears to be representative of much of the northern and north-western Kimberley. Being sited in the highest rainfall area of Western Australia it is especially important in preserving wet-adapted plants and animals. Thus the plant collection includes many species of the Families Droseraceae (sundews), Stylidiaceae (trigger-plants) and Lentibulariaceae (bladderworts). Some of these are not known elsewhere. The many species of fern and aquatic plants in the reserve also reflect its high rainfall.

Areas of semi-deciduous microphyll vine thickets occur within the reserve. Apparently, in Western Australia, this type of vegetation occurs in patches near the coastline between Derby and Kalumburu. More extensive stands with a higher canopy (mesophyll vine forest) occur outside the reserve and the quality and extent of vine thickets inside the reserve was disappointing.

While the lack of extensive collecting of the various animal groups makes interpretation difficult it appears that those animals present in the reserve also reflect the high rainfall of the area. Thus among the fresh water fish are two undescribed species and a number previously unknown from the Kimberley. The birds include fruit-eating species such as the Torres Strait and Green-winged Pigeons and the Yellow Fig Bird; and ground-dwelling species of the vine thickets such as the Rainbow Pitta and Scrub Fowl. Among the reptiles is the spectacular green lizard *Diporiphora superba*, known only from the high rainfall north-west Kimberley.

The size of the reserve and the variety of plant formations within it ensure protection for a broad cross-section of the Kimberley flora and fauna. Thus Beard (1969) states that there are some 1445 species of flowering plants in the Northern Botanical Province, which includes the Fortescue District as well as the Kimberley. With the addition of the 48 new species for the Province found during this survey the Prince Regent River Reserve contains at least 28% of the State's northern flora. Among the better known animal groups a similarly high proportion of species have been found—33 out of 55 species (60%) of Kimberley mammals and 134 out of 341 species (39%) of birds.

Of interest too are which species were not recorded from the reserve. While the survey no doubt missed recording animals both because of its short duration and the time of the year, some generalisations can be made. Being in an area of mainly rugged sandstones the reserve is not representative of some of the better pastoral country in the Kimberley—the broad river valleys, extensive open-woodlands and black soil plains. Thus the only macropod which was common was the Euro (*Macropus robustus*). The Antelope Kangaroo (*M. antelopinus*) and Sandy Wallaby (*M. agilis*) were rare and the Northern Nail-tailed Wallaby (*Onychogalea unguifera*) was not recorded. A similar situation occurs in other groups.

The biological survey reported in this publication shows that the Prince Regent River Reserve is an outstanding conservation area, rich in flora and fauna and with interesting historical associations and aboriginal sites. As far as is known the area has little economic value, but in contrast, its value to nature conservation in Australia is enormous and it should be retained as a conservation reserve in perpetuity.

RECOMMENDATIONS

There would be considerable merit in including the whole of the Prince Regent River catchment in the reserve. This would have three main benefits:

1. It would provide a completely protected catchment in a relatively high rainfall area which could be used as a yardstick for comparison with catchments elsewhere which might be subject to agricultural, pastoral or industrial contamination.
2. It would preclude any contamination of the fresh water within the existing reserve and prevent any effects on the flora and fauna of that water.
3. It would protect an area of great scenic value along the upper reaches of the river around and including Mt Hann, one of the highest peaks in the State.

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Most of the country proposed for inclusion in the reserve is composed of rugged sandstones and is unsuitable for use by the pastoral industry. It is at present vacant Crown land.

It is there recommended that:

1. **The boundary of Reserve No. 27164 be extended as follows: from the south-east corner of the Reserve southward to 16° S, eastward to 125° 50'E, northward to 15° 45' S and westward to the existing reserve boundary (approx. 46 000 ha).**

There would seem to be no reason why the reserves for the purpose "Excepted from Sale", which were declared prior to the creation of the Prince Regent River Reserve

and now lie within it, should not now be included. It is therefore recommended that:

2. **Reserve Nos. 8243, 8248 and 8252 be cancelled and their area be included in Reserve 27164.**

Finally the expedition members believe that the Prince Regent River Reserve is worthy of "Class A" status under the Land Act. It is therefore recommended that:

3. **Reserve 27164 be proclaimed a Class A Reserve.**

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