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**WILDLIFE OF THE
DAMPIER PENINSULA,
SOUTH-WEST KIMBERLEY,
WESTERN AUSTRALIA**

**EDITED BY
N. L. McKenzie
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WESTERN AUSTRALIAN
WILDLIFE RESEARCH CENTRE
DEPARTMENT OF FISHERIES AND WILDLIFE
PERTH, WESTERN AUSTRALIA



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WILDLIFE OF THE DAMPIER PENINSULA, SOUTH-WEST KIMBERLEY, WESTERN AUSTRALIA.

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ABSTRACT

Annotated lists of the wildlife on the Dampier Peninsula are presented and discussed.

The Peninsula is part of the South-west Kimberley, an interzone district between the sub-humid North Kimberley and the arid Great Sandy Desert. The wildlife of the Peninsula reflects this transition; the 311 plant, 33 mammal, 214 bird, 69 reptile and 9 amphibian species recorded on the Peninsula since European settlement (and the 440 insect species recorded during 1977) are a depauperate collection of both Kimberley and desert elements. Few endemics are recognised.

Three nature reserves totalling 29 117 hectares are recommended. These include areas of well-watered coastal, sub-coastal and sandplain communities not well represented in existing and proposed reserves elsewhere in the South-west Kimberley.

PART I**BACKGROUND
AND ENVIRONMENT**

by N. L. McKenzie¹ and K. F. Kenneally²

INTRODUCTION

Previous wildlife surveys in the Kimberley of Western Australia have been documented in earlier publications in this series: Miles and Burbidge (1975), Kabay and Burbidge (1977) and Burbidge and McKenzie (1978). These were surveys of areas in the North Kimberley.

The survey reported here is the second of two undertaken in the South-west Kimberley, the well watered, north-western (seaward) and northern margin of the otherwise arid Canning Basin. Most of the Canning Basin is today known as the Great Sandy Desert (Fig. 1). Our previous survey in this district (McKenzie 1981) dealt with the Edgar Ranges Area on the drier southern inland margin of the South-west Kimberley. Surfaces sampled during that work included alluvial soils and sedimentary outcrops typical of the Fitzroy Plains Province (Wright 1964, p. 104), red sandplains typical of inland areas of Wright's (1964) Sandplain Province, and sandridge country typical of the adjacent Great Sandy Desert.

The survey reported here was undertaken on the Dampier Peninsula (Fig. 2) which includes better watered coastal areas of the Sandplain Province. The field survey lasted from 16 April to May 1977 and was carried out by eight people using three vehicles: N. L. McKenzie, W. K. Youngson, M. L. Onus and I. Cooke

of the Department of Fisheries and Wildlife, W.A.; D. H. Colless of C.S.I.R.O. Division of Entomology, Canberra; R. E. Johnstone of the Western Australian Museum; K. F. Kenneally (assisted by B. Haberley) of the Western Australian Herbarium. From 16 to 23 April the team worked from a camp (17°19'S, 122°10'E) on the Coulomb Point Nature Reserve; from 24 to 30 April the base camp was at Martins Well (16°34'S, 122°51'E) near Lombadina (Fig. 2).

Additional data on vertebrates and vegetation were collected during subsequent field trips in 1978 (28 August to 22 September) and in 1981 (16 to 25 June) by N. L. McKenzie, K. F. Kenneally (assisted by K. C. Pirkopf), J. Rolfe and K. E. Cashin. P. Crab of Monash University and W. K. Youngson assisted in the 1978 survey; B. R. Maslin (assisted by Q. D. Richards) of the Western Australian Herbarium, and I. G. Crook and R. E. S. Sokolowski of the Department of Fisheries and Wildlife, W.A., assisted in the 1981 trip. During both surveys, collections were made at a variety of places on the Peninsula (eg. Waterbank Station, Cygnet Bay area, Dampier Hill) although sites sampled during the 1977 survey were also re-collected.

The aim of this study was to document the present flora and the vertebrate and insect faunas of the Dampier Peninsula, clarifying biogeographical relationships there and determining whether European man has caused changes in its wildlife. Because the conservation objective of the work was to assess the value of the Coulomb Point Nature Reserve in representing the

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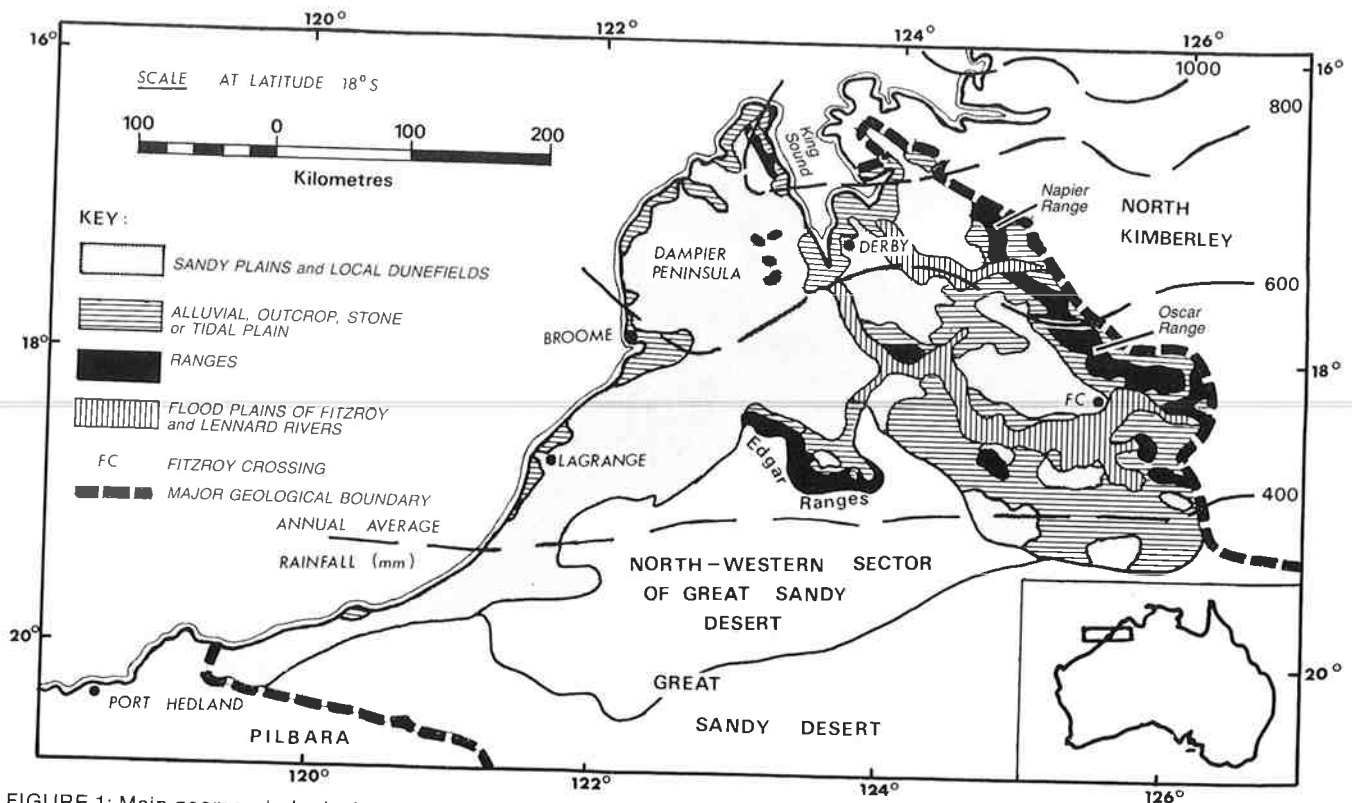


FIGURE 1: Main geomorphological surfaces and rainfall isohyets of the Phanerozoic South-west Kimberley—adapted from the land system map accompanying Speck *et al.* (1964).

wildlife of the Peninsula and, if necessary, to select additional reserves to provide such representation, the survey was concentrated in (but not restricted to) the Nature Reserve and the vacant Crown land on the Peninsula.

GEOLOGY, GEOMORPHOLOGY AND SOILS

Unlike the Precambrian North Kimberley, the Canning Basin comprises Phanerozoic sediments which, in the Great Sandy Desert (Fig. 1), are mantled by red aeolian sandridge country. The northern and north-western edge of the Canning Basin is known as the South-west Kimberley, an area of alluvial sandy and outcrop surfaces which includes the drainage basin of the Fitzroy and Lennard Rivers.

The western half of the South-west Kimberley is typified by extensive reddish sandy plains and includes the Dampier Peninsula.

The Dampier Peninsula is underlain by Jurassic marine sediments (sandstone and mudstone). Occasional outcrops of Early Cretaceous sandstone occur in the Carnot Peak, Cygnet Bay and Mount Jowlaenga areas (Fig. 2). Cainozoic rocks are restricted to relatively small exposures: calcrete in coastal situations on Waterbank Station and Packer Island; laterites on uplands in the Mount Jowlaenga area.

Most of the Dampier Peninsula is mantled by reddish-grey Quaternary sandplains of mixed alluvial and aeolian origin, which grade into yellowish-grey sandplains towards the northern end of the Peninsula where rainfall is higher. Areas of red aeolian sand and weak dunes occur throughout the Peninsula and are understood (see Gibson, this publication) to be remnants

of a previous era of aridity and homologous with the Quaternary dunes of the Great Sandy Desert. Beach and beach dunes of quartzose shelly sand and saline mud flats, either supratidal or tidal (including mangroves) also occur coastally. A seasonally active coastal drainage system and scattered seasonal fresh-water swamps are present, although poorly developed. In east-west section, the Dampier Peninsula is gently convex. Sheet flooding is the most widespread pattern of drainage because few abrupt rises interrupt the gentle gradients of the plains country that forms the broad spine of the Peninsula. The southern half of the Peninsula has a peripheral system of creeks and small rivers, best developed near the coast in the Coulomb Point Nature Reserve, at Roebuck Bay and east of Dampier Hill.

The northern end of the Peninsula is too small and narrow for development of substantial watercourses although steeper gradients are encountered on its eastern and western aspects and broad sub-coastal drainage valleys, with seasonally swampy areas, occur behind most of the larger bays—especially Beagle Bay and Pender Bay.

The surfaces important on the Dampier Peninsula are: coastal saline mudflats; beach and beach dunes with some derived limestone outcrops; Permian and Mesozoic outcrop country of south-eastern areas and the northern coastline; widespread reddish-grey sandplains of southern areas; yellowish-grey sandy plains of northern areas; watercourses and seasonal fresh-water swamps.

CLIMATE

Climatic parameters for the South-west Kimberley are included in the Bureau of Meteorology climatic summary of the Kimberley region (Anon. 1975).

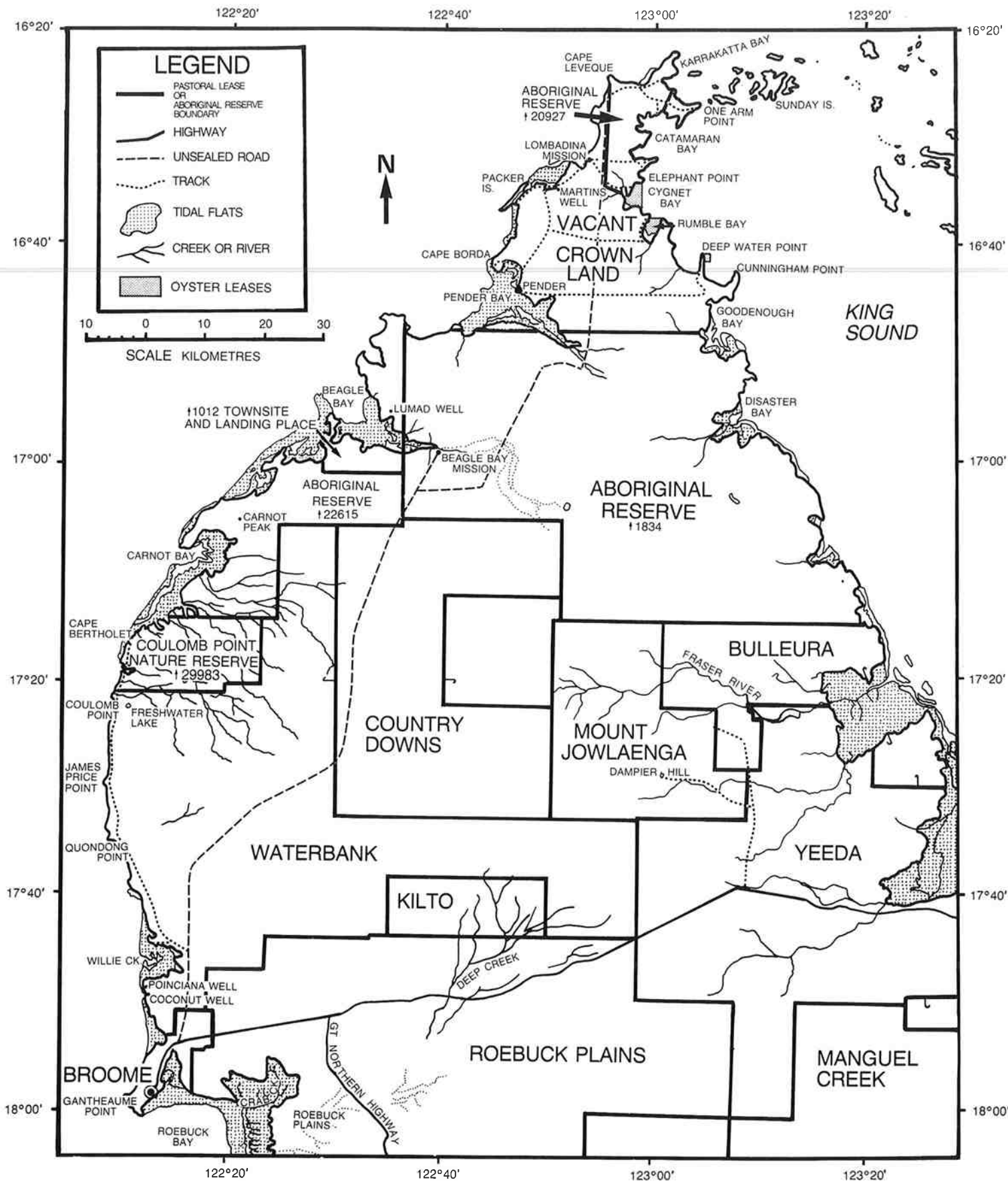


FIGURE 2: The Dampier Peninsula—land tenure, locality names and main access.

TABLE 1
MEAN MONTHLY CLIMATIC FIGURES
(20 years or better)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BROOME												
Rainfall (mm).....	150	150	95	27	35	24	6	1	1	1	8	43
Max. Temps (°C).....	33	23	34	34	31	29	29	30	32	33	34	34
Min. Temps (°C).....	26	26	26	23	19	16	14	15	18	22	25	27
Rel. Humid. (%).....	68	73	67	54	47	48	46	43	46	51	56	62
CAPE LEVEQUE												
Rainfall (mm).....	185	187	133	41	48	22	13	2	1	1	6	79
Max. Temps (°C).....	32	32	33	33	31	29	29	30	31	32	33	33
Min. Temps (°C).....	26	25	26	25	23	20	18	20	22	24	26	26
Rel. Humid. (%).....	75	76	70	61	56	56	47	48	53	65	66	69

The Dampier Peninsula has a tropical climate with a distinct wet season from December to March during which almost all the annual rainfall is received and humidity is high. Climatic parameters are summarized in Table 1. Only two significant seasons occur, separated by brief transitional periods during which daytime temperatures are significantly higher. The difference between the wet and dry seasons is dramatic; the landscape takes on an entirely different complexion. Dahl (1926, p. 310 *et seq.*) describes the change vividly... "some weeks ago these plains were desert. Dry and fine sand rose in little clouds at every step of the horses, while the wind swept the sand away and played with the dry debris of the withered vegetation. Now it might happen that the grass and rushes rose higher than the saddle as one rode among chains of glittering lagoons, and every step of the horses might flush a profusion of waterfowl... almost all of them were species which during the dry season were entirely absent from these parts".

IMPLICATIONS OF LATE QUATERNARY CHANGES IN CLIMATE AND SEA LEVEL.

Nix and Kalma (1972), Jennings (1975) and Wyrwoll (1979) provide an outline of the late Quaternary climatic history of north-western Australia. Jennings (1975) presents evidence that there was a tall mangrove forest in the mouth of the Fitzroy River about 7 000 years ago and concludes that the Fitzroy region had a longer and heavier wet season at that time. This conclusion is consistent with work by Hope and Peterson (1975) who note that there is no evidence for ice on any New Guinea mountain between 7 000 and 5 000 years B.P. when the tree-line in the Carstensz and Mount Wilhelm area of New Guinea was at a higher altitude than at present (as much as 200 m higher). Under such a climatic regime it can be envisaged that the Dampier Peninsula, and South-west Kimberley generally, had a rainfall equivalent to the North Kimberley today. Nix and Kalma (1972) suggest that at 7 000 years B.P. rainfall was 1.5 times the present rainfall.

The late Quaternary sea-level history of this area may also have influenced the biota today found on the Peninsula. During the last glacial maximum (ca. 17 000 years ago) the sea-level in this region was probably about 150 m lower than today (Chappel and Thom 1977), which implies a massive extension of the landmass in this area (see Merrilees 1979 Fig. 1). Because of the low declivity of the continental shelf the subsequent

transgression caused lateral migration of shorelines of around several hundred metres per decade (Chappel and Thom 1977). From a "smoothed" Australian Holocene sea-level curve (Thom and Chappel 1975, Chappel and Thom, 1977), and the present bathymetry of the Fitzroy estuary, it seems likely that the Dampier Peninsula was not cut off from the North Kimberley until about 10 000 to 9 000 years ago. The islands immediately adjacent to the northern tip of the Dampier Peninsula include outcrops of the Precambrian sandstones typical of the North Kimberley. Prior to the transgression therefore, habitats of the North Kimberley were immediately adjacent to the areas we studied on the northern tip of the Dampier Peninsula. Available evidence suggests that the marine transgression of King Sound culminated about 7 000 years B.P. as did rising sea-levels and increasing precipitation.

Climatic conditions and the incomplete marine transgression of King Sound ca. 9 000 years B.P. may have allowed North Kimberley biota to extend onto the Dampier Peninsula so that with the advancing transgression these were isolated there. This implies an elimination of arid zone biota. In view of the known fluctuations of Holocene climates in the southern hemisphere (see Burrows 1979) subsequent returns to wetter conditions may also have established or re-established North Kimberley biota on the Peninsula from time to time, via the route around the south end of King Sound (Fig. 1).

EXPLORATION AND NATURAL HISTORY

The vegetation of the sandplains dominating the Peninsula ranges from open-forest to low open-woodland, over perennial grassland. Upperstorey species include *Acacia* spp., *Grevillea* spp. and *Eucalyptus* spp. in varying proportions depending on climatic gradients. Beard (1967) considered the sandplains a "unit ecological region" because they support "pindan", a vegetation type structurally and floristically unique to the area. See also Beard (1979).

Descriptions of the woodland country near Broome ca. 1896 (Dahl 1926) are consistent with structures occurring there today, although densities and understorey elements may have changed dramatically. Since ca. 1890 the Dampier Peninsula has been subjected to intensive pastoral management involving intensive grazing, very frequent and widespread burning and some localized clearing—events not conducive to

regeneration of tree species and the persistence of shrub layers and leaf litter, but favouring the development of annual and perennial grasslands.

There is evidence that widespread bushfires pre-dated European settlement. In 1838 Stokes commented "indeed during the dry season it not infrequently happens that an immense tract of land is desolated by fire, communicated, either by design or carelessness of the natives, to the dry herbage on the surface" (Stokes 1846).

Grazing and burning are now recognised as important factors in the modification of vegetation structure and floristics and native fauna richness elsewhere in Australia. Of particular relevance to the Dampier Peninsula is experimental work undertaken by C.S.I.R.O. Institute of Biological Resources (Anon. 1981) in areas of the Northern Territory with similar geomorphology, climate, vegetation (both structure and floristics), and pastoral management history (cattle grazing and seasonal burning for green feed). See also Main (1979, p. 98) and Aplin (1979, pp. 69 and 70). Speck (1964) was the first to comment on such effects in the South-west Kimberley.

During our field work in 1977 and 1978 we noted that there was hardly a hectare of the Dampier Peninsula which did not include at least one cattle pad while huge areas were at early stages of regeneration after fire. Trampling damage was especially apparent in the species rich communities along watercourses, in ephemeral swamplands, and in the sub-coastal semi-deciduous vine forests: sites where cattle congregate. The widespread influence of fire on the Coulomb Point Nature Reserve had sharply reduced mature stands of the *Acacia* dominated "pindan" vegetation for which the reserve was originally proclaimed.

The woodlands to open-forests of *Acacia* and *Eucalyptus* that dominate the Peninsula are best described as a tree savannah (Beard 1967) over annual tussock grassland; substantial shrub strata were only noted by the authors in discontinuous and isolated areas that had escaped burning for several years.

During 1980 and 1981 higher cattle prices induced the mustering and sale of stock. The effect of this reduction in cattle numbers was apparent in June 1981; trampling was a severe problem only near water (along creek lines, near swamps and bores) and in vine forests and other near-coastal communities. Burning, however, was still a major influence on the vegetation; large tracts of blackened country were noted, green foliage being retained only by mature *Eucalyptus* trees and by scarcely-visible green shoots in the blackened butts of the tussock grass. The country immediately south of Pender Bay was burning on a 20 kilometre front during the five days we spent on the north end of the Peninsula in June 1981.

The natural history of the Dampier Peninsula and its environs soon after first European settlement is relatively well known. Extensive collections of vertebrates were made by Dahl (1897, 1926) from 1895 to 1896 and by Söderberg (1918) and Lönnberg (1913) from 1910 to 1913. In most cases their specimens were accompanied by environmental descriptions including general accounts of the vegetation.

The earliest recorded observations of the vegetation of the Peninsula were made by William Dampier who anchored in the *Cygnets* near Karrakatta Bay in January 1688 (Tuckfield 1955). He described the hinterland as an area "of dry, sandy soil, destitute of water . . . yet producing diverse sorts of trees; but the woods are not thick nor the trees very big. Most of the trees . . . are about the bigness of our large apple trees and about the same height. There was pretty long grass growing under the trees but it was very thin" (Grant-Richards 1906).

Nicholas Baudin charted the western coast of the Dampier Peninsula in August 1801 and named a number of prominent features including Cape Bertholet, Carnot Bay, Cape Borda, Cape Leveque and Coulomb Point (Marchant 1982).

In February 1822 P. P. King in the *Bathurst*, accompanied by the botanical collector Alan Cunningham, charted the eastern coast of the Peninsula and named Point Cunningham, Goodenough Bay, Foul Point and Disaster Bay. A number of days were spent ashore exploring and collecting plants as the *Bathurst* lay at anchor in Goodenough and Cygnets Bay. During this period Cunningham made several type collections (see Kenneally, this publication).

Further observations on the vegetation, soon after the wet season (April 1879), were made by Alexander Forrest during his expedition from De Grey River to Beagle Bay (Forrest 1880): "The country along the south and east shore of Beagle Bay is very good, and abounds in permanent springs; nearly every mile surface water is to be found. The country is however rather densely wooded with cajeput, red and white gum, and many species of acacia, as well as the palm tree, also the black wattle which would in course of time be a valuable article for export. The cajeput tree here grows to an immense size, and would when sawn be suitable for building purposes and fencing". The palm Forrest referred to is actually *Pandanus*, the black wattle is either *Acacia tumida* or *A. eriopoda* (the most common tree wattles of the Peninsula). Botanical specimens were forwarded by Forrest to the botanist Ferdinand von Mueller in Melbourne (Mueller 1880, 1881).

During the same year Julius Brockman made notes on the vegetation of the Peninsula during a trip from Beagle Bay to the Fitzroy River, observing (Brockman 1880), east from Beagle Bay, dense wattle thickets, over bamboo grass [*Sorghum*]. Brockman also noted that the country about 30 km east of Beagle Bay was very dry, much of it burnt clean. Brockman made particular note of the dense vine thickets found behind the coastal sand dunes on the north end of the Peninsula: "We turned into the beach again at sunset . . . and had hard work to force our way through the jungle that skirts the sea hills, having to get out our knives to cut the tangled masses of creeper, often as strong as rope".

Tepper (1893) published a list of 143 plant species collected by his son, J. W. O. Tepper, from the vicinity of Roebuck Bay during the years 1889 and 1891. Unfortunately, he did not describe the vegetation in structural terms. During the Crossland Expedition in 1906, W. V. Fitzgerald collected plants near Cygnets Bay, Swan Point and Cape Leveque. These were included in his accounts of the botany of the Kimberley (Fitzgerald 1907, 1919). Further collections from the Peninsula were made by C. E. Lane-Poole in October 1919 during a visit to the area in connection with the

issue of licences to extract tannin from mangrove bark (Lane-Poole 1920). Additions to knowledge of the Peninsula's flora were also made by C. A. Gardner during the Easton Expedition of 1921 (Gardner 1923).

Descriptions of vegetation structure in the journals and publications of the above investigators are very superficial and restricted to specific localities; no detailed account of vegetation structures on the Peninsula was available before that of Speck *et al.* (1964). More recently, Beard (1979) expanded Speck's account to provide the first detailed vegetation map of the Peninsula.

Most of the Peninsula is held either as pastoral leases or as reserves for the "use and benefit of Aborigines" (Fig. 2). In both cases the land is managed as an open-range cattle industry.

A substantial area north of Pender Bay is vacant Crown land; Lombadina Mission is located in the north-western sector of this land and cattle from the settlement graze throughout the area. The Coulomb Point Nature Reserve is the only conservation reserve on the Peninsula; it has an area of 28 677 hectares.

The Coulomb Point Nature Reserve (A 29983) originated from the Australian Academy of Science report (Anon. 1962). The Academy recommended an area of 125 000 ha, situated south and east of the present reserve, to preserve a sample of the pindan vegetation formation and . . . "its characteristic fauna". The report also recommended that a smaller area to the north of Coulomb Point, then occupied by Carnot Pastoral Lease, be added to the proposed reserve if it became vacant. The "Carnot Lease" was subsequently declared a nature reserve; the area originally proposed is now part of Waterbank Station.

VEGETATION DESCRIPTIONS

The Dampier Peninsula falls within the Dampier District of the Northern Botanical Province as defined by Beard (1980). The vegetation of the Peninsula has been mapped by Beard (1979) who distinguished seven different communities, including an array of pindan woodlands on the extensive sandy plains that dominate its topography. During our work considerable variation was documented within these communities.

Speck *et al.* (1964) treated the South-west Kimberley as a mosaic of land systems. They defined a land system as: "an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation". So that Dampier Peninsula environments can be interpreted in the context of the South-west Kimberley as a whole (see Table 1 in McKenzie, this publication, p. 79), our descriptions of the communities sampled on the Peninsula are grouped below according to their parent land system.

For consistency with previous Kimberley survey reports in the series, the plant structural terminology of Specht *et al.* (1974), but modified by the addition of an extra shrub stratum (Aplin 1977), is used in the descriptions presented below. Each community is described in terms of physiography, substrate, vegetation formation, and structurally dominant floristics; the various plant strata are described individually. Density figures quoted are estimates of canopy cover. Photographs and their captions are used to extend the descriptions. Mosaic patterning and trends within communities are described

using plant structural parameters and floristics. Codes inserted in the text in bold type identify habitats sampled for mammals.

1. CARPENTARIA LAND SYSTEM

1.1 MANGROVE COMMUNITY

Stands of mangroves are developed on the tidal mudflats associated with sheltered embayments and estuaries. They form an important, although discontinuous, closed canopy community along both shores of the Peninsula.

The mangal is relatively consistent in its structure and floristics; zonation was noted in the more extensive stands (Colour Plate 1) and corresponds to that described and illustrated by Semeniuk *et al.* (1978) and Kenneally (1982) for their biogeographical "Zone 2" (tropical semi-arid).

1.11 Along the south-western coast of the Peninsula the largest patches of mangal are found in the mouths of Dampier and Crab Creeks, both of which empty into Roebuck Bay. Here *Avicennia marina* is the most common species forming dense stands on the landward edge of the mangal (see Colour Plate 5). Other species such as *Aegialitis annulata*, *Aegiceras corniculatum*, *Camptostemon schultzei* and *Rhizophora stylosa* also occur in the community. *Excoecaria agallocha* and the halophyte *Batis argillicola* are common on the mudflats at Crab Creek.

Further north on the Peninsula the most extensive stands of mangroves can be found in the large embayments on both sides of the Peninsula (Colour Plate 2). These stands are often characterised by a seaward zone of *Sonneratia alba* (one tree deep to 10 m high). A zone of this type (**1.12**) is included in stands examined near Packer Island and in Cygnet Bay (Colour Plate 3), but was not seen by the authors in the stands examined on the Coulomb Point Nature Reserve (south of Cape Bertholet), at Willie Creek (on Waterbank Station), or at Crab Creek (near Broome). *S. alba* is known as far south as Cape Bossut (110 km south-west of Broome) and may occur in stands on the south-eastern coast of the Peninsula. In seaward and/or creek fringing situations, *Camptostemon schultzei* (up to 12 m, 40% dense) and *Aegiceras corniculatum* (to 5 m, scattered) were recorded in the stands at Packer Island, Willie Creek and on the Coulomb Point Nature Reserve (**1.13**) (Plate 1).

Avicennia marina and *Rhizophora stylosa* (to 14 m, 60-100%) (Colour Plate 4) are ubiquitous as the central zone of the stands; with *Avicennia marina* (to 5 m, 40-80%) and/or *Ceriops tagal* (to 3.5 m, 80-100%) forming the landward zone (**1.14**) (Colour Plates 2 and 8) depending on substrate characteristics. The hemiparasite *Amyema thalassium* is common on *Avicennia marina*; the lichen *Ramalina ecklonii* is frequently found on the branches of *Ceriops tagal*. Less common species in the landward zone include *Aegialitis annulata*, *Excoecaria agallocha*, *Bruguiera exaristata* and *Osbornia octodonta*.

On the landward side, mangrove communities are adjacent to saltmarshes, mudflats, rocky substrates (sandstone or limestone), sandy beaches and strand communities fringing greyish Wanganut sandplains.

1.2 MUDFLAT COMMUNITIES

Broad tidal mudflats are often encountered behind the mangroves (Colour Plate 2). Tidal areas are bare; supra-tidal areas support low shrublands (Colour Plate 5)



Plate 1.—

Camptostemon schultzi
fringing a tidal creek three
kilometres south of Cape
Bertholet on the Coulomb Point
Nature Reserve.

Plate 2.—

Sporobolus grassland on supra-
tidal flats in the proposed
Borda Nature Reserve.



Plate 3.—

An intermittent fringe of
Melaleuca acacioides grows
along the landward edge of the
supra-tidal flats. Photograph
taken 0.5 km north-west of
Martins Well in the proposed
Borda Nature Reserve. Note
the samphire in the foreground.

Plate 4.—

Coastal dune vegetation behind a beach six kilometres north of Coulomb Point in the nature reserve. The grass tussocks are *Spinifex longifolius*; clumps of *Pandanus spiralis* and *Melaleuca acacioides* mark the top of the sand slope.



dominated by the samphires *Halosarcia halocnemoides* subsp. *halocnemoides* and *H. halocnemoides* subsp. *tenuis* (0.25 m, 10-30%) and/or the grass *Sporobolus virginicus* and the halophytes *Sesuvium portulacastrum* and *Neobassia astrocarpa* (0.25 m, 40-70%) (1.21) (Plate 2). Other sub-shrubs (*Hemichroa diandra*, *Limonium salicorniaceum*, and *Suaeda arbusculoides*), and the grass *Xerochloa imberbis*, may occur on the landward perimeter of the mudflat.

The landward edge of the mudflat is frequently delimited by a fringing stand, up to 10 m wide, of paperbark trees (*Melaleuca acacioides*) to 7 metres high (1.22) (Plate 3) or, on sandy ridges, strand shrubs such as *Hibiscus panduriformis*, *Thespesia populneoides* and *Abutilon indicum* (Colour Plate 8).

1.3 COASTAL DUNE AND BEACH COMMUNITIES

1.31 Holocene sand dunes occur along the coast (Colour Plate 6); some are encroaching into the hinterland

(Colour Plate 7). The grass *Cenchrus biflorus*, and the shrubs *Crotalaria cunninghamii*, *Euphorbia* sp. and *Fimbristylis sericea* are common on the fore-dunes. Isolated clumps of *Pandanus spiralis* var. *convexus* (to 3 m) occur in the interdunal swales and sometimes in the strand community behind beaches (Plate 4).

The leeward side of the dunes is characterised by dense shrub thickets of *Acacia ampliceps* and *Crotalaria cunninghamii* (to 2.5 m, 20-70%) and patches of the grasses *Cymbopogon ambiguus* (to 1.5 m, 60%) and *Spinifex longifolius* (Colour Plate 7 and Plate 5). More subdued beach dune systems usually merge into sandplain surfaces with pindan via small pockets of vine thicket; larger dune systems provide conditions suitable for the persistence of closed vine forests along the foot of their leeward slopes and sometimes truncate coastal drainage areas resulting in the formation of ephemeral swamps.

Plate 5.—

Rear slope of a coastal dune eight kilometres north of Coulomb Point. The shrub thickets are *Melaleuca acacioides*. The shrubs *Crotalaria cunninghamii* and the grass *Spinifex longifolius* can be distinguished.





Plate 6.—

Small sedgeland in fresh water soaks on the coastal platform at Cape Borda. Cattle have disturbed the vegetation.

At Cape Borda, where mudstone rock strata are exposed under the end of a dune system, fresh water seepage areas support dense swards of *Fimbristylis ferruginea* and *Sporobolus virginicus* (1.32) (Plate 6).

Where the mangal abuts directly onto white beach sands, stands of the grasses *Spinifex longifolius* and *Sporobolus virginicus*, and the sedge *Fimbristylis sericea* occur (Colour Plate 8).

1.4 SUB-COASTAL VINE THICKETS TO CLOSED VINE FORESTS

Directly behind the coastal dune systems are discontinuous but discrete pockets of dense vegetation ranging from vine thickets to closed vine forest (Colour Plate 9). They form one of the most interesting formations on the Peninsula. Floristically they contain a predominance of Indo-Malesian elements more typically encountered in the patches of monsoon forest (semi-deciduous vine thickets) in the wetter North-west Kimberley. This formation is best developed at the northern end of the Peninsula, especially along the western coastline. Stands comprising fewer species (such as *Terminalia petiolaris*, *Grewia breviflora*, *Pouteria sericea* and *Celtis philippinensis*) can be found as thickets behind the dunes in the vicinity of Broome, in the Cygnet Bay area, and north of Willie Creek. A thicket behind the coastal dunes south of Cable Beach (near Broome) was examined in detail. Thicket species noted were *Terminalia petiolaris*, *Pouteria sericea* and *Grewia breviflora* but the formation merges with pindan species (such as *Lysiphyllum cunninghamii*, *Eucalyptus papuana*, *Gyrocarpus americanus*, *Acacia tumida* and *A. holosericea*) and coastal dune species (*Acacia bivenosa* and *Adriana tomentosa*). At Quandong Point (north of Broome) this formation is represented by a grove of wind pruned *Diospyros humilis* var. *ferrea* growing directly behind the beach.

The principal upper storey tree species of the closed vine forests (to 15 m) include *Melaleuca cajuputi*, *M. dealbata*, *M. leucadendra*, *M. viridiflora*, *Terminalia petiolaris*, *Cassine melanocarpa*, *Celtis philippinensis*, *Diospyros ferrea* var. *humilis*, *Ficus virens*, *Mimusops elengi* and *Pouteria sericea* (Colour Plate 10 and Plate 7). The understory comprises shrub species such as

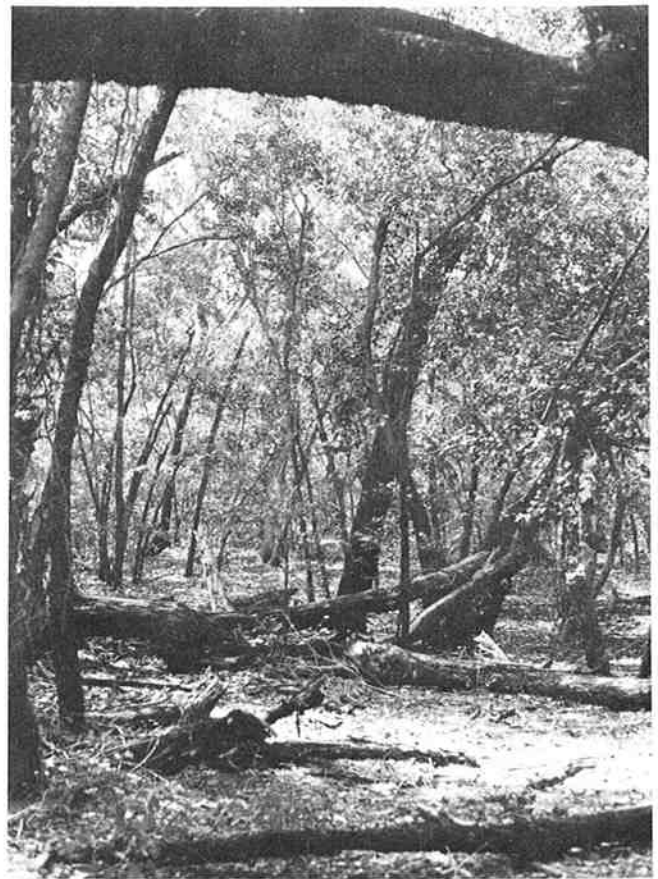


Plate 7.—

A patch of *Diospyros ferrea* low forest further from the foot of the dune illustrated in Colour Plate 10.

Dodonaea platyptera, *Exocarpos latifolius*, *Plumbago zeylanica*, *Santalum lanceolatum*, *Securinega melanthesoides*, *Pandanus spiralis* and *Croton* aff. *tomentellus*.

Plate 8.—

Limestone exposed coastally near Willie Creek. Shrubs on top of the limestone are mainly *Acacia bivenosa* (2 m).



Vine species including *Adenia heterophylla*, *Abrus precatorius*, *Caesalpinia globulorum*, *Gymnanthera nitida*, *Jacquemontia paniculata*, *Passiflora foetida*, *Marsdenia cinerascens* and *Tinospora smilacina* are common climbers extending into the canopies of the trees (Colour Plates 11 and 12). The parasite *Cassytha filiformis* forms dense tangled patches in the canopies of the *Melaleuca* species.

Soils are deep dune sands, white except for a superficial dark grey organic layer covered by leaf litter up to 6 cm in depth (Colour Plate 11).

1.5 COASTAL LIMESTONE

Coastal and sub-coastal limestone outcrops are widespread south of Willie Creek and at Packer Island. The vegetation at Willie Creek (Plate 8) is an open-scrub of *Acacia bivenosa*, *Lysiphyllum cunninghamii*

and *Mallotus nesophilus*. At Poinciana Well, just south of Willie Creek, the vegetation is transitional between the coastal travertine and pindan. Here scattered *Eucalyptus setosa* (to 4 m) occurs with an open-scrub of *Acacia* spp. (including the coastal *A. bivenosa*). *Lysiphyllum cunninghamii* and *Ficus oppositifolia* var. *indecora* are also common as elements of the scrub.

On Packer Island the travertine outcrops form a karst formation. Just south of a trig point on the island is a pool in a deep sink hole which joins the sea (Colour Plate 13). Orange sand overlies much of the travertine, and shrubs of strand species such as *Pemphis acidula* and *Scaevola sericea* occur (Plate 9); *Spinifex longifolius* is the most common grass species. Wind pruned shrubs of *Acacia tumida* and *Crotalaria cunninghamii* are common in sheltered depressions (Plate 10). The coastal creepers *Canavalia rosea* and *Ipomoea brasiliensis* scramble over rocky outcrops.

Plate 9.—

Patches of orange sand on Packer Island. The decumbent shrub *Trianthema pilosa* is in the foreground. Patches of *Spinifex longifolius*, and a clump of *Pandanus spiralis*, are visible behind.





Plate 10.—
Sandhills on Packer Island support a closed-scrub of wind-pruned *Acacia tumida*.

2. YEEDA AND WANGANUT LAND SYSTEMS

2.1 SANDPLAIN COMMUNITIES

Sandy soil plains dominate the landscape of the Peninsula and support a repetitive mosaic of plant communities involving a limited number of dominant species in a variety of permutations.

At least two trends can also be distinguished in the patterning of these communities. One is the gradual change, from low open-woodlands of *Acacia* dominated pindan in the south to open-forests of *Eucalyptus* dominated pindan in the north, corresponding to rainfall and soil trends. The other is caused by more localized landscape trends; Speck *et al.* (1964) distinguish two main sandplain land systems on the Peninsula—the Yeeda Land System dominated by sandplains with uncoordinated drainage high in the landscape and the Wanganut Land System typified by more alluvial sandplains with coordinated through-going drainage at low levels in the landscape.

Beard (1967) has described pindan as a grassland wooded by a sparse upper layer of trees, and a dense, thicket forming, middle layer of unarmed, “phyllodial” *Acacia*. The variability of its height, density and floristics, often caused by fire, has also been noted by Beard (*loc. cit.*). In areas unburnt for long periods, *Acacia* species are co-dominant with *Eucalyptus* species. The influence of cattle on pindan has been discussed previously (p. 9).

In treating the *Eucalyptus* open-forests on the northern end of the Peninsula as forms of pindan we are following Beard (1979) who included open-forest communities dominated by *Eucalyptus* spp. such as *E. miniata*, east of Kimbolton on the northern edge of the South-west Kimberley as forms of pindan even though they are little different from typical North and East Kimberley woodlands and open-forests (see Miles *et al.* 1975).

2.11 From approximately Beagle Bay southwards, the sandy soil plains are generally reddish-grey in colour with occasional areas of red sand (Colour Plate 14). The vegetation is a low woodland to low open-woodland dominated by various species of *Eucalyptus* (*E. papuana*—broad-leaved form, *E. polycarpa*, *E. setosa*, *E.*



Plate 11.—
Acacia-pindan: comprising *Lysiphyllum cunninghamii* in the foreground and *Acacia eriopoda* in the background, in the Coulomb Point Nature Reserve.

tectifera, *E. terminalis* and *E. zygomphyla*) with *Erythrophleum chlorostachys*, *Gyrocarpus americanus* and *Lysiphyllum cunninghamii* also common (Colour Plate 15 and Plate 11). The understory consists of

several species of *Acacia* which reach canopy height (Plates 12 and 13) and include *A. tumida*, *A. eriopoda* and *A. monticola*. Shrub species commonly found in the pindan include *Acacia holosericea*, *Dolichandrone heterophylla*, *Gardenia* sp., *Grevillea refracta*, *G. heliosperma*, *Hakea arborescens*, *Petalostigma pubescens*, *Planchonia careya* and *Terminalia canescens*. The grass layer is mainly *Chrysopogon pallidus*, *Cymbopogon ambiguus*, *Heteropogon contortus*, *Sorghum stipoideum*. The vegetation of Wanganut sandy plains surfaces only becomes distinguishable from the Yeeda surfaces at the lowest levels in the landscape. On the Coulomb Point Nature Reserve, for instance, Wanganut plains support a low open-woodland of *Acacia tumida* with occasional patches of *Melaleuca nervosa*, *Gyrocarpus americanus* and small pockets of vine thicket elements (*Canarium australianum* and *Pouteria sericea*). A mixed grassland of *Cymbopogon* and *Eragrostis* is present (2.12) (Plate 14).

Proceeding north from Broome a gradual change in the vegetation becomes noticeable after the first 30 kilometres. The tree layer of the Yeeda surface begins to

increase in height and density. *Eucalyptus miniata* appears among *E. terminalis*, *E. papuana* (broad leaved form), *Acacia eriopoda* and *A. tumida* (2.13). Other components of the shrub and ground layers do not change appreciably. Where soils become sandy *Eucalyptus tectifera* is common, often with a dense grass layer of *Cymbopogon ambiguus*. Beard (1979) records *Eucalyptus grandifolia* as being common throughout this part of the Peninsula but we did not encounter it. A patch of *Eucalyptus jensenii* and *E. setosa* occurs on the Cape Leveque road 51 km north of Broome; the soil consists of red sand becoming clayey with depth. Associated vegetation includes *Acacia eriopoda*, *A. hippuroides*, *A. platycarpa*, *A. tumida*, *Brachychiton diversifolius*, *Erythrophleum chlorostachys* and *Grevillea refracta*.

Yeeda Land System surfaces north of Pender Bay are yellowish-grey sandy soils, mantling slopes and undulating uplands; gradients are gentle. Higher contours, along the centre of the Peninsula, support *Eucalyptus miniata* open-forest (2.14) (Plate 15) with *E. papuana* (narrow leaved form), *E. tectifera*, *E. terminalis*



Plate 12.—

Acacia-pindan: comprising *Acacia eriopoda* and *A. monticola* as a tall shrubland (to 3 m high) south of Coulomb Point but typical of large areas of the nature reserve.

Plate 13.—

Acacia-pindan: *Acacia eriopoda* open-scrub (to 5 m) in the Coulomb Point Nature Reserve. This patch of vegetation is visible in the top left-hand quadrant of Colour Plate 19.





Plate 14.—

Pindan : a low open-woodland of *Eucalyptus terminalis*, *Canarium australianum* and *Pouteria sericea*, over scattered *Acacia criopoda* and *Hakea macrocarpa* shrubs and various bunch and tussock grasses. A Wanganut Land System surface on the Coulomb Point Nature Reserve.

Plate 15.—

Eucalyptus-pindan : comprising *E. miniata* open-forest, with scattered *E. polycarpa* and *Acacia tumida* forming a sub-canopy, on a 'Yeeda' plains surface in the proposed Borda Nature Reserve.



Plate 16.—

An open-scrub of *Acacia monticola* eight kilometres south-west of Cunningham Point in the proposed Cygnet Bay Nature Reserve. The site had not been burnt for a long time. Understorey shrubs are listed in text.

and an understorey of *Acacia tumida*, *Brachychiton diversifolius*, *Gardenia* sp., *Lysiphyllum cunninghamii*, *Persoonia falcata* and *Planchonia careya*. On the medium level contours, and on patches of softer more sandy soils, woodlands of *Eucalyptus terminalis* and *E. tectifera* (2.15) (Colour Plate 16) replace the *E. miniata* although scattered shrubs and low trees (mainly *Acacia tumida* and *A. eriopoda*) over bunch grasses are the ubiquitous under-strata throughout (Colour Plate 17). An area just south of Deep Water Point, which had not been burnt for many years, carried an open-scrub of *Acacia monticola* (to 7 m, 60%) (Plate 16) with an understorey of *Distichostemon hispidulus*, *Calytrix exstipulata* and *Myrtella* sp. (0.5 to 2 m, 30%).

2.16 Wanganut Land System surfaces, lower in the landscape, are associated with broad sub-coastal drainage valleys and seasonally swampy areas (eg. near Martins Well, just north of Pender Bay and just south of the Rumble Bay oyster lease). Their deep, sandy, darker grey soils support a woodland of *Eucalyptus polycarpa*, *E. papuana* and *Melaleuca viridiflora* (15 m, 20%), over

Pandanus spiralis, *Acacia pellita*, *Grevillea pyramidalis* and *Planchonia careya*. The fern *Platyzoma microphyllum*, and the herbs *Drosera petiolaris* and a species of *Xyris*, frequently occur (Colour Plate 18, and Plate 17). Occasional areas of dark cracking clay are also present.

Plains of dark grey alluvium over clay, inland from both Beagle Bay and Pender Bay, represent the lowest levels of the Wanganut surfaces. These support a grassplain of *Chrysopogon* species with scattered thickets of *Melaleuca acacioides* to 6 m high (Plate 18).

The epiphytic orchid *Cymbidium canaliculatum* is common in the hollow branches of *Eucalyptus papuana*. *Lysiana spatulata* is the most common hemiparasite of the *Acacia* species of the Peninsula.

2.2 RIVERINE COMMUNITIES

The riverine communities are again best developed in the Coulomb Point Nature Reserve (Colour Plate 19) and belong to the Wanganut System. They include dense stands of *Melaleuca acacioides* as low closed-forests in



Plate 17.—

Eucalyptus-pindan : on 'Wanganut' surface two kilometres south-east of Rumble Bay in the proposed Cygnet Bay Nature Reserve. Tree species include *Acacia tumida*, *Eucalyptus polycarpa*, *Pandanus spiralis*, *Melaleuca viridiflora* and *Planchonia careya*.

Plate 18.—

Ribbon-grass plain, with scattered *Melaleuca acacioides* south-east of Pender Bay. The lowest level of 'Wanganut' surfaces in the northern parts of the Peninsula.





Plate 19.—

Estuarine section of a watercourse in the Coulomb Point Nature Reserve. *Melaleuca acacioides* forms a fringing low closed-forest.

Plate 20.—

Bed in the fresh-water section of a watercourse in the Coulomb Point Nature Reserve. At this site, two of the species of the fringing woodland can be distinguished—*Eucalyptus camaldulensis* and *Pandanus spiralis*. Photograph : S. Hopper.



Plate 21.—

Fresh-water swamp in the Coulomb Point Nature Reserve showing *Tristania grandiflora* low woodland.

estuarine situations (2.21) (Plate 19), and fringing woodlands of *Eucalyptus camaldulensis*, *Eugenia eucalyptoides* and *Melaleuca viridiflora* over *Pandanus spiralis* var. *convexus* and *P. darwinensis* along freshwater courses (2.22) (Plate 20). Riverine vegetation on the north end of the Peninsula is not distinct from that of Wanganut surfaces described previously (2.16).

2.3 FRESH WATER SWAMPS

Fresh water swamps are scattered across the Peninsula. The majority are ephemeral. Several occur in the Coulomb Point area.

In the Wanganut Land System, swamps form where the coastal dunes truncate drainage lines. They support a low woodland of *Tristania grandiflora* with a fringe of *Melaleuca viridiflora* and *M. acacioides* (2.31) (Colour Plate 20). When water is present, following summer rain, the surface of these sub-coastal swamps is often covered with a dense bloom of *Lemna aquinoctialis* (Colour Plates 21 and 22). As the water level recedes the damp areas support numerous ephemeral species such as *Byblis liniflora*, *Drosera indica*, *D. petiolaris*, *Goodenia*

sepalosa and *Oldenlandia galioides* (Plate 21). The grasses *Aristida hygrometrica*, *Digitaria bicornis*, *Echinochloa colonum* and *Pseudoraphis spinescens* are common as are the sedges *Cyperus bifax*, *C. pulchellus* and *Fimbristylis caespitosa*. The climbers *Asparagus racemosus*, *Capparis lasiantha* and *Gymnanthera nitida* were recorded from amongst the *Tristania*.

Small semi-permanent lakes and seasonal swamps on Yeeda surfaces are generally further inland and support a fringing low woodland of *Melaleuca acacioides* and either *M. viridiflora* or *M. nervosa*, often with *Eucalyptus papuana* and *Pandanus spiralis*, over numerous grasses (2.32) (Colour Plate 22). *Melaleuca leucadendra* and *M. viridiflora* favour areas of permanent water.

3. REEVES LAND SYSTEM

3.1 LITHIC COMPLEXES

Rock outcrops are fairly rare on the Peninsula and fall into two main groups. The first, coastal limestone, has already been discussed under the Carpentaria Land

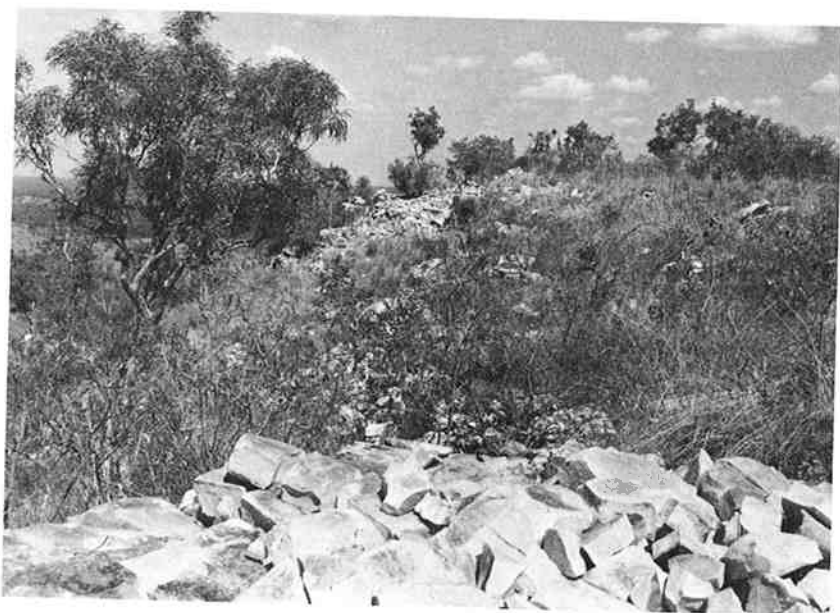


Plate 22.—

View of the top of Dampier Hill. Note the scattered *Eucalyptus tectifica* and *E. confertiflora*, the thickets of *Acacia stigmatophylla* and the tussocks of *Cymbopogon ambiguus* associated with the Melligo Sandstone.

Plate 23.

View across the *Eucalyptus tectifica* open-woodland and *Sorghum stipoideum* grassland surrounding Dampier Hill.

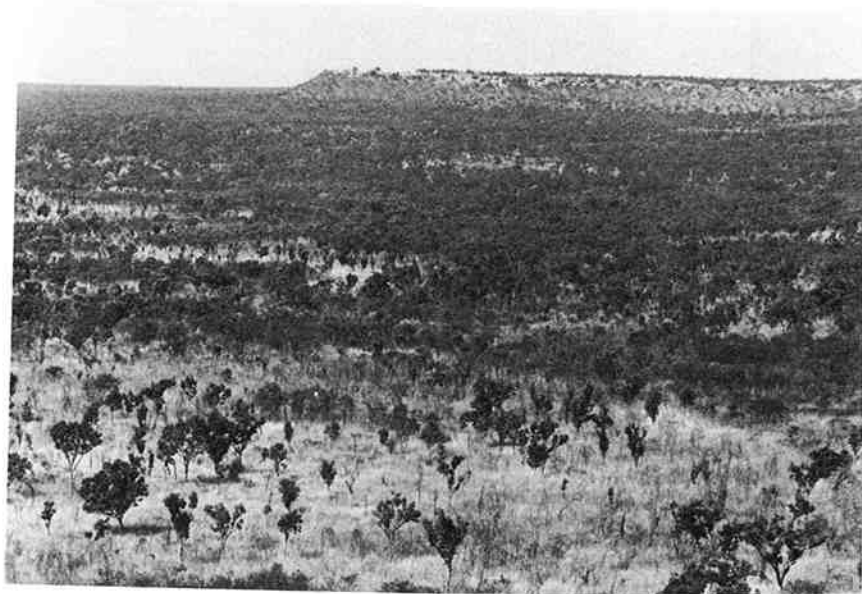




Plate 24.—
Melligo Sandstone outcrop west
of Rumble Bay.

Plate 25.—
Adansonia gregorii on a sandy
plain near Fraser River No. 1
Bore. Formation is a low open-
woodland including *Eucalyptus*
spp. over a tussock grassland.



Plate 26.—
Open-woodland of *Eucalyptus*
tectifera over a hummock
grassland on red-brown sandy
loams with areas of laterite
gravel (in foreground). Five
kilometres east of Dampier
Hill.

System. The vegetation on certain rare surfaces was not sampled: laterite, Jarlemai Siltstone and Emeriau Sandstone.

Broome Sandstone is exposed coastally as mud-stone and red eroding claystone. In the James Price Point area it supports a wind-pruned thicket of *Acacia tumida* in which *Gyrocarpus americanus* and *Ficus opposita* are also common (3.11) (Colour Plate 23).

Extensive outcrops of Melligo Sandstone occur in the Mt. Jowlaenga/Dampier Hill area—the south-eastern sector of the Peninsula (see Gibson, this publication). The vegetation of Dampier Hill (3.12) (Plate 22) is a low woodland to low open-woodland of *Eucalyptus papuana* and *E. confertiflora*, over a high shrubland comprising *Acacia stigmatophylla*, *A. holosericea*, *A. monticola*, *Atalaya hemiglauca*, *Calytrix exstipulata*, *Pterocaulon glandulosum* and *Triumfetta* aff. *denticulata*. The understorey is a tussock grassland of *Cymbopogon ambiguus*. Outcrops of Broome Sandstone in this area were not sampled. Surrounding the hills is a white clay drainage area which supports an open-woodland of *Eucalyptus tectifica*, with scattered *Lysiphyllum cunninghamii*, over a grassland of *Sorghum stipoides* (Plate 23). Termite mounds are very common.



Plate 27.—

Open-woodland of *Eucalyptus tectifica* with scattered *Lysiphyllum cunninghamii* over the tall cane-grass *Sorghum stipoides* on broad valley floors east of Dampier Hill.

Melligo Sandstone exposures around Cygnet Bay are illustrated in Plate 24. Others near Deep Water Point (Colour Plate 24) and Karrakatta Bay support a typical North Kimberley sandstone element (3.13) which includes *Acacia monticola*, *Canarium australianum*, *Exocarpos latifolius*, *Cochlospermum fraseri*, *Ficus opposita* var. *indecora*, *F. playpoda*, *Grevillea wickhamii*, *Pouteria sericea*, *Templetonia hookeri* and *Trachymene glaucifolia* (1 to 2 m, 20-40%). The hummock grass *Triodia pungens* (0.5 m, 30%) is very common. The scramblers *Abrus precatorius*, *Flagellaria indica*, *Passiflora foetida*, *Sarcostemma australe*, *Tinospora smilacina* and *Mukia maderaspatana* are also present.

4. FRAZER AND LOWANGAN LAND SYSTEMS

According to Speck *et al.* (1964), the surfaces of these land systems are restricted to catchments associated with watercourses arising in outcrop country east of Dampier Hill and Mount Jowlaenga. The Frazer River is the largest of these watercourses. Both land systems are confined to pastoral leases and unavailable for reservation.

4.1 SANDY PLAINS WITH OUTCROPS

Although the Lowangan Land System was not sampled, small collections of plants were taken from certain surfaces of the Frazer Land System during a one day visit to Dampier Hill in June 1981. Two kilometres north-west of Frazer River No. 1 Bore (see Fig. 1 in Gibson, this publication) is an undulating plain of shallow reddish to yellowish loam, with some lateritic gravel in the profile. Intermittent low ridges of laterite are present and support closed hummock grassland of *Triodia* species. The plain supports a low woodland to low open-woodland of *Eucalyptus tectifica*, *E. polycarpa* and *Adansonia gregorii* over scattered *Gyrocarpus americanus* and *Lysiphyllum cunninghamii* with a hummock grassland and some tussock grasses (Plate 25). On areas of yellow loam, the Boab (*Adansonia gregorii*) and Beefwood (*Grevillea striata*) form a low open-woodland over a closed-tussock grassland of *Chrysopogon* species. This is comparable to the tree savanna on the Fitzroy Plains described by Beard (1979). Jarlemai Siltstone is exposed in shallow watercourses incising the plain.

4.2 LOW-LYING PLAINS AND DRAINAGE FLOORS

At lower levels in the landscape are plains of firm red-brown sandy-loam soils, interspersed with patches of lateritic gravel. These surfaces were sampled at various points along the track running east from Dampier Hill. The most widespread vegetation on the sandy-loams is an open-woodland of *Eucalyptus tectifica* with scattered shrubs over a tussock grassland; the gravel surfaces support a hummock grassland (Plate 26). Associated are the broad drainage floors of the valleys where patches of greyish sand support low open-woodlands of *Eucalyptus tectifica* and *Lysiphyllum cunninghamii* over tall cane-grasslands (Plate 27).

ACKNOWLEDGEMENTS

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PART II

GEOLOGY

by D. L. Gibson¹

INTRODUCTION

The Dampier Peninsula is entirely underlain by rocks of the Canning Basin, a large Phanerozoic structure which extends along the Western Australian coast from Port Hedland to the Dampier Peninsula, and inland almost to the Northern Territory border. Rock outcrops are scattered, as most of the Peninsula is mantled by thick sandy soil, but geological mapping by the Bureau of Mineral Resources (BMR) in the early 1950s and BMR and the Geological Survey of Western Australia (GSWA) in the late 1970s, combined with geological information from seven petroleum exploration wells drilled in the area, have led to a reasonable understanding of the geology. Details are recorded by Brunnschweiler (1957), Guppy *et al.* (1958), Veevers and Wells (1961), Gellatly and Sofoulis (1973), Crowe *et al.* (1978), Towner and Gibson (1980), Towner (1981), Gibson (in preparation a & b) and Towner and Gibson (in press).

Most rocks exposed in the Dampier Peninsula formed as part of a sedimentary cycle which extended from Early (?) Jurassic (about 180 m.y.) to Early Cretaceous (about 110 m.y.) times. These have undergone only very slight deformation, and are virtually flat-lying. Palaeontological control on the age of most units is poor, and thus many ages given are only approximate. The rocks were deposited on a fairly flat landsurface, formed during a period of erosion in Late Triassic to Early Jurassic times. Distribution of outcrops is shown in Figure 1.

STRATIGRAPHY

The oldest formation of the Jurassic-Cretaceous cycle is the Wallal Sandstone, which consists of sandstone, with minor mudstone, conglomerate, and coaly beds. It is of fluvial, aeolian, and shallow marine origin. Deposition of this unit commenced in the Toarcian (?) (late in the Early Jurassic), and extended through to the Oxfordian (early in the Late Jurassic). It ranges from 154 m to 363 m thick in petroleum exploration wells in the Dampier Peninsula. This unit does not crop out in the Peninsula, and is known to crop out only along the west bank of the Fitzroy River south of the Great Northern Highway (Mudjalla Sandstone Member), and in Geegully Creek in the Edgar Ranges area further to the south (Jurgurra Sandstone Member).

Conformably overlying this is the Alexander Formation (type section at Mt Alexander in the Edgar Ranges), which was laid down as a shallow sea transgressed across the entire western Canning Basin in Oxfordian (Late Jurassic) times. This unit consists of interbedded sandstone and mudstone which were mainly deposited by tidal currents, and contains numerous moulds of shelly fossils. Its most northern exposure is at Langey Crossing near the mouth of the Fitzroy River (about 20 km south of the Dampier Peninsula), and it is well exposed in

mesas and breakaways in the Edgar Ranges. The sandstone is commonly red in outcrop, although it is generally not heavily ferruginised. It is about 70 m thick in the Edgar Ranges, and thinner to the north.

The conformably overlying Jarlemai Siltstone (type section at Mt Jarlemai in the Edgar Ranges) is the oldest unit exposed in the Dampier Peninsula; it crops out in the lower Fraser River area. It is of Late Jurassic to possibly Early Cretaceous age. Outcrops in the lower Fraser River area are highly weathered mudstone; the unit crops out well in the Edgar Ranges as soft, white, massive (probably due to bioturbation), sandy, mudstone and siltstone. It is about 90 m thick in the Edgar Ranges, and reaches 210 m in the Peninsula. It was probably deposited in a shallow sea, below wave base.

In the Edgar Ranges, the Jarlemai Siltstone is overlain by sandstone and conglomerate of the Late Jurassic or Early Cretaceous Mowla Sandstone, which forms hill cappings up to 15 m thick. However, in the Dampier Peninsula, the Broome Sandstone overlies the Jarlemai Siltstone.

The Broome Sandstone (type section at Gantheaume Point near Broome) is made up of strongly cross-bedded sandstone, with some mudstone and minor conglomerate, which were deposited mainly by tidal currents in a shallowing sea. The Broome Sandstone is well exposed in coastal cliffs between Broome and Cape Leveque, and there are some poor inland exposures. Early workers (e.g. Brunnschweiler, 1957) used the term 'Jowlaenga Formation' for outcrops of what is now recognised as Broome Sandstone in the inland part of the Peninsula, and along the east coast. The Broome Sandstone is of latest Jurassic ? to Early Cretaceous age, and is up to 274 m thick in petroleum exploration wells in the Peninsula. Dinosaur footprints have been recognised in the Broome Sandstone at Gantheaume Point near Broome.

Conformably overlying the Broome Sandstone is the Melligo Sandstone (type area at Melligo Creek, Dampier Peninsula), which consists of thin-bedded, well sorted sandstone, which in many exposures is silicified. It was deposited as a beach sand as the sea left the area in Early Cretaceous (Aptian) times. Hard silicified outcrops form flat-topped hill cappings in the central part of the Peninsula, and cliffs along the northeast coast. Unsilicified outcrops have also been recognised in some coastal cliffs along the west coast. Exposures are up to 20 m thick.

Disconformably overlying the Broome and Melligo Sandstones is the Emeriau Sandstone, which has its type section at Emeriau Point on the west coast of the Peninsula. This unit consists of sandstone with minor conglomerate, which was fluvially deposited after the sea had left the area, and is probably of Aptian (Early Cretaceous) age. Most outcrops (e.g. low hills in the Carnot Peak-King Peaks area) are heavily ferruginised. It may be up to 30 m thick.

¹Bureau of Mineral Resources, P.O. Box 378, Canberra City, A.C.T. 2601.

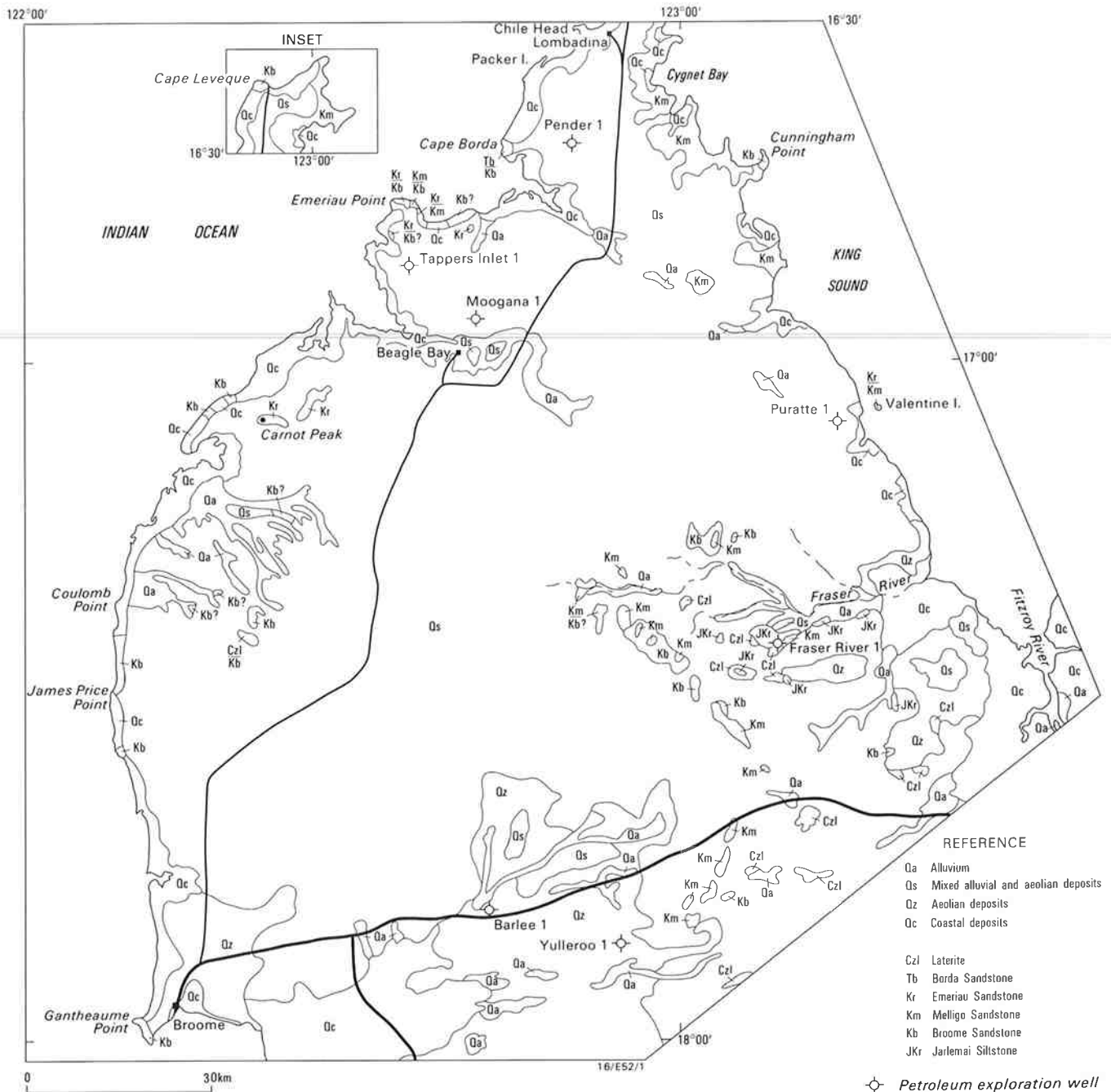


Fig.1 Geology of the Dampier Peninsula

The area was lateritised, probably in the Early Tertiary during a period of seasonally wet climate; laterite is exposed in some inland areas of the Peninsula. The Borda Sandstone, which is recognised only at Cape Borda, contains clasts of lateritised sandstone, and is thus considered to post-date this period. It is probably a local fluvial deposit, consisting of sand and gravel. It unconformably overlies the Broome Sandstone, and is of Tertiary age.

An arid climate and strong easterly winds resulted in deposition of aeolian seif dunes across at least the southern part of the area, probably starting in Late Tertiary times. A change to wetter climate in the Quaternary has modified these dunes, obliterating their morphology in many areas. The thick soil which mantles

most of the Peninsula probably also began to form at this time.

Coastal processes in the Quaternary have resulted in a strip of coastal sediments. These include intertidal and supratidal muds, beach ridges, beach sand, and aeolian sand dunes, all of which are forming at present. Platforms of limestone and lime-cemented sandstone, which probably originated as coastal sand dunes and bars which accumulated during a previous sea level stand of a similar level to that of today, are also present. Packer Island and Chile Head form the above-sea-level part of an arcuate line of these cemented sediments clearly visible on aerial photographs taken at low tide levels.

Recent alluvium is present in watercourses.

STRUCTURE

No faulting or folding has been observed in rock exposures in the Dampier Peninsula. However, it is probable that broad doming took place in the central part in the Tertiary (Gibson, in preparation b); this may have diverted the ancestral Fitzroy River from a previous possible course towards Roebuck Bay to its present outlet into King Sound (Brunnschweiler, 1957).

MINERAL RESOURCES

Petroleum

Major gas shows were encountered in Yulleroo No. 1; no other significant shows have been encountered by the other wells in the Peninsula (see Fig. 1 for locations). However, it is possible that buried Devonian reefs may be present in the Puratte No. 1—Moogana No. 1—Tappers Inlet No. 1 area; these reefs are prime targets for petroleum exploration, especially since the 1981 Blina oil discovery in a buried Devonian reef 110 km to the east of the Peninsula.

Water

Surface water is usually present only after heavy rains. Good quality groundwater from Quaternary sediments and the Broome Sandstone is tapped by station wells and bores in the area. The Wallal Sandstone, Alexander Formation, and Jarlemai Siltstone contain poor quality artesian water.

Heavy minerals

Heavy mineral concentrations occur in beach sands along the west coast, especially at Coulomb and James Price Points. However, only relatively small quantities occur, and the kinds of minerals present (mainly magnetite and magnetite-ilmenite compounds) are of negligible commercial interest.

Building Materials

Silicified Melligo Sandstone is quarried for building stone in areas south of the Fraser River. Laterite is used for road surfacing in many places in the Peninsula. Alluvial sand present in watercourses, especially in the Coulomb Point-Carnot Bay area, may be suitable for use in concrete and mortar.

GEOLOGICAL FEATURES OF RESERVES

Point Coulomb Nature Reserve

This is characterised by incised watercourses which have exposed the Broome Sandstone and laterite. Coastal sediments occupy a strip less than 1 km wide, and consist mainly of aeolian dunes. Heavy mineral sands are present at Coulomb Point.

The common incised watercourses are an unusual feature, with respect to the remainder of the Peninsula; they probably result from the relatively steep topographic gradient in the area, which may have been caused by Tertiary doming (see Structure).

Proposed Reserve near Packer Island

At Cape Borda, the Broome Sandstone (mainly very fine sandstone and mudstone at this locality) is unconformably overlain by the Borda Sandstone. An area of coastal dunes up to about 3 km wide and 31 m high borders the coastline between Cape Borda and Packer Island. Packer Island is composed of cemented calcareous coastal deposits.

Proposed Reserve near Cape Leveque

Minor outcrops of Broome Sandstone occur along the coast; these are best developed at Cape Leveque.

Proposed Reserve between Cygnet Bay and Cunningham Point

This area is characterised by good exposures of hard, silicified, Melligo Sandstone along the coast. Topography inland is relatively rugged, with outcrops of resistant Melligo Sandstone.

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PART III

FLORA

by K. F. Kenneally¹

INTRODUCTION

The Dampier Peninsula occupies the north-west part of Beard's (1979, 1980) Dampier Botanical District within the Northern Botanical Province. It lacks, except for a few species, the higher rainfall elements characteristic of the more northerly Fitzgerald and Gardner Botanical Districts.

The Peninsula is a very gently undulating, monotonous and featureless sandplain dominated by eucalypt woodland and *Acacia* shrubland (pindan). The lack of habitat diversity exhibited for most of the Peninsula is not true of coastal and near coastal situations. Here, such diverse habitats as mangroves, samphire flats, grasslands, coastal dunes, freshwater swamps, monsoon forest, *Melaleuca* thickets, creekside vegetation, outcrops of limestone and sandstone can be encountered (see McKenzie and Kenneally—this publication).

Eucalypt (savanna) woodlands, characterised by deciduous elements are much more representative of the wetter northern tip of the Peninsula. The drier south is dominated by *Acacia* shrubland formation commonly called *pindan* (Beard 1967). Some species more common to the arid Eremaean Botanical Province are also recorded from the southern part of the Peninsula.

Monsoon (rain) forests (vine thickets) described for the north Kimberley by Miles and Burbidge (1975), Beard (1976), Kabay and Burbidge (1977) and Hnatiuk and Kenneally (1981) are confined to pockets of permanent soakage found on the landward side of coastal dunes. On the Dampier Peninsula monsoon forests are at the southern limit of their range in Western Australia and discontinuity and fragmentation are especially characteristic of the depauperate rainforest floristic element.

Seasonal freshwater swamps are present behind coastal dunes and claypans can be found scattered across the Peninsula. Both of these support a rich post-wet ephemeral flora.

HISTORICAL

The earliest significant botanical collections from the Dampier Peninsula are those made by the botanical collector Allan Cunningham in February 1822. Cunningham, who accompanied P. P. King on hydrographic surveys of the north-west coast, collected in the vicinity of Cygnet and Goodenough Bays. During this visit several collections were made which included type material of *Crotalaria cunninghamii* R.Br., *Grewia breviflora* Benth., *Hybanthus aurantiacus* (F. Muell. ex Benth.) F. Muell., *Solanum cunninghamii* Benth., *Terminalia petiolaris* A. Cunn. ex Benth. and *Velleia panduriformis* A. Cunn. ex Benth.

Between the years 1889 and 1891 J. W. O. Tepper made an extensive collection of plants in the vicinity of Roebuck Bay (Broome). These specimens were sent to Ferdinand von Mueller and a list of 143 plant species published (Tepper 1893). This list included descriptions of the new species *Polygala tepperi* F. Muell. Further species, *Didymotheca tepperi* F. Muell. ex H. Walter and *Portulaca dubia* F. Muell. ex Poelln., were subsequently described from Tepper's collection.

THE FLORA AND ITS BIOGEOGRAPHIC AFFINITIES

Little information is available about the non-vascular flora. No bryophyte collections were made. The fungi listed are predominantly wood-rotting species. Further collecting during the wet would add to this list. The lichens were identified by Nathan Sammy who commented that most species have tropical affinities. The majority of species were collected from bark of trees occurring in the closed-forest (vine-thickets) behind the dunes. At least two species *Dirinaria picta* and *Pyrenula nitida* are new records for the State. *Ramalina ecklonii* appeared restricted to the branches of the near-shore mangrove *Ceriops tagal*. The outcrops of sandstone sampled at Dampier Hill supported only a few lichens.

The list of flowering plants collected from the Dampier Peninsula shows the flora to be predominantly composed of an Australasian floristic element. It also includes a number of species whose affinities lie with the Gondwanan flora. These species are usually restricted to the patches of closed coastal monsoon forest (vine thicket) or may form interspersions amongst the Australasian floristic element.

1. Australasian Element

Genera which characterise the Australasian element are widespread on the Peninsula. Here, the xeromorphic *Eucalyptus* and phyllodinous *Acacia* species form the greater part of the arborescent growth with other woody species such as *Grevillea*, *Hakea* and *Persoonia* being common.

Although only 11 species of *Acacia* have been recorded from the Dampier Peninsula, it is the most dominant genus in terms of distribution and abundance.

A comparison with other Kimberley areas surveyed (Table 1) shows the Peninsula has relatively fewer *Acacia* species which probably reflect the lack of habitat diversity in the area.

The Peninsula lies within the South Kimberley *Acacia* Area as defined by Hnatiuk *et al.* (in press). This Area occurs in part within Beard's Dampier Botanical District and its *Acacia* flora is described in Maslin and Hnatiuk (in press).

¹Western Australian Herbarium, George Street, South Perth 6151.

TABLE 1
NUMBER OF SPECIES OF ACACIA RECORDED
FROM
KIMBERLEY AREAS SURVEYED

Prince Regent River Nature Reserve (George & Kenneally 1975).....	21
Drysdale River National Park (George & Kenneally 1977).....	26
Mitchell River Region (Hnatiuk & Kenneally 1981).....	18
Edgar Ranges (Kenneally 1981).....	23
Dampier Peninsula.....	11

The *Acacia* flora of the Peninsula is dominated by species from the closely related sections Juliflorae (*A. eriopoda*, *A. holosericea*, *A. pellita*, *A. stigmatophylla* and *A. tumida*) and Plurinerves (*Acacia monticola* and *A. platycarpa*). The section Phyllodineae is represented by only three species (*Acacia ampliceps*, *A. bivenosa* and *A. victoriae*). The first two species are common in coastal and near coastal areas of the Peninsula whereas the latter species is restricted to lateritised creek beds in the S.E. corner of the Peninsula.

In areas south of Beagle Bay the pindan vegetation is dominated by *Acacia tumida*, *A. holosericea* and *A. eriopoda*. These species normally form a mosaic but in places they form monospecific stands. *Acacia tumida* is extremely variable with a number of different growth forms known. Although normally of arborescent habit, prostrate forms occur in some coastal situations. Based on gross morphological evidence there is a suspected hybrid with *Acacia eriopoda* (BRM 4926).

North of Beagle Bay there is an abrupt change in the *Acacia* flora with *A. eriopoda* being almost absent and *A. holosericea* reduced in frequency. This northern area is dominated by eucalypt woodlands with the dominant understorey wattle being *Acacia tumida*. *Acacia hippuroides* (section *Lycopodiifoliae*) is scattered but may form locally dense stands under *Eucalyptus miniata*.

The *Acacia* flora comprises a mixture of wide-ranging tropical, sub-tropical and arid-zone species, many of which extend into the Northern Territory and Queensland. There are no known endemics. Species such as *A. holosericea*, *A. platycarpa* and *A. tumida* occur in all three regions while others, such as *A. eriopoda*, *A. monticola*, and *A. victoriae*, do not extend into the northern tropical areas but predominate in the subtropical and arid regions. *Acacia pellita* is a tropical species at the southern limit of its range (Maslin and Pedley 1982).

It is puzzling that wide ranging subtropical/arid zone species such as *Acacia coriacea*, *A. drepanocarpa*, *A. stipuligera* and *A. translucens* are not represented on the Peninsula. These species are very common in areas south of Broome in habitats similar to those found on the Peninsula (Kenneally 1981).

Of the 12 species of *Eucalyptus* recorded for the Peninsula three are considered undescribed. The majority of species are widespread in the arid and subtropical regions of Australia with only *E. jensenii*, *E. miniata* and *E. tectifera* regarded as tropical species at the southern limit of their range (Chippendale and Wolf 1981).

Species more typical of the arid Eremaean Botanical Province include *Codonocarpus cotinifolius* and *Didymothea tepperi*.

2. Gondwanan Element:

The Gondwanan element is best represented in the depauperate pockets of monsoon (rain) forest (vine thickets) restricted to areas of permanent soakage found in the lee of coastal dunes. Here one finds species such as *Pandanus spiralis*, *Melaleuca cajuputi* and *M. leucadendra* (Myrtaceae) overlapping with rainforest elements such as *Terminalia petiolaris* (Combretaceae), *Cassine melanocarpa* (Celastraceae), *Celtis philippinensis* (Ulmaceae), *Diospyros ferrea* var. *humilis*, *D. montana* (Ebenaceae), *Ficus virens* (Moraceae), *Mimusops elengi* and *Pouteria sericea* (Sapotaceae). Understorey and/or peripheral species include *Dodonaea platyptera* (Sapindaceae), *Exocarpus latifolius* and *Santalum lanceolatum* (Santalaceae).

3. Interspersed Flora

Certain elements of the Gondwanan flora can be found interspersed amongst the more sclerophyllous arid Australian element. These species form a scattered understorey in the grassy eucalypt woodlands at the north end of the Peninsula and in the *Acacia* pindan in the south. In the former case the floristic elements are often deciduous and characterise the tropical mixed deciduous woodland (Webb & Tracey 1981). Typical examples of interspersions include *Wrightia saligna* (Apocynaceae), *Adansonia gregorii* (Bombacaceae), *Canarium australianum* (Burseraceae), *Cochlospermum fraseri* (Cochlospermaceae), *Terminalia canescens*, *T. cunninghamii*, *T. ferdinandiana*, *T. petiolaris* (Combretaceae), *Gyrocarpus americanus* (Gyrocarpaceae), *Planchonia careya* (Lecythidaceae), *Lysiphyllum cunninghamii* (Leguminosae), *Owenia reticulata* (Meliaceae), *Ventilago viminalis* (Rhamnaceae), *Pavetta granitica* (Rubiaceae) and *Atalaya hemiglauca* (Sapindaceae). Additionally a few taxa (e.g. *Pouteria sericea* and *Celtis philippinensis*) are common to both well developed rainforests and genuinely sclerophyllous vegetation types. Species such as *Gyrocarpus americanus*, *Lysiphyllum cunninghamii*, *Planchonia careya*, *Terminalia canescens*, *T. cunninghamii*, *T. ferdinandiana* and *Ventilago viminalis* are never strictly rainforest elements but are widespread species in the pindan where they appear to be adapted to withstand the arid conditions and repeated burning. The boab *Adansonia gregorii* is not common in the red pindan sand of the Peninsula and is more frequent on the Fitzroy Plains to the south east.

NOTES ON THE COLLECTION

The following list contains all the species so far identified. It totals 311 species, in which there are 1 alga, 11 fungi, 15 lichens, 1 fern and 283 flowering plants (62 monocots, 221 dicots). The monocots belong to 41 genera in 10 families, and the dicots to 147 genera in 65 families.

In terms of species numbers the Poaceae are the largest family recorded on the Peninsula, closely followed by the Myrtaceae. The Papilionoideae and Cyperaceae are next with lesser numbers again of Mimosoideae, Euphorbiaceae, Malvaceae and Amaranthaceae. Table 2 lists the species in the larger families.

TABLE 2

NUMBER OF SPECIES IN THE LARGER FAMILIES
COLLECTED DURING THE DAMPIER
PENINSULA SURVEY

Poaceae.....	33
Myrtaceae.....	22 (<i>Eucalyptus</i> 12)
Papilionoideae.....	19
Cyperaceae.....	15
Mimosoideae.....	11 (<i>Acacia</i> 11)
Euphorbiaceae.....	10
Malvaceae.....	9
Amaranthaceae.....	8

ARRANGEMENT OF THE LIST OF
SPECIES

The groups are arranged alphabetically within families (or subfamilies) which are themselves alphabetical in each section. Introduced plants are indicated by an asterisk (*). Species are followed by a collector's number for easy reference. BRM refers to B. R. Maslin of the Western Australian Herbarium who made specialist collections of *Acacia* and other legumes from the Peninsula in 1981. Where additional collections are cited the collector and the date of collection are given. All specimens cited are housed in the Western Australian Herbarium (PERTH).

LIST OF PLANT SPECIES

CHLOROPHYTA

Algae

CHARACEAE

Nitella penicillata A.Br.

Submerged aquatic, plants dioecious, dactyls with mucronate tip. Common in freshwater swamps.

EUMYCOPHYTA (Fungi and Lichens)

Fungi

ASCOMYCETES

GANODERMATACEAE

Ganoderma lucidum (Fr.) Karsten

Young and stipitate fungus attached to bark of root of living *Acacia*.

HYMENOMYCETES

AURICULARIACEAE

Auricularia mesenterica Fr.

Growing on bark of dead *Melaleuca*.

HYMENOCHAETACEAE

Phellinus gilvus (Schw.) Pat.

Fungus growing on stand of living *Rhizophora stylosa* which is submerged at high tide.

Phellinus setulosus (Lloyd) Imazeki

Common on *Melaleuca* sp. beside and in swamp.

Phellinus sp. KFK 6000

Growing on *Melaleuca* sp.

POLYPORACEAE

Phaeotrametes decipiens (Berk.) Lloyd KFK *s.n.*

Polyporus arcularius (Batsch) Fr.

Growing on rotting wood of both *Melaleuca* and *Tristania* following fire.

Trametes muelleri Berk.

Fungus growing on rotting wood.

STEREACEAE

Stereum sp. KFK 6193

Fungus growing on rotting wood of *Ficus virens*; spores purple.

TRICHOLOMATACEAE

Flammulina velutipes (Fr.) Sing.

Growing in sand behind dunes; area recently burnt.

GASTEROMYCETES

SCLERODERMATACEAE

Pisolithus tinctorius (Mich. ex Pers.) Coker & Couch
Puffball; in sand beside creek.

Lichens

ACAROSPORACEAE

Acarospora schleicheri (Ach.) Mass

Common on sandstone, Dampier Hill.

LECIDEACEAE

Catillaria sp. KFK 7649

On bark of *Lysiphyllum cunninghamii*.

PERTUSARIACEAE

Pertusaria sp. KFK 7628

On bark of *Diospyros ferrea* var. *humilis*.

PHYSICACEAE

Buellia sp. KFK 7675

Common on sandstone, Dampier Hill.

Dirinaria applanata (Fee) Awas.

On bark of *Ventilago viminea*.

Dirinaria confluens (Fr.) Awas. KFK 7628

On bark of *Diospyros ferrea* var. *humilis*.

Dirinaria picta (Sw.) Clem & Shear

On bark of *Diospyros ferrea* var. *humilis*.

Pyxine cocoes (Sw.) Nyl.

On bark of *Lysiphyllum cunninghamii*, *Diospyros ferrea* var. *humilis* and *Ventilago viminea*.

PLEOSPORACEAE

Arthopyrenia aff. *fallax* (Nyl.) Arn. KFK 7628

On bark of *Diospyros ferrea* var. *humilis*.

PYRENULACEAE

Porina sp. KFK 7630, 7638

On bark of *Celtis philippinensis* and *Ficus virens* var. *dasycarpa*.

Pyrenula nitida (Weig.) Ach.

Red pigmented lichen on bark of *Pouteria sericea*.

Pyrenula sp. KFK 6001/B

On bark of *Pouteria sericea*.

TELOSCHISTACEAE

Caloplaca fulgens Koerb.

Common on sandstone, Dampier Hill.

TRYPETHELIACEAE

Trypethelium sp. KFK 6001/A

On bark of *Pouteria sericea*.

USNEACEAE

Ramalina ecklonii (Spreng.) Mey et Flot.

On *Ceriops tagal* at landward edge of mangal.

PTERIDOPHYTA

Ferns and Fern Allies

GLEICHENIACEAE

Platyzoma microphyllum R.Br. KFK 6020

Caespitose fern. Growing in sand near freshwater creek.

SPERMATOPHYTA
ANGIOSPERMAE
MONOCOTYLEDONS

AMARYLLIDACEAE

Crinum sp. KFK 6002

Bulbous herb; strap leaves. In sand adjacent to wet boggy area.

COMMELINACEAE

Cartonema parviflorum Hassk. KFK 6152

Herb, flowers yellow. In grassland.

Cyanotis axillaris D. Don KFK 6140

Herb, flowers purple. In damp grassland, common.

Murdannia graminea (R.Br.) Bruckn. KFK 5985, 6057

Erect/sprawling herb; flowers with inner tepals lilac outer tepals maroon, anthers 3 long and 3 short, filaments hairy. Growing by swamp and in sand beside creek.

CYPERACEAE

Cyperus bifax C. B. Clarke KFK 6017, 6106

Forms dense rhizomatous sedge; root has strong aromatic odour. Common in wet seepage area and beside *Tristania/Melaleuca* swamp.

Cyperus carinatus R.Br. KFK 5918, 5926, 6216

Caespitose sedge. Growing in closed grassland or wet river washed sand.

Cyperus conicus (R.Br.) Boeck.

Caespitose sedge. Growing in river washed sand.

Cyperus pulchellus R.Br. KFK 6068

Sedge; flowers white with green centre. Growing on edge of billabong.

Eleocharis geniculata (L.) Schultes KFK 5915

Caespitose sedge. Common in wet river washed sand.

Fimbristylis caespitosa R.Br. KFK 6118

Sedge. Growing on edge of swamp. Very common in sand.

Fimbristylis ferruginea Vahl. KFK 7640

Caespitose sedge forming dense swards in freshwater seepage area on coast at Cape Borda.

Fimbristylis littoralis Gaud. KFK 5903

Herb. Growing in wet river washed sand. Common.

Fimbristylis microcarya F. Muell. KFK 5908

Common in river washed sand.

Fimbristylis nuda Boeck. KFK 5906

Caespitose sedge. Common in river washed sand.

Fimbristylis rara R.Br. KFK 5928

Sedge. Growing in river washed sand.

Fimbristylis sericea R.Br. KFK 6004

Rhizomatous sedge; leaves glaucous. Creeping over leeward side of sand dune near mangroves.

Fimbristylis squarrosa F. Muell. KFK 5914

Caespitose sedge. Common in river washed sand.

Fimbristylis tetragona R.Br. KFK 6215

Herb. Growing in closed grassland in wet seepage area.

Rhynchospora sp. KFK 6217

Sedge. Growing in closed grassland.

FLAGELLARIACEAE

Flagellaria indica L.

Vigorous creeper. Flowers cream, fruits red. On sandstone at Karrakatta Bay.

LEMNACEAE

Lemna aequinoctialis Welwitsch. KFK 6100, 6858

Floating aquatic. On surface of *Tristania/Melaleuca* swamp. Very common.

LILIACEAE

Asparagus racemosus Willd. KFK 6077, 6179

Climbing shrub with spines. Scrambling on bushes near creek and behind coastal dunes.

Corynotheca aff. *micrantha* (Lindl.) Macbride KFK 6075

Tangled shrub. On sandplain beside creek.

ORCHIDACEAE

Cymbidium canaliculatum R.Br. KFK 6156

Epiphyte; in hollows of *Eucalyptus papuana*. Scattered throughout the Peninsula.

PANDANACEAE

Pandanus darwinensis St. John KFK 6093

Screw pine to 3 m; fruits large; leaves slightly glaucous. On edge of creek.

Pandanus spiralis R.Br. KFK 6841

Screw pine to 5 m; some plants with thin stems. Growing in Cape Leveque vine thicket.

Pandanus spiralis R.Br. var. *convexus* KFK 5920, 6092, 6232

Screw pine to 5 m; trunk smooth; cephalium with 16-24 phalanges; leaves with fine spines on margins. Growing in white sand at edge of beach.

Pandanus sp. KFK 6192

Thin stemmed screw pine to 7 m; no evidence of fruits. Occurring in patches within closed forest behind coastal dunes.

POACEAE

Aristida browniana Henrard KFK 5936

Erect grass in river washed sand near creek.

Aristida hygrometrica R.Br. KFK 6071

One of the most common grasses of wet areas of the Peninsula.

Cenchrus biflorus Roxb. KFK 5977

Common in patches in sand beside creek where it enters the ocean.

Chrysopogon pallidus (R.Br.) Trin. ex Steud. KFK 6035

Caespitose grass common in deep sand.

Cymbopogon ambiguus (Steud.) A. Camus KFK 5962, 5982, 6029, 6102

Caespitose grass, common in wet sand beside creek. At mouth of creek where it enters the ocean.

Cymbopogon procerus (R.Br.) Domin. KFK 7593, 7674

Caespitose grass. Common understory grass on edge of vine thicket behind coastal dunes; in sandstone crevices at Dampier Hill.

Dactyloctenium radulans (R.Br.) Beauv. KFK 5904

Caespitose grass, common in patches in river washed sand.

Digitaria bicornis (Lamarck) Roemer & Schultes KFK 5964, 6098

Caespitose grass in sand beside mouth of creek where it enters ocean; common grass surrounding swamp.

Digitaria ctenantha (F. Muell.) Hughes KFK 5944

Grass, common in sand beside creek.

Diplachne parviflora (R.Br.) Benth. KFK 6850

Caespitose grass. Growing in white sand near beach.

Echinochloa colona (L.) Link KFK 6079, 6105

Slightly ascending grass growing on mud surrounding billabong; caespitose grass common at edge of swamp.

Ectrosia danesii Domin KFK 5937

Erect caespitose grass; inflorescence tinged maroon. Common in river washed sand.

Ectrosia schultzii Benth. KFK 5941
Grass; stems, leaves and spikelets tinged maroon. Common in river washed sand and in alluvial soil under *Eucalyptus polycarpa*.

Enneapogon polyphyllus (Domin) N. T. Burbidge KFK 6030
Caespitose grass common in open patches.

Eragrostis speciosa (Roemer & Schultes) Steud. KFK 5934, 5951, 6023
Caespitose grass; inflorescence straw coloured. Common on damp flat and in sand beside mouth of creek where it enters the ocean.

Eriachne ciliata R.Br. KFK 5946
Grass, common in sand beside creek.

Eriachne glauca R.Br. var. *glauca* KFK 6218
Grass, forming closed grassland in wet seepage area.

Eriachne meliacea F. Muell. KFK 5942
Grass, common in sand beside creek.

Eriachne sulcata Hartley KFK 5963
Caespitose grass. Growing in sand at mouth of creek.

Heteropogon contortus (L.) Beauv. ex Roemer & Schultes KFK 6080
Caespitose grass. Growing on sandplain near creek.

Ischaemum sp. KFK 5919
Caespitose grass to 1.5 m; common in clumps in wet river washed sand.

Panicum cymbiforme Hughes KFK 5978
Caespitose grass growing amongst *Pandanus* at mouth of creek.

Panicum pauciflorum R.Br. KFK 5905, 5979
Erect grass common in river washed sand at mouth of creek.

Paspalidium rarum (R.Br.) Hughes KFK 5907
Sprawling grass, common in river washed sand.

Plectrachne bynoei C. E. Hubb. KFK 7655
Hummock grass. Common amongst sandstone outcrops, Deep Water Point.

Pseudoraphis spinescens (R.Br.) Vickery KFK 6078
Rhizomatous grass growing in and around shallow water of billabong.

Schizachyrium sp. KFK 5945
Grass, sterile, in sand beside creek.

Setaria surgens Stapf. KFK 5909, 5974
Common grass in river washed sand at mouth of creek.

Sorghum stipoideum (Ewart & J. White) C. A. Gardner & C. E. Hubbard KFK 5988
Caespitose grass to 2 m. Growing in patch near swamp.

Spinifex longifolius R.Br. KFK 5966
Male and female clumped grass common at mouth of creek.

Sporobolus virginicus (L.) Kunth KFK 5965
Salt water couch. Common on flats by creek amongst *Melaleuca* sp.

Thaumastochloa pubescens (Domin) C.E. Hubbard KFK 5969
Grass, very common in sand at mouth of creek.

Whiteochloa airoides (R.Br.) Lazar. KFK 6845
Caespitose grass. Growing on edge of mobile sand dune outside closed forest.

Xerochloa imberbis R.Br. KFK 6132
Caespitose grass on mud flat behind mangroves.

XYRIDACEAE
Xyris sp. KFK 5935, 5940
Caespitose herb; flowers yellow. Growing in river washed sand beside creek.

DICOTYLEDONS

ACANTHACEAE

Dicliptera glabra Decaisne KFK 5912
Sprawling herb; flowers pink. Growing in river washed sand.

Nelsonia campestris R.Br. KFK 6070
Prostrate herb. Growing in mud surrounding billabong.

AIZOACEAE

Sesuvium portulacastrum L. KFK 5930, 6138, 6244, 6868
Prostrate, creeping, fleshy herb, rooting from nodes; stems and leaves tinged red; flowers pink, seeds black. Growing on landward edge of broad tidal flat behind mangroves.

Trianthema pilosa F. Muell. KFK 5932, 6235
Prostrate herb, stems and leaves reddish; flowers pink. In orange sand, very common.

AMARANTHACEAE

Achyranthes aspera L. KFK 6047
Shrub to 50 cm, much branched. In sand outside *Melaleuca* thicket and in disturbed areas.

Alternanthera sp. KFK 6116, 6117
Herb, stems red; flowers white tinged red. In sand under *Melaleuca* behind coastal dunes.

Amaranthus sp. KFK 5980, 6101
Herb; flowers greenish. In sand beside creek.

Gomphrena sp. KFK 5933
Erect herb; flowers tinged maroon. Common in sand beside creek.

Hemichroa diandra R.Br. KFK 6135
Herb. On mud flat edge behind mangroves.

Ptilotus exaltatus Nees KFK 7673
Erect herb to 0.3 m; leaves dark green, fleshy; flowers pink. Common on sandstone plateau.

Ptilotus lanatus A.Cunn. ex Moq. var. *lanatus* KFK 5923, 6121, 6238
Erect herb; leaves fleshy, sometimes tinged red; perianth white tinged red. In sand behind coastal dunes.

Ptilotus polystachyus (Gaud.) F. Muell. KFK 7601
Sub-shrub to 0.4 m. In red pindan soil.

APIACEAE

Trachymene glaucifolia (F. Muell.) Benth. KFK 7625, 7657
Erect sub-shrub to 1 m; stems and leaves glaucous green; flowers yellow; fruits green. In red pindan soil.

APOCYNACEAE

Gymnanthera nitida R.Br. KFK 6014, 6103
Climber; fruits green turning brown; flowers white (? night flowering). Growing on *Tristania*.

Wrightia saligna (R.Br.) Benth. KFK 6130
Shrub to 2.5 m; bark fissured; leaves linear. Growing on plain.

ASCLEPIADACEAE

Marsdenia cinerascens R.Br. KFK 6034, 6048, 7648
Creper; twining in *Melaleuca* sp. behind dunes south of Packer Island.

Sarcostemma australe R.Br. KFK 7658
Leafless climber forming dense tangled mass over *Ficus platypoda*. Stems with milky latex. On sandstone outcrop, Deep Water Point.

- ASTERACEAE**
Blumea saxatilis Zoll. & Mor. KFK 5955
 Erect herb. Common in sand.
Pterocaulon glandulosum F. Muell. KFK 7669
 Shrub 0.4 m; flowers pink to red. In shallow soil over sandstone.
- AVICENNIACEAE**
Avicennia marina (Forsk.) Vierh. KFK 5996, 6114
 Mangrove to 5 m; bark smooth, grey/white, flaking in patches; leaves dark green on upper surface, light green below, flowers orange.
- BATIDACEAE**
Batis argillicola van Royen KFK 6865
 Much branched but dense shrub to 0.5 m; leaves fleshy, green; flowers white. Common on landward edge of mangal, with *Avicennia marina*.
- BIGNONIACEAE**
Dolichandrone heterophylla (R.Br.) F. Muell. KFK 6084
 Much branched shrub to 40 cm, flowers white. In pindan.
- BOMBACACEAE**
Adansonia gregorii F. Muell.
 Baobab or Bottle Tree. A large deciduous tree to 10 m with numerous spreading branches. Common only in the SE corner of the Peninsula.
Campostemon schultzei Mast. KFK 5992, 6165
 Mangrove to 15 m, bark smooth; stems greyish, lenticels prominent. On white sandy banks within mangal with *Avicennia* and *Ceriops*.
- BORAGINACEAE**
Heliotropium sp. A. KFK 6083, 6090, 6109
 Herb; flowers white. In sand beside camp.
Heliotropium sp. B. KFK 5983
 Erect herb; flowers blue. In sand.
Trichodesma zeylanicum (N. L. Burman) R.Br. KFK 6072
 Erect shrub; flowers blue. On sandplain next to creek.
- BURSERACEAE**
Canarium australianum F. Muell. KFK 5899, 5959, 6074
 Tree to 4 m; bark rough, silvery in appearance; flowers white. Growing in alluvial sand beside creeks and rivers.
- BYBLIDACEAE**
Byblis liniflora Salisb. KFK 6045, 6058
 Erect glandular herb; flowers lilac, edges of petals fimbriate. Common in damp yellow sand beside creek with *Drosera petiolaris* and on *Tristania* seepage area.
- CAESALPINIOIDEAE**
Caesalpinia globulorum Bakh. f. & van Royen KFK 6036, 6181
 Scrambling vine; pods spinescent. Common behind coastal dunes.
Cassia costata Bailey and White KFK 6120
 Shrub 1.5 m tall. Bark grey, smooth. Pinnules light green. Seeds black, shiny, persistent in legumes following dehiscence. Low lying area with *Melaleuca nervosa*.
Cassia mimosoides L. KFK 6149
 Erect herb. In closed grassland beside creek.
- Cassia occidentalis* L. KFK 6204
 Shrub to 1.5 m, with an acrid smell; flowers yellow. In disturbed sand at Thomas Well near Lombadina Mission.
Lysiphyllum cunninghamii (Benth.) De Wit KFK 6052
 Dense shrub or tree to 6 m, sterile. Common with *Acacia tumida* on sandy plain.
- CAPPARACEAE**
Capparis lasiantha R.Br. KFK 6104
 Climber. Growing from fork in *Tristania* using hooks to ascend. Common behind coastal dunes.
Cleome tetrandra Banks KFK 5998, 6150, 6234
 Small shrub; flowers yellow. In orange sand over travertine and in grassland. Common.
Cleome sp. KFK 6028
 Herb/small shrub to 0.75 m; flowers yellow. Common in sand.
- CARYOPHYLLACEAE**
Polycarpaea longiflora F. Muell. KFK 6094, 7626
 Herb; outer perianth segments white with maroon ridge. Growing in orange soil beside track and on sand dunes behind beach.
- CELASTRACEAE**
Cassine melanocarpa (F. Muell.) Kuntze KFK 6843
 Tree to 8 m, with well developed canopy. In patches of closed forest behind the dunes.
- CHENOPODIACEAE**
Halosarcia halocnemoides (Nees) P. G. Wilson ssp. *halocnemoides* KFK 6867
 Shrub to 40 cm, forming compact bushes. In red soil on landward edge of broad tidal flat extending behind mangroves.
Halosarcia halocnemoides (Nees) P. G. Wilson ssp. *tenuis* P. G. Wilson KFK 6136, 6245, 6247, 6866
 Shrub to 40 cm; articles either orange or red. On landward edge of broad tidal flat extending behind mangroves.
Halosarcia indica (Willd.) P. G. Wilson KFK 6137
 Shrublet. On mud flat edge behind mangroves.
Neobassia astrocarpa (F. Muell.) A. J. Scott KFK 6869
 Diffuse shrub; leaves pale green/grey. On landward edge of broad tidal mud flat behind mangroves. Associated with samphires and *Sesuvium portulacastrum*.
Suaeda arbusculoides L. S. Smith KFK 5995
 Clumped herb. On edge of mangal.
- COCHLOSPERMACEAE**
Cochlospermum fraseri Planch. KFK 7656
 Tall, slender, deciduous shrub to 5 m. Flowers yellow. Common on sandstone near Deep Water Point.
- COMBRETACEAE**
Lumnitzera racemosa Willd. KFK 6113, 6162
 Mangrove to 3 m; bark slightly fissured; flowers fleshy, petals white; fruit fleshy with thick style protruding. On edge of mangroves along high tide mark, and lining creeks.
Terminalia canescens (DC.) Radlk. KFK 7621
 Shrub to 2 m. In red pindan soil.
Terminalia cunninghamii C. A. Gardner KFK 6836
 Tree to 6m; bark brown and fissured.

Terminalia ferdinandiana Exell KFK 6054, 6206, 6847

Tree to 14 m; bark grey, flaky (small flakes) in April, orange and flaky in September; leaves glaucous, pale green and clustered at end of branches; fruits large, yellow/green, fleshy. With *Eucalyptus miniata* and *E. polycarpa*.

Terminalia petiolaris A. Cunn. ex Benth. KFK 6010, 6037

Tree to 10 m; bark fissured; fruits green turning maroon on falling. Common in closed forest behind coastal dunes.

CONVOLVULACEAE

Evolvulus alsinoides L. KFK 5927

Creeping prostrate plant; flowers light blue. Growing in river washed sand.

Ipomoea brasiliensis (L.) Sweet KFK 6155, 6229, 6241

Sprawling herb; flowers pink. Common in orange sand over travertine. Growing in beach sand at Pender Bay and Rumble Bay.

Ipomoea polymorpha Roemer & Schultes KFK 6145

Herb, decumbent, slightly ascending; flowers purple; stems reddish. Growing in grassland.

Jacquemontia paniculata (N.L. Burman) H. Hallier KFK 6182

Climber; flowers lilac. Common in patch of closed forest behind coastal dunes.

CUCURBITACEAE

Mukia maderaspatana (L.) M. Roemer

Creeper; flowers striped yellow/green becoming red at maturity. Growing in sand near mouth of creek.

DROSERACEAE

Drosera indica L. KFK 5931, 6141, 6143

Erect viscid/glandular herb; flowers pink-mauve, sometimes yellowish on outer petals. Growing in grassland and in wet river washed sand beside creek.

Drosera petiolaris R.Br. KFK 5896, 6022, 6142

Herb; leaves greyish; flowers white. In damp white sand beside fresh water creek and in grassland. Not common.

EBENACEAE

Diospyros ferrea (Willd.) Bakh. var. *humilis* (R.Br.) Bakh. KFK 6185, 6844

Tree to 12 m; bark black/brown and fissured; fruit dark green; flowers yellowish. Forming a grove in patch of closed forest and also behind coastal dunes.

Diospyros montana Roxb. KFK 8534

Shrub to 3 m, leaves glossy green above, dull green below. Fruits green becoming yellow then scarlet with age. In vine thicket at Karrakatta Bay. Also collected by W. V. Fitzgerald (Dec. 1906) at Swan Point.

EUPHORBIACEAE

Adriana tomentosa Gaud. KFK s.n.

Compact much branched shrub to 1 m. Growing in white coastal beach sand behind stable dunes.

Bridelia tomentosa Blume KFK 6025

Shrub to 2 m; flowers greenish. Common in sand.

Bridelia aff. *tomentosa* Blume KFK 6031

Shrub to 2 m; flowers green/white. Common in sand.

Croton aff. *tomentellus* F. Muell. KFK 7603

Dense shrub to 2 m. In sandy soil behind dunes.

Euphorbia sp. KFK 6018, 6239

Sprawling herb; fruits with warts. Common in orange sand and in sand behind coastal dunes.

Excoecaria agallocha L. KFK 5987, 5994

Mangrove to 3 m; bark smooth, brown, lenticels numerous, milky latex noticeable, leaves orbicular. Growing in creek with *Avicennia* and on very edge of mangal with *Aegialitis*.

* *Jatropha gossypifolia* L. KFK 6205

Viscid shrub to 4 m, large glandular hairs; young foliage plum red; corolla reddish. Common in grey sand around Lombadina Mission.

Mallotus nesophilus Muell. Arg. KFK 6012, 6834

Tree to 5 m; bark rough, fissured; female fruits yellowish, male flowers yellowish/cream. On leeward side of sand dunes.

Sebastiana chamaelea (L.) Muell. Arg. KFK 5922, 6119, 7635

Erect sub-shrub; flowers cream; fruits green. In red pindan soil.

Securinega melanthesoides (F. Muell.) Airy Shaw KFK 5960, 6039, 6189

Shrub to 2.5 m; fruits creamy white. In vine thicket behind coastal dunes and in sand beside creek.

GOODENIACEAE

Goodenia lamprosperma F. Muell. KFK 6222

Herb with fleshy leaves in rosette; flowers yellow. Growing in closed grassland with *Eriachne glauca* var. *glauca* in seepage area.

Goodenia scaevolina F. Muell. KFK 6073

Dense shrub to 70 cm; flowers blue. Common in sand beside creek under *Eucalyptus miniata*.

Goodenia sepalosa F. Muell. KFK 6069

Semi-prostrate herb with bright yellow flowers. Growing in sand near billabong and along creek.

Scaevola parvifolia F. Muell. ex Benth. KFK 6863

Much branched herb to 30 cm; flowers deep blue. In red soil with *Scaevola* sp. KFK 6864.

Scaevola sericea Vahl. KFK 6160

Compact shrub to 2 m; leaves bright green; flowers white. Growing in sand over travertine with *Pemphis acidula*.

Scaevola sp. KFK 6864

Much branched herb to 40 cm; flowers yellow. In red soil with *Scaevola parvifolia*

Velleia panduriformis A. Cunn. ex Benth. KFK 5958

Much branched glaucous sub-shrub. Growing in sand beside river.

GYROCARPACEAE

Gyrocarpus americanus Jacq. KFK 6152

Tree to 5 m; bark dark grey, flaking off in irregular blocks, yellowish white underneath; leaves deciduous. Common in pindan soil.

GYROSTEMONACEAE

Codonocarpus cotinifolius (Desf.) F. Muell. KFK 6252

Shrub to 3 m; foliage glaucous. In pindan soil.

Didymotheca tepperi F. Muell. ex H. Walter KFK 6091, 7592

Shrub to 1 m; regenerating on sandplain beside creek, and in red soil.

HALORAGACEAE

Gonocarpus leptothecus (F. Muell.) Orchard KFK 5916

Erect herb; flowers yellow/green. Common in river washed white sand.

LAURACEAE

- Cassytha filiformis* L. KFK 5972, 6187
Parasite on *Melaleuca* spp.; flowers white. Growing behind coastal dunes.

LECYTHIDACEAE

- Planchonia careya* (F. Muell.) R. Kunth KFK 5976
Small tree or shrub; bark rough, fissured; fruit green slightly fleshy inside. In pindan soil.

LEGUMINOSAE (see CAESALPINIOIDEAE, MIMOSOIDEAE & PAPILONIOIDEAE)

LENTIBULARIACEAE

- Utricularia kimberleyensis* C. A. Gardner KFK 6202
Herb; flowers lilac. Growing in closed grassland. Not common.

LOGANIACEAE

- Mitrasacme hispida* W. V. Fitzg. KFK 6059
Small herb; stems glandular; flowers white. Growing on wet edge of swamp beside creek.
Mitrasacme sp. A. KFK 6060, 6144, 6146, 6147
Herb; flowers white. Growing in grassland or in wet sand beside billabong.
Mitrasacme sp. B. KFK 6196, 6197
Depauperate herb; flowers white with orange striations on tube. Common in closed grassland.

LORANTHACEAE

- Amyema bifurcatum* (Benth.) Tieghem. KFK 7588
Hemi-parasite; buds rusty, tomentose; on *Eucalyptus* sp. In pindan area.
Amyema benthamii (Blakely) Danser KFK 6011
Hemi-parasite on *Mallotus nesophilus* and *Gardenia* sp.
Amyema sanguineum (F. Muell.) Danser KFK 7633
Hemi-parasite; flowers flesh red, perianth ribbed. Growing on *Eucalyptus papuana* and *E. terminalis* near Cape Leveque.
Amyema thalassium Barlow KFK 6164
Hemi-parasite of mangroves; leaves fleshy; perianth tube red, lobes green. Growing on *Avicennia marina*.
Lysiana spathulata (Blakely) Barlow KFK 5902, 5997, 6175
Hemi-parasite; leaves slightly yellowish; perianth tube red, lobes green. Very common on *Acacia eriopoda*, *A. holosericea*, *A. pellita*, *Persoonia falcata* and *Santalum lanceolatum*.

LYTHRACEAE

- Ammannia auriculata* Willd. KFK 6067
Herb. In damp mud on edge of billabong.
Lythrum arnhemica F. Muell. KFK 6201
Herb; flowers lilac, stem red at base. Growing in closed grassland.
Pemphis acidula J. R. and G. Forst. KFK 6163, 6242
Shrub to 1 m, much branched and sprawling; petals white, calyx maroon. Growing in orange sand and in sand behind mangroves.

MALVACEAE

- Abutilon* aff. *andrewsianum* W. V. Fitzg. KFK 7604
Sub-shrub to 0.5 m. Common in sandy soil behind dunes.

Abutilon indicum (L.) Sweet ssp. *albescens* (Miq.) Borss. var. *australiense* Hochr. KFK 7604

Sub-shrub to 0.5 m; flowers yellow. Common in sandy soil behind coastal sand dunes.

Gossypium australe F. Muell. KFK 6097, 6852

Much branched shrub to 2.5 m; flowers pink with purple centre. Growing in orange soil and common in patches regenerating after fire.

Gossypium populifolium (Benth.) F. Muell. ex Todaro KFK 6171, 6208

Creeping; flowers pink with deep maroon centre, calyx with punctate dots. Growing in *Eucalyptus* woodland.

Hibiscus leptocladus Benth. KFK 5913, 6096

Sprawling herb/shrub; flowers purple/blue with deep purplish centre. Growing in orange soil.

Hibiscus panduriformis N. L. Burman KFK 7641

Sub-shrub to 0.5 m; flowers yellow. On sand ridge on landward edge of tidal mud flat.

Sida acuta L. KFK 6154, 6248

Herb/shrub to 50 cm; flowers yellow. Very common under *Melaleuca* sp. in sandy soil.

Sida spinosa L. KFK 6061

Spreading herb; flowers orange. Growing in sand beside billabong.

Thespesia populneoides (Roxb.) Kostel KFK 6161

Tree/shrub to 5 m; flowers yellow with purple centre, turning pink as they age. A common strand species.

MELIACEAE

Owenia reticulata F. Muell. KFK 6219

Tree to 4 m; bark rough; leaves gathered at end. Growing in *Eucalyptus* woodland behind coastal dunes.

MENISPERMACEAE

Tinospora smilacina Benth. KFK 6190, 7670

Climber; stems brown with prominent lenticels. In closed forest behind coastal dunes, and on sandstone plateau.

MIMOSOIDEAE

Acacia ampliceps Maslin KFK 4907, 4937, 6019

Dense shrub to 2 m; flowers cream. In light brown sand behind coastal dunes in mixed scrub of *Melaleuca nervosa* and *Grevillea pyramidalis* and a ground cover of *Cymbopogon procerus*. In grey sandy loam along creek with dense stand of *Melaleuca acacioides*.

Acacia bivenosa DC. KFK 6835

Shrub to 2.5 m; leaves glaucous; flowers bright yellow. Common in calcareous sand near Willie Creek.

Acacia eriopoda Maiden et Blakely KFK 5968, 6250; BRM 4899, 4923

Tall shrub 5 m with straight, erect trunks. Phyllodes variable in width. Bark grey finely fissured at the base of the trunk. In red sand in tall, dense mixed scrub, *Acacia*, *Eucalyptus* and *Pouteria sericea*.

Acacia hippuroides Heward ex Benth. KFK 5957; BRM 4910, 4931

Low diffuse shrub 0.5 m tall, 1.3 m in diameter. Phyllodes patent, slightly curved upwards, light bright green, deciduous from lower branches (scars prominent); flowers golden yellow. In light brown sand with spinifex and *Acacia eriopoda*.

Acacia holosericea A. Cunn. ex G. Don KFK 5900; BRM 4898, 4933

Open shrub 3 m tall. Phyllodes silvery. Spikes not dense, light golden. Dehisced legumes often persistent in spherical clusters. In red sand in tall, dense mixed scrub, *Acacia*, *Eucalyptus* and *Pouteria sericea*. Bushy shrub ca. 2.5 m tall. Growing with *A. pellita* around the edge of a *Halosarcia*—mangrove tidal flat.

Acacia monticola J. M. Black BRM 4917, 4940

Tall shrubs 5-7 m in height. Mostly single-stemmed. Forming a dense monotypic stand, ca. 2 km wide. Area has not been burnt for a long period. In coastal situations may be a low, dense, domed, wind pruned shrub 1 m tall.

Acacia pellita O. Schwarz BRM 4901, 4932, 4935

Mature plant 4 m tall, with a neat, ascending habit; old legumes glabrescent, in spherical clusters; branchlet indumentum observable at x10 mag. Similar to *A. holosericea* (which also grows here) but differing in darker green, larger phyllodes and more angular branchlets. Favours shady position and seems restricted to creeks (seasonally wet) in light brown sand with *Melaleuca acacioides*.

Acacia platycarpa F. Muell. KFK 6203; BRM 4927, 4938

Small tree 5 m tall. Bark on main trunk maroon and flaking in an almost "Minni Ritchi" fashion. Extreme branchlets pruinose. Phyllodes subglaucous. In reddish brown soil in *Eucalyptus-Acacia tumida* woodland.

Acacia stigmatophylla A. Cunn. ex Benth. KFK 7666

Much branched shrub to 2.5 m, bark reddish, smooth. On sandstone scree.

Acacia tumida F. Muell. ex Benth. KFK 6236, 6851; BRM 4896, 4929

Open spreading shrub 3 m tall. Bark grey, smooth but rough at base of trunks. Branchlets yellow. Phyllodes light green. Forming dense thickets in red sand with spinifex, *A. holosericea* and *A. eriopoda*. Prostrate shrubs. Wind pruned following fire. On coastal red loam cliffs.

Acacia victoriae Benth. KFK 7665

Shrub to 3 m; leaves light green; flowers pale yellow. On lateritised areas along drainage lines.

Acacia (? *A. tumida* x *A. eriopoda*) BRM 4926

Young shrub 2.5 m tall. Phyllodes bright green, consistently uniformly narrow and slightly falcate. Only one plant seen growing with *A. eriopoda* (very common) and *A. tumida* (not common). 20 km S of Beagle Bay turnoff on Cape Leveque Rd.

Acacia (? *A. monticola* x *A. eriopoda*) BRM 4900, 4918, 4919

A ± infundibular shrub to 4 m tall. Bark grey sometimes exfoliating in a Minni Ritchi fashion. Branchlets reddish or yellow. Phyllodes dark green, ascending. Flower heads obloid, light golden-yellow. Often growing with *A. monticola* and *A. eriopoda*. Cable Beach, Broome and 46 km N of Broome on Cape Leveque Rd.

MORACEAE

Ficus opposita Miq. var. *indecora* (A. Cunn.) Corner KFK 6207

Shrub to 3 m; leaves rough, fruit green. Common around water wells.

Ficus opposita Miq. var. *micracantha* (Miq.) Corner KFK 5897, 6860

Tree to 3 m; bark and leaves rough; fruits green, axillary, hairy (finely tomentose). Growing in river washed sand.

Ficus virens Aiton var. *dasycarpa* Corner KFK 6173

Tree to 12 m; buttressed; aerial roots; bark grey; fruit yellow/green, pubescent. Growing in closed forest behind dunes.

Ficus virens Aiton var. *virens* KFK 6172

Tall tree to 15 m; buttressed with aerial roots; trunk grey; fruits cream/green, glabrous, sometimes tinged maroon. Common in closed forest using *Melaleuca* sp. as support.

MYOPORACEAE

Myoporum acuminatum R.Br. KFK 7602

Shrub to 3 m; bark slightly fissured; foliage clustered at ends of branchlets; flowers white with prominent glands on perianth tube and lobes, anthers mauve. In red soil.

MYRSINACEAE

Aegiceras corniculatum (L.) Blanco KFK 6167, 6223/B, 6231, 6838

Mangrove. Much branched dense shrub to 3 m; flowers in umbels; fruits maroon, curved, cylindrical. Growing on edge of mangal with *Ceriops*.

MYRTACEAE

Calytrix exstipulata DC. KFK 6076, 6153

Shrub to 2.5 m; flowers reddish. Growing on sandplain beside creek.

Eucalyptus camaldulensis Dehnh. KFK 6089

Tree to 15 m; bark white. Growing on creek bank with *Melaleuca* and *Pandanus*.

Eucalyptus confertiflora F. Muell. KFK s.n.

Tree to 4 m, bark rough at base, smooth and grey further up. On sandstone scree slopes of Dampier Hill.

Eucalyptus jensenii Maiden KFK 7614

Ironbark to 8 m; bark hard, blackish, rugged, deeply and coarsely furrowed; leaves glaucous. In deep red pindan soil.

Eucalyptus miniata A. Cunn. ex Schauer KFK 6088

Tree to 9 m; bark rough at base, white on branches. Growing with KFK 6086 and 6087.

Eucalyptus papuana F. Muell. KFK 5999, 6211

Tree to 11 m; bark roughish but smooth at base; most of trunk white in colour; buds powdery; flowers slightly cream in colour. Common in *Eucalyptus* woodland.

Eucalyptus polycarpa F. Muell. KFK 6008, 6086, 6212

Tree to 10 m; bark rough, grey; buds scabrous; flowers cream. Growing on sandplain with *E. miniata*.

Eucalyptus setosa Schauer KFK 7618

Tree to 5 m with spreading canopy and pendulous branches; young growth with bristle-like hairs; bark platy; adult leaves opposite and sessile. In red pindan soil.

Eucalyptus tectifera F. Muell. KFK 7599

Box to 5 m; bark shortly fibrous; leaves lanceolate, pendulous; flowers white. In red pindan soil.

Eucalyptus terminalis F. Muell. KFK 6842, 6848

Bloodwood to 10 m; bark variable, usually flaky, mottled orange and brown; fruits large, in terminal clusters. In red pindan soil.

- Eucalyptus zygophylla* Blakely KFK 7606
Tree to 6 m; bark rough and persistent; opposite, sessile leaves; fruits large and urceolate. In red pindan soil.
- Eucalyptus* sp. "bloodwood A." (undescribed) KFK 6007, 6087, 6210, 6213
Bloodwood, tree to 11 m; bark rough, orange and flaky; flowers cream on red. Growing in sand with *Acacia* spp.
- Eucalyptus* sp. "bloodwood B." (undescribed) KFK 6214
Tree to 10 m; bark rough.
- Eucalyptus* sp. "box" (undescribed) KFK 6231
Tree to 7 m; bark grey and roughish.
- Eugenia bleeseri* O. Schwarz
Recorded flowering at Cape Leveque in November 1970 by J. P. Whittaker s.n.
- Eugenia eucalyptoides* F. Muell. KFK 5925
Tree to 3 m; bark rough. Very common on river washed sand banks in creek.
- Lophostemon grandiflorus* (Benth.) Peter G. Wilson and J. T. Waterhouse ssp. *grandiflorus* KFK 6099
Tree to 5 m, bark rough with fissures. Common in ephemeral coastal swamps.
- Melaleuca acacioides* F. Muell. KFK 5967, 6128, 6246
Paperbark to 7 m, flowers white/cream. Common with *Tristania* along creeks and grows almost to beach front where tide comes in. May get freshwater seepage as *Pandanus* grows with it.
- Melaleuca cajuputi* Powell KFK 6183, 6849
Trees to 17 m; bark papery; usually much branched with dense canopy; flowers white. Growing on inner edge of mangal of clay/tidal flat on landward edge of *Ceriops* zone where it forms pure stands.
- Melaleuca dealbata* S.T. Blake KFK 6839
Tree to 15 m; bark papery, white; flowers creamish white. Trees heavily in flower during September. Growing on landward edge of claypan near Gnamagun Well.
- Melaleuca leucadendra* L. KFK 6016, 6839, 7595
Tree to 15 m, bark papery, white, flowers creamish white. On leeward side of dunes.
- Melaleuca nervosa* (Lindl.) Cheel KFK 6253
Small tree to 5 m; flowers scarlet. In red pindan soil.
- Melaleuca viridiflora* Solander ex Gaertn. KFK 5924, 6016, 6049
Paperbark to 15 m; flowers whitish. Very common on river washed sand banks and beside creeks.
- Myrtella* sp. KFK 7584, 7659
Much branched, open, wispy, sub-shrub to 1 m; young fruits green becoming deep burgundy as they ripen. In red pindan soil.
- Osbornia octodonta* F. Muell. KFK 6003, 6166, 6227
Mangrove tree/shrub to 9 m; stem smooth; bark fibrous at base. Common on landward edge of mangal with *Bruguiera*.
- Tristania grandiflora* (Benth.) Cheel (A synonym of *Lophostemon grandiflorus*).
- Verticordia verticillata* N. Byrnes KFK 7624
Erect shrub to 2 m. In red pindan soil on edge of claypan.

NYCTAGINACEAE

Boerhavia diffusa L. KFK 6237

Common herb; flowers pink. In sandy soil, Packer Island.

PAPILIONOIDEAE

Abrus precatorius L. KFK 6040, 6188; BRM 4909

Creeper. Pinnules subglaucous. Seeds red and black, persistent following dehiscence. In light brown sand behind coastal dunes in mixed scrub of *Melaleuca nervosa* and *Grevillea pyramidalis* and a ground cover of *Cymbopogon procerus*.

Atylosia sp. KFK 6041

Prostrate creeping plant with yellow flowers; pods mottled maroon on green. In sand behind coastal dunes.

Canavalia rosea (Swartz) DC. KFK 6042, 6233

Twining creeper on travertine with pink/purple flowers. Common behind dunes.

Crotalaria crispata F. Muell. ex Benth. KFK 6056; BRM 4906

Diffuse, straggly sub-shrub 0.3 m tall. Foliage concentrated towards ends of branchlets, pale green. Flowers deflexed prior to anthesis, yellow. In light brown sand behind coastal dunes in mixed scrub of *Melaleuca nervosa* and *Grevillea pyramidalis* and a ground cover of *Cymbopogon procerus*.

Crotalaria cunninghamii R.Br. KFK 6050; BRM 4903

Regrowth shrub 1.5 m tall, foliage grey. Flowers green, standard with brown stripes. Legumes pendulous. In light brown sand on creek bank. Common on coastal sand dunes.

Crotalaria trifoliatum Willd. KFK 6129; BRM 4908

Erect sub-shrub 0.3 m tall. Leaflets medium olive green. Flowers yellow. In light brown sand behind coastal dunes in mixed scrub of *Melaleuca nervosa* and *Grevillea pyramidalis* and a ground cover of *Cymbopogon procerus*.

Dicerma biarticulatum (L.) DC. BRM 4928

Shrub 2 m tall with numerous slender stems arising from ground level. Flowers pale purple, arranged in terminal racemes. Branchlets fragile, breaking easily. Leaflets complanate. In light brown sand.

Glycine clandestina Willd. BRM 4924

Prostrate with wiry, trailing branches. Leaves digitately trifoliate. Pinnules subglaucous, complanate. Growing on roadside in red-brown sand in mixed woodland.

Indigofera enneaphylla L. KFK 6024

Semi-prostrate shrub; flowers burgundy mauve on drying. In light brown sand.

Indigofera hirsuta L. KFK 6107, 6122

Erect herb; flowers orange/red. In sand behind coastal dunes and on edge of swamp.

Indigofera linifolia (L. f.) Retz. KFK 6038

Small shrub with reddish flowers. Growing in sand.

Psoralea martinii F. Muell. KFK 6846

Shrub to 1 m; flowers blue. Growing in red sand.

Rhynchosia rhomboidea F. Muell. ex Benth. KFK 6854; BRM 4912

Sprawling, prostrate creeper. Flowers yellow. In light brown sand with spinifex and *Acacia eriopoda*.

Sesbania cannabina (Retz.) Poir. KFK 6013, 6133

Shrub; flowers yellow. On sand flats and behind coastal dunes.

Sesbania formosa F. Muell.

Tree to 10 m, bark fissured, corky; leaves bright green, flowers cream. In wet black mud of swamp adjacent to bore.

Templetonia hookeri (F. Muell.) Benth. BRM 4941

Shrub ca. 1 m tall, with straight, ascending, light brown branches. Foliage soft, bright green; leaflets involute. Wing and standard yellow, keel greenish.

Reasonably common in sandstone with spinifex.

Tephrosia aff. *flammea* F. Muell. ex Benth. BRM 4915

Sprawling sub-shrub with branches ca. 0.5 m long. Raceme leaf opposed and to 0.30 cm long. Flowers sparse, apricot. Red sand in spinifex with *Acacia eriopoda* and scattered *Eucalyptus jensenii*, *Acacia holosericea* and *A. tumida*.

Tephrosia remotiflora F. Muell. ex Benth. BRM 4911

Sprawling sub-shrub. Pinnules subglaucous. Flowers pink. Light brown sand with spinifex and *Acacia eriopoda*.

Tephrosia ? *rosea* F. Muell. ex Benth. KFK 6032 BRM 4914

Erect rather open shrub 0.7 m tall. Foliage quite sparse and concentrated towards the ends of the branches. Racemes terminal. Flowers dark pink. Light brown sand on coastal dunes.

Zornia nervata Mohlenb. BRM 4930

Procumbent plant. Leaflets binate, ascending, subglaucous. Calyx foliaceous. Flowers yellow. Roadside in red loam; in grassland surrounding claypan.

PASSIFLORACEAE

Adenia heterophylla (Blume) Koord. KFK 6176

Broad leaved liane. Common climber in forest behind coastal dunes.

Passiflora foetida L. KFK 6213/A

Climber. Growing behind coastal dunes.

PLUMBAGINACEAE

Aegialitis annulata R.Br. KFK 5991, 6157, 6158

Mangrove/small shrub to 1 m; fruits cylindrical. Growing on edge of tidal creek.

Limonium salicorniaceum (F. Muell.) Kuntze KFK 6134

Herb growing on mud flat edge behind mangroves.

Plumbago zeylanica L. KFK 6174

Low, sparsely branched shrub; flowers white. Growing in forest behind coastal dunes.

PORTULACACEAE

Calandrinia quadrialvis F. Muell. KFK 5938, 6021, 6115, 6856

Succulent herb; flowers pink, outer petals yellow. Growing under *Melaleuca viridiflora* on edge of swamp with *Tristania grandiflora*.

Portulaca sp. KFK 5970

Succulent herb; flowers yellow. Growing in sand beside Deep River.

PROTEACEAE

Grevillea pyramidalis R.Br. KFK 7597

Small tree to 2.5 m, flowers white. Growing in understorey of *Acacia eriopoda* thicket in red pindan soil.

Grevillea refracta R.Br. KFK 6082, 6251

Shrub to 3 m, common along road. Growing on edge of creek.

Grevillea wickhamii Meisn. KFK 7654

Dense shrubs to 3 m, young leaves bronze in colour, mature leaves pale glaucous green; perianth red often becoming black toward the tips. In sandstone scree, Deepwater Point.

Hakea arborescens R.Br. KFK 6085

Shrub to 3 m; bark deeply fissured and corky. Growing beside creek.

Hakea macrocarpa A. Cunn. ex R.Br. KFK 7598

Gnarled tree to 3 m; perianth and style creamy white, disk deep crimson red. Common in pindan soil.

Persoonia falcata R.Br. KFK 5975

Tree to 3 m; flowers yellow. Common in sand beside creek.

RHAMNACEAE

Ventilago viminalis Hooker KFK 6862

Tree to 5 m, bark dark brown and fissured; flowers yellow/green. Common in red soil.

RHIZOPHORACEAE

Bruguiera exaristata Ding Hou KFK 5989, 6168

Mangrove to 7 m; bark grey/brown, smooth, with noticeable horizontal marks on stem. Growing in mangal with *Avicennia* and *Ceriops*.

Ceriops tagal (Perr.) C.B. Robinson KFK 5993, 6170, 6228, 6837

Mangrove to 7 m; basal part of stem buttressed; leaves yellow/green; bark smooth orange brown; flowers white. Growing on landward edge of mangal.

Rhizophora stylosa Griff. KFK 5917, 5990, 6043, 6169, 6220

Mangrove to 12 m; prop roots. Growing on edge of mangal forming a dense stand with scattered *Avicennia*.

RUBIACEAE

Borreria breviflora (F. Muell. ex Benth.) Specht KFK 5973, 7607

Sprawling herb; flowers lilac. Growing in sand beside Deep River.

Dentella misera Airy Shaw KFK 7596

Creeper, forming a prostrate mat. In white sand behind coastal dunes.

Gardenia sp. KFK 6209

Shrub to 3 m; bark smooth with orange tinge. Growing in understorey of *Eucalyptus* woodland behind coastal dunes.

Oldenlandia galioides (F. Muell.) F. Muell. KFK 6066

Diminutive herb; flowers white. Growing in grassland surrounding billabong.

Pavetta granitica (F. Muell.) Bremek. KFK 5961

Shrub to 3 m; fruits in clusters, green going black. Growing near mouth of Creek.

SANTALACEAE

Exocarpos latifolius R.Br. KFK 5901, 6033, 6191

Shrub to 3 m; fruit yellow/green; leaves glaucous; flowers yellow/cream, receptacle glaucous. Growing in thicket behind coastal dunes.

Santalum lanceolatum R.Br. KFK 6015, 6026, 6123
Shrub to 2 m; fruits green, reddish with age, endocarp of seed slightly pitted; leaves slightly glaucous; flowers greenish. Growing in sand on leeward side of dunes.

SAPINDACEAE

Atalaya hemiglauc (F. Muell.) F. Muell. ex Benth. KFK 7672

Shrub to 4 m; leaves dark green. Common on sandstone on scree slopes.

Distichostemon hispidulus (Endl.) Baill. KFK 5954

Much branched shrub to 0.75 m; styles red. Growing in sand near mouth of creek.

Dodonaea lanceolata F. Muell. var. *lanceolata* KFK 5952

Shrub to 1 m. Common in sand beside creek.

Dodonaea platyptera F. Muell. KFK 6180

Shrub to 4 m; bark grey/brown, herring bone pattern; fruits green turning straw coloured. Growing behind coastal dunes.

SAPOTACEAE

Mimusops elengi L. KFK 6184

Tree to 12 m; bark grey. Growing in closed forest vine thicket behind coastal dunes.

Pouteria sericea (Aiton) Baehni KFK 5956

Much branched shrub to 4 m, bark rough. Common shrub along creek bank, behind coastal dunes and in pindan.

SCROPHULARIACEAE

Buchnera linearis R.Br. KFK 7612

Herb to 0.3 m; flowers pink. In pindan that had been burnt.

Buchnera ramosissima R.Br. KFK 7619

Erect herb to 0.4 m; flowers white. In red pindan soil.

Buchnera urticifolia R.Br. KFK 7613

Herb to 0.4 m; flowers white tinged maroon. In red pindan soil.

Mimulus sp. KFK 6855

Straggling herb; flowers yellow. Growing in seasonally wet area under *Melaleuca leucadendra* at fringe of swamp.

Morgania floribunda Benth. KFK 6026/A

Much branched perennial sub-shrub to 0.75 m. Growing in damp depression under *Tristania grandiflora*.

SOLANACEAE

**Physalis minima* L. KFK. 6151

Sub-shrub growing in grassland.

Solanum cunninghamii Benth. KFK 5950, 6046, 6124

Much branched shrub to 50 cm; flowers purple/blue. Common in grader spoil near road and growing in sand at mouth of creek.

Solanum nigrum L. KFK 6095

Much branched shrub; flowers white, fruits turning purple. Growing adjacent to *Tristania/Melaleuca* swamp.

SONNERATIACEAE

Sonneratia alba Sm. KFK 6226, 6159

Mangrove to 8 m; bark scaly at base, smooth silvery on upper limbs; calyx green, maroon inside. Common on Packer Island and growing on sandstone ledge at One Arm Point.

STERCULIACEAE

Brachychiton diversifolius R.Br. KFK 6027

Tree to 4 m; leaves light green. In red pindan soil.

Melhania oblongifolia F. Muell. KFK 5986, 6055

Shrub to 50 cm; flowers yellow. Growing in sand of plain along creek.

Melochia corchorifolia L. KFK 6065

Erect herb; flowers pink. Growing along billabong.

Waltheria indica L. KFK 5911, 6243

Erect herb to 1.5 m; flowers yellow. Common on edge of *Eucalyptus* woodland in sandy soil; growing in river washed sand.

TILIACEAE

Corchorus acutangulus Lamarck KFK 5948

Herb; growing on damp flat.

Corchorus sidoides F. Muell. KFK 5981

Low shrub common in sand beside Deep River.

Corchorus sp. KFK 6108

Herb; flowers yellow. Growing in mud beside *Tristania/Melaleuca* swamp.

Grewia breviflora Benth. KFK 6053

Small tree to 9 m; fruits green becoming blue/black. Growing on plain. Eaten by Bowerbird. Not common.

Triumfetta aff. *denticulata* Benth. KFK 7671

Shrub to 0.4 m high. Common on sandstone plateau.

Triumfetta sp. KFK 5984, 6081

Sub-shrub to 50 cm; flowers yellow. Growing in sand. Shrub with bright orange flowers growing on plain beside creek.

ULMACEAE

Celtis philippinensis Blanco KFK 6178, 6186, 6230

Shrub/tree to 7 m; bark brown; fruit green turning scarlet. Growing behind coastal dunes.

VERBENACEAE

Clerodendrum floribundum R.Br. KFK 6249, 6861

Tree/shrub to 4 m; bark dark brown, fissured; fruits green or black. Growing in red soil.

VIOLACEAE

Hybanthus enneaspermus (L.) F. Muell. KFK 5939, 6148

Erect sub-shrub; fruits green; leaves slightly fleshy; flowers bluish. Growing in sand beside Deep River.

ZYGOPHYLLACEAE

Tribulus sp. KFK 6127

Prostrate herb; flowers yellow. Growing in sand near creek.

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PART IV

MAMMALS

by N. L. McKenzie¹

INTRODUCTION

This paper presents an inventory of the mammals of the Dampier Peninsula, the north-western part of the Phanerozoic South-west Kimberley.

The known mammal fauna of the Phanerozoic South-west Kimberley has been listed and discussed in previous papers in this series (McKenzie 1981; Youngson, Henry and McKenzie 1981) in the context of the district's location between the sub-humid Kimberley and the arid Great Sandy Desert. Youngson *et al.* (*ibid*) were concerned with the semi-arid southern margin of the Phanerozoic South-west Kimberley. This paper concerns collections made on the Dampier Peninsula (see Figure 1 in McKenzie and Kenneally, this publication), an area receiving a higher and more dependable rainfall (600-800 mm per annum); a climate much more comparable to the North Kimberley than to that of the Great Sandy Desert.

The mammals previously known to occur on the Dampier Peninsula are a reflection of this climatic character even though, as mentioned in McKenzie and Kenneally (this publication), geomorphologically the Dampier Peninsula is part of the Canning Basin as is the rest of the Phanerozoic South-west Kimberley and the entire Great Sandy Desert. Previous systematic collections made by Dahl (1897) and Butler (1971), and incidental records in the collection of the Western Australian Museum, indicate a fauna (Table 1) including a few medium-sized arid zone species but mainly consisting of species with either a Torresian (sub-humid Northern Australia, sometimes reaching the Pilbara) distribution or with a wider distribution (including arid, semi-arid, and/or other high rainfall regions). Unfortunately, as discussed by McKenzie and Kenneally (this publication), the activities of the pastoral industry during the last 90 years (since European settlement) have caused changes in the environment of the Dampier Peninsula which could well have resulted in important changes in its mammal fauna.

This paper is mainly based on data collected during three biological surveys of Crown land on the Dampier Peninsula. The first of these surveys was undertaken in April 1977, the second in September 1978 and the third in June 1981. An itinerary is presented in McKenzie and Kenneally (this publication).

During the 1977 survey, a 16-day venture, mammal collections were centred on two campsites. The first site (17°18'50"S, 122°10'10"E) was on the bank of a creek in the Coulomb Point Nature Reserve. The second campsite was at Martins Well (16°34'15"S, 122°50'50"E) in the vacant Crown land nearer the northern end of the Peninsula (see Figure 2 in McKenzie and Kenneally, this publication)—**henceforth called the Pender Area**. Mammals were collected by the same techniques as listed in Youngson *et al.* (1981); 2 926

trapnights, 25 hours of spotlighting, 46 hours of headtorching, and 11 nights of mistnetting with three nets being undertaken. Traplines were placed in each of the major habitat types recognised (Table 2), habitats being distinguished in terms of plant structural formation characteristics, floristics, soil type, geomorphological situation and proximity to water.

Laurel Keller of the Chicago Field Museum of Natural History has been kind enough to allow me access to data she collected near Lumad Well (16°55'S, 122°36'E), on the Dampier Peninsula, in August 1976. Her collecting techniques involved mistnetting and trapping; a total of 1 075 trapnights involving three different kinds of trap were undertaken. A trapline of 43 traps was set for five nights in each of the five major habitat types recognised in the vicinity (Table 3).

Following comparison between the species richness of the 1976-77 mammal collections and the richness of ground frequenting mammals previously recorded on the Dampier Peninsula (Table 1) and in the South-west Kimberley generally (McKenzie 1981), it was decided that further field work was necessary to:

TABLE 1

DISTRIBUTION OF NATIVE MAMMALS (USING MODERN TAXONOMIC NAMES) REPORTED FROM THE DAMPIER PENINSULA PRIOR TO 1975

TORRESIAN SPECIES

Macropus agilis^{2,5}
*Onychogalea unguifera*²
*Trichosurus arnhemensis*⁴
*Wyulda squamicaudata*¹
*Petaurus breviceps*⁴
*Mesembriomys macrurus*⁴
*Pseudomys delicatulus*³
*Nyctophilus arnhemensis*⁴
*Miniopterus schreibersii*³
*Chalinolobus nigrogriseus*⁴
*Pipistrellus tenuis*⁴
*Nycticeius greyi*⁴
*Chaerephon jobensis*²

ARID & SEMI-ARID ZONE SPECIES

*Bettongia lesueur*⁴
Macrotis lagotis^{2,3}

WIDELY DISTRIBUTED SPECIES

*Macropus robustus*²
*Isodon auratus*⁴
*Phascogale tapoatafa*⁴
*Hydromys chrysogaster*²
Taphozous flaviventris^{2,3}
*Chalinolobus gouldii*²

¹Ride (1970, p. 18); ²Butler (1971);

³Western Australian Museum Collection; ⁴Dahl (1897);

⁵Bannister (1969).

¹Western Australian Wildlife Research Centre, P.O. Box 51, Wanneroo 6065.

TABLE 2.
TRAPPING EFFORT ON DAMPIER PENINSULA
DURING 1977, 1978 and 1981

Habitat	Habitat Code (see McKenzie & Kenneally, this publication)	Number of Trap nights (C=Cage, E=Elliott, BB=Breakback, P=Pit, PF=Pit fence)									
		April 1977			September 1978				Sept. 1978 to Feb. 79	June 1981	
		C	E	BB	E	BB	C	P		P	PF
Coulomb Area											
<i>Acacia</i> pindan.....	2.11	10	60	55	420	168	70	320	436	24	-
<i>Tristania</i> pindan.....	2.12	-	-	-	-	-	-	126	654	-	-
Seasonal fresh-water swamp areas.....	2.31,2.32	15	150	150	168	70	28	84	-	-	-
Sub-coastal vine forests.....	1.4	5	50	50	-	-	-	-	-	4	60
Beach dunes.....	1.31	8	110	50	84	42	14	126	436	4	-
<i>Melaleuca</i> low forests.....	2.21	23	330	270	168	70	28	-	-	-	-
Borda and Cygnet Bay Areas											
<i>Eucalyptus</i> — <i>Melaleuca</i> woodlands.....	2.16	35	190	125	120	50	20	68	-	4	-
<i>Eucalyptus</i> woodlands.....	2.14,2.15	70	580	250	300	120	50	170	-	12	-
Sub-coastal vine thickets to forests.....	1.4	25	190	125	228	95	38	76	-	8	30
<i>Melaleuca</i> low forests.....	1.22	-	-	-	-	-	-	68	-	-	-
Mangroves.....	1.14	-	-	-	60	30	10	20	-	4	-
Coastal grassland.....	1.21	-	-	-	-	-	-	-	-	4	-
Sandstone screes.....	3.13	-	-	-	-	-	-	-	-	-	-
TOTALS		191	1 660	1 075	1 548	645	258	1 058	1 526	64	90

1. Increase the ground mammal collecting effort at the sites already visited, but at a different time of the year, to add credibility to (or contradict) the largely negative conclusion suggested by the data—a depauperate terrestrial mammal fauna.
2. Visit the sites at which early workers collected species not encountered during the 1976-77 work. For instance, Dahl (1897) collected a variety of such species (including *Bettongia lesueur* and *Phascogale tapoatafa*) on Hill Station, north of Broome. This station is now included in the Waterbank Pastoral Lease.
3. Meet with elders of the Bardi Aboriginal community at One Arm Point to draw on their knowledge of the mammals on the Dampier Peninsula, both today and previously.

The 1978 field trip was therefore arranged. Between 28 August and 22 September 1978, a further 3 509 trapnights (Table 2, including 1 058 pit-trapnights), 40 hours spotlighting, 23 hours of head torching and two nights of mistnetting with three nets were undertaken, mostly at the same sites worked during the 1977 survey. In addition, 14 pit traps were set on the Coulomb Point Nature Reserve (under the supervision of the regional Fisheries Officer, Mr J. Looby) from 22 September 1978 to 8 February 1979. Thus, an additional 1 526 trapnights were undertaken through the late dry season and the early wet season (Table 2). On 12 September 1978, W. K. Youngson and P. Crabb talked with the tribal elder and "old people" of the Bardi Aboriginal community about mammals on the Dampier Peninsula.

Further mammal survey work was undertaken in June 1981, using our recently developed pit-fence technique. Each pit-fence consists of a 50 metre wall of flywire approximately 300 mm high; six plastic pit traps (500 mm deep and 125 mm outside diameter) are sunk

into the ground at regular (10 metre) intervals along the fence. Between 16 and 25 June 1981, 64 pit-fence nights were effected (Table 2) as well as 20 hours of spotlighting and one night of mistnetting with six nets.

Data collected on the Peninsula are presented below as an annotated list. Relevant additional material from elsewhere in the South-west Kimberley, such as museum records and specimens collected during the course of this study from Cape Bossut and Point Torment, is included in the discussion. In the annotated list, data are presented in the following order:

1. Number of specimens or sightings, specimen field numbers (prefixed "FW", "DI" or "DL") or Western Australian Museum accession numbers (prefixed "M"), dates, locations (calculated on Series R 611 1:100 000 Topographic Survey maps).

TABLE 3.
TRAPPING EFFORT ON DAMPIER PENINSULA
DURING 1976

Habitat	Code of Equivalent Habitat in McKenzie and Kenneally (this publication).	No. of Trapnights (see Table 2).		
		E	BB	C
Beach dune community	1.31	100	100	15
<i>Melaleuca</i> low open-forests	2.21	100	100	15
Woodlands with <i>Acacia</i> shrubs	2.13	100	100	15
Pindan (<i>Acacia</i> spp.)	2.11	100	100	15
<i>Melaleuca</i> - <i>Pandanus</i> -sedge swamp	2.3	100	100	15

2. Habitats; gut content data (Megachiroptera only).
3. Breeding data (1977-1981 collections).
4. Taxonomic comments and tabulated measurements.

External measurements quoted include N (number of specimens measured), W (weight in g), H-V (head to vent length), T-V (tail tip to vent length), F/A (Radius length), E (ear tip to canal, stretched), Ti (Tibia length), Ti+P (Tibia plus pes, no claw), HF (hind foot, no claw). Only body weight is taken as a fresh measurement. Standard cranial measurements are quoted, mainly following Davis and Baker (1974). For rodents, the braincase depth measurement follows Handley (1959); for other species it is the distance between the ventral surface of the condyles and the point of the intersection of the Saggital and Lambdoid crests. *Planigale* measurements follow Archer (1976).

Specimens will all be lodged in the collection of the Western Australian Museum. The majority are already accessed. Specimens of *Mus musculus* listed are lodged at, but not accessed into, the W.A. Museum.

ANNOTATED SPECIES LIST

MACROPODIDAE

Megaleia rufa (Desmarest) **Red Kangaroo.**

Coulomb Reserve: 2 (1 seen; 18 April 1977; 17°17'20"S, 122°10'30"E. 1 seen; 31 August 1978; 17°17'00"S, 122°10'30"E.)

Seen crossing the track during the daytime and grazing at night (1940 hrs). Both were in regenerating pindan (*Acacia* spp., 4 m, 10%) over perennial grasses (0.5 m, 70%) with occasional *Eucalyptus* to 9 m.

Four were seen at night grazing on grass round the mill at Poinciana Well (17°48'50"S, 122°12'30"E) on Waterbank Station.

Macropus robustus Gould **Euro.**

The skull of an old animal was found in sandstone scree at Dampier Hill on 25 June 1981 (M22501; 17°28'S, 123°02'E). Butler (1971) reports seeing two near Carnot Peak (17°05'S, 122°22'E) an isolated sandstone outcrop 16 km north of the Coulomb Point Nature Reserve.

The species is known from similarly isolated mesas and breakaways throughout the Canning Basin.

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

Coulomb Area: 28 seen (1; 16 April 1977; 17°18'50"S, 122°10'20"E. 2; 21 April 1977; 17°17'00"S, 122°10'20"E. 1; 23 April 1977; 17°39'29"S, 122°12'40"E. 3; 1 Sept. 1978; 17°17'50"S, 122°10'30"E. 1; 2 Sept. 1978; 17°21'40"S, 122°09'30"E. 11; 13-20 Sept. 1978; 17°20'-17°30'S, 122°09'-122°10'E. 8; 19 June 1981; 17°30'-17°40'S, 122°09'-122°13'E.)

Pender Area: 2 seen (1; 29 April 1977; 16°34'00"S, 122°51'20"E. 1; 5 Sept. 1978; 16°35'40"S, 122°47'10"E.)

The Coulomb Area specimens were recorded throughout the terrestrial habitats of the Nature Reserve and the country to the south: on the edge of a creek in a fringing formation of *Eucalyptus papuana* and *Melaleuca viridiflora* surrounded by pindan country (1 seen); on the interface of semi-deciduous vine thicket and pindan country (4 seen); in pindan country (*Acacia* spp. tall open-shrubland to low

woodland, sometimes with *Tristania grandiflora*, *Eucalyptus* sp. or *Melaleuca viridiflora* to 7 m, over perennial grasses) (1m, 20-60%) (23 seen).

One of the two Pender Area sightings was in an open-forest of *Eucalyptus terminalis*, *E. miniata* and *E. polycarpa* (15m, 40%) over perennial grasses (0.5 m, 40%), the other was on samphire flats adjacent to a *Melaleuca acacioides* low forest fringing pindan woodland.

Butler (1971) described this as the common macropod of the area; he collected a skull (B1651) from sand hills at Cape Leveque. Dahl (1926) made a similar observation at Hill Station (now within Waterbank Station).

Onychogalea unguifera (Gould) **Northern Nail-tailed Wallaby.**

Coulomb Area: 5 (1 seen, with joey; 23 April 1977; 17°30'40"S, 122°08'50"E. 1 seen; 23 April 1977; 17°35'00"S, 122°10'30"E. 1 seen; 13 Sept. 1978; 17°34'50"S, 122°10'30"E. 1 seen; 19 June 1981; 17°25'10"S, 122°09'00"E.)

All were seen in dense pindan (3 to 4 m, 60%) over perennial grasses, with occasional patches of scattered *Eucalyptus papuana* to 10 m. All our records were south of the Coulomb Reserve. Butler (1971) stated: "Only in the pindan near the south-east corner" (of the reserve). "Seems to prefer grass country or open areas."

The "Type Specimen" of *O. unguifera* was collected in 1838 near Swan Point (16°21'S 123°02'E) on the northern tip of the Peninsula. It was shot by Surgeon Bynoe during the surveying voyage of the *Beagle* (Stokes 1846, p. 103).

Dahl collected four specimens near Roebuck Bay (1 to 20 Feb. 1896) where, according to Collett (1897), they were "common amongst the *Melaleuca* scrub on the edges of open plains".

Bettongia lesueur (Quoy and Gaimard) **Boodie.**

The only records of this species from the Dampier Peninsula were collections made by Knut Dahl in 1895 on the Hill Station, ca. 16 km north of Broome. According to Collett (1897), Dahl collected seven spirit specimens, three pouch young, one embryo (rat sized) and eight extra skulls from Roebuck Bay (=vicinity of Broome) in November-December 1895. Dahl (1926, p. 278) stated "... their runs ... were abundant almost everywhere in the vicinity of the station ... they proved to be quite the commonest marsupial in these parts".

Dahl (1926, pp. 279-280) described their habitat as "... all wooded regions, but especially the undulating sandhills, are inhabited by countless numbers."

During the 1978 surveys, sites on Waterbank Station (Hill Station) where Dahl collected *B. lesueur* were revisited. In contrast with Dahl's description of the coastal sand-hill scenery (p. 280), the dunes (with their thickets of *Acacia* spp. to 2 m over tussocks of *Spinifex longifolius* and occasional limestone outcrops that are reminiscent of habitats on Bernier, Dorre and Barrow Islands where *B. lesueur* is still plentiful) were severely trampled by cattle. The sandy surface was completely churned up; much of the *Acacia* and *Spinifex* was trampled. No burrows, scats or other evidence of *Bettongia* were seen on the sandhills or anywhere on the Peninsula.



Plate 1.—

Aerial view of a mangrove community east of Deep Water Point showing zoned patterning of species and the bare mudflats that are inundated during spring tides. The pale green seaward zone is *Avicennia marina* with a narrow outer fringe of *Sonneratia alba*. The central band, of taller dark-green trees, is *Rhizophora stylosa*. The mixed landward zone comprises *Avicennia marina*, *Bruguiera exaristata* and *Ceriops tagal*; the last two species having dark-green foliage.

Plate 2.—

Aerial view of a sheltered embayment in the proposed Cygnet Bay Nature Reserve; Deep Water Point is in the background. Note the mangroves, bare mud-flats, mixed samphire low shrubland and *Sporobolus* grassland on the supra-tidal flats, strand vegetations fringing the flats, and the abrupt transition to pindan woodlands and open-forests dominated by *Eucalyptus* spp.



Plate 3.—

A seaward fringe of *Sonneratia alba* on the southern side of Cygnet Bay ($16^{\circ}36'30''S$) at low tide. The *S. alba* is flowering. Stilt roots of *Rhizophora stylosa* are visible further into the mangrove stand.

Plate 4.—
Rhizophora stylosa as an open-forest in the mangroves fringing Rumble Bay in the proposed Cygnet Bay Nature Reserve.



Plate 5.—
Low shrubland of samphire fringing the coastal mudflats adjacent to Packer Island in the proposed Borda Nature Reserve. *Avicennia marina*, forming a landward zone of the mangrove community, is in the background.

Plate 6.—
Coastal sand dune vegetation at the mouth of a creek two kilometres north of Coulomb Point in the nature reserve. The foreground comprises *Crotalaria cunninghamii* shrubs and tussocks of the grass *Spinifex longifolius*.





Plate 7.—

Landward edge of coastal dunes four kilometres north of Cape Borda in the proposed Borda Nature Reserve. A strip of vine forest is visible in the background. Central strip comprises dunes stabilized by species such as *Acacia ampliceps*, *Spinifex longifolius*, *Crotalaria cunninghamii* and *Fimbristylis sericea*.



Plate 8.—

Interface between mangroves, beach sands, *Sporobolus* grassland and strand vegetation (including some semi-deciduous vine thicket species) seven kilometres south of Elephant Point in the proposed Cygnet Bay Nature Reserve. The landward zone of the mangals consists of *Ceriops tagal* with a few *Osbornia octodonta*.



Plate 9.—

Oblique aerial view westwards across the proposed Borda Nature Reserve at 16°39'S latitude. In the foreground are open-forests of *Eucalyptus-pindan* on the subdued topography that is typical of the Peninsula. Further away is a broad strip of vine forest and beyond that a band of vegetated sand dunes as illustrated in Colour Plate 7. A further strip of vine forest can be seen against the foot of the semi-mobile coastal dune that is in the background.

Plate 10.—

A canopy-height view across a vine forest of *Melaleuca cajuputi*. Vines in the foreground are *Passiflora foetida* and *Adenia heterophylla*. This photograph was taken from the rear edge of the coastal dune system illustrated in Colour Plate 9, at latitude 16°37'S.



Plate 11.—

Leaf litter and understorey density in the vine forest illustrated in Colour Plate 9. The stems of several vines can be seen extending into the *Terminalia petiolaris* canopy. The photograph was taken approximately 150 m east of the dune at latitude 16°17'S.

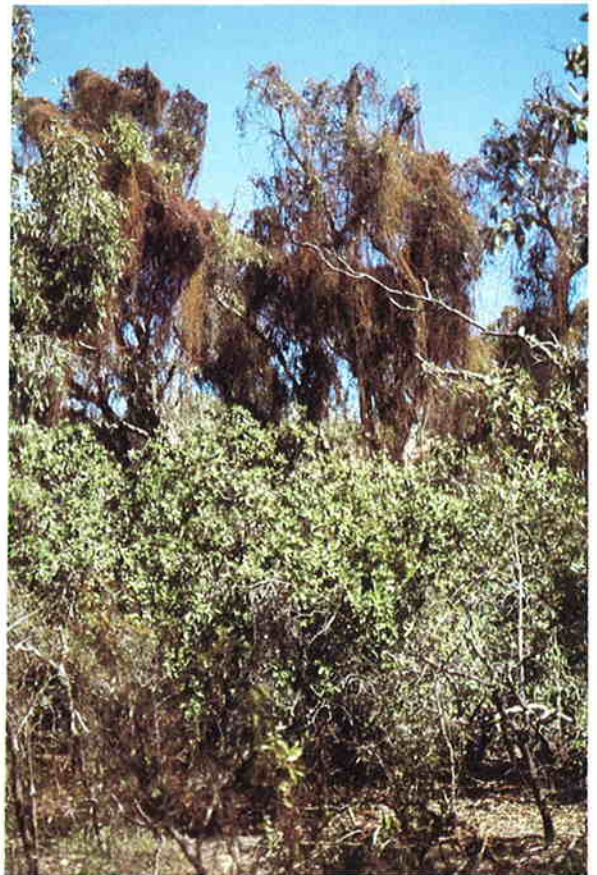


Plate 12.—

Vine forest canopy of *Melaleuca cajuputi* festooned with the parasite *Cassytha filiformis*. Understorey species visible include *Dodonaea platyptera* and *Exocarpos latifolius*. A site in the Coulomb Point Nature Reserve.



Plate 13.—

Limestone surface at Packer Island in the proposed Borda Nature Reserve showing a sink hole in the karst formation. The dense grass is *Spinifex longifolius*; the scrambler *Ipomoea brasiliensis* is common on the rocks.



Plate 14.—

Acacia-pindan: *Acacia tumida* thicket in the Coulomb Point Nature Reserve.



Plate 15.—

Acacia-pindan: emergent *Eucalyptus* spp. (including *E. papuana*) over shrubs, including *Acacia tumida* and *A. holosericea*, in the Coulomb Point Nature Reserve.

Plate 16.—

Eucalyptus-pindan: a woodland of *Eucalyptus terminalis* and *E. tectifica* on a more sandy 'Yeeda' surface in the proposed Borda Nature Reserve.



Plate 17.—

Eucalyptus-pindan: *E. miniata* open-forest with a flowering *Acacia tumida* visible in the sub-canopy. A typical 'Yeeda' Land System surface in the proposed Borda and Cygnet Bay Nature Reserves.



Plate 18.—

Eucalyptus-pindan: mixed *Melaleuca viridiflora* and *Eucalyptus polycarpa* woodland just east of Martins Well in the proposed Borda Nature Reserve. Scattered *Pandanus spiralis* are visible in the background. Vegetation is typical of a Wanganut Land System surface at the northern end of the Peninsula.



Plate 19.—
Watercourse, incising a sandplain surface that supports *Acacia-pindan*, in the Coulomb Point Nature Reserve.



Plate 20.—
Fresh-water swamp in the Coulomb Point Nature Reserve. The low trees at the water's edge are *Tristania grandiflora*; the sedge *Cyperus bifax* is in the foreground.



Plate 21.—
Fresh-water swamp three kilometres south of Coulomb Point. Dense *Lemna aequinoctialis* bloom is covering the surface of the water. Cattle tracks are visible along the water's edge. The fringing low woodland is *Melaleuca viridiflora*.

Plate 22.—

Semi-permanent fresh-water lake in the Coulomb Point Nature Reserve. *Acacia-pindan* with scattered emergent *Eucalyptus* covers the surrounding 'Yeeda' sandplain. The fringing woodland of *Melaleuca* spp. is visible around the swamp.



Plate 23.—

Broome Sandstone and mudstone exposed as low coastal cliffs at James Price Point. Decumbent *Acacia tumida* is visible in the foreground.

Plate 24.—

Melligo Sandstone scree at the south end of Deep Water Point in the proposed Cygnet Bay Nature Reserve. The shrub (to 2 m) is *Exocarpos latifolius* over the hummock grass *Triodia pungens*. *Sarcostemma australe* can be seen scrambling over the rocks.



PHALANGERIDAE

Wyulda squamicaudata Alexander **Scaly-tailed Possum.**

Ride (1970, p.18) included an account of one found at the lighthouse on Gantheaume Point (17°58'S, 122°11'E) near Broome, by Mr J. Tapper, and kept as a pet. No subsequent records are available from the Dampier Peninsula. Possibly an animal transported to Broome by man. Although records are few, available habitat descriptions are inconsistent with the country around Broome.

Trichosurus arnhemensis Collett **Northern Brush Possum.**

Dahl (1897 p. 205, see Collett 1897 p. 328) recorded *Trichosurus arnhemensis* from "...vicinity of Roebuck Bay... the species was occasionally met with...". Not recorded during the 1976-81 surveys although, according to the Bardi people, "Wallambra" still occurs in mangrove communities on the Peninsula. They have seen these animals at Catamaran Bay and One Arm Point, living in hollows, and believe that they eat the flowers of mangrove trees.

A specimen was collected on the Wharf at Broome in 1980 (M24570); another was captured in the garden of a house in Broome in 1982 (J. Looby, pers. comm.).

Measurements (mm) of relevant specimens (not necessarily adults) from the Western Australian Museum are presented below.

Museum Number	N	W	H-V	E	F/A	HF
M18067 male	1	—	280	116	67	100

Museum Number	M6708 male	M6165 female
C-M ⁴	39.2	35.2
Condylo-basal Length	—	78.2
C ¹ -C ¹	10.2	8.6
M ² -M ²	24.3	21.7
Auditory Bulla Length	17.1	14.8
Braincase Depth	22.5	20.3
Inter-orbital Breadth	9.9	10.6
Zygomatic Breadth	39.9	34.0

PETAURIDAE

Petaurus breviceps Waterhouse **Sugar Glider.**

First recorded by Dahl in 1895 (Dahl 1897, p. 206). He said they were "not common in the vicinity of Roebuck Bay". No other specimens are available from the Dampier Peninsula.

The Bardi people knew the animal as "Bollonga" and said these were quite common at Cygnet Bay; seen gliding from tree to tree on moonlit nights—presumably in the *Eucalyptus* woodland. P. De Long of Dampier Downs Station told me he once caught "some sort of Gliding Possum" by hand near Cygnet Bay (ca. 1970). Although several visits were made to Cygnet Bay during the 1977 and 1978 surveys, this species was not recorded.

THYLACOMYIDAE

Macrotis lagotis (Reid) **Dalgyte.**

Although not recorded in either the Coulomb Area or the Pender Area during the 1976-81 surveys, a road kill was found by J. Looby on the Great Northern Highway at the foot of the Peninsula on 27 Feb. 1978 (M18067 male; 17°40'30"S; 123°05'30"E). Another record indicating their continued presence further north on the Peninsula has been provided by Mrs Shepard of Mt Newman who showed the author a colour slide of a Dalgyte she found killed on the road "5 to 10 miles north of the Lombadina airstrip" in 1975.

Records are available from the Coulomb Area, the most recent specimen being fresh skeletal material collected by W. H. Butler at Coulomb Point in 1971 (M8476; June-July 1971; 17°22'S, 122°09'E). Other records from the Peninsula in the collection of the Western Australian Museum include: M5900 (1963, 17°22'05"S, 122°31'55"E), M6165 female (27 Dec. 1963; 17°50'S, 122°38'E), M6708 male (16 Mar. 1965; 17°57'S, 122°13'E).

PERAMELIDAE

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

Specimens of this species from the Peninsula were given to Dahl when he was on Hill Station in November-December 1895 (Dahl 1897). According to Collett (1897), Dahl's Roebuck Bay collection included three adult specimens, one mouse-sized young, seven embryos and one skeleton; these are housed at the Oslo Museum along with the rest of the collection (W.D.L. Ride, pers. comm.). The W.A. Museum holds a specimen collected at La Grange (90 km SW of Broome) in 1898 (M16078) by J. T. Tunney.

Butler reports seeing the species while spotlighting on the Coulomb Reserve in 1971 (Butler 1971). On the other hand, the Bardi elders could not remember seeing the species on the Peninsula.

No specimens were recorded during the 1976-81 work. In contrast to the observation in Dahl (1897, p. 210: "... it was very numerous in the coast country around Roebuck Bay...") the species has certainly declined in numbers and is now either very rare or extinct on the Peninsula.

DASYURIDAE

Phascogale tapoatafa Meyer **Tuan, Wambenger.**

Dahl (1897, p. 208) collected *Phascogale penicillata* (= *tapoatafa*) near Roebuck Bay on 3 February 1896. He commented "... this single specimen was the only one observed during five months' collecting in this locality..." There are no other records.

Planigale maculata (Gould) **Northern Planigale.**

Pender Area: 1 male (M22667; 23 June 1981; 122°49'45"E, 16°34'50"S).

From pit-fence in a woodland of *Eucalyptus tectifica*, *E. polycarpa* and *Acacia tumida* over the tall open grass *Cymbopogon ambiguus* and a low dense grass on a grey brown sandy plain.

Testes were scrotal and 8.5 mm long.

The Bardi people reported small Dasyurids as quite common on the Peninsula; they recognised the small dog-like teeth and had seen only thin-tailed animals. D. Higgins of Waterbank Station said he had caught one "years ago" but released it.

M22667 male: Basicranial Length 19.38, Zygomatic Width 11.38, Bulla Length 4.55, Skull Depth 4.86, Inter-orbital Width 4.46, Foramen Magnum Diameter 3.94, Dentary Length 15.70, C-M⁴ 7.62, M¹-M⁴ 4.51, H-V 69.1, T-V 57.6, Ear 12.75, Supertragus Length 3.72, Hindfoot Length (no claw) 11.54, Body Weight (g) 9.1.

MURIDAE

Hydromys chrysogaster Geoffroy **Water Rat.**

The Bardi people knew it from mangroves and reefs around the Peninsula and stated that it feeds on crabs. Not recorded during the 1976-81 surveys.

W. H. Butler (pers. comm.) reports seeing a specimen which had been taken from mangroves near Broome and held as a pet.

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

Dahl (1926, p. 281) reports killing the rodent *Conilurus boweri* "in the house" (presumably the Hill Station Homestead). Troughton (1965, p. 309) wrote: "According to Dahl, the species was rare in the vicinity of Broome, where they occasionally entered houses, and were known to natives as "Katkomba". No more recent records from the Peninsula are known.

Dahl's specimens comprised an adult female (collected on 8 December 1895) and two half grown young (collected 16 December 1895) and are listed as coming from Roebuck Bay (Collett 1897).

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

Coulomb Reserve: 1 (M22521; Nov. 1978; 17°20'10"S, 122°09'40"E).

Taken from a pit trap on the interface of a coastal dune and pindan. The dune supported *Spinifex longifolius* and *Crotalaria cunninghamii* (0.5-1 m, 10-20%); The pindan (*Acacia* spp.) is a woodland (4 m, 20%) with *Melaleuca* sp. thickets to 4 m.

The specimen was damaged, it could not be sexed.

Cranial measurements (mm) of the specimen, an adult, are presented below. The measurements of this and the specimens collected elsewhere in the Southwest Kimberley (Youngson *et al.* 1981) correspond to measures in Kitchener *et al.* (1981).

M22521: Molar Row 5.71, Condylal-basal Length 24.48, Post-palatal Length 8.68, M¹-M¹ 4.95, Auditory Bulla Length 5.09, Braincase Depth 8.05, Inter-orbital Breadth 3.51, Mastoid Breadth 12.04, Post-zygomatic Breadth 11.23.

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

Coulomb Area: In September 1978, 5 were collected at: 17°20'10"S, 122°09'40"E (M22502-3), 17°17'10"S, 122°10'40"E (M22504-5), 17°18'30"S, 122°10'00"E (M22506). In October and November 1978, 6 craniums were taken from pit traps at the first of the above sites (M22507-12), one from 17°20'20"S, 122°09'40"E (M22513) and one from 17°22'40"S, 122°10'30"E (M22514). In June 1981, 4 were collected in pit-fences at 17°18'50"S, 122°10'10"E (M22515-6), 17°18'10"S, 122°10'20"E (M22517), and at 17°20'20", 122°10'10"E (released).

Pender Areas: In September 1978, M22518 was captured at 16°33'50"S, 122°49'00"E. In June 1981, M22519 was captured at 16°38'20"S, 122°49'50"E and M22520 was captured at 16°38'50"S, 122°58'30"E; both were in pit fences.

Collected in all the major plant communities on the Peninsula except those on rocky outcrops and of vine thickets and mangroves.

- (i) M22502-3, M22507-12 were trapped on a coastal dune supporting low shrublands to grasslands of *Crotalaria cunninghamii* and *Spinifex longifolius* (0.5-1 m, 10-20%) with occasional stunted paperbarks (*Melaleuca* sp.). M22513 was trapped in a similar situation in dense *Crotalaria cunninghamii* (1.5 m, 60%).
- (ii) M22504-5 were trapped in a dry seasonal fresh-water swamp, supporting a woodland of *Tristania grandiflora* (5 m, 20%) over grasses (0.3 m, 60%), fringed with *Melaleuca acacioides* (10 m) in pindan country. M22514 was trapped in similar vegetation near a fresh water lake.
- (iii) M22506, M22515-7 and the released specimen were trapped in pindan typical of the southern parts of the Peninsula—*Acacia tumida*, *A. eriopoda*, *A. monticola*, *A. holosericea*, *Lysiphylum cunninghamii* and/or *Terminalia* sp. as low open-woodlands to low woodlands (to 6 m and 30 to 60%); often with scattered emergent *Eucalypts*, over bunch grasses (0.25-1 m, 20-50%) and leaf litter—on grey to red sandy soil plains.
- (iv) M22518-20 were trapped in pindan woodlands to open-forests comprising *Eucalyptus terminalis*, *E. miniata*, *E. papuana* and/or *E. polycarpa* (14 m, 40%) over scattered *Acacia tumida* shrubs to small trees and grassland (0.25-1 m, 30-50%) of such native bunch grasses as *Cymbopogon ambiguus* on grey-brown sandy soil plains. Such woodlands to open-forests form the dominant cover of the northern areas of the Peninsula.

Of the three adult females (M22504-6) collected 7-14 September 1978, only M22506 was pregnant; it had three foetuses (3 mm crown-rump) in its right side uterine horn but showed no mammae development. M22505 had two red spots, thought to be sites of recent implantation, on its right side uterine horn and one such spot on its left side horn; both uterine horns were faintly striated and its teats were all enlarged although no milk could be expressed. M22518 did not appear to be pregnant nor were its mammae or teats enlarged. Only one adult male (M22502) was collected in September 1978. It had scrotal testes 4.5 mm long.

Three adult females were collected in June 1981: M22519 had a foetus (4.8 mm crown-rump) in each uterine horn and enlarged teats; M22515 was post-partum with striated uterine horns (1.8 mm diam.), elongate teats and well developed mammae; M22516 had neither developed teats nor enlarged uteri (0.4 mm diam.). Neither of the two males from June 1981 had scrotal testes.

Measurements (mm) of adult individuals are presented below.

Sex	N	W	H-V	T-V	HF	E
F	2	6.9	53.60	64.76	15.8,16.1	12.0,14.0
M	1	8	61	69	16.1	—

Museum Number	M22502 male	M22506 female
Molar Row	3.47	3.64
Condylal-basal Length	19.00	18.17
Post-palatal Length	7.16	6.38

M ¹ -M ¹	4.67	4.60
Auditory Bulla Length	3.61	3.61
Braincase Depth	6.86	6.85
Inter-orbital Breadth	3.45	3.47

Rattus rattus Linnaeus **Black Rat.**

Pender Area: 2 males, 1 female (M22522-3; 28 April 1977; 16°36'30"S, 122°47'10"E. M22524; 12 Sept. 1978; 16°35'00"S, 122°47'10"E.)

April specimens were trapped in vine-forests (a closed-forest of *Melaleuca viridiflora*, *M. cajuputi*, *Terminalia petiolaris*, *Ficus virens*, *Pandanus spiralis* and *Celtis philippinensis*) fringing the landward side of coastal dunes south of Packer Island.

September specimen was trapped in the landward zone of mangal (*Ceriops tagal*), 70%, 2 m) adjacent to Packer Island.

One male was adult with scrotal testes 23 mm long; the other was sub-adult. The female was adult with all four teats elongated; its right side uterine horn showed signs of recent parturition (tape-like, striated walls, 5 mm wide).

The Western Australian Museum has one specimen (M12169) from Lombadina Mission (16°31'S, 123°53'E) collected by R. E. Johnstone in June 1974.

Measurements of adult specimens (mm) are presented below.

Museum No.	N	W	H-V	T-V	HF	F/A	E
M22522 male	1	100	160	210	33.9	27.4	22.3
M22524 female	1	103	—	196	32.5	28.5	24.9

M22522 male: Molar Row 6.78, Condyl-basal Length 38.95, Post-palatal Length 14.66, M¹-M¹ 7.07, Auditory Bulla Length 7.02, Braincase Depth 11.16, Inter-orbital Breadth 5.87.

Mus musculus Linnaeus **House Mouse.**

Coulomb Area: 3 males, 7 females; (DL2, DL3, DL10; 19-20 April 1977; 17°23'00"S, 122°09'20"E. DL20-22; 21 April 1977; 17°21'20"S, 122°09'10"E. FW688, FW713; 12 and 22 Sept. 1978 respectively; 17°17'10"S, 122°10'40"E. FW690, FW707; 6 Sept. 1978; 17°20'10"S, 122°09'50"E.)

Pender Area: On 22 June 1981 one was trapped at 16°41'20"S, 122°47'00"E (FW1730).

DL2, DL3 and DL10 were trapped in a woodland of *Melaleuca acacioides* (10 m, 20%) over sedges near a fresh-water swamp. FW688 and FW713 were trapped in a dry, seasonally fresh-water, swamp supporting a woodland of *Tristania grandiflora* (6 m, 20%) over grasses (0.3 m, 60%), fringed with *Melaleuca acacioides*. DL20, DL21 and DL22 were collected from under discarded corrugated iron on a beach dune supporting scattered *Spinifex longifolius* to 0.5 m.

FW690 and FW707 were trapped in pindan (*Acacia* spp.) woodland (4 m, 20%) with *Melaleuca* sp. thickets (4 m) adjacent to the coastal dune.

The June 1981 specimen was collected on a low grassland of samphires and *Sporobolus* (0.2 m, 30%) on coastal mud.

Two of the April adult females were pregnant with all eight mammae developed; one of these had four fetuses in its right side and three in its left side uterine horn; the other had five in its right side and two in its left side uterine horn. The September females were sub-adult. The June 1981 male had scrotal testes 5.3 mm long.

Measurements (mm) of adult specimens are presented below.

Sex	N	W	H-V	T-V	HF	F/A	E
F	2	14,18	67,74	77,81	15.5,17.1	12.9,13.4	12.1,14.1
M	2	12,12	67,65	75,75	17.0,16.7	12.0,12.4	13.9,14.6

PTEROPODIDAE

Pteropus alecto Temminck **Black Flying Fox.**

Pender Area: 2 males, 2 females (M22525-6 and M22628; 11-12 Sept. 1978; 16°26'50"S, 122°55'00"E. M22629; 21 June 1981; 16°36'20"S, 122°59'20"E.)

Shot (1900-1930 hrs) while crawling over and feeding on blossom of flowering *Melaleuca viridiflora* (15 m, 40%) at Gnamagun Well. Many others were seen and heard throughout the night at this site. M22525-6 both had greenish pollen stains on their muzzles and chests.

Shot (M22629) flying over a low forest of *Sonneratia alba* and *Rhizophora stylosa* to 1 m at 1930 hrs.

No obvious development of mammae, uteri, or testes was detected.

Measurements (mm) of adult individuals are presented below.

Sex	N	W	H-V	F/A	E	Ti
F	2	360,365	190,201	150,134	35,35	78,67
M	1	660	232	168	36	87

M22525 male: C-M³ 26.8, Condyl-basal Length 68.8, Inter-orbital Breadth 10.2, Zygomatic Breadth 39.7, C¹-C¹ 14.5, M²-M² 17.7.

Pteropus scapulatus Peters **Red Flying Fox.**

Coulomb Reserve: 3 males, 1 female (M22527-8; 21-22 April 1977; 17°18'50"S, 122°10'10"E. M22529, M22630; 17 Sept. 1978; 17°18'50"S, 122°10'10"E.)

Pender Area: 2 females (M22530; 26 April 1977; 16°43'50"S, 122°48'30"E. M22631; 28 April 1977; 16°38'50"S, 122°58'00"E. Others seen at 16°39'S, 122°56' to 122°57'E in June 1981.)

The April Coulomb Reserve specimens were solitary individuals shot on successive nights (2030-2100 hrs) over a fresh-water creek fringed with a low woodland (6 m, 30%) of *Melaleuca acacioides*, through pindan country (*Acacia* spp., including *A. holosericea* and *A. eriopoda*, to 5 m, 20%). In September 1978 a further two were collected at 1930 hrs from a party of at least twenty individuals feeding on flowering *Melaleuca viridiflora* trees (20 m, 80%)—an isolated stand in pindan (5-6 m, 10-30%)—100 m south of the Coulomb Area camp; many others were heard calling along nearby creeks during the same night. One of the two Pender Area females was shot at 2100 hrs over the clearing at Cocky Well. Surrounding vegetation

was a pindan woodland (15 m, 30%) of *Eucalyptus miniata* and *E. terminalis* over grasses (*Cymbogon* sp. and *Chrysopogon* sp.). The other female was collected from a group of 15 to 20 individuals heard in flowering bloodwoods (*Eucalyptus polycarpa*) in a seasonal swamp (including *Melaleuca viridiflora* to 15 m) on the track to Cygnet Bay. In June 1981 the species was observed in numbers, feeding on flowering *Eucalyptus miniata*, along the same track.

M22631 was lactating with enlarged and spatulate teats; M22630 was lactating one side. None of the three adult females collected (April and September) were obviously pregnant although both the April specimens (M22631 and M22530) had one slightly enlarged uterine horn (2.5 mm diameter compared with 1.5 mm diam. of the centra-lateral). M22631 had faint striations on its larger uterine horn suggesting previous parturition. M22529 had one scrotal and one abdominal testis; both measured 20 x 12 mm. M22527 and M22528 both had scrotal testes (10 x 13 mm). Radcliffe (1931, p. 36) noted the seasonal nature of births in this species in Queensland "... birth in the case of *P. scapulatus* will take place in April."

Measurements (mm) of adult individuals are listed below—they are consistent with those listed by Johnson (1964).

Sex	N	W	H-V	F/A	E	Ti
F	3	365,420,510	201,-,-,,-	134,-,149	34,38,34	67,44,68
M	3	490,420,460	-,-,180	-,-,140	36,-,35	70,64,64

Museum Number	M22527 male	M22529 male
C-M ³	17.0	18.5
Condylo-basal Length	52.6	54.8
Inter-orbital Breadth	9.1	8.8
Zygomatic Breadth	31.9	34.4
C ¹ -C ¹	12.2	13.0
M ² -M ²		14.2

Macroglossus minimus Geoffroy Northern Blossum Bat.

Pender Area: 2 males, 2 females (M22683-6; 27 April 1977; 16°35'10"S, 122°46'40"E.)

M22686 and M22685 were netted soon after dark in mangroves. Vegetation was a woodland of *Sonneratia alba* (9 m, 30%) fringing a forest of *Rhizophora stylosa* (10 m, 80%) on the south-eastern shore of Packer Island. The other two were netted in the same place later on the same night.

Gut contents were examined by A. N. Start; one specimen appeared to have an empty gut (M22683), the other three contained pollen of *Sonneratia alba*. Start (1975) recorded *Sonneratia* pollen as an important food source of Malaysian *Macroglossus* and I have recorded large numbers of *M. minimus* at flowering *Sonneratia alba* in both the Saint George Basin and Barlee Impediment of the North-west Kimberley in June 1978. In contrast, Tate (1952) recorded Queensland *M. minimus* (as *M. lagochilus*) at flowering *Agave* trees and Kitchener *et al.* (1981) recorded Kimberley *M. minimus* feeding on *Melaleuca leucadendra* blossoms at Mitchell Plateau in October.

One of the females had a distinct swelling (2.0 mm diam.) in its left side uterine horn and had enlarged teats. The right side of the other female was not fully

regressed; it also had enlarged teats. These April observations are comparable to date presented in Kitchener *et al.* (1981) suggesting year round births.

Measurements (mm) of adult specimens are presented below and are consistent with measurements in Kitchener *et al.* (1981) of specimens from Mitchell Plateau.

Sex	N	W	F/A	E	Ti
F	2	12.0,13.0	40.3,40.4	15.8,16.2	16.5,17.5
M	2	12.0,14.5	40.3,40.9	16.0,-	17.4,17.9

M22686 male: C-M² 7.7, Lamda-Gnathion Length 24.4, Condylo-basal Length 23.0, Post-palatal Length 9.1, Auditory Bulla Length 3.4, M²-M² 5.4, Mastoid Breadth 9.8, Zygomatic Breadth 14.2, Inter-orbital Breadth 4.6.

EMBALLONURIDAE

Taphozous flaviventris Peters Yellow-bellied Bat.

Coulomb Reserve: 4 males, 1 female (M22535; 19 April 1977; 17°20'10"S, 122°09'40"E. M22531; 20 April 1977; 17°21'20"S, 122°09'20"E. M22532; 22 April 1977; 17°18'50"S, 122°10'10"E. M22662; 18 June 1981; 17°16'00"S, 122°10'30"E. M22533; 17 June 1981; 17°17'00"S, 122°10'30"E.)

Pender Area: 1 female (M22534; 26 April 1977; 16°43'50"S, 122°48'30"E.) Several seen; 22 June 1981; 16°38'50"S, 122°54'20"E.

M22535 was shot after full dark over a beach dune supporting patches of shrubland (*Crotalaria cunninghamii*, 1 m, 40%) and grassland (*Spinifex longifolius*, 0.5 m, 20%) with occasional stunted ti-trees (*Melaleuca* sp. 4 m).

M22531 was collected after dark over a low forest of *Melaleuca acacioides* (9 m, 60%) fringing a creek behind beach dunes. M22532 was shot at 2030 hrs over a fresh-water creek, fringed with *Melaleuca acacioides* (10 m), in pindan.

M22662 was shot, and others were seen, after full dark (1930 hrs) over a mangrove creek through a low woodland to 8 m of *Camptostemon schultzei*, *Bruguiera exaristata*, *Rhizophora stylosa* and *Ceriops tagal*.

M22533 was shot after full dark (1930 hrs) over a coastal samphire flat fringed with *Melaleuca acacioides*.

M22534 was collected at 2115 hrs as it flew over a clearing at Cocky Well in a woodland (15 m, 30%) of *Eucalyptus* spp. over grasses (see *Pteropus scapulatus* annotation). The specimens seen in the Pender Area in June 1981 were flying over the canopy of *Eucalyptus miniata* woodland.

Neither female (M22534-5) had enlarged uterine horns, mammae, or teats.

Measurements (mm) of adults are presented below.

Sex	N	W	H-V	T-V	F/A	E	Ti
F	2	45,37	84,84	28,26	76,73	23.2,21.1	30.3,29.3
M	1	6	85	32	75	21.5	30.2

M22535 female: C-M³ 10.74, Condylo-basal Length 24.00, Post-palatal Length 10.80, M³-M³ 11.50, Auditory Bulla Length 5.44, Braincase Depth 12.50, Mastoid Breadth 14.28, Post-zygomatic Breadth 12.61.

MOLOSSIDAE

Chaerephon jobensis (Miller) **Northern Mastiff Bat.**

Coulomb Area: 11 males, 10 females (M22536-48; 21 to 22 April 1977; 17°18'50"S, 122°10'10"E. M22549; 17 April 1977; 17°22'40"S, 122°10'30"E. M22550-1; 31 August 1978; 17°16'50"S, 122°10'50"E. M22552; 13 Sept. 1978; 17°18'50"S, 122°10'10"E. M22560-1, M22553-4; 19 June 1981; 17°22'40"S, 122°10'30"E.)

M22549 and the June 1981 specimens were shot, between 1830 and 2000 hrs, over a fresh-water swamp fringed with *Melaleuca acacioides* (13 m, 40%) in pindan country. In 1981 this swamp had been cleared as a dam.

The remainder of the April series of specimens and M22552 were shot (1925-2135 hrs) over a watercourse fringed with a *Melaleuca* sp. (10 m) in pindan country (*Acacia* spp., 5 m, 10-20%).

M22550-1 were both shot (2000-2145 hrs) over a samphire (0.2 m, 20%) flat fringed with *Melaleuca acacioides* (9 m, 50%).

None of the eight adult females collected in April were obviously pregnant; six had a right side uterine horn slightly enlarged (2-2.5 mm diam.) in relation to the contra-lateral horn (0.5-1.0 mm) and, of these, four had both teats elongated. One of the two June females was not lactating and had both uterine horns 1 mm in diameter; the other (M22553) was lactating with a slightly enlarged (2.5 mm diameter), striated, right side uterine horn. Two of the three adult males collected in September had scrotal testes 5 mm long (M22550 and M22552); one of the two adult males collected in June had scrotal testes 4 mm long (M22560).

Measurements (mean and range; mm) of adults are presented below.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	8	25(7)	—	40(7)	49	22.7	24.7
		23-28		35-42	48-51	21.5-23.5	23.6-25.9
M	6	25	67	42	50	23.2	25.5
		24-26	65-69	41-45	48-51	22.0-24.0	24.0-25.8

Mormopterus loriae (Thomas) **Little Northern Scurrying Bat.**

Pender Area: 2 females (FW1696, FW1699; 21 June 1981; 16°36'20"S, 122°59'20"E.)

The only other specimens of this species from the Dampier Peninsula are three specimens (DI20, DI24, DI26) collected by the author at Crab Creek (18°59'20"S, 122°22'00"E) near Broome on 4 May 1977.

The June 1981 specimens were shot after full dark (1930 to 2015 hrs) just outside the canopy of a low open-forest of mangrove trees: *Sonneratia alba*, *Rhizophora stylosa*, *Avicennia marina* and *Bruguiera exaristata* (10 m, 70%). The Crab Creek specimens were netted between 1800 and 1900 hrs in a mangrove community—a low woodland to low open-forest zone of *Avicennia marina* (9 m, 50%).

The series included three females (DI26, FW1696, FW1699). In all cases teats were pigmented, although

not detectably enlarged, and uterine horns were thick walled with a diameter of 1 mm.

Measurements (mm) of adult specimens are presented below and correspond to published measurements of *M. loriae* (as *Tadarida loriae*) from Queensland and Northern Territory presented by Felton (1964). The Crab Creek specimens are the first *M. loriae* recognised from Western Australia.

Sex	N	W	H-V	T-V	F/A	E	Ti
M	2	7,10	48,49	31,34	32.0,33.2	14.2,14.3	10.3,10.5
M	1	6	48	33	34.0	14.3	11.0

DI24 male: C—M³ 5.62, Condyllo-basal Length 14.30, Inter-orbital Breadth 3.44, Post-zygomatic Breadth 7.26, Mastoid Breadth 8.40, Skull Height at Posterior Edge of Palate 3.74.

VESPERTILIONIDAE

Nyctophilus bifax Thomas **North Queensland Long-eared Bat.**

Coulomb Reserve: 1 female (M22555; 21 April 1977; 17°17'10"S, 122°10'10"E.)

Pender Area: 2 females, 1 male (M22556-7; 26 April 1977; 16°40'30"S, 122°45'50"E. M22558; 23 June 1981; 16°34'15"S, 122°50'50"E.)

The April Coulomb and Pender specimens were mist netted after full dark (1830-2130 hrs) over fresh-water swamps (0.1-1.0 m deep) supporting low woodland of *Tristania grandiflora* (7 m, 30%) over *Lemna* sp. The swamps were surrounded by fringing woodland of *Melaleuca acacioides* (10 m, 30%) over sedges.

The June specimen was mist netted at first dark over the tank at Martins Well. Surrounding vegetation was a woodland of *Melaleuca viridiflora* and *Eucalyptus polycarpa* with stands of *Acacia tumida* and occasional *Lysiphyllum cunninghamii* and *Pandanus spiralis*.

In none of the specimens was development of mammae, teats or uteri detected. Uterine horn diameters for the three females were 0.7, 0.9 and 1.0 mm, with the right side horn equal to the left side. The June specimen was a male with scrotal testes 5.6 mm long.

Measurements (mean and range, mm) of adults are presented below. The Dampier Peninsula specimens appear to have shorter bodies and maxillary tooth rows than measurements quoted by Thomas (1915) for *Nyctophilus bifax* and *N. deadalus* from Queensland and Northern Territory respectively. Measurements given by Johnson (1964) for *N. bifax deadalus* from Northern Territory show similar differences.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	3	9.5	48	42	41.3	23.7	26.4
		9-10	47-49	41-44	40.7-41.8	23.2-24.1	25.7-26.9

Museum Number	M22555 female	M22557 male
C—M ³	5.81	6.17
Condyllo-basal Length	15.28	16.42

Inter-orbital Breadth	3.58	3.53
Zygomatic Breadth	11.32	11.01
Mastoid Breadth	9.39	9.40
Max. Bulla Length	3.51	3.75
C ¹ —C ¹	4.68	5.00

Nyctophilus arnhemensis Johnson **Arnhem Land Long-eared Bat.**

Coulomb Area: 7 males, 2 females, 8 released (M22632-4; 18 April 1977; 17°15'50''S, 122°10'50''E. M22635-7; 21 April 1977; 17°17'10''S, 122°10'10''E. M22663-5 and 8 others released; 18 June 1981; 17°16'00''S, 122°10'30''E.)

Pender Area: 8 males, 2 females (M22638-41; 26 April 1977; 16°40'30''S, 122°45'50''E. M22642-6; 27 April 1977; 16°31'20''S, 122°47'00''E. M22647; 16 September 1978; 16°31'20''S, 122°58'50''E.)

First recorded by Dahl (1897 p. 193) from around Roebuck Bay as "*Nyctophilus timoriensis*".

Mist netted from dusk onwards (1745-2130 hrs) in the array of mangrove stands and in fresh water swamp communities in both areas:

- (i) *Bruguiera exaristata*, *Avicennia marina* and *Ceriops tagal* (2-8 m, 70-80%)—M22632-4.
- (ii) *Camptostemon schultzei*, *Rhizophora stylosa*, *Bruguiera exaristata* and *Osbornia octodonta* (3-11 m, 60%)—June specimens.
- (iii) *Avicennia marina*, *Rhizophora stylosa* and *Bruguiera exaristata* (5-8 m, 90%)—M22642-6.
- (iv) *Sonneratia alba* (10 m, 70%) adjacent to *Rhizophora stylosa* (7 m, 90%)—M22647.
- (v) Fresh-water swamps 1 m deep supporting *Tristania grandiflora* as low woodlands (5-7 m, 30%) over *Lemna* sp. The swamps were surrounded by fringing woodland of *Melaleuca acacioides* (10 m, 30%) over sedges—M22635-41.

Previously reported habitats of this species include mangroves (Kitchener *et al.* 1981), river fringing formations of the paperbarks *Melaleuca argentia* and *M. leucadendron* (McKenzie *et al.* 1977), dams and lagoons (Kitchener 1978, Calaby and Keith 1974), monsoonal forest and *Melaleuca leucadendron* (Johnson 1964).

In neither of the April female specimens (M22634, M22646) was development of the teats, mammae or uterine horns (left side diameter equals right side=0.8 mm) detected. The June female (M22663) had slightly larger uterine horns (1.2 mm diam.). However, although the mammae and teats of the September specimen (M22647) were not enlarged, both its uterine horns were enlarged (1.9 mm diam.) with thickened walls suggesting pro-oestrus. The author has collected adult females elsewhere in tropical Western Australia during March (4 females), May (4), June (1) and July (4). Only two specimens (from March) showed signs of reproductive activity; both had enlarged mammae, elongate teats and faintly striated uteri suggesting a post-partum condition. Kitchener (1978) and Kitchener *et al.* (1981) list one pregnant and two post-partum specimens from a total of three adult females collected in November. Combined, these data indicate that *Nyctophilus arnhemensis* breeds from late in the dry season (September) to well into the wet season (perhaps even as late as February) but that by the early dry season (mid-April) breeding has ceased.

Measurements (mean and range, mm) of adults are presented below. These specimens have shorter bodies than measurements presented for Northern Territory specimens by Johnson (1959, 1964) and Calaby and Keith (1974) but correspond to measurements of other Kimberley specimens presented in McKenzie *et al.* (1977) and Kitchener *et al.* (1981). Johnson (1959) distinguished *N. arnhemensis* from the New Guinea *N. microtis* Thomas 1915 on the basis of colour and geographical location. The Dampier Peninsula specimens correspond in colour to *N. microtis* but cannot be distinguished from either *N. microtis* or *N. arnhemensis* on the basis of the measures provided by Thomas (1915) and Johnson (1964).

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	3	7.0	45	42	37.9	23.2	25.0
		6.5-7.5	44-46	40-44	36.3-39.4	22.5-24.3	24.0-25.5
M	8	6.8	43	43	37.2	22.6	24.8
		6.0-8.4	40-44	42-45	36.5-38.4	21.1-24.1	23.7-25.9

Museum Number	M22636	M22640	M22644
Sex	M	M	M
C-M ³	5.60	5.44	5.49
Condyllo-basal Length	14.72	13.94	14.55
Inter-orbital Breadth	3.35	3.16	3.30
Zygomatic Breadth	10.20	9.49	10.01
Mastoid Breadth	8.52	8.30	8.66

Nyctophilus geoffroyi pallescens Thomas **Lesser Long-eared Bat.**

Coulomb Area: 1 male (M22559; 20 April 1977; 17°22'50''S, 122°09'30''E.)

Mist netted after dark (2040 hrs) over a fresh-water swamp (0.5 m deep) supporting occasional *Tristania grandiflora* (10%) and *Lemna* sp. and surrounded by a fringing formation of *Melaleuca acacioides* over sedges.

Measurements (mm) are presented below (the specimen is an adult) and correspond to measurements included in Thomas (1913). Although the maxillary tooth row (C-M³) of this Kimberley specimen is shorter than the figure quoted by Thomas, this may be a crown measurement rather than the alveolar measure quoted here.

M22559 male: C-M³ 5.35, Condyllo-basal Length 14.42, Inter-orbital Breadth 3.36, Zygomatic Breadth 9.66, H-V 42, T-V 36, F/A 34.3, Ear 22.8, Ti+P 22.4, Body Weight 6.5.

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

Pender Area: 3 females, 3 males (M22562-7; 23 June 1981; 16°34'15''S, 122°50'50''E.)

The Western Australian Museum holds a series of 27 males taken from a cave at Gantheaume Point (17°58'S, 122°11'E) near Broome, on 8 January 1962 (M4884-7, M4906-22, M4943-5, M5055-6, M5097). Laurel Keller, of the Chicago Field Museum of Natural History (FMNH) collected a series of eight specimens in nets at Lumad Well (FMNH 120250-3 males, FMNH 120256 male, FMNH 120254-5 males, FMNH 120257 female; 21-25 August 1976;

16°55'00''S, 122°35'50''E.). Lumad Well is half way between the Coulomb Point Nature Reserve and the Pender Area.

The June specimens were collected over a tank at Martins Well after dark. Surrounding vegetation was a woodland of *Melaleuca viridiflora* and *Eucalyptus polycarpa*.

None of the three females were lactating or had developed mammae, elongate teats, or enlarged uterine horns (right side 0.8-1.3 mm diameter, left side 0.5 mm). Two of the June males were adult with scrotal testes 4.0 to 5.0 mm long.

Measurements (mm) of adult specimens from Lumad Well are presented below.

Sex	N	W	H-V	T-V	E	F/A	Ti+P
M	2	10,11	53,-	54, 58	12.8, 11.7	45,45	25.4, 26.3
F	3	9.5-10	53-51	49-	11.0-10.2	44-45	26.2-24.5

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

Coulomb Area: 6 males, 6 females (M22568-77; 22 April 1977; 17°18'50''S, 122°10'10''E. M22578; 31 August 1978; 17°22'40''S, 122°09'30''E. M22579; 1 Sept. 1978; 17°22'40''S, 122°10'40''E.)

Pender Area: 2 males, 5 females, 1 damaged (M22580-3; 25 April 1978; 16°34'15''S, 122°50'50''E. M22584-5 and 4 released; 23 June 1981; 16°34'15''S, 122°50'50''E. M22586; 22 June 1981; 16°38'50''S, 122°54'20''E. M22648; 21 June 1981; 16°36'20''S, 122°59'20''E.)

The April specimens from the Coulomb Area were shot after dark (1850-2130 hrs) over a fresh-watercourse, fringed with *Melaleuca acacioides* (6 m, 30%), through pindan country (*Acacia* spp. to 5 m, 20%). The August-September specimens came from fresh-water swamps (0.3 m deep) surrounded by fringing *Melaleuca acacioides* (14 m, 30%) in pindan country including *Tristania grandiflora* (5 m, 10%) and *Acacia* spp; they were shot after dark.

The Pender Area specimens from April, and six of those from June, were mist netted and shot after dark in the clearing adjacent to the tank at Martins Well.

Surrounding vegetation was a woodland (20 m, 30%) of *Melaleuca viridiflora* and *Eucalyptus polycarpa* with stands of *Acacia tumida* (4-6 m) and occasional *Lysiphyllum cunninghamii* (5 m) and *Pandanus spiralis* (2 m). M22586 was shot at canopy height in a woodland of *Eucalyptus miniata* at 2000 hrs.

M22648 was shot after dark (1900 hrs) beside the canopy of a low open-forest of mangrove trees *Sonneratia alba*, *Rhizophora stylosa*, *Avicennia marina* and *Bruguiera exaristata* (10 m, 70%).

Significant development of the mammae or uterine horns was not detected in any of the five adult females from April 1977. One of the two adult females collected in September 1978 had both uterine horns enlarged to 2.6 mm diameter (M22579), however mammae or teats were enlarged in neither. The two adult females from June were not lactating and showed no development of their uterine horns (M22584-5).

Measurements (mean and range; mm) of adult specimens are included below.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	5	11	50(4)	47(4)	40.3	12.9	24.5
		10-12	47-52	44-50	39.8-41.5	12.6-13.2	23.8-25.9
M	7	10	50	44(5)	39.8	13.7	24.4
		9-10	48-51	39-48	38.2-40.8	12.9-14.4	23.4-25.1

Chalinolobus nigrogriseus (Gould) **Hoary Bat.**

Coulomb Area: 7 males, 5 females (M22666, M22679-80, 21-22 April 1977; M22587, 13 Sept. 1978; 17°18'50''S, 122°10'10''E. M22681; 20 April 1977; 17°22'40''S, 122°09'30''E. M22588 and M22687, 1 Sept. 1978; M22589-93, 19 June 1981; 17°22'40''S, 122°10'40''E.)

Pender Area: 5 males, 1 female, 3 released (M22682; 26 April 1977; 16°40'30''S, 122°45'50''E. M22594-97, 3 released; 23 June 1981; 16°34'15''S, 122°50'50''E. M22598; 22 June 1981; 16°38'50''S, 122°54'20''E.)

Collected around Roebuck Bay by Dahl (1897).

Four of the Coulomb Area specimens (M22666, M22679,80 and M22587) were shot between 1830 and 2130 hrs over a fresh-water creek, fringed with a low woodland (6 m, 30%) of *Melaleuca acacioides*, through pindan country (5 m, 20%). Another (M22681) was netted over a fresh-water swamp (0.5 m deep) supporting *Lemna* sp. and surrounded by a fringing woodland of *Melaleuca acacioides* (7 m) over sedges in April.

The other seven Coulomb specimens were shot over a similar, but dry, swamp surrounded by *Melaleuca acacioides* as a fringing community (7 m, 30%) in September and June. In 1981 this swamp had been cleared and a large dam established.

The Pender Area specimen (M22682) was mist-netted in April at 1915 hrs in a fresh-water swamp supporting a low woodland of *Tristania grandiflora* (7 m, 30%) over *Lemna* sp. The swamp was surrounded by a fringing woodland of *Melaleuca acacioides* over sedges. M22598 was shot after dark (2000 hrs) below canopy height in a *Eucalyptus miniata* woodland. The other seven from Pender were caught in mist nets over the tank at Martin's Well. Surrounding vegetation was a woodland of *Melaleuca viridiflora* and *Eucalyptus polycarpa*.

None of the adult females from April (2), June (2) and September (1) had enlarged uterine horns although one of the April females had small but elongated teats.

Measurements (mean and range, mm) of adults are presented below.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	2	7.5,6.0	45,44	—,40	—,33.9	12.2,12.0	22.9,21.9
M	3	6.2	43	40	33.9	11.0	21.8
		5.5-6.5	42-45	38-42	33.1-34.1	10.9-11.1	21.4-22.1

M22666 male: C-M³ 4.42, Condyllo-basal Length 12.10, Post-palatal Length 4.89, M³-M³ 6.00, Auditory Bulla Length 2.99; Braincase Depth 4.90; Inter-orbital Breadth 3.80; Mastoid Breadth 7.25; Postzygomatic Breadth 7.17; Zygomatic Breadth 8.95.

Pipistrellus tenuis (Temminck) **Timor Pipistrelle.**

Pender Area: 2 females, 1 male (M22668-70; 23 June 1981; 16°34'15''S, 122°50'50''E.)

Recorded at Roebuck Bay in 1895 by Dahl (1897).

All were mist-netted after dark (1930 to 2030 hrs) over the tank at Martin's Well. Surrounding vegetation was a woodland of *Melaleuca viridiflora* and *Eucalyptus polycarpa*.

One of the two females (M22668) had an enlarged uterine horn (left side 0.8 mm, right side 1.3 mm diameter) and elongate teats. The male (M22670) had testes 2.5 mm long.

Measurements (mm) of adult specimens are presented below.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	2	3.7,3.2	38,36	33,34	28.4,28.2	11.5,10.4	16.5,15.7
M	1	3.2	33	33	27.8	10.5	15.4

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

Coulomb Reserve: 4 males, 3 females (M22649-50; 19 April 1977; 17°15'50''S, 122°10'40''E. M22599-600; 31 August 1978; 17°15'00''S, 122°12'00-20''E. M22659; 21 April 1977; 17°17'10''S, 122°10'40''E. M22657-8; 18 June 1981; 17°16'00''S, 122°10'30''E.)

Pender Area: 3 males, 4 females (M22651-6, 25 April 1977; M22603, 23 June 1981; 16°34'15''S, 122°50'50''E.)

Collected in coastal and near coastal habitats on the Peninsula:

- (i) M22649-50, M22657-8 were mist-netted from first dark onwards (1810-1915 hrs) in mangroves—*Camptostemon schultzei*, *Bruguiera exaristata*, *Rhizophora stylosa*, *Avicennia marina* and *Ceriops tagal* (5-8 m, 60-90%).
- (ii) M22599 and M22600 were shot (2045-2100 hrs) over extensive mudflats, with scattered patches of *Sporobolus* grassland and samphire, behind mangroves.
- (iii) M22659 was mist-netted at 2130 hrs in a fresh-water swamp (0.5 m deep) supporting a low woodland of *Tristania grandiflora* (5 m, 30%) over duckweed.
- (vi) The Pender Area specimens were shot or mist-netted in the clearing at Martin's Well after full dark. Surrounding vegetation was a woodland of *Melaleuca viridiflora* and *Eucalyptus polycarpa*.

Three of the seven adult females collected in April were recently post-partum (striated enlarged uteri) and had developed mammae; all three came from the Pender Area (M22654-6). None of the other April females had detectably enlarged uteri or mammae. No other females were collected. Males were collected in April (2), August (2) and June (3); all had prominent testes 3 to 3.5 mm long.

Measurements (mean and range, mm) of adults are presented below. In distinguishing *N. greyi* from *N. balstoni caprenus*, the cranial measures suggested by Koopman (1978) were used.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
M	2	5.0,4.5	40,40	33,34	30.2,29.8	11.0,11.2	17.7,18.1
F	4	5.0	42	33	31.2	10.8	18.4
		4.0-6.5	41-44	30-36	30.7-32.1	10.3-11.2	18.1-18.8

M22659 female: C-M³ 4.61, Condyllo-basal Length 12.15, Post-palatal Length 5.20, M²-M² 5.64, Auditory Bulla Length 2.89, Braincase Depth 5.11, Inter-orbital Breadth 3.48, Mastoid Breadth 7.78, Post-zygomatic Breadth 7.14, C¹-C¹ 4.02.

Nycticeius balstoni caprenus (Troughton) **Broad-nosed Bat.**

Coulomb Reserve: 2 males (M22601; 31 August 1978; 17°16'30''S, 122°10'40''E. M22602; 13 Sept. 1978; 17°18'50''S, 122°10'10''E.)

Pender Area: 3 females, 2 males (M22660, 25 April 1977; M22604-5, 23 June 1981; 16°34'15''S, 122°50'50''E. M22661; 26 April 1977; 16°43'50''S, 122°48'30''E. M22606; 22 June 1981; 16°38'50''S, 122°56'00''E.)

Collected after dark (1830-2105 hrs) in inland and near coastal environments on the Peninsula:

- (i) M22601 was shot over pindan (*Acacia* spp., 5 m, 20%) over bunch grasses (0.5 m, 70%). M22602 was shot over a fresh-water creek fringed with *Melaleuca acacioides* (6 m, 30%) in pindan country.
- (ii) M22660, M22604-5 were shot or netted in the clearing at Martin's Well. Surrounding vegetation was a woodland of *Melaleuca viridiflora* and *Eucalyptus polycarpa*.
- (iii) M22661 and M22606 were shot in woodlands of *Eucalyptus* spp. (including *E. miniata*) over bunch grasses (0.5 m, 50%).

None of the adult females (M22660-1 and M22604 had enlarged uterine horns or developed teats or mammae. All the adult males collected in September (2) and June (2) had prominent testes 4.0 to 4.9 mm long.

Measurements (mean and range, mm) of adults are presented below.

Sex	N	W	H-V	T-V	F/A	E	Ti+P
F	3	6.3	44.3	37.3	32.7	11.9	19.8
		5.0-7.3	44-45	35-39	32.4-32.9	11.7-12.4	19.4-20.0
M	2	7.0,7.2	49,47	36,35	31.5,33.3	11.6,12.2	19.3,19.8

M22661 female: C-M³ 5.00, Condyllo-basal Length 12.32, Post-palatal Length 5.36, M²-M² 6.39, Auditory Bulla Length 2.90, Braincase Depth 5.01, Inter-orbital Breadth 3.36, Mastoid Breadth 7.75, Post-zygomatic Breadth 7.18, C¹-C¹ 4.46.

TACHYGLOSSIDAE

Tachyglossus aculeatus (Shaw) **Echidna.**

D. Higgins of Waterbank Station said they are common, especially in limestone outcrops on the western side of Waterbank Station. The Bardi people called it "Camarang" and also said they were common on the Peninsula.

CANIDAE

Canis familiaris dingo (Meyer) **Dingo.**

Coulomb Area: Heard howling; 20 April 1977; 17°18'50''S, 122°10'10''E. 2 seen; 30 Aug. 1978; 17°30'10''S, 122°08'50''E. Tracks seen; 2 Sept. 1978; 17°18'40''S, 122°10'10''E.

Pender Area: 2 (1 seen; 4 Sept. 1978; 16°26'S, 122°55'E. 1 seen; 12 Sept. 1978; 16°24'20''S, 122°57'00''E.)

Records came from pindan (*Acacia* spp.), *Eucalyptus* woodland, watercourse, coastal dune, and mangrove fringe habitats. Although evidence of Dingoes was not common, it was widespread. Butler (1971) wrote that Dingoes were plentiful in the Coulomb Reserve, especially on the coast.

The two seen on 30 August 1978 were pups weighing 8-10 kg. Butler (1971) recorded "half-grown" pups in June-July 1971.

A Dingo scat picked up at our Coulomb Area campsite contained exoskeleton material belonging to a crab (1 Sept. 1978). Another scat was collected adjacent to mangroves (3 Sept. 1978; 16°34'10''S, 122°48'30''E) near Packer Island; it contained *Macropus ?agilis* hair material.

EQUIDAE

Equus asinus (Linnaeus) **Feral Donkey.**

W. H. Butler recorded two mobs on the Coulomb Reserve in June-July 1978.

BOVIDAE

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

Coulomb Area: Common, tracks and scats throughout all habitats.

Pender Area: Common, tracks and scats throughout all habitats, even in mangroves.

Most of the Peninsula is managed as "open range" cattle industry. The effects of heavy grazing by cattle, combined with annual burning, are modifying both the floristics and structure of plant formations in all parts of the Peninsula visited during the survey (McKenzie and Kenneally, this publication).

FELIDAE

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

Coulomb Area: 1; 20 Sept. 1978; 17°29'S, 122°09'E.

Collected specimen was shot at night in decumbent *Acacia* sp. (0.5 m, 30%) on top of coastal cliffs near James Price Point on Waterbank Station. Tracks were recorded in the Coulomb Reserve, Borda Area and west of Cygnet Bay. Butler (1971) found them "plentiful throughout" the Coulomb Reserve.

The stomach of the September specimen contained fish material.

DISCUSSION

Since European settlement, 33 species of native mammal have been recorded on the Dampier Peninsula. These have been detailed in the annotation and are listed in Table 4.

To understand the species composition of the mammal fauna it is necessary to realise that the Peninsula is part of a larger and topographically more diverse district known as the Phanerozoic South-West Kimberley

(PWK). The PWK approximately corresponds to the Dampier Botanical District of Beard (1978). McKenzie (1981) lists 51 species of native mammal known from the PWK since settlement, and points out that its mammal fauna comprises a depauperate selection of arid zone and Torresian (sub-humid to humid zone) species as well as a comparatively rich array of more cosmopolitan species; its composition reflects the district's climatic and geographical location between, and its geomorphic continuity with, two distinct natural sub-regions in Western Australia—the sub-humid North Kimberley that borders it to the north and the arid Great Sandy Desert to the south (see Fig. 1 in McKenzie and Kenneally, this publication). As a result of further field

TABLE 4.

NATIVE MAMMALS KNOWN FROM THE DAMPIER PENINSULA

Species ¹	Most Recent Specimen ²	Records from Proposed/Existing Reserves	
		CPR ³	PA ³
<i>Megaleia rufa</i> (A)	1978	X	X
<i>Macropus robustus</i> (W)	1981	—	—
<i>M. agilis</i> (T)	1981	X	X
<i>Onychogalea unguifera</i> (T).....	1981	X	—
<i>Bettongia lesueur</i> (A).....	1895	—	—
<i>Wyulda squamicaudata</i> (T).....	?	—	—
<i>Trichosurus arnhemensis</i> (T).....	1980	—	—
<i>Petaurus breviceps</i> (T)	1895 (?1970)	—	—
<i>Macrotis logotis</i> (A)	1978	X	—
<i>Isoodon auratus</i> (W)	1895 (?1971)	—	—
<i>Phascogale tapoatafa</i> (W).....	1895	—	—
<i>Planigale maculata</i> (T)	1981	—	X
<i>Hydromys chrysogaster</i> (W).....	?1978	—	—
<i>Mesembriomys macrurus</i> (T)	1895	—	—
<i>Pseudomys nanus</i> (W).....	1978	X	—
<i>P. delicatulus</i> (T).....	1981	X	X
<i>Pteropus alecto</i> (T).....	1981	—	X
<i>P. scapulatus</i> (W).....	1978	X	X
<i>Macroglossus minimus</i> (T)	1977	—	X
<i>Taphozous flaviventris</i> (W).....	1981	X	X
<i>Chaerephon jobensis</i> (T).....	1981	X	—
<i>Mormopterus loriae</i> (T)	1981	—	X
<i>Nyctophilus bifax</i> (T)	1981	X	X
<i>N. arnhemensis</i> (T)	1981	X	X
<i>N. geoffroyi</i> (W)	1977	X	—
<i>Miniopterus schreibersii</i> (T)	1981	—	X
<i>Chalinolobus gouldii</i> (W).....	1981	X	X
<i>C. nigrogriseus</i> (T)	1981	X	X
<i>Pipistrellus tenuis</i> (T).....	1981	—	X
<i>Nycticeius greyi</i> (T)	1981	X	X
<i>N. balstoni caprenus</i> (W).....	1981	X	X
<i>Tachyglossus aculeatus</i> (W)	?1978	—	—
<i>Canis familiaris</i> (W)	1978	X	X

Note:

1. Biogeographical relationships (T = Torresian, A = Arid to Semi-arid, W = More cosmopolitan distribution)
2. From annotated list
3. CPR = Coulomb Point Nature Reserve; PA = Pender Area (proposed Borda and Cygnet Bay Nature Reserves. See Figure 1 in McKenzie, this publication).
? See annotation

work by the author, and a re-appraisal of the taxonomy of *Nycticeius* by Koopman (1978), three additional species can now be added to the PWK list—*Planigale maculata*, *Sminthopsis youngsoni* and *Nycticeius balstoni*—making a total of 54 species.

Twenty-one species are present in the PWK but apparently absent from the Peninsula—*Macropus antilopinus*, *Lagorchestes conspicillatus*, *Petrogale penicillata*, *P. brachyotis*, *Pseudocheirus dahli*, *Antechinus bilarni*, *Planigale ingrami*, *Sminthopsis macroura*, *S. youngsoni*, *Notoryctes typhlops*, *Rattus tunneyi*, *Zygomys argurus*, *Leggadina forresti*, *Pseudomys hermannsburgensis*, *Macroderma gigas*, *Eptesicus pumilis*, *E. douglasi*, *Hipposideros ater*, *Rhinonictes aurantius*, *Mormopterus cf. beccarii* and *Taphozous gerogianus*. Twelve of these are species found in rugged country not extensively represented on the peninsula—rocky ranges, screes and gorges (see McKenzie *et al.* 1975, 1977 and 1978; Kitchener *et al.* 1981; Youngson *et al.* 1981). *Notoryctes typhlops*, *Sminthopsis youngsoni* and *Pseudomys hermannsburgensis* are arid zone species which are only known to reach the semi-arid southern fringes of the PWK; this southern fringe is the northern limit of the arid sand-ridge country—typical habitat of these species (see Corbett 1975; McKenzie *et al.* 1979; McKenzie and Archer 1982). The remaining six species possibly do (or did) occur on the Peninsula; *Macropus antilopinus*, *Lagorchestes conspicillatus*, *Planigale ingrami*, *Sminthopsis macroura*, *Leggadina forresti* and *Rattus tunneyi* are all known from habitats not unlike those present on the Peninsula today. Habitat descriptions for *Lagorchestes conspicillatus* are provided by Parker (1973) and for *Planigale ingrami* by Archer (1976). Thus, the Peninsula's relatively homogeneous environment, compared with the PWK as a whole, may explain the lesser species richness of its known mammal fauna.

While not as species rich as the entire PWK the Dampier Peninsula mammal fauna still includes the same three biogeographical components—18 Torresian, 3 arid zone and 12 'more cosmopolitan' species (Table 4). In comparison, the PWK as a whole has 27 Torresian, 9 arid zone and 18 cosmopolitan (from McKenzie 1981, but modified by the inclusion of the 3 subsequent species records discussed above). That proportionately fewer arid zone species are known from the Dampier Peninsula than the PWK indicates the close affinity of Dampier Peninsula habitats to those of the North Kimberley and probably reflects the Holocene history of the Peninsula (discussed in McKenzie and Kenneally, this publication). Despite its geological affinity to the Great Sandy Desert, the Peninsula has experienced sub-humid conditions during the last 10 000 years that have modified its geomorphology and soils.

A number of species have disappeared or become rare on the Peninsula since European settlement. Table 4 lists the date of the most recent record of each species known on the Peninsula. Likely changes in the environment of the Peninsula caused by the activities of the pastoral industry since European settlement have already been discussed in McKenzie and Kenneally (this publication). In addition, at least five species of exotic mammal are already common—*Equus asinus*, *Bos taurus*, *Felis catus*, *Rattus rattus* and *Mus musculus*.

Frith (1973, p. 105), amongst others, has associated pastoral management and the establishment of exotic mammal populations with the disappearance of native mammals elsewhere in Australia. The rapid spread of introduced species in Australia may give evidence of empty niches although the corresponding decline of many similarly sized native species suggests otherwise. Whether the spread of exotics would have been so rapid and apparently successful without the corresponding environmental disturbance and modifications caused by European man is open to speculation and needs further systematic study (see Hutchinson 1975 p. 424) because of its implications in the success or otherwise of programs to re-establish the variety of medium-sized mammals through environmental restoration and management.

The existing and proposed reserves on the Dampier Peninsula include populations of, or apparently suitable habitat for, nearly all mammals currently known to be extant on the Peninsula (see Table 4). Of species now rare or absent on the Peninsula available local habitat data, which is limited to that described by Dahl (1897) in most cases, suggest that suitable habitats for the majority of species should be found in the delineated areas. Unfortunately, Dahl's data is mostly too scanty for a definite judgement since allowance must also be made for the subsequent effects of pastoralization and introduced competitors/predators on local environments.

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PART V

BIRDS

by R. E. Johnstone¹

INTRODUCTION

The Dampier Peninsula in west Kimberley is bounded in the northeast by King Sound and in the south by Roebuck Bay. The area covered by this report comprises almost all the Peninsula, south to Crab Creek (near Broome), to the old telegraph line and Great Northern Highway, and east to the upper Little Logue River and Disaster Bay (see Fig. 2, McKenzie & Kenneally, this publication). This paper is based on data gathered during a biological survey of the Coulomb Point Nature Reserve and the area of vacant Crown land between Lombadina and Pender Bay from 15 April to 5 May 1977 by Department of Fisheries and Wildlife and Western Australian Museum personnel. Visits by vehicle were also made to Cape Leveque, the southern end of Cygnet Bay and Crab Creek; and two transects were made down the Peninsula between Lombadina and Broome. Most of the data are my own, but I am grateful for notes from N. L. McKenzie, I. Cooke and W. K. Youngson of the Department of Fisheries and Wildlife.

Additional data are available from:

- (1) H.M.S. Beagle's visit to Valentine Island in February 1838 (Stokes, 1846)
- (2) Observations and collections in southern Dampier Peninsula from October 1895 to early 1896 (Dahl, 1926)
- (3) Notes on birds seen in and around Broome in ca 1909 (Crossman, 1910 a and b)
- (4) The Mjöberg Swedish Expeditions' visit to Sunday Island in January and February 1911 and to Beagle Bay from 26 June to 27 July 1911 (Söderberg, 1918);

and the unpublished accounts of several workers, namely:

- (1) D. L. Serventy's visit by boat to coasts and adjacent seas in September and October 1949;
- (2) W. H. Butler's survey of the Coulomb Point Reserve for the Department of Fisheries and Wildlife in June and July 1971;
- (3) Mrs H. B. Gill's visit to the Dampier Peninsula from 12 to 19 July 1973;
- (4) R. E. and C. Johnstone's visit to the Dampier Peninsula (upper Logue River, Cape Leveque, Curlew Bay, Cygnet Bay, Lombadina, Pender Bay, Beagle Bay and Broome) from 6 to 14 June, 1974;
- (5) R. E. and C. Johnstone's visit to the south-west of the Peninsula (north to Willie Creek) from 22 to 24 September, 1975;
- (6) L. A. Smith's visit to Waterbank Station in October 1976;
- (7) L. A. Smith's and R. E. Johnstone's notes from vicinity of Broome and between Broome and the upper Logue River during survey work in the Kimberley between 1971 and 1977;
- (8) Visits by the Wader Study Group led by R. P. Jaensch to Crab Creek in August-September 1981 and to Broome in March-April 1982.

Additional data are given in square brackets for Sunday and Valentine Islands and where relevant for the Roebuck Plains and Lacepede Islands.

For the purpose of this paper I recognise eight major habitat types; they are briefly described.

1. Pindan

This is the local name for the acacia-dominated small tree/shrub formation found on red sandy soils. Generally it is an open mixed stand of *Acacia* spp., *Hakea lorea*, *Grevillea* spp., bloodwoods and other eucalypts, *Lysiphyllum*, *Gardenia* and *Canarium* and a ground cover of rank grasses.

2. Eucalypt Forest and Woodland

This formation occurs south to about the level of Beagle Bay (see McKenzie and Kenneally, this publication). It consists mostly of tall *Eucalyptus miniata* to 18 m, *E. papuana* to 6 m and scattered bloodwoods and acacias. Canopy cover ranges from 30 to 70%.

3. Melaleuca Woodland, Thickets and Scrubs

Most of the coastal melaleuca scrubs and thickets consist of *Melaleuca acacioides* growing on the landward side of coastal dunes and around tidal creeks adjacent to mangal and fringing samphire flats. *Melaleuca cajuputi* is common in vine forests and often forms pure stands around wells and swamps especially in northern parts of the Peninsula. *Melaleuca viridiflora* is common along sandy creeks. *M. nervosa* forms tall thickets near the southern end of Packer Island.

4. Vine Forests, Vine Thickets and Vine Scrubs

The richest vine forests and scrubs occur in the far north of the peninsula on both the east and west coasts. They are located mostly on the landward side of coastal dunes. Trees and shrubs include *Ficus virens*, *Ficus dasycarpa*, *Ficus opposita*, *Celtis philippinensis*, *Terminalia* sp., *Melaleuca cajuputi*, *Diospyros ferrea* and *Cassine melanocarpa*; and vines include *Caesalpinia*. The ground is thickly carpeted with fallen leaves.

5. *Tristania* Swamps

Most of these swamps are between James Price Point and Pender Bay. They consist mainly of circular claypans and are either completely vegetated or fringed with *Tristania grandiflora* of varying density. Many of the smaller swamps were almost dry in April-May 1977. The ground is covered with dense sedges including *Cyperus*.

6. Samphire Flats, Grasslands and Coastal Dunes

Samphire flats are found along both the east and west coasts and are often fringed with *Melaleuca acacioides*. Buffel grass (*Cenchrus ciliaris*) flats occur along the south-western coast, and other small areas of grassland are found in woodlands and open pindan. Coastal dunes are vegetated mostly with *Spinifex longifolius*.

7. Creekside Vegetation

Most creeks are lined with *Melaleuca viridiflora*, *Eucalyptus*, *Acacia* and isolated patches of *Pandanus*.

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8. Mangal

Seven mangal areas were investigated: Rumble Bay, Cygnet Bay, Tilbata Creek (south end of Packer Island), Pender Bay, 3 km south of Cape Bertholet, Willie Creek and Crab Creek. The composition and zonation of these mangals are fairly similar, with *Sonneratia*, *Avicennia*, *Aegialites*, *Rhizophora*, *Bruguiera* and *Aegiceras* growing in the seaward and central zones, and *Ceriops*, *Camptostemon*, *Osbornia* and *Lumnitzera* mostly to landward. Although most species were recorded at each site, relative abundance was sometimes very different; for example at Rumble Bay *Rhizophora* formed almost pure stands.

In the annotated list I summarize for each species its relative abundance and habitat preferences, and where available I give data on breeding and notes on taxonomy. The thirty specimens collected by W. H. Butler and the seventy-nine collected by myself are lodged in the Western Australian Museum under registered numbers A11584-11614, 12927, 12945, 12957, 12959-60, 12963-65, 12977-78, 12987-89, 13027, 13032-33, 13035-36, 13056-57, 13062-63, 13073-74, 13084-98, 14393-98, 14425, 14480, 14759-14793, 14797-14802.

The classification and nomenclature follows Storr and Johnstone (1979).

ANNOTATED SPECIES LIST

CASUARIIDAE

Dromaius novaehollandiae (Latham) **Emu**

Scarce. Only observed in open pindan between Coulomb Point and Broome. Knut Dahl found tracks on Hill Station (20 km N Broome) in November 1895; W. H. Butler found egg shells and tracks on the Coulomb Point Reserve in June-July 1971 and noted that birds appeared to be small and dark; and I.C. Carnaby saw chicks near Broome in early October 1958.

PODICIPEDIDAE

Podiceps novaehollandiae novaehollandiae Stephens **Black-throated Grebe**

Moderately common. Fresh-water swamps and lagoons. An abandoned nest with 2 eggs was found on muddy ground in a drying swamp 5 km north of Coulomb Point on 17 April 1977; adult with 4 striped juveniles with black and grey heads on a small billabong fringed with melaleucas and bloodwoods and dense sedge 5 km north of Coulomb Point on 20 April 1977; an adult with young on open water in *Tristania* swamp 8 km north of Pender Bay on 26 April 1977. [Common on the Roebuck Plains when flooded.]

OCEANITIDAE

Oceanites oceanicus (Kuhl) **Wilson's Storm Petrel**

One was collected by D. L. Serventy from a boat anchored at Broome in September-October 1949.

PELECANIDAE

Pelecanus conspicillatus Temminck **Australian Pelican**

Moderately common in small flocks (up to 10). Recorded at Beagle Bay, Barred Creek and Broome.

Probably more common in the past as Soderberg recorded "a great flock" at Beagle Bay in 1911. [Breeding in small numbers on the Lacepede Islands 120 km NNW of Broome.]

SULIDAE

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

Common, particularly along the western coast of the Peninsula. Usually in small groups but occasionally in flocks of up to 60. Often feeding close inshore. [Breeding in many thousands on the Lacepede Islands 120 km NNW of Broome.]

PHALACROCORACIDAE

Phalacrocorax sulcirostris (Brandt) **Little Black Cormorant**

Crossman (1910) listed it as common in the Broome district on pools and swamps during the wet season.

Phalacrocorax carbo novaehollandiae Stephens **Great Cormorant**

Scarce. One seen by H.B. Gill at Barred Creek (35 km north of Broome) on 14 and 16 July 1973.

Phalacrocorax melanoleucos (Vieillot) **Little Pied Cormorant**

Scarce. H. B. Gill recorded 4 at Barred Creek on 14 July 1973.

Anhinga melanogaster novaehollandiae (Gould) **Darter**

One seen by Crossman in a mangrove swamp near Broome ca 1909.

FREGATIDAE

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

Moderately common. Mainly small flocks (up to 7). Usually seen soaring along the coast. Knut Dahl saw a flock pass over 69 km east of Broome during the wet season, early 1896; perhaps these birds were crossing the peninsula between Broome and King Sound. [Breeds on nearby Lacepede Islands.] A male and female collected by Söderberg at Broome in August 1911.

ARDEIDAE

Ardea sumatrana Raffles **Great-billed Heron**

Two seen by Gill at Barred Creek on 14 July 1973.

Ardea pacifica Latham **Pacific Heron**

Two females collected by Söderberg at Beagle Bay in June-July 1911.

Ardea novaehollandiae Latham **White-faced Heron**

Moderately common. Fresh-water swamps, creeks and dams; occasionally tidal creeks and along coast. I. C. Carnaby found a nest with 3 young east of Broome on 26 February, 1959.

Female collected by Söderberg at Beagle Bay in July 1911.

Ardea picata Gould **Pied Heron**

As this species is rarely seen west of the Ord drainage, some doubt attached to Söderberg's record of a juvenile female collected at Beagle Bay on 4 July

1911. His poor description matched better with the Pacific Heron, especially its having "the whole of the underparts of the body white as in adults" [the Pied Heron has only the neck and upper breast white and the rest of the underparts black]. Dr B. O. Stolt, Naturhistoriska Riksmuseet, Stockholm, kindly confirmed Söderberg's identification and provided additional details of the specimen (No. 250): total length 47 cm, eye yellow, legs yellow, bill now light and yellowish (on the label "reddish"). Its size and the colour of its eye and legs separate it from the Pacific Heron.

Egretta alba modesta (Gray) **Great Egret**

Scarce. A few recorded on flats near Broome by Crossman, and one seen by Johnstone on 17 April 1977 at a freshwater pool on the creek 5 km north of Coulomb Point. [Common on Roebuck Plains when flooded.]

Egretta intermedia (Wagler) **Intermediate Egret**

Forty-four recorded by Jaensch *et al.* near Crab Creek on 27 March 1982

Egretta garzetta nigripes (Temminck) **Little Egret**

Two single birds seen by Gill at Barred Creek on 14 July 1973, and several seen by Jaensch *et al.* near Broome in August-September 1981.

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

Both phases common. Rocky, sandy and muddy coasts and edges of mangal. Also Packer and Sunday Islands. Miss M. C. MacDonald collected a male near Broome on 5 January 1962, and Söderberg collected a female at Broome in June 1911 and a male and female in January and February respectively at Sunday Island in 1911.

Butorides striatus (Linnaeus) **Mangrove Heron**

Moderately common in mangal. Usually in ones and twos, but at Crab Creek 15 were feeding on small crabs and mudskippers in soft mud on a large tidal flat.

Two specimens (male, female) from Crab Creek.

Nycticorax caledonicus hilli Mathews **Rufous Night Heron**

Listed by Crossman as "not common in the mangroves about Broome." As there are no other records of this heron from the peninsula, I suspect that Crossman's birds were in fact Mangrove Herons (which he did not list). [Moderately common on flooded Roebuck Plains in March 1982.]

Ixobrychus flavicollis (Latham) **Black Bittern**

A specimen in the Western Australian Museum is labelled "J. T. Tunney, 13 August 1898, Broome". This locality is doubtful; like many other Tunney specimens labelled "Broome", it could only have been collected much nearer to Derby.

CICONIIDAE

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

Moderately common. Coastal and inland waters. An empty nest, lined with green leaves and twigs and placed in a fork of a huge *Rhizophora stylosa* in dense mangal at Rumble Bay (southern end of Cygnet Bay) on 28 April 1977.

THRESKIORNITHIDAE

Threskiornis aethiopicus moluccus (Cuvier) **Sacred Ibis**

Uncommon. Mangal, mudflats and *Tristania* swamps. Listed by Crossman as more plentiful during rainy season.

Threskiornis spinicollis (Jameson) **Straw-necked Ibis**

Common during wet season, moderately common during dry. Mainly small flocks (up to 10). Mostly south of Beagle Bay, favouring low-lying country subject to inundation. [Flocks of over 100 on the Roebuck Plains when flooded.]

Plegadis falcinellus (Linnaeus) **Glossy Ibis**

Several seen by Jaensch *et al.* near Crab Creek in March 1982.

Platalea regia Gould **Royal Spoonbill**

"Seen occasionally at low tide on the mud flats" by Crossman at Broome and four observed by Jaensch *et al.* near Crab Creek on 27 March 1982.

Platalea flavipes Gould **Yellow-billed Spoonbill**

Noted by Söderberg as common at Beagle Bay in July 1911.

ANATIDAE

Anseranas semipalmata (Latham) **Pied Goose**

Scarce vagrant. Recorded at Broome during the 1952 irruption when this species reached the south-west of Western Australia (Serventy and Whittell 1976). Early in 1952 birds began arriving in Broome, and numbers gradually increased to 3-400 birds by June. They stayed around Broome until January 1953 when the first heavy rains came, most then left. On 8 February 1953 only 12 remained. [In 1968 F. Hamblett saw 200 on the Duck Holes, Lake Eda.]

Dendrocygna arcuata (Horsfield) **Chestnut Whistling Duck**

Uncommon. Small flocks on claypans and swamps. Dahl recorded this species visiting a tank at Hill Station (19 km north of Broome); the birds came from "a creek further north, where during the day they frequented the mangroves".

Dendrocygna eytoni (Eyton) **Plumed Whistling Duck**

[An immature seen by Jaensch *et al.* on Roebuck Plains on 28 March 1982.]

Anas superciliosa Gmelin **Black Duck**

Uncommon. Observed by Butler at the Coulomb Point estuary in winter 1971 and noted by Crossman as common in the rainy season of 1909. [Large numbers of Black Duck and Grey Teal have been seen at Lake Eda.]

Anas gibberifrons gracilis Buller **Grey Teal**

Scarce. Recorded by Butler at the estuary just north of Coulomb Point in winter 1971; and one seen near Coulomb Point on 17 and 19 April 1977 on a small swamp with open water and duckweed and fringed with *Melaleuca viridiflora*.

Aythya australis (Eyton) **Hardhead**

[Breeding recorded on Roebuck Plains by Jaensch *et al.* in April 1982.]

ACCIPITRIDAE

Elanus caeruleus notatus Gould **Black-shouldered Kite**
One over mangal at Broome on 21 April 1976.

Elanus scriptus Gould **Letter-winged Kite**
Scarce. Normally absent from the area and probably only present during droughts in the eastern interior of Australia. Listed by Crossman as not uncommon in 1909.

Lophoictinia isura (Gould) **Square-tailed Kite**
Moderately common in northern two thirds of the Peninsula south to James Price Point. Mainly seen over the more heavily wooded areas of *Eucalyptus miniata* and *E. papuana*; vine thickets with *Celtis*, *Melaleuca* and *Ficus*; *Melaleuca acacioides* thickets; and occasionally coastal dunes. Four were seen over dunes at Cygnet Bay on 18 July 1973.
Söderberg collected a male and female at Beagle Bay in July 1911.

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

The only record is Butler's sighting of several feeding on the beach at Coulomb Point in winter 1971.

Haliastur indus girrenera (Vieillot) **Brahminy Kite**
Common. Mainly ones and twos, sometimes threes. All coasts including tidal creeks, bays and estuaries, often near mangal. Occasionally ascending creeks to freshwater pools, e.g. Söderberg saw a bird 13 km inland on a freshwater creek near Beagle Bay.

Söderberg collected a female from Beagle Bay in July and a female from Broome in August 1911.

Haliastur sphenurus (Vieillot) **Whistling Kite**
Scarce. Four sightings of single birds. Open pindan at Beagle Bay, Quandong Point, Barred Creek and near Broome.

Milvus migrans affinis Gould **Black Kite**
Common around Broome in flocks (up to 50), especially at rubbish tip and airstrip. Generally scarce over the rest of the Peninsula with odd birds attracted to fires and road kills.

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

Moderately common in early part of dry season; earliest record 23 April 1977, latest 16 July 1973. Probably visitors of *A. f. fasciatus* from southern Australia. Mostly well-wooded areas: pindan with *Acacia*, *Eucalyptus*, *Lysiphylum*, *Hakea* and tall rank grasses; *Melaleuca* and *Acacia* thickets, vine scrubs and vine thickets; mangal.

Accipiter cirrocephalus (Vieillot) **Collared Sparrowhawk**

Moderately common. Mainly open pindan, but one hunting in dense *Melaleuca* and *Acacia* thicket at Martins Well. On 12 October 1976 an adult attending a nest about 6 m up in a fork of a eucalypt at Waterbank Station.

Aquila morphnoides morphnoides Gould **Little Eagle**
Scarce. One at 4 km north of Broome on 11 July 1973. A nest with 2 eggs, 56 km ENE of Broome, and a nest with a partly incubated egg near Deep Creek (ENE of Broome) on 5 June 1978 (N. Kolichis, pers. comm.).

Aquila audax (Latham) **Wedge-tailed Eagle**
Moderately common. Ones and twos throughout the Peninsula. Mainly around settlements, over swamps and at road kills. Crossman in 1909 saw only one bird (on Streeters sheep station near Broome) and was informed that they made their appearance soon after sheep were put on the country.

Haliaeetus leucogaster (Gmelin) **White-breasted Sea Eagle**
Moderately common to common along coasts. Mainly ones and twos. Most frequent at Broome. Light brown immatures seen at Barred Creek, Broome and Crab Creek. [Breeding on Sunday Island (Söderberg, 1911).]

Circus assimilis Jardine & Selby **Spotted Harrier**
In winter 1971 two were seen regularly along dunes at Coulomb Point and others on main Beagle Bay road. One on 22 April 1977 hawking over open *Melaleuca* with grassy flats near small dam at Kelk Creek (10 km S of Pender Bay turn-off on main Cape Leveque road).

Circus aeruginosus approximans Peale **Marsh Harrier**
The only record is that of Söderberg, who saw them in ones and twos around creeks at Beagle Bay in June-July 1911.

Pandion haliaetus cristatus (Vieillot) **Osprey**
Moderately common along coasts. [Breeding on Sunday Island (Söderberg, 1911).]

FALCONIDAE

Falco subniger Gray **Black Falcon**
One seen by Butler over open pindan 50 km ENE of Broome on 9 June 1975.

Falco peregrinus macropus Swainson **Peregrine Falcon**
Scarce. One or two seen along the coast near Broome by Crossman. One over a *Tristania* swamp near Coulomb Point on 19 April 1976, and one hunting over an open grassy area near a small dam at Kelk Creek (10 km S of Pender Bay turn-off on main Cape Leveque road) on 22 April 1977.

Falco longipennis longipennis Swainson **Australian Hobby**
Moderately common. Pindan, eucalypt woodlands, creeks, cliffs and mangal. Often seen hunting bats at dusk. One bird was attacked by two White-breasted Wood-swallows at dusk over mangal at Crab Creek. Söderberg collected 2 males from Beagle Bay in July-August 1911.

Falco hypoleucos Gould **Grey Falcon**
One seen by Crossman in pindan country near Broome.

Falco berigora berigora Vigors & Horsfield **Brown Falcon**
Common. The most abundant diurnal raptor on the Peninsula. Observed in all habitats. Attracted to reptiles and insects escaping fires and often feeding on road kills. Both dark and pale birds seen.
Söderberg collected 12 males and 12 females from the Dampier Peninsula.

Falco cenchroides cenchroides Vigors & Horsfield
Australian Kestrel

Moderately common. Mainly ones and twos. Coastal dunes and cliffs, swamps and pindan. In April-May 1977 they were attracted to plagues of locusts in open pindan with *Acacia*, *Lysiphllum* and bloodwoods. [Also recorded for Sunday Island.]

PHASIANIDAE

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

Scarce. Only recorded at One Arm Point, Beagle Bay, Coulomb Point and Crab Creek. Tall grass along creeks and around swamps.

TURNICIDAE

Turnix pyrrhoroax (Gould) **Red-breasted Button-quail**

A male collected in soft grass and *Cyperus* at edge of swamp 3 km south of Cape Bertholet on 21 April 1977.

Turnix velox (Gould) **Little Button-quail**

Recorded by Crossman and Jaensch *et al.* near Broome. A small quail flushed from low grass in open pindan near Coulomb Point on 17 April 1977 was possibly this species.

GRUIDAE

Grus rubicundus (Perry) **Brolga**

Uncommon. Largest flock 22. Seen in small flocks at Beagle Bay, in open areas around Coulomb Point, at Barred Creek and on samphire flats near Willie Creek.

RALLIDAE

Rallina fasciata (Raffles) **Red-legged Rail**

A specimen, A7955 in W.A.M. collected by R. J. Baird at Broome on 16 July 1958, is the only Australian record of this south-east Asian rail.

Gallinula ventralis Gould **Black-tailed Native Hen**

One observed by Jaensch *et al.* on flooded Roebuck Plains on 26 March 1982.

OTIDAE

Otis australis Gray **Australian Bustard**

Moderately common. Ones and twos. Mainly pindan, samphire flats and edges of swamps and melaleuca thickets.

HAEMATOPODIDAE

Haematopus longirostris Vieillot **Pied Oystercatcher**

Common. Sandy, muddy and rocky beaches. Greatly outnumbering Sooty Oystercatcher.

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

Uncommon. Three records of two birds and one flock of eight. Rocky coasts and reef flats. [Also on Sunday Island, but no other records for King Sound.]

CHARADRIIDAE

Vanellus miles miles (Boddaert) **Masked Plover**

Crossman saw 2 pairs near Broome in October 1909 and Söderberg collected an adult male and 2 females at Beagle Bay in July 1911. [Flocks up to 100 recorded on Roebuck Plains when flooded.]

Pluvialis squatarola (Linnaeus) **Grey Plover**

Uncommon. Recorded in April, June and October. Sandy, muddy and rocky coasts.

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

Noted by Crossman at Broome on migration, and Gill saw 2 here on 11 July 1973.

Charadrius ruficapillus Temminck **Red-capped Plover**

Moderately common. Largest flock 60. Beaches, mudflats and open samphire flats. Nest with 2 eggs at Coulomb Point on 15 July 1973. In April-May 1977 most birds were paired and a downy chick was found on open samphire flat 3 km south of Cape Bertholet. Söderberg collected an adult female with a large egg in uterus at Beagle Bay on 11 July 1911, and on 24 July he noted that birds had paired.

One male and 6 females collected at Beagle Bay in June-July 1911.

Charadrius mongolus Pallas **Mongolian Sand Plover**

Two banded by Jaensch at Crab Creek in August 1982 and seven near Broome in March 1982.

Charadrius leschenaultii Lesson **Large Sand Plover**

Moderately common to very common. Mainly small flocks (up to 8) on coastal beaches and mudflats. Recorded at Packer Island, Cape Bertholet, Coulomb Point, Barred Creek, Broome and Crab Creek.

Charadrius melanops Vieillot **Black-fronted Plover**

Moderately common. Rocky and sandy creeks. Breeding at Coulomb Point estuary: 2 nests with 3 eggs in winter 1971.

Two males collected by Söderberg at Beagle Bay in July 1911.

Charadrius veredus Gould **Oriental Plover**

Ten at Broome on 18 November 1977.

Charadrius cinctus (Gould) **Red-kneed Plover**

Eight observed by Jaensch *et al.* on Roebuck Plains on 27 March 1982.

SCOLOPACIDAE

Numenius minutus Gould **Little Whimbrel**

Crossman listed it as common during spring and autumn migrations.

Numenius phaeopus variegatus (Scopoli) **Whimbrel**

Common. Mainly in ones and twos but occasionally small flocks (up to 30). Coastal beaches and mudflats.

Numenius madagascariensis (Linnaeus) **Eastern Curlew**

Moderately common. Mainly mudflats and mangal, once on a sandy beach. [Male collected on Sunday Island by Söderberg in February 1911.]

- Limosa limosa* (Linnaeus) **Black-tailed Godwit**
Moderately common. Five hundred observed by Jaensch *et al.* near Crab Creek in August 1981.
- Limosa lapponica baueri* Naumann **Bar-tailed Godwit**
Moderately common, mainly in small flocks (up to 15). Jaensch *et al.* recorded 6 000 near Crab Creek in August 1981 and 350 near Broome in March 1982. Sandy and muddy coasts.
- Tringa nebularia* (Gunnerus) **Greenshank**
Moderately common. Fresh, brackish and salty waters on and near west coast of Dampier Land. Recorded 2 km west of Skeleton Point, Tilbata Creek, Beagle Bay and Broome.
Four males and 1 female collected at Beagle Bay by Söderberg in July 1911.
- Tringa terek* (Latham) **Terek Sandpiper**
Moderately common. Three hundred recorded by Jaensch *et al.* near Crab Creek in August 1981 and 400 near Broome in March 1982.
- Tringa hypoleucos* Linnaeus **Common Sandpiper**
Moderately common, in ones and twos. Muddy, sandy and rocky shores. Recorded in April, July and September.
- Tringa brevipes* (Vieillot) **Grey-tailed Tattler**
Moderately common. Ones, twos and small groups (up to 4). Mostly mudflats but occasionally rocky and sandy coasts. Recorded in April, July and September.
- Arenaria interpres interpres* (Linnaeus) **Ruddy Turnstone**
Scarce. Small flocks on beach at Coulomb Point in winter 1971; 9 at Coulomb Point on 16 July 1973; and 3 on beach east side of Packer Island on 24 April 1977. A migrating flock of 400 observed near Broome in March 1982.
- Calidris canutus canutus* (Linnaeus) **Red Knot**
A female was collected by Miss M. C. MacDonald at Crab Creek on 7 January 1961, and a flock of 20 seen by Johnstone on eastern side of Packer Island on 25 April 1977.
- Calidris tenuirostris* (Horsfield) **Great Knot**
Very common. Jaensch *et al.* observed migrating flocks of 7 000 near Crab Creek in August 1981 and over 2 000 near Broome in March 1982.
- Calidris alba* (Pallas) **Sanderling**
Scarce. A specimen collected by J. P. Rogers at Broome on 24 October 1903, ten recorded by Jaensch *et al.* at Crab Creek in August 1981 and six in March 1982.
- Calidris ruficollis* (Pallas) **Red-necked Stint**
Common in flocks (up to 200). Beaches and tidal mudflats.
- Calidris acuminata* (Horsfield) **Sharp-tailed Sandpiper**
Uncommon. Small parties seen by C. F. H. Jenkins on tidal flats at Broome between April and June 1944, and by Butler on beaches at Coulomb Point in June/July 1971.
- Calidris ferruginea* (Pontoppidan) **Curlew Sandpiper**
One seen by Gill at Coulomb Point on 16 July 1973 and flocks of 1500 and 100 observed by Jaensch *et al.* in August 1981 and March 1982 respectively.
- Limicola falcinellus sibiricus* Dresser **Broad-billed Sandpiper**
One collected by J. P. Rogers at Broome on 16 October 1903.
- RECURVIROSTRIDAE
- Himantopus himantopus leucocephalus* Gould **Black-winged Stilt**
Moderately common to common. Mainly small flocks of 10-15 but occasionally larger flocks (up to 60). Sandy beaches, claypans and flooded samphire flats and grasslands. A flock of 60 at Crab Creek on 5 May 1977 contained about 20 immatures with dusky grey necks. [Very common after rains, in flocks up to 1 000, on the Roebuck Plains.]
A female collected by Söderberg at Beagle Bay in July 1911.
- Recurvirostra novaehollandiae* Vieillot **Red-necked Avocet**
Seen on the beach at Hill Station (19 km north of Broome) by Dahl in November 1895.
- BURHINIDAE
- Burhinus grallarius* (Latham) **Bush Stone-curlew**
Moderately common. Ones, twos and threes. Open areas such as roads, creek beds, edges of swamps and behind dunes. [Juvenile collected by Söderberg on Sunday Island on 15 February 1911.]
- Esacus magnirostris* (Vieillot) **Beach Stone-curlew**
Moderately common in twos and threes. Beaches and offshore islands including Sunday Island. An immature was seen on beach at Coulomb Point in winter 1971.
One collected by Söderberg on Sunday Island in February 1911.
- GLAREOLIDAE
- Stiltia isabella* (Vieillot) **Australian Pratincole**
One recorded by Butler on a marsh at Coulomb Point in winter 1971. [Common on the Roebuck Plains.]
- Glarcola maldivarum* Forster **Oriental Pratincole**
Common, irregular visitor. F. Hamlett estimated flocks of 5 000 to 8 000 near Broome between February and April 1968. They were feeding on locusts.
- LARIDAE
- Larus novaehollandiae* Stephens **Silver Gull**
Common at Broome (largest flock 100), becoming less frequent further north. Smaller flocks around settlements at Beagle Bay and Cygnet Bay. [Breeds on Lacepede Islands.]
Two specimens (male and female). Söderberg collected 2 females from Broome and 6 females and 2 males from Beagle Bay.
- Anous stolidus pileatus* (Scopoli) **Common Noddy**
Several sightings over coastal waters and on Sunday Island. [Breeds on Lacepede Islands.]
- Sterna nilotica macrotarsa* Gould **Gull-billed Tern**
Moderately common winter visitor. Mainly small flocks (up to 50). Coasts and samphire flats.
Three adult females collected by Söderberg at Beagle Bay in July 1911.

Sterna caspia Pallas **Caspian Tern**

Scarce. Probably only a winter visitor. Söderberg collected 2 adult males and 2 adult females at Broome on 20 and 21 June 1911; he recorded it as general in winter on the Dampier Peninsula coast. Crossman listed it as not uncommon along the coast. No subsequent records.

Sterna bergii Lichtenstein **Crested Tern**

Moderately common along coasts. Largest flock 50. There is a clutch of eggs in the W.A.M. labelled island off Broome; they were laid just above high water mark and were collected by E. J. Stuart on 20 November 1915. Söderberg collected a nestling from among a colony of Bridled Terns on small rocks near Sunday Island on 8 February 1911.

Sterna bengalensis Lesson **Lesser Crested Tern**

Scarce (greatly outnumbered by Crested Terns). Only three records: at Crab Creek three on 27 April 1973, one on 5 May 1977 and five on 27 March 1982.

Sterna dougallii gracilis Gould **Roseate Tern**

Flocks of 3, 13, 30 and 10 were recorded by Johnstone between Beagle Bay and the Lacepede Islands on 15 July 1973. A. Begbie collected 2 clutches of 2 eggs on Sunday Island on 20 July 1911; they were laid in a depression in sandy gravel.

Sterna anaethetus anaethetus Scopoli **Bridled Tern**

Breeding visitor to offshore islands. Recorded by Serventy at Cygnet Bay and Lugger Cove on 16 October 1949. Söderberg's breeding data for Sunday Island needs confirmation; on 8 February 1911 he recorded eggs (mostly single, sometimes 3) and young. The date is within the breeding season for Bridled Terns in Australia but this species only lays a single egg.

Sterna hybrida javanica Horsfield **Whiskered Tern**

Serventy recorded a flock of about 200 and several small flocks off Cape Bertholet on 18 October 1949 and Jaensch *et al.* recorded it as common along the coast near Broome in August-September 1981.

Sterna albifrons sinensis Gmelin **Little Tern**

Small flocks of ternlets have been recorded at Broome, Willie Creek (23 September 1974) and Coulomb Point (winter 1971). The identity of these birds is uncertain, but the Willie Creek birds were more likely to be *sinensis* than *nereis* in view of the date and habitat (the two birds were feeding along a tidal creek in dirty water, a habitat unsuitable for the Fairy Tern *S. nereis*).

COLUMBIDAE

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

Uncommon. Small groups (up to 6). Extreme north-east of Dampier Peninsula from One Arm Point to southern end of Cygnet Bay. Dense vine thicket growing behind dunes with *Ficus* spp, *Celtis philippinensis*, *Terminalia* sp., *Melaleuca cajuputi*, *Diospyros ferrea*, *Cassine melanocarpa*, and vines such as *Caesalpinia*. Also mangal and *Melaleuca leucadendron* forest.

One specimen (male).

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

Common. Mostly small parties but occasionally feeding and roosting in flocks of up to 40. Mainly vine

thickets where they feed on the fallen fruits of *Ficus virens* and *Celtis philippinensis*; also in mangal and *Melaleuca* forests and thickets. Scarce to moderately common in *Eucalyptus miniata* and *E. papuana* woodland and open *Acacia* and *Eucalyptus* near coast. Söderberg collected a male and female from Beagle Bay in July 1911 and also shot birds on Sunday Island where it was common in mangroves.

One specimen (female).

Geopelia striata placida Gould **Peaceful Dove**

Common. Mostly small parties of up to 4, once a flock of 30. *Melaleuca* thickets and swamps, *Melaleuca* and *pandanus* along watercourses, *Tristania* swamps and *eucalypt* woodland. Mainly in coastal thickets and along creeks in the southern two-thirds of the Peninsula, more frequent inland north of Beagle Bay (where the country is more heavily wooded). Nest with two chicks in a broken-down acacia 1 m from ground at 5 km north of Coulomb Point on 20 April 1977. Söderberg recorded 2 clutches of 2 eggs on Sunday Island on 14 and 21 February 1911.

Three specimens (1 male, 1 female and 1 in spirit).

Geopelia cuneata (Latham) **Diamond Dove**

Scarce to moderately common. Mainly small flocks (up to 11). Throughout the Peninsula in *pindan* (open, dense and burnt), *Melaleuca acacioides* thickets (especially around samphire flats) and low open *eucalypt* woodland with *Acacia*, *Canarium*, *Lysiphyllum*, bloodwoods and soft grasses.

Phaps chalcoptera (Latham) **Common Bronzewing**

One in open woodland of *Eucalyptus papuana* and *Melaleuca acacioides* at edge of samphire flat 8 km north of Pender Bay on 24 April 1977. Dahl recorded a great number of *Phaps chalcoptera* coming in to drink at wells in evening at Hill Station in November-December 1895. He refers to *chalcoptera* as the "common large Bronzewing Pigeon"; however the numbers suggest that these birds were Flock Pigeons (*Phaps histrionica*).

Phaps histrionica (Gould) **Flock Pigeon**

On 13 July 1973 Gill saw two birds at Barred Creek perched on the same rock as two Common Sandpipers.

Ocyphaps lophotes (Temminck) **Crested Pigeon**

Scarce, in ones and twos. Open *pindan* country north to Pender Bay.

PSITTACIDAE

Trichoglossus haematodus rubritorquis Vigors & Horsfield **Rainbow Lorikeet**

Moderately common nomad. Pairs and small flocks (up to 8). Mainly well-wooded northern parts of the Peninsula. Attracted to flowering *Eucalyptus miniata*, *E. papuana*, *Melaleuca leucadendra*, *M. acacioides* and *Tristania* and to vine thickets. Scarce or casual in *pindan* (only present when *eucalypts*, particularly bloodwoods, are flowering).

Trichoglossus versicolor Lear **Varied Lorikeet**

Uncommon, largest flock 15. Favours more densely wooded northern part of the Peninsula (north of Beagle Bay), with flowering trees and shrubs especially *Eucalyptus*, *Melaleuca* and *Gardenia*.

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

Moderately common throughout the Peninsula in flocks of up to 19. Pindan (especially acacia thickets, where they often feed on green pods), acacia-melaleuca thickets, *Eucalyptus miniata* woodland, vine thickets and *Tristania* swamps.

Söderberg collected one male and two females at Beagle Bay in winter 1911.

Melopsittacus undulatus (Shaw) **Budgerigar**

Moderately common to very common. Highly nomadic. In June 1974 they were numerous throughout the Peninsula (especially in southern pindan) in small flocks of 3 to 40 and larger flocks of 50 to 300. Mainly pindan and grassy areas around claypans and edges of woodlands. In April-May 1977 they were moderately common in small flocks of up to 25 (once 60), but were only seen in open pindan with *Acacia*, *Lysiphyllum*, *Gardenia*, scattered bloodwoods and a ground cover of soft grasses.

Nymphicus hollandicus (Kerr) **Cockatiel**

Moderately common to common throughout the Peninsula in pairs and flocks (up to 50). In July 1973 the largest flock was 40, in June 1974, 50 and in April-May 1977, 28. Mainly coastal dunes and cliffs, open pindan and open eucalypt woodland.

Calyptorhynchus magnificus macrorhynchus Gould **Red-tailed Black Cockatoo**

Moderately common in small parties (up to 25). Mainly well-wooded northern parts of the Peninsula in *Eucalyptus miniata*-*E. papuana* woodland, vine forests with *Celtis*, *Ficus* etc., and *Melaleuca viridiflora* forest and woodland. Occasionally in southern parts of the Peninsula in open pindan with bloodwoods. Flocks observed drinking at mills and dams. Also visits Sunday Island from time to time (Söderberg). Its status does not appear to have changed since 1911 when Söderberg wrote "it can hardly be said to be really common, for the flocks are in all places very solitary and scattered. The biggest flock I saw at Beagle Bay and Meda consisted of 15-20 birds, but for the most part in much smaller flocks of 6-8."

An adult female collected by Söderberg at Beagle Bay on 29 May 1911.

Cacatua roseicapilla Vieillot **Galah**

Scarce. Small flocks (up to 10). Only recorded in southern two-thirds of the Peninsula north to Pender Bay. Open pindan.

Cacatua tenuirostris sanguinea Gould **Corella**

Common but patchily distributed on southern Dampier Peninsula north to Pender Bay. Mostly small flocks (up to 30) but one flock of 600 at Barred Creek on 13 July 1973. Recorded by Söderberg as common on Sunday Island, with flocks straggling to neighbouring islands. Dahl thought there were possibly two species of white cockatoos at Hill Station; however the Sulphur-crested Cockatoo (*Cacatua galerita*) is at its south-western limit along the Fitzroy River.

CUCULIDAE

Cuculus saturatus Blyth **Oriental Cuckoo**

One seen by Gill at 4 km south of James Price Point on 16 July 1973.

Cuculus pallidus (Latham) **Pallid Cuckoo**

Common non-breeding winter visitor (recorded in April, June and July). Mostly in pindan but also in melaleuca woodland and thicket and eucalypt woodland.

Söderberg collected 3 adult males and 3 adult females at Beagle Bay between 4 and 19 July 1911.

Cuculus variolosus Vigors & Horsfield **Brush Cuckoo**

One seen by Gill at Cygnet Bay on the 18 July 1973.

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

A female was collected by Johnstone from stunted *Melaleuca acacioides* at Deep Creek on 6 June 1974.

Chrysococcyx basalis (Horsfield) **Horsfield's Bronze Cuckoo**

Moderately common. Mainly pindan (open, dense and burnt), eucalypt woodland, melaleuca thickets and *Tristania* swamps. A juvenile male was collected at 6 km north of Coulomb Point on 17 April 1977. It was being fed by a pair of Red-backed Fairy-wrens in open pindan with *Hakea*, *Acacia*, stunted eucalypts and tall rank grass.

One specimen (male).

Chrysococcyx malayanus minutillus Gould **Little Bronze Cuckoo**

Moderately common. Mangal forest and other near-coastal formations (*Melaleuca acacioides* and other thickets and vine forest). Usually seen or heard high up in the canopy.

Two specimens (1 male, 1 female).

Chrysococcyx lucidus plagosus (Latham) **Shining Bronze Cuckoo**

A juvenile was collected in a *Melaleuca acacioides* thicket behind coastal dunes 3 km south of Cape Bertholet on 17 April 1977; its identity was kindly confirmed by Messrs J. R. Ford and S. A. Parker. The bird was making a begging call "seep seep" and was being fed by a pair of Mangrove Flyeaters (*Gerygone levigaster*).

This species breeds in southern Australia (in Western Australia north to about Geraldton) and is probably only a rare winter visitor to Northern Australia. Wintering birds have however been recorded on many of the Lesser Sunda Islands, to reach which they must have crossed the Kimberley and Northern Territory. There is only one Northern Territory record (also an immature), and this is the first record for the Kimberley Division. Serventy and Whittell (1976) mention two specimens from Carnarvon (May and August) and one from near Roebourne (July); these were probably also birds in transit.

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

Moderately common in south-western part of the Peninsula south of Coulomb Point; elsewhere uncommon. Mainly tall rank grass along creeks, *Melaleuca acacioides* thickets, vine scrubs and thickets and edges of mangal.

[One collected by Stokes on Valentine Island in King Sound on 24 February 1838. Söderberg collected an adult male on Sunday Island on 16 January 1911 and found a nest with 2 eggs at same place on 18 November 1911.]

One specimen (female).

STRIGIDAE

Tyto alba delicatula (Gould) **Barn Owl**

Two seen by Butler near Coulomb Point in winter 1971.

Tyto novaehollandiae novaehollandiae (Stephens) **Masked Owl**

One recorded by Crossman near Broome in 1909.

Tyto capensis longimembris (Jerdon) **Grass Owl**

One observed by Jaensch 13 km east of Broome on 30 August 1981 and two flushed from same site on 1 September 1981. Several feathers were collected.

Ninox connivens connivens (Latham) **Barking Owl**

Scarce. Seen and heard on Coulomb Point Reserve in June-July 1971, and a male with its stomach full of large grasshoppers was collected at Pender Bay on 26 April 1977.

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

Moderately common throughout the Peninsula but favouring the better wooded northern areas. In April-May 1977 they were found in an area infested with locusts; on 3 May 1977, 5 were sighted on a spotlight run from Lombadina to Beagle Bay in *Eucalyptus miniata* forest and woodland with flowering bloodwoods, *Acacia* and a ground cover of grasses.

PODARGIDAE

Podargus strigoides (Latham) **Tawny Frogmouth**

Moderately common. Mainly better-wooded northern parts of the Peninsula. Favours *Eucalyptus miniata*-*E. papuana* woodland and *Melaleuca* thickets. On 18 April 1977, 2 were perched on dead trunks of *Bruguiera* on seaward side of mangal 3 km south of Cape Bertholet.

AEGOTHELIDAE

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

Moderately common in far north of the Peninsula (north of Pender Bay). Mainly well-wooded areas of *Eucalyptus miniata* and *E. papuana*, tall *Melaleuca* and vine forests and scrubs. Scarce or uncommon in southern pindan.

CAPRIMULGIDAE

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

Only three records for the Peninsula. Crossman saw a bird probably this species on the wing one evening; Butler recorded it for the Coulomb Point area in winter 1971; and Johnstone saw one on a road near Lombadina on 3 May 1977. [Recorded nesting by Söderberg on Sunday Island on 22 January 1911.]

APODIDAE

Apus pacificus (Latham) **Fork-tailed Swift**

Common, mainly a summer visitor. Recorded by Crossman at Broome as plentiful at intervals during summer; and on 21 April 1977 Johnstone saw a flock of 50 flying above a flock of 20 Tree Martins over coastal dunes at Coulomb Point. [Söderberg observed them in early January 1911 at Sunday Island.]

One specimen (female).

ALCEDINIDAE

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

Moderately common throughout the Peninsula. Woodland and forest of *Eucalyptus miniata* and *E. papuana*, tall *Melaleuca* along creeks and around swamps and pindan with tall eucalypts (bloodwoods etc).

Söderberg collected a male and female at Broome and a female and juvenile male at Beagle Bay in July 1911.

Halcyon pyrrhopygia Gould **Red-backed Kingfisher**

Moderately common. Mainly well-wooded northern parts of the Peninsula. Eucalypt woodland and dense pindan with *Acacia*, *Eucalyptus*, *Lysiphillum* and rank grasses. Southernmost record 42 km NNE of Broome.

Söderberg collected a male and female from Beagle Bay in July 1911.

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

Common throughout the Peninsula. Mainly mangal; commonly along water-courses with *Melaleuca* and *Pandanus* and in *Tristania* swamps; and occasionally pindan. In winter there is an increase in numbers when resident population is augmented by visitors from the south. [Recorded in mangroves at Sunday Island by Söderberg in 1911.]

One specimen (male).

Crossman recorded the Forest Kingfisher (*Halcyon macleayi*) as seen on several occasions in pindan near Broome. These birds were no doubt male Sacred Kingfishers, which are more bluish than females. Ramsay (1886 and 1887) made the same mistake and identified Sacred Kingfishers collected by Bowyer-Bower near Derby as Forest Kingfishers. It was not until Mathews (1917) went back through the Bowyer-Bower specimens, that they were correctly identified.

On the basis of these two faulty records the RAOU (1926) Checklist gives the Forest Kingfisher's distribution in Kimberley as south to Broome, and Condon (1975) and other recent texts give it south to Derby. There are no authentic Forest Kingfisher records for Western Australia, the nearest being Port Keats in the Northern Territory (Storr, 1977, 1980).

Halcyon chloris sordida Gould **Mangrove Kingfisher**

Rare. Only one acceptable record, a specimen collected by Miss M. C. MacDonald in mangal at Crab Creek near Broome on 7 January 1962.

MEROPIDAE

Merops ornatus Latham **Rainbow Bee-eater**

Common (at least as winter visitor and passage migrant) throughout the Peninsula. Mostly in small flocks (up to 50). Mainly around mills with water, at *Tristania* and *Melaleuca* swamps, and in open, dense or burnt pindan.

CORACIIDAE

Eurystomus orientalis pacificus (Latham) **Dollarbird**

Moderately common breeding visitor, arriving in October and leaving in April (latest record 20 April). Mainly pindan, *Tristania* swamps and watercourses.

ALAUDIDAE

Mirafra javanica Horsfield **Horsfield's Bushlark**

Common in southern parts of the Peninsula north to Beagle Bay; scarce or absent further north. Open grassy flats.

Three adult females collected by Söderberg at Beagle Bay in July 1911.

HIRUNDINIDAE

Hirundo nigricans nigricans Vieillot **Tree Martin**

Common non-breeding winter visitor (April to September). Mainly small flocks (up to 30) but occasionally large flocks (up to 300). Favouring coastal dunes, creeks, swamps and pindan. Often hawking over mangal or perching in burnt trees at dusk in pindan.

One specimen (female).

Hirundo ariel (Gould) **Fairy Martin**

Uncommon; recorded north to Beagle Bay. Small flocks (up to 60) seen in May, June and July. Mainly around coastal cliffs.

Two females collected by Söderberg at Beagle Bay on 10 and 15 July 1911.

MOTACILLIDAE

Anthus novaeseelandiae australis Vieillot **Richard's Pipit**

Common about Broome; scarce or uncommon further north. Samphire flats, coastal dunes with *Spinifex longifolius*, open stony flats near coast, and edges of creeks and swamps. One observed in a "mouse run" display (wings held tight to body, head lowered and tail dragging) on coastal dunes at Coulomb Point on 21 April 1977, but no nest or young were found.

One specimen (male).

Motacilla flava Linnaeus **Yellow Wagtail**

A flock of 8 to 10 was observed by Mr E. Adamson at Broome on 25 and 26 October 1981.

Motacilla alba (Linnaeus) **Pied Wagtail**

A single bird feeding on a roof and a wet lawn in Broome on 18 November 1977 (Johnstone and Smith, 1978, *West. Aust. Nat.* 14:56).

CAMPEPHAGIDAE

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

Common throughout the Peninsula. Ones, twos and threes; occasionally small migrating flocks of up to 8. Tall *Melaleuca viridiflora* and *M. cajuputi*, vine thickets with fruiting trees (particularly *Ficus virens*), *Tristania* swamps, *Eucalyptus miniata* woodland and pindan.

Two specimens collected by Söderberg at Beagle Bay in July 1911.

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

Moderately common to common throughout the Peninsula. Mainly in small flocks (up to 12) but also in larger flocks (up to 20) when migrating. Favouring all types of pindan (open, dense and burnt); also visiting other habitats with flowering trees and shrubs.

Söderberg collected 2 juvenile males at Beagle Bay and noted that young birds were shot in April and August.

PACHYCEPHALIDAE

Microeca tormenti Mathews **Brown-tailed Flycatcher**

Moderately common. Confined to mangal, south to Barred Creek. Usually singly, occasionally two together. Mainly tall, pure or mixed stands of *Bruguiera*, *Rhizophora* and *Avicennia*; occasionally *Ceriops* and areas with scattered dead trees.

Four specimens (2 males, 1 female and 1 unsexed).

Microeca leucophaea leucophaea (Latham) **Jacky Winter**

Common in ones and twos in well-wooded northern parts of the Peninsula in *Eucalyptus miniata*-*E. papuana* woodland, *Melaleuca* woodland and edges of vine thickets and *Tristania* swamps. Moderately common in pindan, especially dense pindan with bloodwoods, *Lysiphyllum* and *Acacia*. [Also on Sunday Island.]

Söderberg collected 2 males and one female at Beagle Bay on 3 July 1911.

Petroica goodenovii (Vigors & Horsfield) **Red-capped Robin**

Only two records; Crossman noted one male and several females near Broome; and Söderberg collected a juvenile male at Broome on 4 August 1911 and noted that it was seldom seen. Storr (1979) gives its status in Kimberley as a non-breeding winter visitor.

Petroica cucullata (Latham) **Hooded Robin**

Uncommon. Mainly well-wooded northern parts of the Peninsula and dense pindan. Southernmost records 2 km south of Quandong Point and 39 km NNE of Broome on Cape Leveque road.

Two specimens (1 male and 1 in spirit).

Eopsaltria pulverulenta leucura Gould **Mangrove Robin**

Scarce. Confined to blocks of mangal with large *Rhizophora* in extreme north-eastern part of the Peninsula (Cygnet Bay and Curlew Bay).

Pachycephala melanura Gould **Mangrove Golden Whistler**

Moderately common. Confined to mangal (especially *Rhizophora* forest) and adjacent vine scrubs and thickets (*Celtis*, *Ficus virens*, *Terminalia*, *Melaleuca cajuputi* and *Caesalpinia*). Most birds observed in vine thickets were immature.

Eight specimens (4 male, 4 female).

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

Moderately common throughout the Peninsula. Recorded in all habitats but favouring *Melaleuca acacioides* thickets around claypans and swamps, creekside vegetation, and edges of vine thickets; also *Eucalyptus miniata*-*E. papuana* woodland, *Tristania* swamps and dense pindan.

Six specimens (3 male, 1 female and 2 in spirit).

Pachycephala lanioides lanioides Gould **White-breasted Whistler**

Moderately common. Confined to mangal, mainly tall stands of *Avicennia*, *Bruguiera*, *Rhizophora* and *Ceriops*. Often seen feeding on trunks and roots.

Five specimens (3 male, 2 female).

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

Moderately common throughout the Peninsula. Dense pindan with *Acacia*, *Eucalyptus* and *Lysiphyllum*; also *Melaleuca acacioides* thickets, *Tristania* swamps and occasionally mangal.

Two specimens (male).

Oreoica gutturalis (Vigors & Horsfield) **Crested Bellbird**

A single bird seen by Crossman near Coconut Well (15 km N of Broome).

MONARCHIDAE

Rhipidura fuliginosa phasiana De Vis **Grey Fantail**

Common. Mainly mangal but also dense melaleuca thickets near mangal. Observed feeding in all strata of mangrove forests and woodlands.

Two specimens (1 male, 1 female).

Rhipidura fuliginosa alisteri Mathews

Probably a moderately common winter visitor to the Dampier Peninsula. Söderberg collected two males and one female in mangal at Beagle Bay in July 1911.

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

Common resident and very common winter visitor. Throughout the Peninsula. Mainly lightly wooded country, including pindan (dense and open); also along watercourses, around swamps and melaleuca thickets, and at windmills and edge of mangal. Söderberg recorded nests in January, February and November.

Two specimens both females collected by Söderberg at Beagle Bay in July 1911.

Rhipidura rufiventris isura Gould **Northern Fantail**

Moderately common. Well-wooded northern areas generally south to latitude of Beagle Bay, but extending down west coast in melaleuca and vine thickets and *Tristania* swamps as far as Barred Creek. [Recorded for Sunday Island by Söderberg in February 1911.]

One specimen (male).

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

Uncommon. Confined to mangal (mostly forest of *Rhizophora*, *Bruguiera* and *Avicennia*). [Two specimens, a male and female collected by Söderberg at Sunday Island on 23 and 25 January 1911.]

Five specimens (3 male, 1 female and 1 unsexed).

Myiagra rubecula concinna Gould **Leaden Flycatcher**

Scarce or uncommon. Generally the well-wooded northern third of the Peninsula south to latitude of Beagle Bay and in west-coastal thickets south to Coulomb Point. Mainly *Melaleuca* thickets (*M. acacioides* and *M. cajuputi*) with scattered *Acacia* and *Eucalyptus*; also *Tristania* swamps, *Eucalyptus miniata* and *E. papuana* woodland, and vine forests. [Male and female collected by Söderberg at Sunday Island in February 1911.]

Two specimens (1 male, 1 female).

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

Moderately common in ones and twos. Throughout the Peninsula but mainly coastal and northern areas.

Melaleuca acacioides and *M. viridiflora* woodland and thickets behind dunes, at edge of samphire flats and along creeks; also mixed *Melaleuca* and *Acacia* woodland and *Tristania* swamps.

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

Uncommon. Only recorded in mangal of far north of the Peninsula at Tilbata Creek, Cygnet Bay and Sunday Island. Mainly tall *Rhizophora* forest. [Male collected by Söderberg at Sunday Island on 5 February 1911.]

One specimen (female).

ORTHONYCHIDAE

Pomatostomus temporalis rubeculus (Gould) **Grey-crowned Babbler**

Moderately common in small parties (up to 8). All wooded habitats, but favouring edge of melaleuca thickets, creekside vegetation with bloodwoods and melaleucas, dense pindan and eucalypt woodland. Three old nests found, two in *Melaleuca* and one in *Eucalyptus miniata*.

ACANTHIZIDAE

Gerygone olivacea rogersi Mathews **White-throated Flyeater**

Moderately common in ones and twos. Mainly pure stands of *Melaleuca viridiflora* and *M. acacioides*, mixed *Acacia* and *Eucalyptus* woodland, and *Eucalyptus* woodland with flowering bloodwoods. Less frequent in pindan areas.

Söderberg collected an adult male at Beagle Bay on 3 July 1911, and Butler a female at Cape Baskerville on 22 June 1971.

Gerygone levigaster levigaster Gould **Mangrove Flyeater**

Common. The most plentiful flyeater in Dampier Land. *Melaleuca acacioides* thickets around near-coastal samphire flats, behind coastal dunes and along watercourses; also *Melaleuca cajuputi* and mangal (mainly canopy of *Rhizophora*, *Camptostemon* and *Bruguiera*). Pair feeding an immature Shining Bronze Cuckoo in dense *Melaleuca acacioides* thicket near mangal 5 km south of Cape Bertholet.

A bird was building a nest in a melaleuca at Cygnet Bay on 8 June 1974; the top half of the nest was completed and wholly made of small strips of paperbark and spider web.

Eleven specimens (4 male, 3 female and 4 unsexed).

Gerygone tenebrosa tenebrosa (Hall) **Dusky Flyeater**

Moderately common. Confined to mangal; observed in all species of mangrove but favouring thickets and forests of *Avicennia*, *Camptostemon*, *Rhizophora* and whipstick *Bruguiera*.

Seven specimens (4 male, 2 female and 1 unsexed).

Smicronnis brevisrostris (Gould) **Weebill**

Scarce. Pairs and small groups (up to 6). Mainly eucalypts and melaleucas along watercourses south to Deep Creek; also *Eucalyptus miniata* and *E. papuana* woodland in northern third of the Peninsula. Absent from most pindan areas.

MALURIDAE

Malurus lamberti assimilis North **Variegated Fairy-wren**

Scarce to moderately common throughout the Peninsula, in pairs and small parties (up to 5). Dense stunted *Melaleuca* covered with dodder, closed *Acacia* shrubland, pindan and edge of mangal.

A clutch of 3 eggs of "*Malurus elegans*" taken at Broome by G. Dunstan on 4 September 1902 (S. W. Jackson, 1907 *Catalogue...*) no doubt belonged to this species.

Two specimens (males).

Malurus melanocephalus (Latham) **Red-backed Fairy-wren**

Moderately common. Pairs and small parties (up to 5). Tall rank grasslands along creeks; edge of *Tristania* swamps; thickets along creeks with *Melaleuca*, *Pandanus* and *Acacia*; and open *Acacia* with tall grass and *Spinifex longifolius* on coastal dunes. Pair feeding an immature Horsfield's Bronze Cuckoo (*Chrysococyx basalis*) in open pindan on 17 April 1977.

SYLVIIDAE

Megalurus timoriensis Wallace **Tawny Grassbird**

A single unconfirmed record of two birds near Coulomb Point on 16 July 1973. In Kimberley this species occurs along the subhumid north-west coast south to Yampi Peninsula (Storr, 1980), hence I would doubt its occurrence on the much drier Dampier Peninsula.

Cincloramphus mathewsi Iredale **Rufous Songlark**

Scarce. Two near Coulomb Point on 16 July 1973; one in pindan 60 km SSW of Beagle Bay on 17 July 1973; and one in acacia and tall grass at edge of creek 3 km north of Coulomb Point on 21 April 1977.

Cincloramphus cruralis (Vigors & Horsfield) **Brown Songlark**

Recorded by Crossman as common on plains in Broome district, but there are no other sightings for the Dampier Peninsula.

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

Scarce. Recorded at Beagle Bay and on samphire/grass flats near Broome. [Moderately common on Roebuck Plains.]

DAPHOENOSITTIDAE

Daphoenositta chrysoptera leucoptera (Gould)

Australian Sittella

Moderately common, in small flocks (up to 5). Most frequent in better-wooded northern parts of the Peninsula (north of Beagle Bay) in tall *Eucalyptus miniata*, *E. papuana* and *Melaleuca* woodland. Uncommon in southern pindan, mainly areas with bloodwoods and acacia. [Nest found by Söderberg at Sunday Island on 15 February 1911.]

One specimen (female).

CLIMACTERIDAE

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

Uncommon, in ones and twos. Mainly *Eucalyptus miniata*-*E. papuana* forest and woodland in northern

parts of the Peninsula; also tall dense pindan with bloodwoods south to Broome and east to Deep Creek, but absent from low open pindan.

Dicaeum hirundinaceum hirundinaceum (Shaw)

Mistletoe-bird

Moderately common throughout the Peninsula. All wooded areas including *Melaleuca* woodland and thickets, *Tristania* swamps, pindan (open and dense), vine thickets, eucalypt woodland and mangal. Nest with two partly feathered young in topmost foliage of huge *Melaleuca* in vine thicket 8 km south of Martins Well on 26 April 1977.

One specimen (male).

PARDALOTIDAE

Pardalotus striatus uropygialis Gould **Striated Pardalote**

Common in well-wooded northern areas (south to latitude of Beagle Bay), especially *Eucalyptus miniata*-*E. papuana* forest and woodland and *Melaleuca* woodland with scattered bloodwoods. Moderately common in southern parts of the Peninsula (southernmost record 19 km north of Broome) in pindan with bloodwoods.

In June 1974 hundreds of birds were excavating burrows in grader spoil along edge of roads, in sides of dams and along creeks. Three burrows were checked on 12 June 1974; two were completed and ready for egg laying, the other was still under construction.

Two specimens (female).

ZOSTEROPIDAE

Zosterops lutea Gould **Yellow White-eye**

Common in flocks (up to 20) in mangal and gardens at Broome; elsewhere moderately common in mangal (especially forests of *Avicennia*, *Camptostemon* and *Rhizophora*) and adjacent vine forests and thickets (*Celtis*, *Ficus* and *Melaleuca*).

[Recorded by Söderberg as common on Sunday Island in mangal and lush vegetation close to shore. Three nests found on Sunday Island in January 1911: one with 2 eggs, one with 3 young and the other empty.]

One specimen (female).

MELIPHAGIDAE

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

Common to very common throughout the Peninsula. Mainly stands of *Melaleuca* (especially when flowering); also vine thickets and scrubs, mangal, and other flowering trees and shrubs including bloodwoods, *Crotalaria cunninghamii* and *Tristania*.

Four specimens (3 males and 1 in spirit).

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

Moderately common. Mangal, coastal vine thickets and scrubs, and dense *Melaleuca* thickets behind dunes or fringing tidal creeks and samphire flats. [A male and female collected at Sunday Island by Söderberg on January 1911.]

Two specimens (males).

Certhionyx niger (Gould) **Black Honeyeater**

One calling from open pindan at Deep Creek on 6 June 1974.

Meliphaga virescens (Vieillot) **Singing Honeyeater**
Common throughout the Peninsula in all habitats with flowering trees and shrubs. Observed feeding in (on dunes), bloodwoods and mangroves. [Common on Sunday Island (Söderberg).]
One specimen (male).

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

Moderately common throughout the Peninsula but absent from lightly wooded parts of pindan. Mainly creekside vegetation especially with flowering *Melaleuca* and bloodwoods, vine scrubs and thickets, and *Eucalyptus miniata*-*E. papuana* forest and woodlands. Also flowering trees and shrubs in Broome gardens. [Recorded for Sunday Island (Söderberg).]
Seven specimens (3 males, 1 female, 1 unsexed and 2 in spirit).

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

Moderately common. Northern parts of the Peninsula south to level of Beagle Bay and down west coast to 5 km south of James Price Point. Usually in small groups (up to 8). Vine scrubs and thickets with *Celtis*, *Ficus*, *Terminalia*, *Melaleuca*, *Crotalaria* and *Caesalpinia*; dense *Melaleuca* thickets; *Tristania* swamps (especially when flowering); dense creekside vegetation of *Melaleuca*, *Pandanus* and *Acacia*; and mangal.

Six specimens (4 male and 2 in spirit).

Melithreptus albogularis Gould **White-throated Honeyeater**

Uncommon. Eucalypt woodland (especially flowering bloodwoods) and dense vegetation along watercourses (*Eucalyptus*, *Melaleuca*, *Terminalia*, *Acacia* etc.). Four birds with young at Barred Creek on 19 July 1973.

Two specimens (males).

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

Uncommon. Nomadic. Recorded throughout the Peninsula. Mainly *Melaleuca* thickets, creekside thickets, and pindan with flowering bloodwoods.

Two specimens (1 male and 1 female).

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

Moderately common throughout the Peninsula. Mainly pindan with flowering bloodwoods, *Melaleuca* thickets and scrubs, coastal dune vegetation (especially when *Crotalaria* flowering), creekside vegetation, *Eucalyptus miniata*-*E. papuana* forest and woodland and mangal. Often seen in Broome gardens.
One specimen (female).

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

Common on Sunday Island in trees on mountain slopes (Söderberg).

Cissomela pectoralis (Gould) **Banded Honeyeater**

Scarce nomad. Southern Dampier Peninsula (northernmost record 5 km north of Coulomb Point). Eucalypt woodland and creekside vegetation with *Melaleuca*s. [Recorded by Söderberg at Sunday Island visiting flowering mistletoe as well as eucalypts.]

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

Moderately common north of Beagle Bay in ones, twos and small flocks (up to 10); uncommon on southern Dampier Peninsula. Mainly *Melaleuca* scrub and thickets, flowering eucalypts (including bloodwoods in pindan), *Tristania* swamps and flowering *Crotalaria* on coastal dunes.
Three specimens (2 males, 1 female).

Manorina flavigula (Gould) **Yellow-throated Miner**
Scarce. Small parties of up to five. Only recorded at 33 km SSW of Beagle Bay and at Deep Creek.

Epthianura tricolor Gould **Crimson Chat**

An irregular dry-season visitor to the southern Dampier Peninsula, north to Beagle Bay. Common in July 1911, June-July 1971 and about the Little Logue in June 1975. Mainly open pindan (attracted to flowering trees and shrubs). Crossman recorded the Crimson Finch (*Neochmia phaeton*) as "seen in hundreds during the winter months"; these were no doubt Crimson Chats or Painted Finches.

PLOCEIDAE

Emblema pictum Gould **Painted Finch**

Scarce to moderately common. In 1896 G. A. Keartland recorded several birds off Broome where they settled in the ship's rigging. Several flocks (up to 20) observed by Jaensch *et al.* near Crab Creek in March-April 1982.

Poephila guttata castanotis (Gould) **Zebra Finch**

Moderately common but patchily distributed throughout the Peninsula. Usually in small flocks (up to 25). Open country, especially pindan, often flocking around water. [Recorded on Sunday Island (Söderberg).]

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

Moderately common but patchily distributed throughout the Peninsula. Largest flock recorded 20. Possibly more plentiful in past; Söderberg recorded it as very common at Beagle Bay in 1911, especially in pandanus.

Two specimens (both spirit).

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

Moderately common throughout the Peninsula. Mainly small flocks of up to 10, occasionally larger flocks (up to 30). Edge of creeks with pandanus and tall grasses; acacia and pandanus; open pindan; and eucalypt woodland with tall grasses. Often drinking at windmills and settlements.

Two specimens (1 male and 1 in spirit).

Erythrura gouldiae (Gould) **Gouldian Finch**

Scarce. Only in extreme north of the Peninsula south to Lombadina. Two drinking at a dripping tap at Lombadina on 26 April 1977; Mr William Marchant of Lombadina informed me that small flocks (red-headed and black-headed) drank around the Mission.

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

Formerly in far north of the Peninsula. Now possibly extinct through trapping. In 1910 Söderberg was informed by a bird catcher that it was found in the

northernmost part of the Dampier Peninsula; he saw one of the captured birds in Broome. There are no subsequent records.

ORIOLIDAE

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

Two in mangroves at Cape Baskerville on 27 June 1971 and one in melaleuca at Curlew Bay on 10 June 1974.

Two specimens (1 male, 1 female).

GRALLINIDAE

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

Moderately common to uncommon resident in ones and twos, and common dry-season visitor in flocks of up to 30. Throughout the Peninsula, especially in open areas, around water, on airstrips and in gardens.

ARTAMIDAE

Artamus leucorhynchus (Linnaeus) **White-breasted Woodswallow**

Moderately common along coasts in ones, twos and small flocks (up to 6). Favouring edge of mangal.

Artamus personatus (Gould) **Masked Woodswallow**

Common nomad. Mainly southern lightly wooded parts of the Peninsula. Usually in flocks of up to 50, but Söderberg observed great flocks near Broome in August 1910. Attracted to flowering trees and shrubs in pindan (eucalypts, hakeas, grevilleas etc.). [Listed for Sunday Island by Söderberg as more common in January, February and March.]

Artamus cinereus melanops Gould **Black-faced Woodswallow**

Common throughout the Peninsula in small flocks (up to 10). Mainly open pindan with acacia, scattered bloodwoods, hakea and grasses; also open melaleuca woodland, edge of mangal and occasionally burnt pindan.

Artamus minor Vieillot **Little Woodswallow**

Moderately common in twos and fours, but patchily distributed. Mainly coastal, but also edges of *Tristania* and *Melaleuca* swamps, creeks with eucalypts, *Melaleuca* thickets and pindan (open dense and burnt).

CRACTICIDAE

Cracticus nigrogularis (Gould) **Pied Butcherbird**

Common. In north of Peninsula mostly in *Eucalyptus miniata*-*E. papuana* woodland; in south mainly pindan (open and dense) with bloodwoods but also *Melaleuca* thickets. One bird observed sandbathing in fine red sand at edge of track near Lombadina.

PARADISAEIDAE

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

Moderately common. Mainly well-wooded north of the Peninsula; also south along coast to Broome in vine scrubs, dense melaleuca thickets and creekside vegetation. Favouring vine thickets with fruiting trees including, *Ficus virens*, *Ficus opposita*, *Celtis philippensis* and *Terminalia*. Many active bowers in the vine thickets were decorated with hundreds of the blue-green seeds of the common vine *Caesalpinia*.

Also seen feeding on seeds of a small tree (? *Grewia*) in open woodland with melaleuca, bloodwoods, pandanus and acacia. [Recorded as common on Sunday Island (Söderberg).]

CORVIDAE

Corvus orru salvadorii Finsch **Australian Crow**

Status uncertain, because of lack of specimens. Crossman recorded it as seldom seen around Broome but common at Streeters Station 29 km to north; these however could have been Little Crows (*C. bennetti*). [Recorded by Stokes at Valentine Island on 24 February 1838.]

Corvus bennetti North **Little Crow**

Söderberg did not record the Little Crow but noted the Australian Crow as common at Beagle Bay in flocks of one hundred or more, often with Black Kites. He collected three specimens at Beagle Bay. Dr B. O. Stolt (Naturhistoriska Riksmuseet, Stockholm) kindly provided details and measurements of these specimens which are as follows: No. 272, adult female, 7 July 1911, total length 44 cm (on label), bill 49 mm, wing 300 mm; No. 156, male adult, 5 July 1911, total length 43 cm (on label), bill 49 mm, wing 317 mm; and No. 295, adult female, 11 July 1911, total length 47 cm (on label), bill 51 mm and wing 310 mm. According to the measurements in Storr and Johnstone (1979), all three of Söderberg's specimens would in fact be *C. bennetti*.

DISCUSSION

A total of 214 species (143 non-passerine and 71 passerine) have been recorded from the area covered in this paper. This number can be compared with the 121 species recorded for the Edgar Ranges (elsewhere in the south-west Kimberley); 128 for Drysdale River National Park (north Kimberley); and 219 for the Mitchell Plateau area (north-west Kimberley). The richness of the avifauna is mainly due to the diversity of habitats, especially those on or near the coast. Sixty-three species were recorded from coastal habitats; without them the total (138) is more comparable with those of the landbound Edgar Ranges and Drysdale River National Park. The non-coastal fauna is typical of semi-arid Kimberley; there is a slight admixture of species from the north-western subhumid zone and a smaller number from the arid zone.

Much work has been done on the Dampier Peninsula, and I feel that most of the resident species have been recorded. More work however along coasts will no doubt add other visiting waders. Additional wetland birds could be expected during visits after good seasons.

Peninsulas generally have depauperate faunas; largely surrounded by sea, there is limited access for land-based animals. This is partly true of the Dampier Peninsula, for King Sound in the north-east and the semi-arid pindan in the south have obstructed the dispersal of such "Torresian" species as the Sulphur-crested Cockatoo, Blue-faced Honeyeater, Silver-crowned Friarbird, Crimson Finch and Masked Finch. All of these are common on either Yampi Peninsula (to north-east) or the Fitzroy River (to south-east) but have been unable to colonize the north end of the Dampier Peninsula despite the availability of suitable habitat.

Pindan covers about 70% of the Peninsula. It contains many flowering trees and shrubs and often a good ground cover of spinifex and soft grasses. It has a fairly low number of sedentary bird species such as the Rufous Whistler, Grey Shrike-thrush, Crested Bellbird, Grey-crowned Babbler, Variegated Fairy-wren, Rufous Songlark and Singing Honeyeater. A larger category comprises nomads, breeding and non-breeding visitors and nectivorous birds following the flowering trees and shrubs.

The *Eucalyptus miniata*, *E. tectifica* and *E. papuana* forests and woodlands, treated by Beard (1979) and McKenzie and Kenneally (this publication) as forms of pindan, contrast sharply with the *Acacia* dominated pindan areas but cover only about 15% of the Peninsula. Species which are more common or mainly restricted to this habitat include the Rainbow Lorikeet, Varied Lorikeet, Boobook Owl, Blue-winged Kookaburra, Jacky Winter, Hooded Robin, Northern Fantail, Leaden Flycatcher, Australian Sittella, Black-tailed Tree-creeper, Striated Pardalote and Gouldian Finch.

The coastal melaleuca woodlands, thickets and scrubs extend as a broken belt from northern Dampier Peninsula south-west into the northern Pilbara. On the Dampier Peninsula this habitat is important for the Mangrove Flyeater, which prefers *Melaleuca acacioides* thickets to mangal; it is more common here than elsewhere in Kimberley. Other birds partial to the melaleuca belt include the Bar-shouldered Dove, Rufous Whistler, Restless Flycatcher, Brown Honeyeater, White-gaped Honeyeater, Rufous-throated Honeyeater and Great Bowerbird. The mangrove Grey Fantail (*R. f. phasiana*), Yellow White-eye and Red-headed Honeyeater visit melaleuca thickets that adjoin mangal. When flowering, melaleucas attract lorikeets and many honeyeaters.

Kimberley vine forests, thickets and scrubs are best developed in the subhumid north-west. On the Dampier Peninsula, at their southern limit in Western Australia, they are floristically very depauperate. Here they occur mostly on the landward side of coastal dunes. Most blocks are small and could be easily degraded by livestock and fires. The Red-crowned Pigeon is confined to this habitat and, though at the southern limit of its range in Western Australia, is more common here than elsewhere in Kimberley. The fruiting trees and shrubs provide food for the Bar-shouldered Dove, Red-winged Parrot, Black-faced Cuckoo-shrike and Great Bowerbird. Other species found in vine forests include Mangrove Golden Whistler, Yellow White-eye, White-gaped Honeyeater and Little Friarbird.

Tristania swamps account for less than 1% of the area but are important for waterfowl and some waders. Flowering *Tristania* also attract honeyeaters.

Samphire flats, open grasslands and coastal dunes represent about 7% of the area; birds mostly seen in these habitats include Brown Quail, Red-breasted Button-quail, Australian Bustard, Oriental Pratincole, Horsfield's Bushlark, Richard's Pipit and Golden-headed Fantail Warbler.

A few species are more common on watercourses and in creekside vegetation than in other habitats. They include the Black-fronted Plover, Pheasant Coucal, Blue-winged Kookaburra, Dollarbird, Grey-crowned Babbler, Yellow-tinted Honeyeater and Weebill.

The large blocks of mangal along the Dampier Peninsula coasts are home to 14 birds most of which are confined to mangroves: Mangrove Heron, Little Bronze Cuckoo, Mangrove Kingfisher, Brown-tailed Flycatcher, Mangrove Robin, Mangrove Golden Whistler, White-breasted Whistler, Grey Fantail, Broad-billed Flycatcher, Shining Flycatcher, Mangrove Flyeater, Dusky Flyeater, Yellow White-eye and Red-headed Honeyeater. Two of these are at their southern limit in Western Australia, namely the Little Bronze Cuckoo (south to Coulomb Point) and the Brown-tailed Flycatcher (south to Barred Creek). Many mangrove birds have a broken distribution in Western Australia with one population in Kimberley and another isolated in the Pilbara region. Species whose Kimberley population is at its southern limit in Dampier Land are the Mangrove Kingfisher (Broome), Mangrove Robin (Cygnet Bay) and Shining Flycatcher (Tilbata Creek). Two absentees are the Chestnut Rail (*Eulabeornis castaneiventris*) and the large-billed Flyeater (*Gerygone magnirostris*), neither of which extends beyond the north-east of King Sound.

A breakdown of the avifauna under each of the main habitat types is given below (where the status of a species is similar in two or more habitats it was included in each of them).

- (1) Pindan: 56 species (25 passerine)
- (2) Eucalypt forest and woodland: 30 species (15 passerine)
- (3) *Melaleuca* woodland, thickets and scrubs; vine forests, thickets and scrubs: 29 species (18 passerine)
- (4) *Tristania* swamps: 24 species (4 passerine)
- (5) Samphire flats, grasslands and coastal dunes: 21 species (7 passerine)
- (6) Creekside vegetation: 8 species (4 passerine)
- (7) Mangal: 20 species (14 passerine)
- (8) Inshore seas, tidal mudflats, beaches and coastal cliffs: 59 species (13 passerine)

This gives an indication of the richness of each habitat type, but more particularly it shows the importance of the minor habitats especially the eucalypt, melaleuca, vine and mangrove formations.

The migrants, which make up 20 per cent of the fauna, can be divided into six main groups.

- (1) Non-breeding summer visitors from the northern hemisphere, e.g. Red-legged Rail, Grey Plover, Little Whimbrel, Oriental Pratincole, Oriental Cuckoo, Fork-tailed Swift and Pied Wagtail.
- (2) Breeding summer visitors from the north, e.g. Bridled Tern and Dollarbird.
- (3) Non-breeding visitors from the south, e.g. Pallid Cuckoo, Shining Bronze Cuckoo, Tree Martin, Red-capped Robin and Grey Fantail (*R. f. alisteri*).
- (4) Passage migrants, e.g. many of the waders such as Sharp-tailed Sandpiper.
- (5) Resident species whose numbers are greatly augmented by visitors in winter, e.g. Brown Goshawk, Rainbow Bee-eater, Sacred Kingfisher and Willie Wagtail.
- (6) Vagrants and rare visitors from elsewhere in Australia, e.g. Pied Heron, Pied Goose, Letter-winged Kite and Flock Pigeon.

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PART VI

AMPHIBIANS AND REPTILES

by G. M. Storr¹ and R. E. Johnstone¹

INTRODUCTION

The Dampier Peninsula in South-west Kimberley is bounded in the northeast by King Sound and in the south by Roebuck Bay. It is divisible into two main kinds of country: the pindan of the southern two-thirds of the Peninsula, and the eucalypt woodlands and forests of the north. Pindan grows on red sands and varies in density from closed to very open; it is composed of thicket-forming species of *Acacia*, *Eucalyptus* (especially bloodwoods), *Lysiphyllum*, *Canarium*, *Hakea* and long grasses. The eucalypt formations occur on relatively heavy grey or red soils and are dominated by *E. miniata* and *E. papuana*. Additional habitats include closed forests (*Melaleuca*, *Ficus*, *Celtis*, *Terminalia* etc.) and *Melaleuca* thickets, which are mostly located at the inner foot of coastal dunes; *Melaleuca* scrubs along watercourses and around claypans; and *Melaleuca*, *Tristania* and mangrove swamps.

Herpetological exploration began late on the Dampier Peninsula. Knut Dahl observed and collected in the far south from October 1895 to early 1896. He worked mainly at Hill Station (20 km N of Broome) and at Loomoogoon Out-station (70 km ENE of Broome). In his book Dahl (1926) mentions some of the species he encountered; others are mentioned by Boulenger (1896) or Parker (1940), especially when describing new taxa. The combined list consists of *Cyclorana australis*, *Notaden nicholli* (holotype), *Caretta caretta*, *Diplodactylus stenodactylus* (holotype), *Gehyra australis*, *Amphibolurus gilberti*, *A. inermis*, *Chlamydosaurus kingii*, *Diporiphora pindan*, *Ctenotus colletti*, *C. pantherinus ocellifer* (holotype), *Egernia kintorei* and *Aspidites melanocephalus*.

The Mjöberg Expedition collected at Streeters [=Hill] Station in June-August 1911. Their amphibians were reported on by Andersson (1913), and the reptiles by Lönnberg & Andersson (1913). They added 14 species to the Peninsula list: *Limnodynastes ornatus*, *Diplodactylus ciliaris*, *D. conspicillatus*, *D. taeniatus* (holotype), *Heteronotia binoei*, *Oedura rhombifera*, *Ctenotus inornatus*, *Lerista bipes*, *Menetia greyii*, *Proablepharus tenuis*, *Liasis "childreni"*, *Furina ornata*, *Hydrelaps darwiniensis* and *Hydrophis kingii*. Their splendid collection of sea snakes from off Cape Jaubert (125 km SW of Broome) is beyond the scope of this paper.

Over the last 60 years residents of the Peninsula, especially of Broome, have sent specimens to the Western Australian Museum. Among those collected by W. O. Mansbridge in 1922-24 were three species previously unrecorded for the Peninsula: *Litoria caerulea*, *Chelonia mydas* and *Aipysurus laevis*. In 1931 Bro. Wollseifer of the Beagle Bay Mission added *Pseudechis australis* to the list; in 1960 J. Reid added *Fordonia leucobalia* and *Acalyptophis peronii*; in 1962 K. Male added *Cyclorana longipes*; in 1967-8 A. Halton

added *Varanus gouldii*, *Ramphotyphlops grypus* and *Astrotia stokesii*; and in 1977 B. L. Anderson added *Vermicella approximans*. In 1960 *Vermicella minima* was described on the basis of a specimen collected at Broome by M. Ward.

In 1968 W. H. Butler obtained a specimen of *Aipysurus apraefrontalis* at Broome. In mid-1971 he carried out a faunal survey of the Coulomb Point Reserve for the Department of Fisheries and Wildlife, during which seven species were added to the Peninsula list: *Litoria rothii*, *Rhynchoedura ornata*, *Cryptoblepharus carnabyi*, *Lerista apoda*, *L. separanda* (the holotype remains unique), *Varanus brevicauda* and *Liasis olivaceus*. Two years later he collected a *Denisonia punctata* on the same reserve.

R. E. and Christine Johnstone collected on the Peninsula in June 1974, adding to the list *Litoria rubella* and *Ramphotyphlops diversus*.

In April 1977 the combined Department of Fisheries and Wildlife and Western Australian Museum expedition concentrated their work in the wetter northern third of the Peninsula and were rewarded with the first specimens of *Delma tinctoria*, *Chelosania brunnea*, *Carlia rufilata*, *Morethia storri*, *Varanus scalaris*, *V. tristis*, *Dendrelaphis punctulatus* and *Demansia olivacea*. In August and September 1978 and in June 1981 the Department of Fisheries and Wildlife returned to the Peninsula and added three more species to the list: *Carlia foliorum*, *Lerista griffini* and *Notoscincus ornatus*.

In February 1980 M. J. Tyler, M. Davies and A. A. Martin collected frogs along the main road between Broome and Derby, among which were the first specimens of *Uperoleia aspera* and *U. mjobergi* from the Peninsula. In October 1981 A. E. Greer led a field-trip to the Dampier Peninsula; I am grateful to Dr Greer for a list of the specimens collected there, which included *Vermicella semifasciata*.

ANNOTATED SPECIES LIST

AMPHIBIA

LEPTODACTYLIDAE Ground Frogs

Cyclorana australis (Gray)

Common and widespread, mainly in *Melaleuca* and *Tristania* swamps.

Cyclorana longipes Tyler & Martin

On the Dampier Peninsula this widespread Kimberley species has only been collected near Broome and on the Roebuck Plains.

Limnodynastes ornatus (Gray)

Eight specimens were collected in April 1977 between Coulomb Point and Cape Bertholet, mainly in swamps and swampy watercourses vegetated with *Melaleuca* and sedges. The Mjöberg Expedition collected one at Streeters Station.

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Notaden nichollsi Parker

Occurring in the southern half of the Peninsula, north to Coulomb Point.

Uperoleia aspera Tyler, Davies & Martin

Recorded from the southern half of the Peninsula, north to Coulomb Point.

Uperoleia mjobergi (Andersson)

One record: a specimen collected in February 1980 by M. J. Tyler *et al.* at 83 km ENE of Broome.

HYLIDAE Tree Frogs

Litoria caerulea (White)

Widespread and plentiful, mainly in swamps and watercourses vegetated with *Melaleuca*, *Tristania* and sedges, but also in seasonally dry *Melaleuca* thickets along inland foot of white coastal dunes.

Litoria rothii (DeVis)

Only known from the northern half of the Peninsula (south to Coulomb Point). Occurring in *Tristania* swamps and in seasonally dry *Melaleuca* thickets fringing claypans.

Litoria rubella (Gray)

Widespread, mainly in swamps vegetated with *Tristania*, *Melaleuca* and sedges.

REPTILIA

CHELONIIDAE Marine Turtles

Caretta caretta (Linnaeus)

Dahl (1926) observed a dead Loggerhead on the beach at Hill Station (now Waterbank).

Chelonia mydas (Linnaeus)

The Western Australian Museum has six specimens of Green Turtle from Broome and one from the Lacepede Islands. The Bardi people at One Arm Point, Cygnet Bay, attempted to farm these turtles in the early 1970s.

GEKKONIDAE Geckos

Diplodactylus ciliaris Boulenger

Common near coast, mainly in the *Melaleuca*, *Acacia* and vine thickets growing along the inland foot of dunes, and also in the dodder-infested stunted *Melaleuca* of the dunes themselves.

Diplodactylus conspicillatus Lucas & Frost

The only record of this predominantly arid zone species is the two specimens collected at Broome in 1911 (Lönnerberg & Andersson, 1913).

Diplodactylus stenodactylus Boulenger

This widespread tropical gecko has been collected throughout the Peninsula on a variety of substrates: coastal white sands, pindan red sands, and rocks.

Diplodactylus taeniatus (Lönnerberg & Andersson)

Only known from the vicinity of Broome, which is apparently close to the northern limit of this arid zone gecko.

Gehyra australis Gray

Found in small numbers throughout the Peninsula. It was collected in *Melaleuca* thickets and, as in other parts of the Kimberley, in buildings.

Gehyra pilbara Mitchell

Plentiful and widespread on the Peninsula. This terrestrial gecko was found on the white sands of coastal dunes, the grey sands of *Melaleuca* thickets, and the red sands of the pindan.

Heteronotia binoei (Gray)

Plentiful throughout the Peninsula on a wide variety of substrates.

Oedura rhombifera Gray

So far this arboreal gecko has only been found in the far south of the Peninsula: 7 specimens from Broome and one from Waterbank.

Rhynchoedura ornata Günther

The only record is a specimen collected at Coulomb Point in 1971.

PYGOPODIDAE Legless Lizards

Delma tinctoria DeVis

Two records: specimens collected near Pender Bay and Coulomb Point, both in *Acacia-Eucalyptus* woodland on grey sandy loam.

Lialis burtonis Gray

Widespread and moderately plentiful on the Peninsula, mainly in and near coastal dunes.

AGAMIDAE Dragon Lizards

Amphibolurus gilberti gilberti (Gray)

Common throughout the Peninsula. Judging from the number of specimens in the Western Australian Museum this is the most abundant agamid on the Peninsula. It is found in all well-wooded habitats: pindan, acacia thickets in coastal dunes, vine thickets (*Ficus*, *Celtis*, *Melaleuca* etc.), creek-side thickets, *Melaleuca* swamps, mangal, and town gardens (Broome).

Amphibolurus inermis (DeVis)

Common in the southern half of the Peninsula, but no records from north of Cape Bertholet.

Amphibolurus isolepis isolepis (Fischer)

The only record is a specimen collected at Broome in 1929 (Loveridge, 1934). This lizard is abundant further south and southeast in arid South-west Kimberley, e.g. at Lagrange and the Edgar Ranges.

Amphibolurus minor mitchelli Badham

Widespread and plentiful, both in the pindan country of the south of the Peninsula and in the Woollybutt woodland (*Eucalyptus miniata*) of the north.

Chelosania brunnea Gray

There are only two records of this species of the northern semiarid and subhumid zones. The first specimen was caught at night in the topmost boughs of a tall acacia in *Acacia-Melaleuca* woodland at Martins Well in April 1977. The second was found dead on a track through pindan near Cape Boileau in September 1978.

Chlamydosaurus kingii Gray

Only recorded from the northern two-thirds of the Peninsula (south to lat. 17°30'S). Uncommon.

Diporiphora pindan Storr

Plentiful and widespread, mostly in pindan.

SCINCIDAE Skinks

Carlia foliorum (DeVis)

Common throughout the Peninsula.

Carlia rufilatus Storr

Two specimens were collected near Coulomb Point in April 1977: one in an *Acacia-Melaleuca* thicket, the other in creek-side vegetation.

Cryptoblepharus carnabyi Storr

Throughout the Peninsula in about the same numbers as *C. plagiocephalus*, mostly in *Acacia* and *Melaleuca* thickets.

Cryptoblepharus plagiocephalus (Cocteau)

Moderately common throughout the Peninsula, mainly in pindan and *Melaleuca* thickets.

Ctenotus colletti colletti (Boulenger)

One specimen (the holotype) was collected by K. Dahl at Roebuck Bay; another was collected in April 1977 in the red sandy soil of a creek bed 26 km south of Beagle Bay Mission. Otherwise this rare skink is only known from Lagrange.

Ctenotus inornatus (Gray)

Plentiful throughout the Peninsula in a wide variety of habitats: pindan, *Eucalyptus* (Woollybutt-Bloodwood) forest, *Acacia-Melaleuca* thicket, *Tristania* swamp and *Melaleuca* swamp.

Ctenotus pantherinus ocellifer (Boulenger)

The only record is the holotype of *ocellifer*, which came from "Roebuck Bay". There is little habitat on the Peninsula for this spinifex-loving skink.

[*Egernia kintorei* Stirling & Zietz

The holotype of *E. dahl* (a synonym of *E. kintorei*) was labelled "Roebuck Bay", but it is doubtful whether this desert skink occurs on the Peninsula. We know of no suitable habitat nearer than ca 100 km to the southeast (the northwestern corner of the Great Sandy Desert).]

Lerista apoda Storr

Common in the northern half of the Peninsula, south to Coulomb Point, mainly in leaf litter beneath scrubby vegetation. Endemic to the Dampier Peninsula.

Lerista bipes (Fischer)

Common in the southern half of the Peninsula (north to Coulomb Point), mainly in or near coastal dunes.

Lerista griffini Storr

Common throughout the Peninsula, usually in well-wooded sandy country.

Lerista separanda Storr

This Dampier Peninsula endemic is known from a single specimen collected near Coulomb Point in winter 1971. It was found under a mangrove log among bushes of *Crotalaria cunninghamii* growing at the foot of a coastal dune.

[*Lerista walkeri* (Boulenger)

One of the type specimens of this skink was said to come from Roebuck Bay, but as all the specimens in the Western Australian Museum were collected in subhumid northwest Kimberley (Storr, 1976), its occurrence on Dampier Peninsula needs confirming.]

Menetia greyii Gray

This widespread skink is evidently uncommon on the Peninsula.

[*Morethia ruficauda ruficauda* (Lucas & Frost)

Storr (1972) listed two specimens from Broome, but their provenance is doubtful. This skink is certainly present further south at Lagrange.]

Morethia storri Greer

Moderately common in the northern half of the Peninsula, south to Coulomb Point. It favours leaf litter beneath vine scrubs and other dense vegetation.

Notoscincus ornatus wotjulum (Glauert)

One record: a specimen collected in *Eucalyptus-Acacia* woodland on grey sandy loam near Pender Bay in June 1981.

Proablepharus tenuis (Broom)

Only known from the southern quarter of the Peninsula, where it is moderately common.

Sphenomorphus isolepis (Boulenger)

Common throughout the Peninsula, mainly in deep leaf litter beneath dense vegetation such as vine scrubs, *Melaleuca* thickets at inland foot of coastal dunes, *Tristania* swamps, and thickets along creeks.

Tiliqua multifasciata Sternfeld

Moderately common throughout the Peninsula.

Tiliqua scincoides (Shaw)

Occurring throughout the Peninsula. About as plentiful as *T. multifasciata*.

VARANIDAE Monitors

Varanus acanthurus Boulenger

Recorded on the Peninsula only in the vicinity of Broome.

Varanus brevicauda Boulenger

Three specimens were collected by W. H. Butler at Coulomb Point.

Varanus gouldii (Gray)

Probably more plentiful than the few specimens and observations would suggest; most visits to the Peninsula have been made in winter when the animals are inactive. A specimen from 24 km north of Broome has the bright coloration of the desert variant described by Mertens as *V. g. flavirufus*. A specimen from further north at Martins Well has the dark coloration characterizing the populations of subhumid northwest Kimberley.

Varanus scalaris Mertens

Three records from the north of the Peninsula: the holotype (collected at Beagle Bay), a specimen from open grassy *Acacia-Melaleuca* at Martins Well in April 1977, and a specimen from *Eucalyptus-Acacia* woodland near Beagle Bay in September 1978.

Varanus tristis tristis (Schlegel)

Widespread on the Peninsula but seldom collected.

TYPHLOPIDAE **Blind Snakes**

Ramphotyphlops diversus diversus (Waite)

Widespread on the Peninsula but seldom collected.

Ramphotyphlops grypus (Waite)

Two records: single specimens from Broome in the Western Australian Museum and National Museum of Victoria.

BOIDAE **Pythons**

Aspidites melanocephalus (Krefft)

Although there are only two formal records (single specimens collected at Broome and 20 km NNE of Broome), this snake could be common in the pindan of the south of the Peninsula. In late 1895 Dahl frequently found them and another species of python in warrens of the rat-kangaroo *Bettongia lesueur*, on which they preyed. One of us (R.E.J.) saw several on the highway between Broome and Roebuck Plains during the evening of 21 April 1976 after a light shower, and N.L. McKenzie saw one on 20 August 1979 in a low open-woodland of *Acacia eriopoda* pindan 15 km NNE of Broome.

Liasis "childreni" Gray

Moderately common. Dahl's observations of "*Python molurus*" in *Bettongia* warrens possibly refer to this species.

Liasis mackloti Duméril & Bibron

The only record is a specimen from Broome.

Liasis olivaceus olivaceus Gray

The only records are single specimens from Coulomb Point and Martins Well.

COLUBRIDAE **Fangless and Rear-fanged Snakes**

Dendrelaphis punctulatus (Gray)

Confined to the northern half of the Peninsula (south to Cape Bertholet). Found in dense vegetation, e.g. vine scrub (*Celtis*, *Ficus*, *Terminalia* etc.) and *Melaleuca* thicket.

Fordonia leucobalia (Schlegel)

Only collected at Cape Leveque and Broome, but probably common on all sheltered coasts.

ELAPIDAE **Front-fanged Snakes**

Demansia olivacea olivacea (Gray)

Widespread and moderately common on the Peninsula.

Denisonia punctata Boulenger

Only one record for the Peninsula, a specimen collected at Coulomb Point in July 1973.

Furina ornata (Gray)

Widespread, but uncommon, on the Peninsula.

Pseudechis australis (Gray)

This widespread and abundant snake has surprisingly been collected only twice on the Peninsula: at Beagle Bay and 10 km west of One Arm Point.

Pseudonaja nuchalis Günther

Evidently much more plentiful on the Peninsula than *Pseudechis australis*. There are 14 specimens in the Western Australian Museum and one in the Museum of Comparative Zoology (Loveridge, 1934).

Vermicella anomala (Sternfeld)

One record: a specimen from Broome in the National Museum of Victoria (Storr, 1967).

Vermicella approximans (Glauert)

This snake of the western arid zone of Western Australia probably only reaches the far south of the Peninsula. The sole record is a specimen collected at Broome in March 1977.

Vermicella minima (Worrell)

This snake was removed by Storr (1979) from the synonymy of *V. anomala*. It is only known from two specimens collected on the Peninsula, namely the holotype, which was collected at Broome, and a specimen found in September 1978 at a freshwater swamp 4 km SE of Coulomb Point.

Vermicella semifasciata roperi (Kinghorn)

One record: a specimen collected by A.E. Greer (pers. comm.) in October 1981 under tin in the Broome rubbish tip.

HYDROPHIIDAE **Sea Snakes**

Acalyptophis peronii (Duméril)

Commonly collected at Broome and in adjacent seas (including a specimen trawled in 57 m of water 110 km W of Broome).

Aipysurus apraefrontalis M.A. Smith

One record: a specimen collected at Broome in February 1965.

Aipysurus eydouxii (Gray)

The Western Australian Museum and the Museum of Comparative Zoology each has a specimen from Broome.

Aipysurus laevis laevis Lacépède

Judging from the number of specimens in collections, this is the commonest sea snake around Broome (it has been trawled up to 110 km W of the town and in seas up to 80 m deep).

Astrotia stokesii (Gray)

Two records: a specimen collected at Coulomb Point and another at Broome.

Ephalophis greyii M.A. Smith

The Western Australian Museum has three specimens from Broome and one from Beagle Bay. The British Museum has the holotype from Cape Boileau. The Broome specimen of "*Lapemis hardwickii*" in the Museum of Comparative Zoology was actually an *E. greyii* (L.A. Smith, 1974: 108).

Hydrelaps darwiniensis Boulenger

There are five specimens from Broome in the Western Australian Museum and one in the Mjöberg collection.

Hydrophis kingii Boulenger

Lönnberg & Andersson (1913) examined a specimen from Broome.

CROCODYLIDAE Crocodiles

Crocodylus porosus Schneider

At least one estuarine crocodile has wandered down the west coast of the Peninsula to Beagle Bay; a large specimen was shot there ca 1976 (D. Hembree, pers. comm.)

DISCUSSION

The herpetofauna of the Dampier Peninsula comprises 14 families, 47 genera and 78 species. Although further collecting will undoubtedly add several more species to the list, the fauna is clearly depauperate. The causes of this poverty are twofold. First there is the partial insularity of the area. This especially affects the north of the Peninsula, which is isolated by King Sound from similar country to the northeast. Second there is a decided lack of environmental diversity: fresh water, spinifex grasslands, heavy soils and rocks are scarce on the Peninsula, and the soils are overwhelmingly dominated by sands and sandy loams.

Three species are endemic to the Peninsula, namely the skinks *Lerista apoda* and *L. separanda* and the elapid snake *Vermicella minima*; and another two taxa are almost endemic, namely the agamid lizard *Diporophora pindan* and the skink *Ctenotus c. colletti*. Of the remaining 64 land and freshwater species, 51 are widespread or extend from the Kimberley south to at least the Pilbara.

Twenty-two species and subspecies are northern taxa at or near their southern limit in Western Australia, viz. the frogs *Limnodynastes ornatus*, *Uperoleia aspera*, *Uperoleia mjobergi*, *Litoria caerulea* and *L. rothii*, the geckos *Gehyra australis* and *Oedura rhombifera*, the agamids *Chelosania brunnea* and *Chlamydosaurus kingii*, the skinks *Carlia rufilatus*, *Ctenotus inornatus*, *Lerista griffini*, *Morethia storri*, *Notoscincus ornatus wotjulum*, *Proablepharus tenuis* and *Tiliqua scincoides*, the monitor *Varanus scalaris*, and the snakes *Ramphotyphlops d. diversus*, *Liasis mackloti*, *L. o.*

olivaceus, *Dendrelaphis punctulatus*, *Demansia olivacea olivacea* and *Vermicella semifasciata roperi*. Five of these taxa are confined to the far north of the Peninsula, namely *Chelosania brunnea*, *Morethia storri*, *Notoscincus ornatus wotjulum*, *Varanus scalaris* and *Dendrelaphis punctulatus*.

Eight species and subspecies are arid zone taxa close to their northern limit, viz. the frog *Notaden nichollsi*, the gecko *Diplodactylus taeniatus*, the skinks *Ctenotus pantherinus ocellifer* and *Lerista bipes*, the monitor *Varanus brevicauda*, and the snakes *Ramphotyphlops grypus*, *Vermicella anomala* and *V. approximans*.

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PART VII INSECTS

by D. H. Colless¹

INTRODUCTION

The systematic collection of insects in the Kimberley area has a slim history, summarised by Common (1981). I report here on additional collections made during 16 to 29 April, 1977, in the general vicinity of the sites described by McKenzie and Kenneally (this publication). The methods used were much the same as those described by Common (op. cit.), the principal exception being the extensive use of Malaise traps, which are especially effective for the capture of Diptera and Hymenoptera. Sweeping was scarcely possible, due to grass seeds, except in very limited areas such as samphire and blossom.

The environments of the Peninsula are described elsewhere in this publication. The moister habitats associated with beaches, streams, etc., were naturally the most productive; but attempts were made to give at least some attention to all major types of habitat: open-forest and scrub; grasses, foliage and blossom; the moist margins of rivers and ponds; mangrove flats and orchards; beaches and dunes; and the vine forest sometimes found behind the dunes. Major attention was given to the Diptera, but substantial catches were made of other groups. However, some of the latter are not dealt with here, due to dispersal of collections before appropriate specialists became available.

DIPTERA

Catches are reported in Table 1. Considering the season, when the fauna could be expected to be at its peak, diversity seemed rather low. The number of species taken, which represents (at a guess) no more than half those occurring in the area, is comparable with that recorded for the McArthur River area of the Northern Territory during the dry season. The reason lies, no doubt, in the monotonous terrain and rather uniform vegetation, as well as the relatively arid nature of the area surveyed. It may be noted that 12 out of 38 families in Table 1 comprise mostly species that, as larvae, require free water or at least moist soil.

I note below the salient features of collections in a selection of families:

- (1) Tipulidae. Includes 2 species in an undetermined genus, one known only from Drysdale River, the other not at all.
- (2) Scatopsidae. A single species of *Colbostema*, possibly new.
- (3) Mycetophilidae. Two species of *Orfelia* (*Xenoplatyura*), typical of the arid tropics.
- (4) Ceratopogonidae ('biting midges' or 'sandflies'). All but one species innocuous to man. The exception, *Styloconops spinosifrons* Carter, is a well-known pest on beaches and sand-flats near high-tide level.

- (5) Culicidae (mosquitoes). Predominantly the widespread pest *Aedes vigilax* (Skuse), which breeds in pools behind the tidal zone. Other records: *Anopheles hilli* Woodhill & Lee, *Culex annulirostris* Skuse, *C. starckeae* Stone & Knight, *C. 'Normanton sp.'*, *Aedes tremula* (Theobald), *A. elchoensis* Taylor, and *A. britteni* Marks & Hodgkin.
- (6) Chironomidae. The catch includes an attractive, apparently new species of *Polypedilum*.

TABLE 1
DIPTERA (PINNED SPECIMENS) COLLECTED AT
DAMPIER PENINSULA, APRIL 1977

Family	Species (approx.)	Speci- mens
Tipulidae.....	5	36
Psychodidae.....	2	14
Cecidomyiidae.....	11	18
Scatopsidae.....	1	12
Sciaridae.....	2	3
Mycetophilidae.....	2	9
Ceratopogonidae	4	numerous, in spirit
Culicidae.....	8	42
Chironomidae.....	10	51
Tabanidae.....	6	18
Nemestrinidae	1	1
Bombyliidae.....	32	95
Asilidae.....	8	37
Therevidae.....	3	8
Scenopinidae.....	2	2
Empididae.....	6	70
Dolichopodidae.....	14	79
Phoridae.....	7	14
Pipunculidae.....	3	7
Syrphidae.....	1	1
Platystomatidae.....	5	53
Tephritidae.....	2	3
Sepsidae.....	1	19
Lauxaniidae.....	4	18
Sphaeroceridae.....	3	34
Lonchaeidae.....	3	5
Agromyzidae.....	3	8
Fergusoninidae.....	1	2
Ephydriidae.....	20	71
Drosophilidae.....	3	59
Milichiidae.....	1	1
Tethinidae.....	6	186
Canaceidae.....	5	45
Chloropidae.....	28	144
Muscidae.....	12	94
Calliphoridae.....	8	42
Sarcophagidae.....	10	48
Tachinidae.....	31	106
Undetermined family.....	1	1
Total	275	1456

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- (7) Tabanidae ('March flies'). *Cydistomyia ?germanica* (Ricardo) was a common, irritating pest in the Cape Coulomb area. Also taken: *Tabanus townsvilli* Ricardo, *T. wyndhamensis* Mackerras, *T. ?cinerescens* Macleay, *Cydistomyia caesia* (Walker), and *C. ?pseudocallosa* (Ferguson & Hill).
- (8) Nemestrinidae. A single specimen of the rather rare *Atriadops javana* Wiedemann.
- (9) Bombyliidae. Well represented, by a fauna of the kind to be expected in dry tropical woodland. Included genera: *Ligyra* (*bombylifformis* (Macleay), *punctipennis* (Macquart), *?burnsi* (Paramonov)), *Exoprosopa*, *Villa*, *Bombylius*, *Systoechus*, *Dischistus*, *Comptosia*, *Docidomyia*, *Cyrtomorpha*, *Cyrtosia*, *Geron*.
- (10) Asilidae (robber flies). An inexplicably small fauna, especially notable for its single species of *Ommatius* (usually much better represented in tropical areas). 3 specimens were taken of the magnificent wasp-mimic *Chrysopogon crabroniformis* Reed. Other species fell in *Bathypogon* and *Neoratus*.
- (11) Therevidae. Again, an inexplicably small fauna encountered.
- (12) Empididae. The expected fauna of small Tachydrominae (5 species) and 1 species of *Syneches*.
- (13) Dolichopodidae. A substantial fauna, taken mainly on margins of streams and ponds. Genera recorded: *Paraclius*, *Thinophilus*, *Hydrophorus*, *Diaphorus*, *Sciapus*, *Condylostylus*, and *Mesorhaga*.
- (14) Syrphidae (hover flies). Represented by a single specimen, sighted not captured. I have never known the family so rare in the tropics.
- (15) Platystomatidae. A normal fauna: *Rivellia* sp., *Duomyia tomentosa* Hendel, *D. ?foliata* McAlpine, *D. sp. nov.*, and *Euprosopia remota* McAlpine. If correctly identified, the latter constitutes the first record outside N.S.W.
- (16) Tephritidae (fruit flies). Trapping with the usual lures yielded only two specimens of *Dacus newmanni* (Perkins). Also taken was a specimen of an undescribed trypetine genus.
- (17) Sepsidae. *Australosepsis niveipennis* (Becker) only, no doubt breeding in cow dung.
- (18) Ephydriidae. Many species, especially prevalent along margins of bodies of water. Identified: *Gymnopiella paucula* Cresson, *Ochthera ?pilimana* Becker, *Zeros defectus* (Malloch), *Hecamede persimilis* Hendel, *Hecamoides hepaticus* (Meijere), *H. ?tarsalis* (Meijere).
- (19) Drosophilidae. Predominantly *Leucophenga albofasciata* (Macquart) and '*Drosophila*' *poecilothorax* Malloch; also *Cacoxenus perspicax* (Knab).
- (20) Tethinidae. The relatively large fauna (all unidentified) reflects the prevalence of beach and sand-flat, the typical habitat for the family.
- (21) Canaceidae. Similar in habits to the preceding. Species noted: *Trichocanace atra* Wirth, *Chaetocanace biseta* (Hendel), *C. sp. ?nov.*, *?Canace sp.*, *Xanthocanace sp. ?nov.*

- (22) Muscidae. The expected fauna, including *Musca vetustissima* Walker, the bush fly, and *Haemotobia exigua* (Meijere), the buffalo fly. Also recorded: *Musca terraereginae* Johnston & Bancroft, *M. ventrosa* Wiedemann, one species each of *Limnophora* and *Atherigona*, and a notable fauna of six species of *Lispe*. Bush fly activity was very low, perhaps due to the observed activity of introduced dung beetles.
- (23) Calliphoridae (blow flies). *Chrysomya megacephala* (Fabr.) extremely (and predictably) common on carrion; *C. saffranae* (Bigot) and four species of Rhininae also present. Two species of Ameniinae—*Amenia dubitalis* Malloch and *Paraplatytropesa rieki* Paramonov are recorded for the first time in W.A.

LEPIDOPTERA (by Dr. I. F. B. Common)

The specimens collected are listed in Table 2. In the main they belong to species that are widely distributed in the drier parts of northern Australia, and have been represented in previous collections from the north. However, when detailed work is done upon some of the more obscure groups, interesting species and distribution records may well emerge. The single species of *Amata* (Ctenuchidae) is probably undescribed and was not previously represented in the ANIC.

TABLE 2
LEPIDOPTERA COLLECTED AT DAMPIER
PENINSULA, APRIL 1977

Family	Number of Species	Number of Specimens
Tortricidae.....	11	22
Choreutidae.....	1	2
Tineidae.....	15	39
Lyonetiidae.....	1	1
Gracillariidae.....	2	2
Yponomeutidae.....	1	1
Stathmopodidae.....	5	17
Oecophoridae.....	9	62
Ethmiidae.....	2	5
Lecithoceridae.....	1	1
Cosmopterigidae.....	22	58
Xyloryctidae.....	1	3
Gelechiidae.....	16	47
Pyalidae.....	24	49
Papilionidae.....	1	1
Pieridae.....	2	2
Nymphalidae.....	1	1
Lycaenidae.....	2	3
Geometridae.....	1	1
Sphingidae.....	1	1
Arctiidae.....	2	4
Ctenuchidae.....	1	1
Nolidae.....	1	1
Noctuidae.....	4	4
Total.....	127	328

TABLE 3.

ORTHOPTEROIDS COLLECTED AT DAMPIER
PENINSULA, APRIL 1977

Taxon	Number of Species	Number of Spec- imens
BLATTODEA:		
<i>Cosmozosteria zonata</i> (Walker).....	1	2
<i>Calolampra</i> sp.....	1	2
<i>Ellipsoidion</i> sp.....	1	1
Other Blattellidae.....	1	3
MANTODEA:		
<i>Paraoxyphilus</i> sp.....	1	3
<i>Cliomantis</i> sp.....	1	1
<i>Bolbe</i> sp.....	1	1
<i>Orthodera</i> sp.....	1	2
<i>Sphodropoda mjobergi</i> Sjöst.....	1	1
<i>Sphodropoda</i> sp.....	1	1
Genus nov. "3" sp.....	1	3
<i>Archimantis monstrosa</i> Wood- Mason.....	1	1
DERMAPTERA:	1	2
ORTHOPTERA:		
Gryllacrididae—.....	1	3
Tettigoniidae—		
<i>Polichne</i> sp.....	1	3
Other Phaneropterinae.....	3	5
Conocephalinae.....	1	2
Gryllidae—.....	8	11
Gryllotalpidae—.....	1	1
Eumastacidae—		
<i>Geckomima</i> sp.....	1	7
Acrididae—		
<i>Rectitropis</i> sp.....	1	1
<i>Desertaria longirugosa</i> Sjöst.....	1	1
<i>Pardillana limbata</i> (Stål).....	1	2
<i>Goniaea vocans</i> (Fabr.).....	1	5
Genus nov. "57" sp. 1.....	1	2
<i>Stenocatantops angustifrons</i> (Walk.).....	1	2
<i>Austracris guttulosa</i> (Walk.).....	1	1
<i>Chortoicetes terminifera</i> (Walk.)...	1	2
<i>Aiolopus thalassinus</i> (Fabr.).....	1	3
<i>Pycnostictus seriatus</i> Sauss.....	1	2
<i>Caledia captiva</i> (Walk.).....	1	2
Tetrigidae—		
<i>Paratettix nigrescens</i> Sjöst.....	1	1
<i>P. histricus</i> Stål.....	1	4
PHASMATODEA:		
<i>Eurycnema goliath</i> (Gray).....	1	1
<i>Anophelepis</i> sp.....	1	1
Total	44	85

ORTHOPTEROID INSECTS (by J. Balderson)

The specimens collected are listed in Table 3. On the whole they are typical of northern Australia, but the collection is small and non-comprehensive, so little more can be said about the fauna as a whole. However, the Mantodea are interesting and later study may show the presence of one or two new species. There are also some interesting distributional records in the Acridoidea. *Caledia captiva* is generally regarded as more typical of far northern and eastern Australia. The *Rectitropis* sp. is typically a more northern species, and this seems to be its most southerly record. Similarly, the record of *Stenocatantops angustifrons* considerably enlarges its known range.

PART VIII

CONCLUSIONS AND RECOMMENDATIONS

by N. L. McKenzie¹

RELEVANCE TO CONSERVATION

The Phanerozoic South-west Kimberley is the north-western corner of the Canning Basin, most of which is occupied by the reddish sand dunes and swales of the Great Sandy Desert. Compared with the rest of the Canning Basin, the South-west Kimberley district is well-watered, receiving an annual average rainfall of 400 to 800 mm during a predictable rainy season.

Unlike the Edgar Ranges Area, discussed by McKenzie and Kenneally (1981), the Dampier Peninsula is one of the highest rainfall areas in the district. This is reflected in both its floral and faunal communities, which have a greater proportion of sub-humid tropical species, and in the generally more subdued topography of the sandy surfaces that dominate its landscape. Generally wetter conditions during the Holocene are thought to have eroded the dunefields leaving extensive red sandplains and, especially in northern parts of the Peninsula, allowed organification and a degree of soil development.

It is the dominance, continuity, and variety of these sandy plains that distinguish the Dampier Peninsula from other well-watered areas of the South-west Kimberley. Sand surfaces of the central South-west Kimberley are dissected by major river systems and include substantial areas of a variety of heavy alluvial soil surfaces. They are also interrupted by limestone and sedimentary ranges each mantled in and surrounded by areas of their derived soils. The Dampier Peninsula is basically a continuous, but heterogeneous, sandplain. Coastal environments and, rarely, rock outcrops provide only minor relief except in the Mount Jowlaenga area.

Well-watered tropical sandplain environments do not occur elsewhere in Western Australia. Their peculiar array of vegetations, known collectively as "pindan", is unique to the South-west Kimberley although most of the component species are widespread across tropical Australia (see McKenzie and Kenneally, this publication, p. 15).

There are only four conservation reserves in the South-west Kimberley—each of these conserves one or two relatively restricted environments rather than the widespread surface types of the district. The Coulomb Point Nature Reserve (28 300 ha) on the Dampier Peninsula comes closest to representing the "typical rather than the special" by including extensive areas of well watered communities on through-drained sandplains and, to a lesser extent, light alluvial soils, as well as small areas of four different coastal environments: samphire and grasslands on supratidal mudflats, estuarine low forests of paperbarks, coastal sand dunes and vine thickets. However, as currently outlined, it includes neither tidal mudflats nor mangroves because the reserve does not extend to low water mark.

The other three conservation reserves (Tunnel Creek, Winjana Gorge and Geikie Gorge National Parks) have a total area of only 5 361 hectares and are restricted to the attractive limestone Oscar and Napier Ranges on the inland northern edge of the district (see Fig. 1 in McKenzie and Kenneally, this publication).

To improve the coverage of South-west Kimberley environments by conservation reserves, a large (807 000 ha) nature reserve has already been proposed in the vicinity of the Edgar Ranges, on the dry, southern, inland margin of the district (McKenzie 1981b). Dry country versions of communities on heavy alluvial soil surfaces and river frontage surfaces are included in the proposed Edgar Ranges Nature Reserve (McKenzie 1981b, p.68), but only as relatively small areas. Unfortunately, it is not possible to propose reserves to represent the well-watered versions of communities growing on these surfaces (Gilgai soils, black soils, etc.) even though they are widespread in central and northern areas of the South-west Kimberley (Crowe, Towner and Gibson 1978); desirable as cattle pasture, they are entirely included within pastoral leases.

A different situation exists for the other main category of South-west Kimberley surface—sandplains and dunefields. Because communities of these sandy surfaces are less suitable for cattle grazing, large tracts along the drier southern edge of the district remain as vacant Crown land and are represented in the proposed Edgar Ranges Nature Reserve. Although the well-watered versions of sandplain communities in central and northern areas of the South-west Kimberley are all held by pastoral stations, a substantial area still occurs as vacant Crown land on the Dampier Peninsula. In fact, some of the most luxuriant forms of pindan occur in the vacant Crown land on the northern end of the Peninsula. Beard (1979) did not map these pindan areas, expressed as open-forests of *Eucalyptus miniata*, on the northern end of the Peninsula.

This pattern of land tenure also makes additional reserves on the Dampier Peninsula essential for the conservation of adequate areas of other communities typical of the South-west Kimberley. Examples include coastal communities such as vine thickets, grassed mudflats and mangroves.

WILDLIFE RESOURCES

Speck, Wright and Rutherford (1964) distinguish twenty-eight distinct land systems (topographically related groups of surfaces mapped by the C.S.I.R.O. Division of Land Research) in the Phanerozoic South-west Kimberley (Canning Basin section of the South Kimberley). Seven of these occur on the Dampier Peninsula (see Table 1) although only one is confined to it.

Sandplains belonging to the Yeeda Land System are the most widespread surfaces on the Dampier Peninsula (Table 1). They support an array of pindan vegetations. In the southern half of the Peninsula these range from

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TABLE 1.
ESTIMATED COVERAGE OF DAMPIER PENINSULA
ENVIRONMENTS BY THE PROPOSED AND
EXISTING CONSERVATION RESERVES
(taken to the low tide line)

LAND SYSTEM Community Types	Area (ha) on Peninsula	Percent of Peninsula	Area (ha) on Peninsula's Proposed and Existing Nature Reserves					Per cent for Reservation
			Coulomb Point	Borda	Cygnat Bay	Leveque	Total	
CARPENTARIA	140 800	9.7	1 127	3 861	1 642	784	7 414	5.3
Coastal Dune			376	1 920	354	440	3 090	
Vine Thicket, Forest			43	461	22	118	644	
Mangal			107	472	740	140	1 459	
Mud Flat			579	590	526	86	1 781	
<i>Melaleuca acacioides</i>			22	182	0	0	204	
Ribbon Grass Swamp			0	0	0	0	0	
Limestone			0	236	0	0	236	
WANGANUT	485 500	33.2	27 220	896	1 979	129	30 224	6.2
Pindan (scrub to low open- woodland)			26 850	0	0	0	26 850	
Pindan (woodland)			30	893	1 919	119	2 961	
Fresh-water Creeks			330	0	60	10	400	
Claypans/swamps			10	3	0	0	13	
Dunefield			0	0	0	0	0	
YEEDA	705 500	48.2	50	7 543	10 228	97	17 918	2.5
Pindan (scrub to low open- woodland)			*0	0	0	0	*0	
Pindan (open-forest to woodland)			0	7 543	10 228	97	17 868	
Claypans/swamps			50	0	0	0	50	
REEVES	39 780	2.7	0	2	1 956	0	1 958	4.9
Rocky Outcrop			0	2	1 956	0	1 958	
LOWANGAN	10 550	0.7	0	0	0	0	0	0
FRAZER	66 570	4.6	0	0	0	0	0	0
LULUIGUI	13 800	0.9	0	0	0	0	0	0
TOTALS	1 462 500	100	28 397	12 302	15 805	1 010	57 514	3.9

*Patches are included in the north-western corner of the proposed Edgar Ranges Nature Reserve and occur on higher country between drainage floors in the Coulomb Point Nature Reserve. On the Dampier Peninsula these have not been mapped by ground traverses, and are not distinguishable by air photo interpretation from Wanganut equivalents.

tall shrublands predominantly of *Acacia* spp. especially *A. eriopoda*, along with scattered *Lysiphyllum cunninghamii* and eucalypts such as *Eucalyptus tectifica*. In northern parts of the Peninsula they support woodlands of *Eucalyptus tectifica* and *E. polycarpa* in a mosaic with open-forests of *E. miniata*; these alliances are well represented in the proposed Borda and Cygnet Bay Nature Reserves (Table 1; Figure 1).

Yeeda surfaces elsewhere in the South-west Kimberley support a variety of vegetation alliances (Speck *et al.* 1964, p. 67; Speck and Lazarides 1964), such as pindan over *Plectrachne* (Beard 1979), as well as the more typical forms (such as those on the Dampier Peninsula) that have a herbaceous layer dominated by tussock grasses.

While Yeeda surfaces are widespread in the proposed Edgar Ranges Nature Reserve, their communities are generally different from those on the Dampier Peninsula. Although sandplain communities in the extreme north-western corner of the proposed Edgar Ranges Nature Reserve are similar in structure to those widespread in southern areas of the Dampier Peninsula, comparison of site "P2" in the Edgar Ranges proposal (McKenzie and Kenneally 1981, p. 24) with descriptions in McKenzie and Kenneally (this publication, p. 16) highlights their floristic differences.

The lower-lying sandy alluvial plains of the Wanganut Land System are also important on the Dampier Peninsula (Table 1). These dominate the Coulomb Point Nature Reserve. In southern parts of the Peninsula, including the Coulomb Point Nature Reserve, they support low open-woodland to scrub pindans dominated by *Canarium australianum*, *Gyrocarpus americanus* and *Acacia* species such as *A. eriopoda*, *A. monticola* and *A. tumida* although scattered *Eucalyptus papuana* and *E. tectifica* also occur. Towards the north end of the Peninsula, the distinction between plains vegetations of the Wanganut and Yeeda Systems becomes more apparent, the former supporting woodlands of *Eucalyptus polycarpa*, *E. papuana* and *Melaleuca viridiflora* over *Pandanus*. Such woodlands are well developed in the proposed Borda Nature Reserve near Cape Borda and Martin's Well, and near Cygnet Bay in the proposed Cygnet Bay Nature Reserve.

Sandy drainage channels on broad drainage floors of the Wanganut System are particularly well represented in the Coulomb Point Nature Reserve. They support well developed fringing woodlands of River Gums and paperbarks (*Melaleuca viridifolia*). Scattered through the lowest levels of this system are shallow seasonal swamps with *Tristania grandiflora* and *Melaleuca acacioides* forming low woodlands; five of these were noted in the Coulomb Point Nature Reserve, another was sampled near Cape Borda in the proposed Borda Nature Reserve.

Although Wanganut communities are widespread south-east of Derby, they are not represented on the Edgar Ranges proposal and do not occur in the three National Parks. Dunefields belonging to the Wanganut System are extensively developed in south-eastern areas of the Peninsula (Speck *et al.* 1964); these only occur in pastoral leases and are unavailable for conservation.

The Carpentaria Land System (Table 1) is coastal and usually occurs between the Wanganut System and the ocean. It includes tidal mudflats and mangrove communities, supratidal saline soils with halophytic

vegetation such as samphires and *Sporobolus* grassland, *Melaleuca acacioides* low forests as fringing communities along the landward edge of mudflats and the estuarine sections of creeks and rivers, coastal sand dune and beach systems up to seven kilometres long supporting shrublands of *Crotalaria cunninghamii* and *Spinifex* grasslands, and vine thickets to vine forests variably developed at the landward foot of the coastal dunes. South-east of both Pender and Beagle Bays were small areas of sandy bottom-land supporting seasonally inundated "Ribbon-grass" grasslands with occasional paperbark trees.

The Carpentaria Land System is well developed in the South-west Kimberley and adequately represented on the Peninsula (Table 1). However, the Coulomb Point Nature Reserve includes only one extensive area of beach and coastal dunes, two creek mouths fringed with *Melaleuca acacioides* low forest, one narrow strip of fire damaged vine thicket, one area of mudflat with patches of samphire and *Sporobolus* grassland and, provided the reserve can be extended to the low tide line, two small areas of mangrove.

These Carpentaria communities are also found in the vacant Crown land at the north end of the Peninsula (Table 1): samphire and *Sporobolus* on mudflats, coastal sand dunes, vine thickets and mangroves are particularly well developed in the proposed Borda Nature Reserve (between Packer Island and Pender Bay). Areas of coastal sand dune and vine thickets also occur just south of Cape Leveque. Mangroves and beach communities are well developed in embayments between rocky headlands from Cunningham Point north to Cygnet Bay (proposed Cygnet Bay Nature Reserve).

Although coastal limestones are not listed by Specht *et al.* (1964), Gibson (this publication) discusses the distribution of limestone outcrops on the Peninsula. Packer Island is a limestone surface and is included in the proposed Borda Nature Reserve. Its vegetation is different from communities on more extensive areas of exposed coastal limestones noted on Waterbank Pastoral Lease, near Willie Creek, at the south end of the Peninsula.

Outcrops of the underlying Cretaceous to ?Tertiary sedimentary strata are uncommon on the Dampier Peninsula and belong to the Reeves Land System (Speck *et al.* 1964, p. 40). This Land System is restricted to the Dampier Peninsula. The largest exposures of these sedimentary rocks are the Broome and Melligo Sandstone hills of the station country near Dampier Hill, in the south-eastern section of the Peninsula. Although these outcrops are unavailable for conservation purposes, another extensive area of exposed Broome and Melligo Sandstone extends into the vacant Crown land—between Cygnet Bay and Cunningham Point—on the north-eastern side of the Peninsula (Table 1). Its vegetation is a shrubland and hummock grassland with elements more typical of the North Kimberley. Due to climatic trends, the vegetation of the sandstone outcrops near Cygnet Bay is much more luxuriant than, and different floristically from, that sampled in the Dampier Hill area.

Relatively small outcrops of Cretaceous sandstones occur elsewhere on the Peninsula (Gibson, this publication). Broome Sandstone outcrops intermittently as coastal platforms and cliffs along the western side of the Peninsula and at Cunningham Point in the proposed Cygnet Bay Nature Reserve. Emeriou Sandstone is exposed in north-western parts of the Peninsula as three



FIGURE 1: Boundaries of the Nature Reserves proposed on the Dampier Peninsula.

distinct but small outcrops in the Beagle Bay Aboriginal Reserve (Reserve No. 1834). These are unavailable for nature reservation; the vegetation of this surface has not been sampled.

A minute area (less than 2 ha) of Borda Sandstone is exposed on a slope above the coastal platform of Broome Sandstone at Cape Borda. The only known outcrop, it is included in the proposed Borda Nature Reserve. Associated are several small fresh-water soaks. A small area of ? Tertiary laterite is exposed in the hinterland.

The sandstone outcrops of the Reeves Land System are only available for conservation in coastal and near-coastal situations. Communities of the associated drainage channels, sandplains, and sandy outcrop plains (Speck *et al.* 1964 p. 40) cannot be conserved under the

current pattern of land tenure because they are well developed only in the Mount Jowlaenga area. Unfortunately, the same situation is true of the three remaining land systems represented on the Peninsula—Lowangan, Frazer and Luluigui (Table 1)—all of which occur in the Mount Jowlaenga area.

The 311 species of plant (including 283 flowering plants) recorded on the Peninsula includes both Torresian (sub-humid Kimberley) and desert species many of which are either near the southern or at the northern limits of their known ranges in Western Australia. In this context the Torresian species *Pavetta granitica*, *Mimusops elengi*, *Diospyros ferrea* var. *humilis* and *Gyrocarpus americanus* and the arid zone species *Codonocarpus continifolius* and *Didymotheca tepperi* are relevant. The

flora of the Dampier Peninsula has a much greater proportion of Torresian species than that of the proposed Edgar Ranges Nature Reserve. Of particular biogeographical significance in this context are the semi-deciduous vine thicket to vine forest communities. These relict, outlying communities belong to the continuum of monsoon forest that stretches across the humid north of Australia. They are depauperate in Indo-Malesian species, even when compared with their North-west Kimberley counterparts, and reflect a wetter era on the Peninsula.

The fauna of the Peninsula is also mainly Torresian with a smaller proportion of desert species. Thirty-three species of native mammal have been recorded on the Dampier Peninsula since European settlement. Only three of these are arid zone species (Boodie, Rabbit-eared Bandicoot and Red Kangaroo); 18 are Torresian (including the Sugar Glider, Agile Wallaby, Arnhemland Long-eared Bat, Northern Blossom Bat, and Golden-backed Tree-Rat). Even though the extant mammal fauna of the Peninsula, and of the South-west Kimberley generally, has declined in its species richness since European settlement (McKenzie 1981a), available data on habitat requirements indicates that 13 of the Peninsula's mammal species would not have occurred in the proposed Edgar Ranges Nature Reserve even at first European settlement. Conversely, three of the species recorded in the Edgar Ranges proposal are unlikely to occur on the Peninsula; two desert species (Lesser Hairy-footed Dunnart and Sandy Inland Mouse) and one with a wider distribution (*Petrogale penicillata*).

Suitable habitat for all native mammal species known to persist today on the Dampier Peninsula is present in at least one of the reserves or proposed reserves.

The bird list from the Dampier Peninsula comprises 214 species. Much of this richness is due to the array of Carpentaria (coastal) habitats and other relatively restricted habitats such as watercourses and fresh-water swamps. Sixty-eight species were recorded as more common in pindan formations than in the other community-types. Twelve of these were more common in, or restricted to, eucalyptus pindans (woodlands to open forests) and vine thickets to vine forests at the northern end of the Peninsula (examples include Red-crowned Fruit Pigeon and Chestnut-breasted Mannikin).

One hundred and four of the bird species recorded from the Peninsula were not recorded in the Edgar Ranges proposal; most of these are Torresian and/or coastal species. In contrast, 11 of the bird species recorded on the Edgar Ranges proposal were not recorded on the Peninsula; nine of these are arid zone species (for example: Princess Parrot, Spinifex Bird, White-fronted Honeyeater).

Sixty-nine species of reptile and nine species of amphibia have been recorded on the Peninsula. Three species are endemic—the skinks *Lerista apoda* and *L. separanda* and the snake *Vermicella minima*. Only eight of the above are arid zone species; 22 are at their southern limits on the Peninsula although more than half of the herpetofauna is considered to be Torresian. Five of the Torresian species are confined to the far north of the Peninsula.

Considering how poorly the insects of the Kimberley are known it is not surprising that many of the 440 odd species collected are considered rare in collections, are new records for Western Australia, or are new records for the South-west Kimberley.

RESERVE DESIGN CONSIDERATIONS

The vacant Crown land on the northern end of the Dampier Peninsula (Figure 1) is currently used as open range for cattle by the Lombadina Aboriginal Community. To this end a number of watering points (bores), yards and tracks have been installed. Clearly, the community depends on these facilities and the pasture for much of its income.

In the context of conservation of South-west Kimberley environments, the ideal reserve on the north end of the Peninsula would occupy the entire area of vacant Crown land. However, to avoid prejudicing the pastoral pursuits of the Lombadina community, three smaller areas were selected to exclude tracks, bores and the major part of the pasture yet, at the same time, to represent the biological richness of the northern end of the Peninsula as far as possible.

During consideration of public submissions relating to the proposed Kimberley reserve system, the Conservation Through Reserves Committee arranged a meeting between a representative of the Department of Fisheries and Wildlife and representatives of:

- (i) the Aboriginal Lands Trust,
- (ii) the Aboriginal Legal Service (representing the Kimberley Land Council),
- (iii) the Department of Aboriginal Affairs.

The Lombadina issue was discussed at this meeting; the boundaries of the three proposed nature reserves in the vacant Crown land on the northern end of the Dampier Peninsula (Figure 1, originally produced for C.T.R.C. 1977 and E.P.A. 1980) were presented and received general approval provided that access by Aborigines to sacred sites was guaranteed (A. A. Burbidge, pers. comm.).

In view of the importance of the proposed reserve system on the Peninsula in representing coastal environments of the South-west Kimberley—

- (i) The conservation areas existing and outlined in Figure 1 need to extend to low water mark so that mangroves and tidal mud flats are included. The papers in this publication show that much of the richness of the Peninsula comes from species dependent on these littoral areas.
- (ii) Substantial areas of coastal dunes, vine thickets to forests and paperbark fringes need to be reserved and, importantly (considering the fire history of the area), duplicated.

These requirements explain the peculiar outline of the proposed Cygnet Bay Nature Reserve and the small area of the proposal near Cape Leveque, compared with the more manageable design of the proposed Borda Nature Reserve (Figure 1).

RECOMMENDATIONS

In addition to the Coulomb Point Nature Reserve (Reserve No. A29983), **three conservation reserves are proposed on the Dampier Peninsula—the Borda Nature Reserve (12 302 ha), the Cygnet Bay Nature Reserve (15 805 ha) and the Leveque Nature Reserve (1 010 ha).** These are delineated in Figure 1; **all should extend to the low tide line.**

The three proposed nature reserves were selected from the only remaining area of vacant Crown land in well-watered areas of the South-west Kimberley. They are

the minimum possible requirement. Together with the Coulomb Point Nature Reserve, they total only 3.9 per cent of the Peninsula's land surface yet represent most of its biological richness.

All three proposed reserves are essential if:

- (i) the array of coastal communities in the South-west Kimberley are to be represented in conservation reserves with some degree of duplication to allow for their characteristic occurrence as small patches.
- (ii) the more luxuriant forms of pindan communities are to be conserved; these are otherwise unavailable for conservation purposes.
- (iii) well watered communities on Phanerozoic sandstones, and any representation at all of the coastal limestones, of the South-west Kimberley are to be conserved.

It is therefore recommended that they all be declared "A Class".

The Coulomb Point Nature Reserve represents other versions of pindan that are unavailable for reservation elsewhere in the district.

Because of the fragmentary nature and small sizes of the proposed conservation reserves on the Dampier Peninsula, and their importance in representing relatively fragile communities under intense grazing pressure by cattle and regularly burnt to create green feed, it is recommended that they be protected from increased public access and usage by being **declared Nature Reserves** rather than national parks, and **vested in the Western Australian Wildlife Authority.**

They should remain **open to Aboriginal usage for traditional purposes such as ceremonial use of sacred sites.** Existing access routes to oyster and pearl licence

areas (Figure 1) should also be guaranteed; should any of these licences be surrendered, consideration should be given to including their dry land and littoral areas in the adjacent reserve.

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