

(approximately 1 km away) indicating that there may be more plants of *C. ficifolia* in the area.

Given that *C. ficifolia* is thought to be a relic from a past wetter climate, it is not surprising that this species occurs in the Stirling Range, 100 km north of its main distribution. The local climate around the ranges is cooler and wetter than surrounding areas due to the orographic effects of the high peaks. Indeed 143 plant species are known to reach their inland limit in the Stirling Range due to the cooler wetter climate while 87 species are known to be endemic, most of these being closely related to species from the wetter regions of the south west (Keighery and Beard 1993, Keighery 1993). Interestingly the population of *C. ficifolia* in the Stirling range occurs on quite different soils from the other two populations indicating that climatic rather than edaphic factors are possibly driving its

distribution (cf. Wardell-Johnson & Coates 1996).

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BIRDS OF THE GARDNER AND DENISON RANGES, AND LAKE WILLISON AREA SOUTH-EAST KIMBERLEY, WESTERN AUSTRALIA

By K. H. COATE
21 Acanthus Road, Willleton WA 6155
R. E. JOHNSTONE
Western Australian Museum, Francis Street, Perth WA 6000
and G. A. LODGE
Kona Lakeside, Lakeview Drive, PO Box 52, Kununurra WA 6743

SUMMARY

This paper is based mainly on data gathered during visits to the Gardner and Denison Ranges in June-July 1975, August-September 1993, April 1994, July 1995, May 1997, September-October 1997 and May 1998. A total of 155 species of bird were recorded during these visits many of which are an important extension of known range. Additional data have also been collated from the literature and other sources. Conservation recommendations are made.

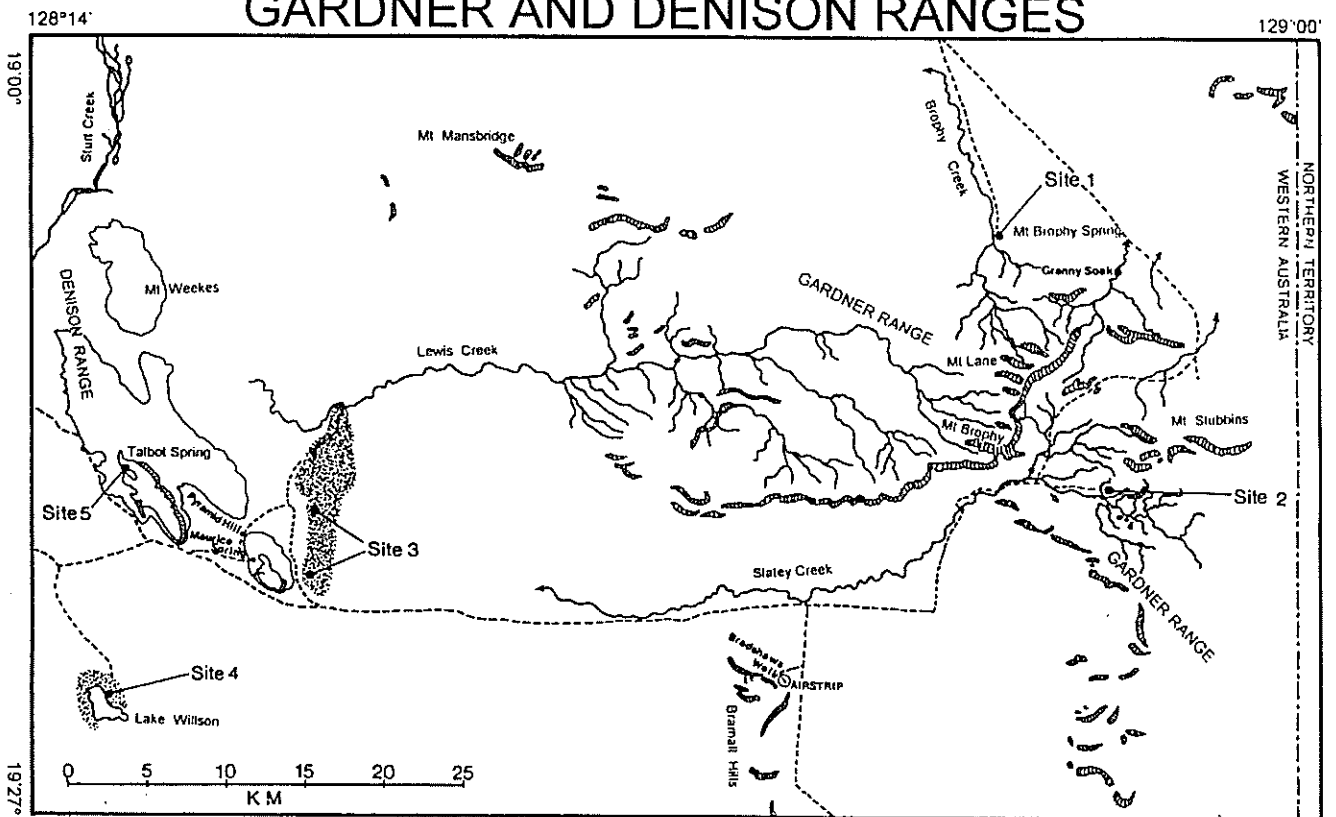
INTRODUCTION

The Gardner Range (19°15'S, 128°52'E) (Figure 1) lies near the Western Australian-Northern Territory border, about 190 km SE of Halls Creek in close proximity to the Tanami Desert. The Denison Range (19°17'S, 128°18'E) is to the west of the Gardner Range and about 10 km E of Sturt Creek homestead. Lake Willison (19°22'S, 128°16'E) is situated about 10 km S

of the Denison Range and about 25 km SE of Sturt Creek homestead.

The first exploration of the area was carried out in 1900 by A. A. Davidson for the Central Australian Exploring Syndicate Ltd, which was formed to explore and prospect an area of 8,000 square miles in the central portion of the Northern Territory (Davidson 1905). R. T. Maurice visited the area during his exploration in 1902 from Fowler Bay in South Australia to Cambridge Gulf in the Kimberley and noted parrots, cockatoos, quail and fresh Emu tracks near Slatey Creek (Maurice 1904). The Gardner Range was named after F. L. Gardner, Chairman of the syndicate and was misspelt for many years, appearing on some maps as "Gardiners Rangers". The Denison Range was named in 1955 after Denison Downs Station (the original name of Sturt Creek Station), by P. Nelligan following his surveys of the area. Lake Willison was named during the

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1966 army field check, after Sapper B. H. Willson, a member of the survey team.

The Gardner and Denison Ranges are composed mostly of Proterozoic sandstones surrounded by flat to gently undulating sandplain. The sandplains are dissected by drainage channels and scattered rocky outcrops and hills. The Gardner Range rises to a maximum of 690 m above sea level whereas the Denison Range rises no more than 429 m at its highest point. Although semi-arid there is a considerable amount of surface water at springs, soaks and rockholes along Slatey, soaks and Lewis Creeks. Good permanent water can be obtained from Mt Brophy Spring at the northern end of the Gardner Range and at Talbot and Maurice Springs in the Denison Range. Lake Willson seldom dries completely and according to station people in the vicinity, can flood out for 1–2 km from the shoreline in a good season.

Nothing was known of the avifauna of the area before June–July 1975 when naturalist W. H. Butler visited the region collecting specimens for the Western Australian Museum (Butler 1977). Sixty-seven species of bird were recorded during this survey. No further work was carried out until we began visiting the area in 1993. Lodge visited Mt Brophy Spring and Lake Willson areas from 18–22 August and 4–9 September 1993 and compiled data on breeding species. Lodge again visited Mt Brophy Spring from 10–16 April 1994. From the 3–11 July 1995

Lodge and Coate visited all the sites and compiled extensive bird notes. They returned again from 14–19 July 1997 visiting most areas including Maurice Spring and Bradshaw's Well in the Bramall Hills. More recently Johnstone and Lodge visited most sites from 29 September to 4 October 1997 and K.H. Coate visited all sites including Granny Soak from 4–11 May 1998. Additional information has also been extracted from the G. M. Storr-R. E. Johnstone, Western Australian bird data base. For the purpose of this paper we recognise five major habitat types and study sites (see Figure 1); they are briefly described below.

Site 1: Mt Brophy Spring (19°06'39"S, 128°49'08")

Situated in close proximity to Brophy Creek at the northern end of the Gardner Range and about 13 kms from the old and now disused Tanami Track. The spring is surrounded by *Eucalyptus camaldulensis*, dense stands of *Acacia neurocarpa* and *Melaleuca nervosa crosslandiana* trees. Away from the spring is an open woodland with Snappy Gum (*Eucalyptus brevifolia*), bloodwood (*Corymbia* sp.), *Acacia corticea sericophylla*, *Melaleuca nervosa crosslandiana* and hummock grass (*Triodia* sp.). On rocky sandstone slopes leading toward Mt Brophy, the vegetation consists of scattered *Corymbia pachycarpa pachycarpa* to 4 m. high, a small mallee (*Eucalyptus odontoarpa*), various *Acacia* sp. (including *Acacia orthocarpa*) *Grewillea wickhamii*, *Grewillea refracta* and hummock grass (*Triodia* sp.). In

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the gullies are a mixture of *Acacia neurocarpa*, *Acacia coleii* var. *coleii*, *Melaleuca nervosa crosslandiana*, *Corymbia pachycarpa pachycarpa* and *Eucalyptus aspera*.

In 1995 after good seasons, many species of small mammal were seen. Active mounds of Pebble-mound Mice (*Pseudomys* sp.), previously unknown to be in the area, were found (19°07'12.0"S, 128°50'02"E) over rocky hills.

Site 2: Slatery Creek within the Gardner Range (19°15'43"S, 128°52'58"E)

This study area consists of a semi permanent waterhole lined with *Eucalyptus camaldulensis*, *Melaleuca nervosa crosslandiana*, and *Acacia neurocarpa*, which is surrounded by steep rocky hills covered in hummock grass (*Triodia* sp.) with a few sparse Snappy Gum (*Eucalyptus brevifolia*). Permanent water can be obtained from a large rockhole near the site of a former mineral exploration camp. Along the creek where the valley broadens out, are a number of pockets, where vegetation is quite dense with *Melaleuca nervosa crosslandiana*, a number of *Acacia* spp., *Eucalyptus aspera* and *Gastrolobium grandiflorum*. In July 1995, there was abundant water in pools and rockholes along the creek. Through the ranges in the vicinity are several rough and eroded drilling tracks.

Site 3: Lewis Creek Floodout (19°18'40"S, 128°24'19"E and 19°16'45"S, 128°24'05"E). Created when the creek floods out over a large sandplain. Stands of good sized mature *Eucalyptus victrix* trees with plenty of

hollows are scattered over both lakes. A sometimes dense cover of perennial Spiny Mudgrass (*Pseudoraphis spinescens*) with occasional small patches of *Nymphoides indica* float on the surface. In shallow water around the lakes edge a fresh water algae (*Chara* sp.) is abundant. On 9 July 1995 and 16 May 1997 the overall depth of water was no more than about 1 metre. Prior to May 1997 it appeared from water marks on trees that the water level had remained at about 2 metres for some time. From the age and position of old Eurasian Coot (*Fulica atra*) nests, we estimated water level to have peaked toward the end of March in 1997.

On both visits cattle (*Bos taurus*) were wandering in and around the floodout area.

Site 4: Lake Willson (19°22'31"S, 128°16'54"E)

A dense grassland of *Eragrostis desertorum* growing to a height of about 50 cm surrounds the lake and extends out into *Melaleuca glomerata* woodlands. On the northern and eastern fringes of the lake are extensive stands of *Melaleuca glomerata*, ranging from small to about 7 m. *Aburilon otocarpum* and *Sesbania cannabina* are plentiful in the grassland. Around the southern side *Halosarcia indica leiostachya* is common. Away from the lake, in depressions flooded when the lake overfills, are thickets of multi-stemmed *Melaleuca glomerata*, growing to a height of about 3 metres. A small white barked *Eucalyptus* sp. is also

sometimes associated with these depressions.

Lodges visits to Lake Willson in 1993 and 1994 followed good seasons. The lake far exceeded its normal boundaries, attracting spectacular numbers of water-fowl. Large harvester termite mounds (*Nasutitermes* sp.) that had collapsed well away from the usual lake edge, provided nesting platforms for Black-winged Stilt (*Himantopus himantopus*), Masked Lapwing (*Vanellus miles*) and Black Swan (*Cygnus atratus*). When Lodge and Coate visited in 1995, the water had receded back from the vegetation. After a visit in October 1996, the manager of Sturt Creek Station, Mervyn Worley, found Lake Willson to be almost dry. Exceptionally heavy rainfall in 1997 had however, refilled the lake to a slightly higher level than the 1995 visit.

Many thousands of Little Red Flying-fox (*Pteropus scapulatus*) were colonising a dense area of partly submerged *Melaleuca glomerata*, during Lodge's visit in August 1993. On all visits Dingoes (*Canis lupus dingoi*), feral Horses (*Equus caballus*) and Donkeys (*Equus asinus*) were recorded and in May 1998 a single Camel (*Camelus dromedarius*).

Site 5: Talbot Spring and areas to the south and south-east, following the Denison Range (19°14'20"S, 128°17'20"E).

Talbot Spring is located in a small gorge, the entrance of which is fenced off to prevent cattle wandering in and damaging the water supply. *Eucalyptus aspera* and Rock Fig (*Ficus platypoda*) grow near the source of the spring. Palms (*Livistona* sp.) at one time were the dominant plant species in the gorge, but were used locally for construction of stockyards and buildings and no longer occur there. Maurice Spring at the southern end of the Denison Range has many similarities to Talbot Spring, and at one time according to anecdotal evidence from local people, was also heavily vegetated with the palm (*Livistona* sp.). Until 1977 both Talbot and Maurice Springs were shown on maps as Palm Spring.

Within the gorge is some ancient Aboriginal rock art. Outside the entrance to the gorge, two small dams have been built across the spring. Fed creek, and are surrounded by densely growing young *Eucalyptus camaldulensis*, *Acacia neurocarpa* and *Acacia coleii* var. *coleii*.

CLIMATE

Temperature

Sturt Creek Station does not keep temperature records. The nearest station is Halls Creek, more than 150 kms to the north-west of the study area. These have been included only as a guide.

Mean Maximum Temperatures

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Annual |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| Mean Max: | 36.9 | 35.8 | 35.6 | 33.8 | 29.9 | 27.3 | 27.1 | 29.9 | 33.8 | 37.1 | 38.4 | 38.2 | 33.6 |
| Highest | 44.0 | 43.3 | 42.2 | 39.4 | 36.9 | 33.8 | 34.1 | 36.6 | 39.5 | 43.8 | 45.0 | 44.9 | 45.0 |
| Lowest | 22.3 | 23.3 | 21.3 | 19.7 | 13.4 | 12.4 | 11.4 | 14.6 | 18.4 | 23.1 | 19.4 | 19.4 | 11.4 |

Rainfall

The area is semi arid desert and has an average rainfall of 372 mm. The nearest rainfall station to the Gardner and Denison Ranges is Sturt Creek Station, and while statistics from there are helpful, they can only be used as a guide. Anecdotal data suggest that tropical storms occurring in the Gardner Range have at times filled Lewis and Slaley Creeks while no rain was recorded at Sturt Creek Station.

Monthly Rainfall Records 1974-1997

The following data is based on rainfall records for Sturt Creek Station from the Bureau of Meteorology over a 23 year period (to end 1997).

| YEAR | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total |
|---------|-------|-------|-------|-------|------|------|------|-----|------|-------|------|-------|-------|
| 1974-75 | 0.4 | 100.4 | 121.0 | 122.6 | 0.0 | 0.0 | 0.0 | 3.6 | 89.8 | 21.6 | 50.0 | 50.6 | 560.0 |
| 1975-76 | 125.6 | 80.2 | 18.8 | 3.0 | 0.0 | 7.2 | 7.2 | 0.4 | 22.6 | 109.8 | 50.6 | 121.6 | 547.2 |
| 1976-77 | N/R | 326.4 | 37.4 | N/R | N/R | 0.0 | 0.0 | 0.0 | 3.4 | 14.6 | 7.2 | 17.0 | 406.0 |
| 1977-78 | 273.0 | 58.4 | 8.0 | 0.4 | 58.6 | N/R | N/R | 0.0 | N/R | 3.0 | 16.0 | 101.8 | 519.2 |
| 1978-79 | 129.6 | 24.8 | 101.8 | 0.4 | 64.8 | 91.0 | 76.8 | 4.0 | 3.0 | 0.0 | 0.0 | 23.0 | 519.2 |
| 1979-80 | 45.2 | 138.0 | 16.2 | 30.8 | 0.0 | 2.0 | 0.0 | 0.0 | 2.6 | 0.0 | 13.4 | 35.8 | 284.0 |
| 1980-81 | 170.2 | 250.4 | 18.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.2 | 0.0 | 54.4 | 530.0 |
| 1981-82 | 197.0 | 355.0 | 281.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 4.0 | 46.0 | 81.6 | 970.9 |
| 1982-83 | 9.0 | 56.0 | 169.0 | 140.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.0 | 34.0 | 36.2 | 461.2 |
| 1983-84 | 232.0 | N/R | 299.0 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 556.0 |
| 1984-85 | 37.0 | 37.0 | 21.0 | 42.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50.5 | 0.0 | 18.0 | 8.6 | 214.1 |
| 1985-86 | 251.6 | 64.5 | 31.1 | 6.0 | 0.0 | 23.0 | 0.0 | 0.0 | 0.0 | 7.0 | 22.5 | 28.0 | 433.7 |
| 1986-87 | 92.8 | 73.8 | 8.0 | 0.0 | 0.0 | 52.0 | N/R | N/R | N/R | N/R | N/R | N/R | 226.6 |
| 1987-88 | 37.5 | 35.0 | 49.1 | 1.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50.6 | 88.8 | 276.0 |
| 1988-89 | 9.2 | 20.2 | 219.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 0.5 | 86.8 | 106.3 | 445.4 |
| 1989-90 | 4.2 | 37.1 | 19.0 | 14.4 | N/R | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.2 | 80.9 |
| 1990-91 | 485.1 | N/R | N/R | N/R | N/R | N/R | N/R | N/R | N/R | N/R | 0.0 | N/R | 80.9 |
| 1991-92 | 52.2 | 43.8 | 9.0 | 4.8 | 40.0 | N/R | N/R | N/R | N/R | N/R | 34.0 | 41.2 | 225.0 |
| 1992-93 | 149.6 | 629.8 | 12.4 | 0.0 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 803.8 |
| 1993-94 | N/R | N/R | N/R | N/R | N/R | N/R | N/R | 0.0 | N/R | 0.0 | N/R | 142.6 | 142.6 |

| | | | | | | | | | | | | | |
|---------|-------|-------|-------|------|-----|-----|-----|-----|-----|------|------|-------|-------|
| 1994-95 | 94.1 | 288.4 | N/R | N/R | N/R | N/R | N/R | N/R | N/R | N/R | 15.5 | N/3 | 398.0 |
| 1995-96 | N/R | 42.4 | 109.0 | 58.8 | 6.0 | N/R | N/R | N/R | N/R | 8.0 | 50.2 | 60.6 | 335.0 |
| 1996-97 | 176.2 | 222.6 | 0.0 | N/R | N/R | N/R | N/R | N/R | N/R | 24.0 | 0.0 | 214.2 | 637.0 |

N/R = indicates that no records were sent to the Bureau of Meteorology for that month.

Summary of Total Monthly Precipitation using available data between 1899 and 1997

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Annual |
|---------|-------|-------|-------|-------|-------|-------|------|------|------|-------|-------|-------|--------|
| Average | 102.0 | 102.8 | 53.7 | 18.2 | 10.7 | 8.0 | 6.1 | 1.9 | 3.6 | 10.1 | 22.3 | 59.6 | 371.8 |
| Highest | 485.1 | 629.8 | 338.8 | 224.0 | 140.0 | 103.1 | 76.8 | 42.5 | 89.8 | 109.8 | 150.9 | 292.4 | 920.5 |
| Lowest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 101.7 |

Summary of Rain Days using available data between 1899 and 1997

| | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Annual |
|---------|-----|-----|-----|-----|-----|------|------|-----|------|-----|-----|-----|--------|
| Average | 6.7 | 6.6 | 3.8 | 1.1 | 1.2 | 0.6 | 0.5 | 0.2 | 0.4 | 1.1 | 2.5 | 4.7 | 28.5 |
| Highest | 24 | 20 | 15 | 8 | 10 | 5 | 9 | 3 | 6 | 7 | 10 | 15 | 66 |
| Lowest | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10 |

ANNOTATED SPECIES LIST

CASUARIIDAE

Lewis Creek floodout on 4 October 1997.

Emu Dromaius novaehollandiae

Moderately common, usually in ones and twos. Favouring sandy areas at Brophy Spring, Lewis Creek floodout and around Lake Willison. Adult with chick 1 m high at Lewis Creek floodout on 4 October 1997 and 7 adults and 4 juveniles at Lake Willison in May 1998.

ANATIDAE

Maggie Goose

Anseranus semipalmata
Ten in dense cover of *Halosarcia indica* at the southern end of Lake Willison on 14 May 1997. Probably only a rare visitor to Lake Willison (and nearby Lake Gregory) when filled.

PHASIANIDAE

Plumed Whistling Duck

Dendrocygna eytoni

Brown Quail *Coturnix ypsilophora australis*
Moderately common to common throughout the region in ones, twos and small groups (up to 6). Adults with small young at Brophy Spring and Lake Willison in September 1993 and a recently used nest with broken eggs at

Common. About 500 including groups of juveniles at the Lewis Creek floodout in May 1997 and small flocks (up to 10) in October 1997; 30 in small groups around Lake Willison in May 1997 and flocks of 60 and 200 near mouth of Slaley Creek (Lake Willison) in October 1997.

Wandering Whistling Duck
Dendrocygna arcuata
 Common. About 200 including some juveniles at Lewis Creek floodout in May 1997 and flocks of 7-60 recorded at Lake Willson in 1997.

Black Swan *Cygnus atratus*
 Common in pairs and small groups (up to 22) and less frequently larger groups (up to 200). Recorded at the Lewis Creek floodout and Lake Willson. Small numbers breeding in April, May and June.

Australian Wood Duck
Chenonetta jubata
 Scarce. Small flocks (up to 20) recorded on Lewis Creek floodout and Lake Willson in July 1995, May and October 1997 and May 1998.

Grey Teal *Anas gracilis*
 Very common at Lake Willson and Lewis Creek floodout in small flocks (up to 40) and larger aggregations (up to 1000) in August 1993, April 1994, July 1995 and May 1997. Much less frequent (largest group 40) at these sites in October 1997. Also small groups at pools on Brophy Creek. At Lake Willson favoured the shoreline and drainage creeks. Adult with 8 small ducklings at Lake Willson in August 1993 and nest with eggs in hollow of eucalypt in Lewis Creek Floodout May 1997.

Pacific Black Duck
Anas superciliosa
 Moderately common in pairs and flocks (up to 200). Recorded at Lake Willson, Lewis Creek

floodout and pools on Brophy Creek.

Pink-eared Duck *Malacorhynchus membranaceus*

Very common at Lake Willson (thousands breeding) in August 1993, September 1993 and April 1994; common, about 500 on the lake in May 1997 and less frequent in small flocks (up to 50) in October 1997. Also moderately common in small flocks (up to 20) at the Lewis Creek floodout in May 1997. Many nests at Lake Willson were built on old disused Eurasian Coot (*Fulica atra*) nests in forks of *Melaleuca glomerata* trees about a metre above the water and several were in tree hollows.

Hardhead *Aythya australis*

Moderately common to common at Lake Willson and Lewis Creek floodout. Mainly in small flocks (up to 40). Most frequent at Lake Willson in May 1997 with about 2000 in small loose groups scattered around the lake. Adult with 7 small ducklings at Lewis Creek floodout in May 1997.

PODICIPEDIDAE

Australasian Grebe *Tachybaptus novaehollandiae*

Common at Lake Willson usually in small groups (up to 18), occasionally large groups (up to 200) on all visits; 13 at Lewis Creek floodout in May 1997 and 2 on Brophy Creek in May 1997.

Hoary-headed Grebe *Poliocephalus poliocephalus*

Scarce. Four at Lake Willson on 14 May and one on 4 October 1997.

Great Crested Grebe *Podiceps cristatus australis*

Scarce to moderately common, only recorded at Lake Willson. Several adults and two nests, one with 3 eggs, in April 1994; a flock of 25 circled at the lake several times before landing and dispersing in July 1995; 3 on the lake in May 1997 and 69 in May 1998.

ANHINGIDAE

Darter *Anhinga melanogaster novaehollandiae*

Common at Lake Willson during flood years, August 1993 and April 1994 and at Lewis Creek floodout in May 1997; less frequent during other visits. Also recorded at pools on Slatey Creek. Breeding (at all stages) at Lake Willson in April 1994; at several locations there were hundreds of nests; especially on the west side in thick stands of *Melaleuca glomerata* and occasionally in company of Little Black Cormorants. Breeding also at Lewis Creek floodout in May 1997.

PHALACROCORACIDAE

Great Cormorant *Phalacrocorax carbo novaehollandiae*

Scarce. Small numbers at Lake Willson in April 1994. Two nests both with 5 eggs found in a solitary *Melaleuca glomerata* tree in deep water near a large colony of Little Black Cormorant *Phalacrocorax sulcirostris*.

Pied Cormorant *Phalacrocorax varius*

Scarce, only recorded at Lake Willson. About 50 on 16 April 1994 and 12 including one sitting on a nest and several about to nest on 14 May 1997.

Little Black Cormorant *Phalacrocorax sulcirostris*

Common to very common at flooded Lake Willson in 1993, 1994, 1995 and May 1997; a flock of 20 at Talbot Spring on 13 July 1995; 50-60 nests (with almost mature young) at Lewis Creek floodout in May 1997; and 4 at same place on 3 October 1997. Thousands breeding at Lake Willson in *Melaleuca glomerata* and dead *Acacia neurocarpa* trees in August 1993 (most nests empty, some with large young); April 1994 (breeding at all stages); and May 1997 about 150 nests ranging from eggs to half grown young.

Little Pied Cormorant *Phalacrocorax melanoleucos*

Common to very common at flooded Lake Willson in August 1993 and April 1994; moderately common at Lake Willson and Lewis Creek floodout in July 1995 and May 1997; one at pool on Brophy Creek on 18 May 1997; 13 at Lewis Creek floodout on 3 October 1997, and 3 at Lake Willson on 4 October 1997. Breeding in thousands at Lake Willson in August 1993 (most nests empty, some with large young), at all stages in April 1994; and 20-30 nests, 4 with small young at Lewis Creek floodout in May 1997.

PELECANIDAE

Australian Pelican *Pelecanus conspicillatus*

Moderately common (up to 45) at Lake Willson in August, September 1993, April 1994 and May 1998, less frequent on other visits; also 8 at Lewis Creek floodout in July 1995.

floodout; 4 in July 1995, 30 in May 1997 and 100 in October 1997; also 6 at Lake Willson in October 1997.

ARDEIDAE

White-necked Heron *Ardea pacifica*

Moderately common. Mainly ones and twos occasionally small groups (up to 15). Recorded at Brophy Springs, pools on Slatery Creek, Lewis Creek floodout and Lake Willson. Breeding in small numbers at Lewis Creek floodout in May (nests with large young) and October 1997 (nests with eggs and hatchlings).

Cattle Egret *Ardea ibis*
Uncommon. A flock of 25 at Lewis Creek floodout in May 1997, 10 or 12 in October 1997 and 3 at Lake Willson in May 1998.

Rufous Night Heron *Nycticorax caledonicus hilli*

Uncommon to common. Ones and twos at Brophy Spring, at pools on Slatery Creek, at Lewis Creek floodout and Lake Willson. One eating a fresh water crab *Holduiscana* sp. in a recently dried up pool, in the middle of the day, in July 1995. Breeding in April 1994 at Lake Willson (nests with eggs and chicks) in *Melaleuca glomerata* on west side of lake.

THRESKIORNITHIDAE

Glossy Ibis *Plegadis falcinellus*

Great Egret *Ardea alba*
Moderately common at Lake Willson (70 in May 1997) and Lewis Creek floodout (25 in May 1997) in wet years, less frequent (mainly ones and twos) in October 1997. Nest with 3 eggs and one with small young at Lake Willson in April 1994.

Moderately common at Lewis Creek floodout and Lake Willson. Usually in small groups (up to 12) but occasionally in larger flocks (up to 165). Breeding in May 1997 at the Lewis Creek floodout; 34 nests (4 freshly made nests, 1 with 3 eggs, 17 with small young and others with half grown to fully fledged young).

Intermediate Egret *Ardea intermedia*

Common at Lewis Creek

Australian White Ibis *Threskiornis aethiopicus moluccus*
Scarce. Two at Lewis Creek

floodout in May 1997.

Straw-necked Ibis *Threskiornis spinicollis*

Moderately common at Lewis Creek floodout and Lake Willson. Mainly small flocks (up to 80). Recorded in May, July and October.

Royal Spoonbill *Platalea regia*

Scarce. Small groups (up to 4) at Lewis Creek floodout and Lake Willson in October 1997. Breeding in October at Lewis Creek floodout; 1 nest with 2 heavily incubated eggs and another with 3 feathered young.

Yellow-billed Spoonbill *Platalea flavipes*

Scarce. Only recorded at Lewis Creek floodout. Mainly ones and twos. Breeding in May (1 nest with half grown young another with almost fledged young) and October (3 nests, 1 with 2 feathered chicks).

CICONIIDAE

Black-necked Stork

Ephippiorhynchus asiaticus

Scarce. Ones and twos at Lewis Creek floodout in July 1995, October 1997 and Lake Willson in May 1998. A nest with fresh twigs in top of eucalypt appeared to have been used recently.

ACCIPITRIDAE

Black-shouldered Kite *Elianus caeruleus axillaris*

Scarce. Single birds in open country along Slatery Creek.

Square-tailed Kite *Hamirostra isura*

Scarce. One over Brophy Creek on 18 May 1997 and one at Granny Soak in May 1998.

Black-breasted Buzzard

Hamirostra melanosternon

Moderately common; in ones and twos throughout the region. Pair at nest in a dead tree at Brophy Creek on 16 August 1995; nest with 2 eggs at Brophy Creek on 30 September 1997; and nest with one egg (chipping) and a downy hatchling on Slatery Creek on 3 October 1997. Old nests also observed at Granny's Soak and south end of Denison Range. Pair at Slatery Creek had been feeding almost exclusively on skinks *Tiliqua multifasciata*.

Black Kite *Milvus migrans affinis*

Uncommon. Mainly ones, twos and small groups (up to 4). Attracted to campsites, fires and roadkills. One flushed from a disused nest platform, with remains of a freshly killed juvenile Eurasian Coot *Fulica atra* at Lewis Creek floodout in May 1997.

Whistling Kite *Haliastur sphenurus*

Uncommon to moderately common throughout the region. Mainly ones and twos. Most frequent at Lewis Creek floodout and Lake Willson during flood years eg. July 1995 and May 1997, less frequent during other visits. Breeding (egg laying) in April and August-September; 4 nests at Lake Willson were in large *Acacia neurocarpa* and *Melaleuca glomerata* trees standing in 2 m of

water; 9 nests all with young at Lewis Creek floodout in May 1997; and a nest with 2 eggs at Lewis Creek floodout on 3 October 1997.

Brown Goshawk *Accipiter fasciatus*

Uncommon. Mainly ones and twos and favouring well wooded areas. Most records in May and July especially 5 at Maurice Spring in the Denison Range were probably migrants of *A. f. fasciatus* from southern Australia. A nest with 3 eggs in bloodwood at Brophy Creek on 30 September 1997 belonged to the northern subspecies *A. f. didimus*.

Collared Sparrowhawk *Accipiter cirrocephalus*

Uncommon in ones and twos. Recorded at Brophy Spring, along Brophy and Slaty Creeks and at Lake Willson, nest with 4 eggs in *Melaleuca nervosa* at Brophy Spring on 7 July 1993 and nest with 2 eggs and 2 hatchlings in a river gum on Slaty Creek on 2 October 1997.

Little Eagle *Aquila morphnoides*

Scarce; ones and twos. Only recorded at Brophy Spring and Talbot Spring. One disturbed eating a freshly killed Little Black Cormorant (*Phalacrocorax melanoleucos*) on the ground near dam at Talbot Spring in July 1995.

Wedge-tailed Eagle *Aquila audax*

Moderately common. Ones and twos throughout the region. One at a nest in a coolibah at Lewis Creek floodout on 3 October 1997.

Spotted Harrier *Circus assimilis*

Uncommon. Ones and twos at

Brophy Creek and on open spinifex flats edge of Slaty Creek. Nest with 3 eggs, 16 m up on a horizontal limb of a river gum *Eucalyptus camaldulensis* at Brophy Spring on 7 September 1993.

Swamp Harrier *Circus approximans*
Moderately common around the rookeries at Lake Willson in April 1994. This species is a non-breeding visitor to the Kimberley (February-July).

FALCONIDAE

Brown Falcon *Falco berigora*

Moderately common in ones and twos throughout the region. Observed in all habitats. Both dark and pale phase birds seen. Nest with 3 partly eaten eggs at Lewis Creek floodout on 3 October 1997.

Australian Kestrel *Falco cenchroides*

Moderately common. Mainly ones and twos. Favouring the vicinity of watercourses with river gums. Nest with 4 eggs at entrance to a large hollow in the trunk of a *Eucalyptus camaldulensis* on Brophy Creek on 8 September 1993; and nest with 4 eggs (chipping) in hollow of *Eucalyptus camaldulensis* on Slaty Creek on 3 October 1997.

Australian Hobby *Falco longipennis*

Moderately common in ones, twos and threes. Favouring river gums along watercourses, the Lewis Creek floodout and Lake Willson.

Peregrine Falcon *Falco peregrinus*
One at Granny Soak in May 1998.

Black Falcon *Falco subniger*

Two probably a pair (one slightly larger than other) at Lewis Creek floodout on 3 October 1997 and one in May 1998.

GRUIDAE

Brolga *Grus rubicunda*

Moderately common in small flocks (up to 22). Most plentiful at Lake Willson (58 in October 1997 and 60 in May 1998) and Lewis Creek floodout, less frequent along watercourses. Feeding on bulbs of the sedge (*Cyperus bulbosus*) at Brophy Creek and Talbot Spring in July 1995. Many old nests around the Lewis Creek floodout in September 1993.

RALLIDAE

Ballon's Crane *Porzana pusilla*

Scarce to moderately common transient and visitor to Lewis Creek floodout and Lake Willson when filled. In May 1997 about 20 were scattered over both lakes at Lewis Creek floodout, taking refuge in dense patches of floating spiny mudgrass (*Pseudoraphis spinescens*). Old nest found at Lewis Creek floodout in May 1997.

Australian Spotted Crane *Porzana fluminea*

One flushed from spiny mudgrass at Lewis Creek floodout on 16 May 1997. There are very few records of this species for the Kimberley.

Purple Swampphen *Porphyrio porphyrio melanotus*

Moderately common at Lewis Creek floodout in small groups (up to 12) also one loose group of 50. Recorded in July 1995 and May and October 1997. Nest with 4 eggs and several old nests found in May 1997.

Black-tailed Native Hen *Gallinula venetralis*

About five thousand around the Lewis Creek floodout in September 1993; appears to be only transient or a visitor to this wetland when filled.

Eurasian Coot *Fulica atra australis*

Common to very common at Lake Willson and Lewis Creek floodout. Thousands around Lake Willson in August-September 1993 and April 1994, less frequent (100s) during other visits. Large numbers breeding at Lake Willson in August-September 1993 (nests with 1-9 eggs); April 1994 (eggs and newly hatched young); and at Lewis Creek floodout (many half grown downy chicks) on 16 May 1997. Some nests at Lake Willson were built on top of nests of Australasian Grebe.

OTIDIDAE

Australian Bustard *Otis australis*

Moderately common in ones, twos and threes. Recorded throughout the area in July 1995, May and October 1997 and at Lake Willson in May 1998. One flushed from an egg laid on bare sandy ground in low spinifex with

scattered Acacia near Brophy Spring on 30 September 1997.

TURNICIDAE

Red-chested Burton-quail *Turnix pyrrhorrax*

Moderately common at Lake Willson in September 1993 and one flushed from marshy area at Brophy Spring on 4 May 1995. Call a distinctive 'g-oom' repeated several times.

Little Burton-quail *Turnix velox*

Common throughout the area in July 1995, less frequent during other visits. Mainly ones, twos and small groups (up to 4). Favouring spinifex flats with Acacia and *Grewillea*.

SCOLOPACIDAE

Black-tailed Godwit *Limosa limosa melanuroides*

A single bird feeding in shallow water at edge of Lake Willson on 4 October 1997. Visitor (July-February) to Kimberley from northern hemisphere.

Marsh Sandpiper *Tringa stagnatilis*

Three at Lake Willson on 10 July 1995 and single birds and one group of 4 at same place on 4 October 1997. Visitor (July, September, October and April) to Kimberley from northern hemisphere.

Wood Sandpiper *Tringa glareola*

One at Lewis Creek floodout on 3 October 1977. Visitor (August-May) to Kimberley from northern hemisphere.

Common Sandpiper *Tringa hypoleucos*

Single birds at Lake Willson on 4 October 1997. Visitor (mainly July-April) to Kimberley from northern hemisphere.

Red-necked Stint *Calidris ruficollis*

Thirteen at Lake Willson in May 1998. A rare passage migrant with few inland records.

Long-toed Stint *Calidris subminuta*

Two at the edge of Lake Willson on 4 October 1997. A rare passage migrant to this region with few Kimberley records.

Sharp-tailed Sandpiper *Calidris acuminata*

Two and a flock of 10 at edge of Lake Willson on 4 October 1997. A rare passage migrant to this region with few Kimberley records.

Curlew Sandpiper *Calidris ferruginea*

Two and a flock of 6 at edge of Lake Willson on 4 October 1997. Rare visitor to Kimberley from northern hemisphere.

BURHINIDAE

Bush Stone-curlew *Burhinus grallarius*

Single birds around Brophy Springs in October 1997. Mainly on open stony flats with spinifex.

RECURVIROSTRIDAE

Black-winged Stilt *Himantopus himantopus leucocephalus*

Common at Lake Willson in August 1993 and July 1995 (when lake filled); about 30 in May 1997; and 10 in October 1997. Breeding in August 1993; a loose colony with nests on top of collapsed termite mounds on the floodout away from the lake; many fresh nest scrapes. 2 nests with 2 eggs and 1 nest with 1 egg.

Red-necked Avocet *Recurvirostra novaehollandiae*

One at Lake Willson in May 1998.

CHARADRIIDAE

Masked Lapwing *Vanellus miles miles*

Common at Lake Willson and Lewis Creek floodout. Mainly ones, twos and small groups. Breeding at Lake Willson on 23 August 1993 (1 nest with 1 egg and one with 3 eggs); 5 September 1993 (nest with 4 eggs); 11 April 1994 (nest with 4 eggs); and 4 October 1997 (nest with 4 eggs). Nests were placed on small islands created by collapsed termite mounds on the floodout away from the lake and on bare ground left by receding water.

Red-capped Plover *Charadrius ruficapillus*

Common at Lake Willson in small groups (up to 4) and larger flocks (up to 40). Mainly bare edge of lake and grassy flats. Nests with 2 eggs on 21 August 1993; 4 September 1993; and 4 October 1997.

Black-fronted Dotterel *Charadrius melanops*

Common at Lake Willson and

moderately common around pools on Brophy Creek. Nest with 3 eggs on top of an old Brologas nest at Lake Willson on 4 September 1993; nests with 2 eggs on bare ground edge of lake on 10 September 1994 and 4 October 1997; and nest with 2 eggs in washed gravel in Brophy Creek on 9 September 1993.

Oriental Plover *Charadrius veredus*

Common in small groups (up to 10) around edge of Lake Willson on 4 October 1997. Visitor (September-February) to Kimberley from northern hemisphere.

Red-kneed Dotterel *Erythrogonus cinctus*

Common in small groups (up to 14) at Lake Willson and Lewis Creek floodout. Recorded in July 1995 and May and October 1997.

GLAREOLIDAE

Australian Pratincole *Stilia isabella*

Common in twos and small groups (up to 15) at Lake Willson in September 1993 and October 1997. Favouring the damp grassy edge of lake. Nest with 1 egg and one with 2 eggs on 4 September 1993.

LARIDAE

Gull-billed Tern *Sterna nilotica macrotarsa*

About 6 at Lake Willson on 10 July 1995.



Figure 1. Gardner Ranges (K. Coate)



Figure 5. Lewis Creek Floodout (K. Coate)



Figure 2. Large permanent rockhole within the Gardner Range (K. Coate)



Figure 6. Lewis Creek Floodout showing spiny mudgrass and *Eucalyptus victrix* trees, with Denison Range in background (K. Coate)



Figure 3. Mt Brophy Spring (K. Coate)



Figure 7. Lake Willson 1995 (K. Coate)



Figure 4. Granny Soak (K. Coate)



Figure 8. Lake Willson 1995, showing disused nests of Little Black Cormorant in *Melaleuca glomerata* trees (K. Coate)

Caspian Tern *Sterna caspia*
Seven at Lake Willson on 14 May 1997 and 4 in May 1998.

Whiskered Tern *Sterna hybrida javanica*

Uncommon. Small flocks (up to 6) at Lake Willson on 10 July 1995 and 4 October 1997.

COLUMBIDAE

Common Bronzewing

Phaps chalcoptera

Uncommon to moderately common, in ones, twos and threes. Favouring thickets of *Melaleuca*, *Eucalyptus* and *Acacia* along creeks and around Lake Willson. Nest with 2 eggs in eucalypt over a creek near Bradshaw's Well on 2 October 1997.

Flock Pigeon *Phaps histrionica*

Small flocks (up to 25) recorded by W.H. Butler in June 1975.

Crested Pigeon *Ocyphaps lophotes*

Uncommon, mainly in ones and twos except for one group of 15 at Granny's Soak. Mainly about watercourses. Nest with 2 small young 2 m above water in thick *Melaleuca* at Lake Willson on 13 April 1994.

Spinifex Pigeon *Geophaps plumifera*

Common, mostly in pairs but also in small flocks (up to 10). Favouring rocky slopes of ranges; also descending to small pools in creeks. Several nests with eggs or newly hatched young on rocky hills at Brophy Spring in July 1995.

Diamond Dove *Geopelia cuneata*

Very common around Lake Willson in October 1997 but generally uncommon in ones, twos and small groups (up to 4). Most habitats including ranges, thickets and scrub along creeks and around wetlands and open spinifex flats. A nest with 2 eggs in *Grewillea refracta* at Brophy Spring on 4 July 1995.

Peaceful Dove *Geopelia striata placida*

Common throughout the area in July 1995, less frequent during other visits and confined largely to watercourses. These records represent the southern limit for this species in east Kimberley.

Bar-shouldered Dove *Geopelia humeralis*

Several at the Lewis Creek floodout on 9 July 1995. The southernmost records for south-east Kimberley (previously only recorded south to the lower Mary, Black Elvire and Negri Rivers).

PSITTACIDAE

Galah *Cacatua roseicapilla roseicapilla*

Uncommon to moderately common in pairs and small groups. Mainly in vicinity of watercourses. Much more frequent in neighbouring pastoral country.

Little Corella *Cacatua sanguinea sanguinea*

Common in flocks (up to 100). Mainly about watercourses, also ghost gum *Corymbia bella* and coolibah flats.

Major Mitchell's Cockatoo *Cacatua leadbeateri*

Uncommon. Ones, twos and threes around Mt Brophy Springs, Brophy Creek, Lewis Creek floodout, Maurice Spring and base of Denison Range. Observed feeding on the green seed pods of *Acacia coleii* on Brophy Creek in October 1997.

Cockatiel *Nymphicus hollandicus*

Common throughout the region in July 1995 scarce during other visits.

Australian Ringneck *Platysercus zonarius zonarius*

Moderately common. Mainly in pairs and favouring watercourses with tall river gums *Eucalyptus camaldulensis*. The northern limit of this species in Western Australia.

Budgerigar *Melopsittacus undulatus*

Very common throughout the area in July 1995, and occasional small flocks seen in May 1997. Breeding in large numbers at Lewis Creek floodout in July 1995.

Night Parrot *Pezoporus occidentalis*

On 5 July 1996 at Mt Brophy Springs K. Coate and G. Lodge found 4 immaculately clipped tunnels leading into small cavities in the top of three spinifex tussocks, which were possibly made by Night Parrots. They were all within 3 m of each other. Three tunnels faced east with entrance 4-6 cm in diameter and extended for about 21 cm from near the top of the spinifex clump at an angle of 45

degrees. The cavity at the base of the tunnel was several centimetres above the ground. The fourth tunnel faced west and was much shorter. The spinifex had been bitten off at a 45° angle consistent with parrot clippings.

CUCULIDAE

Pallid Cuckoo *Cuculus pallidus*

Moderately common at Lake Willson in July 1995 and May 1997, and at Lewis Creek floodout in October 1997; elsewhere uncommon. Breeding at Lewis Creek floodout in October 1997, parasitising White-breasted Woodswallow. This is the first breeding record for this species in the Kimberley, most birds being non-breeding visitors and passage migrants from the south.

Horsfield's Bronze Cuckoo

Chrysococcyx basalis

Moderately common throughout the area. Recorded in most habitats including creekside vegetation, *Melaleuca* thickets around wetlands and open *Acacia* - spinifex.

Channel-billed Cuckoo *Scythrops novaehollandiae*

One record, a fledgling, light brown with darker barring on back, found in a nest of Little Crow *Corvus bennetti* at Lake Willson on 10 April 1994. The southernmost breeding record for south-east Kimberley. This species is an uncommon visitor and passage migrant to the Kimberley during October-March.

STRIGIDAE

Boobook Owl

Ninox novaeseelandiae boobook

Moderately common. Recorded at Brophy Spring, along Brophy Creek, Mongrel Creek and at Lewis Creek floodout. Mainly in creekside vegetation especially river gums and coolbaha. Breeding in hollows of river gums on 7 September 1993 (nest with 2 eggs); and 30 September 1997 (2 nests with 3 eggs and one with 2 eggs).

Moderately common. Mainly rocky slopes of ranges also around water holes and Lake Willson.

AEGOTHELIDAE

Australian Owlet Nightjar

Aegotheles cristatus leucogaster

Moderately common throughout the area in July 1995, less frequent during other visits. Nest with 2 eggs in hollow of *Eucalyptus camaldulensis* edge of Brophy Creek on 8 September 1993.

TYTONIDAE

Barn Owl *Tyto alba*

Uncommon. Recorded at Brophy Spring and Lewis Creek floodout during most visits eg. 4 flushed from hollows of *Eucalyptus* at Lewis Creek on 9 July 1995 and 2 on 3 October 1997, also one at Granny Soak in May 1998. Nest with 4 eggs in hollow of large *Eucalyptus camaldulensis* at Brophy Spring on 18 August 1993 and a pair with fully fledged young in same hollow on 3 July 1995.

Red-backed Kingfisher

Todiramphus pyrrhopygia

Moderately common. Mainly ones and twos and favouring vicinity of watercourses. Nest with 5 eggs in a 28 cm long tunnel dug into the vertical bank of Brophy Creek on 8 September 1993.

HALCYONIDAE

Sacred Kingfisher *Todiramphus sanctus sanctus*

Moderately common in September-October 1997. Mainly single birds along watercourses (Brophy Creek, Bradshaw's Well and Lewis Creek floodout). Most are probably passage migrants that begin moving south in October.

PODARGIDAE

Tawny Frogmouth *Podargus strigoides phalaenoides*

Scarce. Recorded at Palm Spring (Maurice Spring) by Butler in June 1975 and 2 adults and 2 feathered chicks at nest in eucalypt near Brophy Spring on 1 October 1997.

MEROPIDAE

Rainbow Bee-eater *Merops ornatus*

Moderately common to very common. Mainly a winter visitor and passage migrant (moving north in February-May and south in October-November). Recorded in June-July 1975, September 1993,

July 1995 and May and October 1997. Favouring open sandy areas along watercourses and edges of Lewis Creek floodout and Lake Willson. Breeding in October 1997, nest burrows with eggs at Brophy Creek, Lewis Creek floodout and Lake Willson.

MALURIDAE

Variegated Fairy-wren *Malurus lamberti assimilis*

Scarce to moderately common throughout the area, in pairs and small parties (up to 5). Mainly sandplain vegetation with *Acacia*, *Grevillea*, *Triodia* and *Melaleuca* thickets. Nest with 3 eggs at base of bush edge of Lake Willson on 22 August 1993 and nest with 2 young in dead *Acacia* at Brophy Spring on 30 September 1997.

White-winged Fairy-wren
Malurus leucopertus leuconotus

Moderately common throughout the area, in pairs and small parties (up to 5). Mainly sandplain vegetation with *Acacia*, *Grevillea* and *Triodia*, also spinifex flats with scattered *Hakea* and open grassy flats.

Rufous-crowned Emu-wren
Stictiurus ruficeps ruficeps

Moderately common in pairs and small parties (up to 10). Recorded along Brophy Creek around Mt Brophy Spring, Slaty Creek, Bramall Hills and southern end of Denison Range. Mainly dense *Triodia* with scattered *Acacia* and *Grevillea* on sandy or stony substrates. The first records for the Kimberley, previously only known north to Well 48 Canning

Stock Route (Storr 1981) and reported between Stafford Bore and Well 51 by K. Coate on 3 July 1993.

PARDALOTIDAE

Red-browed Pardalote *Pardalotus rubricatus*

Locally common but generally uncommon; in ones and twos. Mainly along watercourses. Nest with 2 eggs on 18 May 1997 and fresh nest burrow on 30 September 1997.

ACANTHIZIDAE

Weebill *Smicronis brevirostris*

Moderately common throughout the area, in small flocks. Mainly eucalypts along watercourses. Nest with 2 eggs 1 m up in drooping leaves of *Eucalyptus brevifolia* on 7 July 1995.

MELIPHAGIDAE

Brown Honeyeater *Lichmera indistincta indistincta*

Common throughout the area. All wooded habitats, but locally aggregating at flowering trees and shrubs, especially *Melaleuca*, *Grevillea* and *Eucalyptus*.

Black Honeyeater *Certhionyx niger*

Common in June 1975 and May 1997, uncommon or scarce during other visits. Mainly attracted to flowering *Eucalyptus pachyphylla* and *Grevillea wickhamii*.

Pied Honeyeater *Certhionyx variegatus*

Common throughout the area in

CAPRIMULGIDAE
Spotted Nightjar *Eurostodopus argus*

June 1995, several near Mt Brophy Spring in July 1995; several throughout area in September-October 1997, and one at Mt Brophy Spring in May 1998. Mainly attracted to flowering *Grewillea*.

Singing Honeyeater *Meliphaga virescens*

Moderately common throughout the area. Recorded in all habitats with flowering trees and shrubs.

Grey-headed Honeyeater

Meliphaga kearlandi

Common in sandplain vegetation with flowering *Grewillea wickhamii* around Mt Brophy Spring; also in gullies in ranges with flowering *Eucalyptus*.

Grey-fronted Honeyeater

Meliphaga plumula

Common throughout the area. Mainly creekside vegetation with thickets of *Melaleuca nervosa*. Also attracted to flowering *Grewillea wickhamii*, *Eucalyptus camaldulensis* and *E. brevifolia*. Several nests with young in *Melaleuca nervosa* at Brophy Creek in August-September 1993. Two nests (1 with 2 large young, the other with 1 egg and a broken egg on ground below), in *Melaleuca nervosa*, also nest with 2 young in *Eucalyptus* and another with 2 eggs in *Grewillea wickhamii* at Brophy Creek; and two nests with 2 eggs and several with small young in *Eucalyptus camaldulensis* and *E. brevifolia* on Slaty Creek in July 1995. Many fledged young were observed along Slaty Creek in July 1995.

White-plumed Honeyeater

Meliphaga penicillata

Locally common egg at Mt Brophy Spring, Brophy Creek, Granny Soak, Talbot Spring, Maurice Spring and around Lake Willson less frequent elsewhere. Mainly river gums on watercourses also ghost gum flats and *Melaleuca* thickets including *M. glomerata* around Lake Willson.

Breeding recorded at Lake Willson; nest with 2 small young in drooping leaves of small *Eucalyptus* on 21 August 1993, nest with 2 eggs also in drooping leaves of *Eucalyptus* and another with 2 young in leaves of *Melaleuca glomerata* on 11 April 1994. Many fledged young noted at Lake Willson in May 1997.

Black-chinned Honeyeater

Meliphrephus gularis laetior

Uncommon. Recorded at Mt Brophy Spring, Granny Soak, East Palm Spring (=Maurice Spring), Lewis Creek floodout and near Lake Willson. Near Lake Willson mainly attracted to flowering *Eucalyptus pachyphylla*, *Eucalyptus odontocarpa* and *Grewillea wickhamii*.

Little Friarbird *Philemon citreogularis citreogularis*

Scarce. Only recorded near Mt Brophy Spring and Granny Soak. Mainly attracted to flowering *Melaleuca nervosa*. These are the southernmost records for south-east Kimberley.

White-fronted Honeyeater

Phylidonyris albigrons

Common throughout the area in June 1975; otherwise scarce.

Several 3 km north of Lake Willson on 14 May 1997; and several in flowering *Grewillea wickhamii* near Mt Brophy Spring on 30 September 1997.

Rufous-throated Honeyeater

Conopophila rufogularis

Locally common egg at Mt Brophy Spring, Bradshaw's Well, and around Lake Willson, but generally uncommon. Mainly attracted to flowering *Melaleuca nervosa*, *Eucalyptus camaldulensis* and *Grewillea wickhamii*. These represent the southernmost records for the Kimberley.

Yellow-throated Miner *Manorina flavigula*

Moderately common throughout the area. Mainly small flocks (up to 15). Favouring eucalypt woodland along watercourses. Two nests (one with young the other 2 eggs) in hanging branches of *Eucalyptus victrix* at Lewis Creek floodout on 16 May 1997, and nest with young in ghost gum at Granny Soak on 1 October 1997.

Spiny-cheeked Honeyeater

Acanthagenys rufogularis

Locally moderately common egg around Mt Brophy Spring, head of Slaty Creek and south end of Denison Range, but generally scarce. Attracted to flowering *Melaleuca* and *Eucalyptus*. These represent the northernmost records for Western Australia.

Orange Chat *Ephianura aurifrons*

Eleven at Lake Willson in May 1998. The northernmost record for Western Australia.

Crimson Chat *Ephianura tricolor*
Common around Lake Willson in September 1993 and at Lake Willson, Talbot Spring, and Granny Soak in May 1998; also two near Mt Brophy Spring on 3 July 1995. Two nests (one with 3 eggs the other 3 large young) in flooded *Triodia* at Lake Willson on 4 September 1993.

EOPSALTRIIDAE

Red-capped Robin

Petroica goodenowii

Two in well vegetated area about 2 km north of Mt Brophy Spring on 18 May 1997 and single males observed at Denison Range and Granny Soak in May 1998. A non-breeding winter visitor to southern Kimberley (May-August).

POMATOSTOMIDAE

Grey-crowned Babbler

Pomatostomus temporalis rubeculus

Moderately common, throughout the area. Mainly vegetation along watercourses. The Denison and Gardner Ranges and Lake Willson are the southern limit of the Kimberley population. Nest with 2 young at Lake Willson on 18 May 1997.

PACHYCEPHALIDAE

Crested Bellbird *Oreocica gutturalis*

Moderately common in ones and twos around Mt Brophy Spring, Granny Soak and in Gardner Range.

Rufous Whistler *Pachycephala rufiventris rufiventris*
Scarce. Recorded around Mt Brophy Spring, Granny Soak and Talbot Spring.

Grey Shrike-thrush *Colluricincla harmonica rufiventris*
Scarce. Recorded around Mt Brophy Spring, Granny Soak and in Gardner Range. One was collected by Butler in a thicket of flowering *Grewillea* near Granny Soak.

DICRURIDAE

Grey Fantail *Rhipidura fuliginosa*
Three at Lewis Creek floodout in May 1998. Probably migrants from south-eastern Australia.

Willie Wagtail *Rhipidura leucophrys leucophrys*
Common throughout the area. Mainly in ones and twos and favouring watercourses and edge of Lake Willison. Nest with 3 small young in *Eucalyptus* in dried up backwater of Lake Willison on 4 September 1993.

Magpie Lark *Grallina cyanoleuca*
Moderately common resident throughout the area, in ones and twos, and also a moderately common dry season visitor in small flocks (up to 8). Mainly open areas around water. Two nests with 4 eggs at Lake Willison on 21 August 1993, one with 3 eggs at same place on 4 September 1993, and one with 2 added eggs and 1 chick at Lewis Creek floodout on 3 October 1997.

CAMPEPHAGIDAE

Black-faced Cuckoo Shrike
Coracina nowaeohollandiae nowaeohollandiae

Uncommon to moderately common, usually in ones and twos but occasionally in small flocks. In all wooded habitats. Nest with 3 eggs in bloodwood at Mt Brophy Spring on 10 October 1997. Six feeding on fruits of *Ficus* on cliff face at Bradshaw's Well on 2 October 1997.

Ground Cuckoo Shrike
Pteropodocys maximus

Uncommon in ones, twos, threes and small flocks (up to 6). Recorded at Granny Soak, Lewis Creek floodout and Maurice Spring (East Palm Spring) at south end of Denison Range.

White-winged Triller *Lalage tricolor*

Uncommon to moderately common in ones, twos and small parties, (most frequent in May 1997). Recorded throughout the area in most wooded habitats.

ARTAMIDAE

White-breasted Woodswallow
Artamus leucorhynchus

Locally common e.g. at Lewis Creek floodout and Lake Willison, elsewhere scarce. Nest with small young in old Magpie Lark nest 3 m up in small eucalypt at Lake Willison on 21 August 1993; nest with 4 eggs and 1 egg of Pallid Cuckoo in hollow spout of *Eucalyptus victrix* at Lewis Creek floodout on 3 October 1997; and

nest with 4 pin-feathered young in spout of dead tree at Lake Willison on 4 October 1997.

Masked Woodswallow *Artamus personatus*

Common nomad. Most flocks around Gardner Range and sandplain country around Mt Brophy Spring. Attracted to flowering trees especially *Grewillea wickhamii*.

White-browed Woodswallow
Artamus superciliosus

Scarce; 7-8 in with flocks of Masked Woodswallows at Mt Brophy Spring on 4 July 1995 and 18 May 1997. Feeding on blossom of *Grewillea wickhamii*.

Black-faced Woodswallow
Artamus cinereus melanops

Common throughout the area. All wooded habitats. Nest with 3 young in small *Melaleuca glomerata* and another with 3 eggs in small *Eucalyptus* at Lake Willison on 21 August 1993, and nest with 3 eggs in small bloodwood near Mt Brophy Spring on 30 September 1997.

Little Woodswallow *Artamus minor*

Common to moderately common in Gardner and Denison Range, Bramall Hills and around Lewis Creek floodout. Usually in pairs or small parties (up to 16).

CRACTICIDAE

Pied Butcherbird
Cracticus nigrogularis

Moderately common throughout the area. Mainly open eucalypt

woodland also *Azacia* and *Grewillea* on plains. Nest with 2 pin-feathered young in *Melaleuca* at Granny Soak on 1 October 1997 and another with young in eucalypt on rocky hill, Denison Range, on 4 October 1997.

Australian Magpie *Cracticus tibicen tibicen*

Two at Mongrel Creek crossing (19°10'S, 128°56'E) in river gums on 2 October 1997.

CORVIDAE

Torresian Crow *Corvus orru ceciliae*

Locally moderately common e.g. at Mt Brophy Spring and around Lake Willison but generally scarce or uncommon. Usually in ones and twos occasionally in small groups (up to 6). More frequent in adjacent pastoral country. Mainly river gums along watercourses. Nest with young in tall river gum at Mt Brophy Spring on 1 October 1997.

Little Crow *Corvus bennetti*

Moderately common around Lake Willison in small flocks (up to 20), scarce or absent elsewhere. Nest with a young Channel-billed Cuckoo at Lake Willison on 10 April 1994.

ALAUDIDAE

Singing Bushlark *Mirafra javanica*

Uncommon. Mainly ones, twos and threes. Recorded on open spinifex flats around Mt Brophy Spring; and on grassy flats on Slatey Creek and around Lake Willison.

MOTACILLIDAE

Richard's Pipit
Anthus novaeseelandiae australis
Uncommon to moderately common throughout the area. Spinifex flats with scattered *Acacia* and *Grevillea*, open stony flats on ranges and around wetlands.

PASSERIDAE

Zebra Finch *Taeniopygia guttata castaneotis*
Moderately common to common throughout the area. Pairs and small flocks (up to 20). Breeding recorded in June and July including many nests under old cormorant nests in *Melaleuca glomerata* at Lake Willison in July 1995.

Painted Finch *Emblema pictum*

Common around Mt Brophy Spring and on rocky slopes and gullies of the Gardner Range in May 1995; and in Gardner Range and Talbot Spring area in May 1998; but generally uncommon and patchily distributed with only small numbers recorded at Granny Soak and Denison Range in June 1975 and at Bradshaw's Well in October 1997. Two nests with young built in clumps of *Triodia* near Mt Brophy Spring on 4 May 1995. A female eating decomposed bone of an old camel skeleton in Gardner Range in May 1998.

Pictorella Mannikin *Heeromunia pectoralis*
Scarce. Two at Lake Willison on 14 May 1997 and 2 near Slatley Creek

just north of Bramall Hills on 17 May 1997. These are the southernmost records for south-east Kimberley.

DICAEDIDAE

Mistletoebird *Dicaeum hirundinaceum hirundinaceum*
Uncommon throughout the area. All wooded habitats including *Melaleuca* thickets.

HIRUNDINIDAE

Tree Martin *Hirundo nigricans nigricans*
Common non-breeding winter visitor (only recorded in May-June), around wetlands.

Fairy Martin *Hirundo ariel*

Common around Lake Willison but generally uncommon to moderately common in small flocks. Two clusters of nests built on trunk and branches of small *Melaleuca lasiantha* 500 m from water, in dried out area edge of Lake Willison on 4 September 1993; about 10 nests at Bradshaw's Well on 2 October 1997; and old nests at Talbot Spring (Palm Spring), Denison Range in June 1975.

SYLVIIDAE

Little Grassbird
Megalurys gramineus
Status uncertain; probably only a rare non-breeding visitor. Several observed and calling in a dense stand of *Melaleuca glomerata* in 4 m of water at Lake Willison on 15 April 1994. This species has only

recently become established in north-east Kimberley.

Spinifex-bird *Eremiornis carteri*
Uncommon throughout the area. Spinifex on stony slopes and sandy flats.

Rufous Songlark *Cincloramphus mathewsi*

Locally common (at Lake Willison in May 1997) but generally scarce or uncommon. Mainly around wetlands and along watercourses.

Golden-headed Cisticola *Cisticola exilis exilis*

Two in dense cane grass (*Sorghum* sp.) 10 km north of Mt Brophy Spring on 3 and 5 July 1995. Previously only recorded south in east Kimberley to Ord River Station.

DISCUSSION

A total of 155 species (103 non-passerine and 52 passerine) were recorded from the area covered in this paper. The number can be compared with the 121 species recorded in the Edgar Ranges in south-west Kimberley (Johnstone *et al.* 1981). The richness of the avifauna is mainly due to the diversity of habitats, especially the wetlands of the Lewis Creek floodout and Lake Willison. Without the wetland species the total (about 110) is more comparable with that of the Edgar Ranges. A considerable amount of work has been done in the area and we feel that most of the resident species have been recorded. More work however during different seasons would

no doubt add other visiting waders and waterfowl to the list.

Most of our visits to the area were after good seasons with above average rainfall. It would appear, judging from rainfall records from Sturt Creek, that the flooding of Slatley and Lewis Creeks into Lake Willison is not that uncommon. During these periodic floodings the Lewis Creek floodout and Lake Willison become an important breeding and refuge area for many waterbirds including Grey Teal *Anas gracilis*, Pink-eared Duck *Malacorhynchus membranaceus*, Hardhead *Aythya australis*, Little Black Cormorant *Phalacrocorax sulcirostris*, Little Pied Cormorant *Phalacrocorax melanoleucos*, Black-tailed Native Hen *Gallinula ventralis* and Eurasian Coot *Fulica atra*. Some species of waterfowl including the Magpie Goose *Anseranas semipalmata*, Plumed Whistling Duck *Dendrocygna eyroni* and Wandering Whistling Duck *Dendrocygna arcuata* are no doubt visitors from the Ord region to the north, and the Australian Wood Duck *Chenonetta jubata* and Great Crested Grebe *Podiceps cristatus* visitors from southern Australia.

The Gardner and Denison Ranges are on the boundary between two major zoogeographic subregions, the Torresian in the north and the Eyrean in the south. The Ord River drainage lies close the north, and the dunes of the Great Sandy and Tanami Deserts lie to the south. Although situated just within the Kimberley Division, the Torresian element in the avifauna is small and comprises

only 7 species none of which are resident in the Pilbara: Magpie Goose *Anseranas semipalmata*, Red-breasted Buton-quail *Turnix pyrrhonorax*, Flock Pigeon *Phaps histrionica*, Channel-billed Cuckoo *Scythrops novaehollandiae*, Little Fiarbird *Philemon citreogularis*, Rufous-throated Honeyeater *Conopophila rufogularis* and Pictorella Mannikin *Heteromunia pectoralis*.

The Great Sandy Desert is a major barrier between the Kimberley and the Pilbara regions, and many species have a broken distribution with a population in the Kimberley and one in the Pilbara or southern Western Australia. Species whose Kimberley population is at its southern limit in the Gardner and Denison Ranges and Lake Willson area include: Brown Quail *Corurnix ypsilophora*, Black-necked Stork *Ephiphiorhynchus asiaticus*, Peaceful Dove *Geopelia striata*, Bar-shouldered Dove *Geopelia humeralis*, Little Corella *Cacatua sanguinea*, Australian Owllet *Nightjar Aegoheles cristatus*, Little Grassbird *Megalururus gramineus*, Golden-headed Cisticola *Cisticola exilis* and also the Kimberley subspecies of the Brown Goshawk *Accipiter fasciatus didimus*. Some arid country species whose range is continuous across the deserts are at or near their northern limit in south-east Kimberley in the Gardner and Denison Ranges: these include Major Mitchell's Cockatoo *Cacatua leadbeateri*, Australian Ringneck *Platycercus zonarius*, Rufous-crowned Emu-wren *Stipiturus ruficeps*, Spinifex-bird *Eremionis carteri*, White-fronted Honeyeater *Phylidonyris*

albifrons, Spiny-cheeked Honey-eater *Acanthagenys rufogularis*, White-plumed Honeyeater *Meliphaga penicillata* and Orange Chat *Ephianura aurifrons*.

The area contains many flowering trees and shrubs and often a good ground cover of spinifex and soft grasses. It contains a fairly low number of sedentary bird species such as the Common Bronzewing *Phaps chalcoptera*, Variegated Fairy-wren *Malurus lamberti*, Red-browed Pardalote *Pardalotus rubricatus* and Brown Honeyeater *Lichmera indistincta*. A larger category comprises nomads, breeding and non-breeding visitors and nectivorous birds following the flowering trees and shrubs.

Non-breeding winter visitors to the area from southern Australia include the Brown Goshawk *Accipiter fasciatus fasciatus*, Red-capped Robin *Petroica goodenowii* and the Tree Martin *Hirundo nigricans*. The Rainbow Bee-eater *Merops ornatus* is a breeding visitor.

This survey has shown that the Gardner and Denison Ranges and the Lake Willson area is of outstanding conservation importance and also contains areas of spectacular scenery. We would firmly recommend that a reserve be established in the region taking in the two range systems and the Slatery Creek, Lewis Creek drainage including Lake Willson.

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