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AN ANNOTATED LIST OF THE BIRDS OF MEANDARRA, QUEENSLAND*

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SUMMARY

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From June 1977 to January 1982 the Meandarra Ornithological Field Study Unit kept systematic records of birds observed at its main study site centred on 'The Dell' and at a few selected localities near Meandarra, Queensland. A total of 172 species is included with 69 known to breed. The status, numbers and reproductive activities are summarized for the 160 species observed at 'The Dell'. A few records from the period 1969 to 1976 provide a historical perspective.

Ranges of three pairs of species that replace each other on an east-west gradient overlapped at the study site. Twenty-three per cent of the total number of species were vagrants and thirty-one per cent were transients. Eleven per cent of the species in the list were added in the final three months of the study, following heavy rains.

We speculate on the influence that topography, climate and more local conditions such as soil type, vegetation and rainfall may have on the avifauna. As an illustration, we report changes in the populations of some species during a severe drought in 1979-1981.

INTRODUCTION

Meandarra, situated on the western edge of the Darling Downs in Queensland, has been a centre for intensive ornithological field work since 1969. Although the region has a rich avifauna and doubtless has been traversed by other ornithologists from time to time, no systematic list of birds has been published.

Initially, banding studies of Noisy and Yellow-throated Miners were undertaken in Meandarra itself with the help of the then Postmaster Mr W. Garrad. Soon further studies of Miners and of Grey-crowned Babblers were begun 6 kilometres northwest of the town on 'Boningar', a property owned by Mr and Mrs G. Bridle but at the time managed by the late Mr L. Ross and his family. Some banding of birds was conducted in 1970 and 1981 on 'Foriston' (17 km north), a property owned by Mr E.H. L'Estrange and now managed by Mr and Mrs K. L'Estrange. Other properties on which birds were studied were 'Ourigilla' (21 km northeast), owned by Mr C. Lethbridge, and 'Cooreena Park' (45 km southeast), owned by Mr P. Meacle. The authors are grateful for the assistance and hospitality freely given by all these people, which provided the impetus for ornithological work to continue in the region.

Long-term interest in the region and continuing field work there led to the formal establishment of the Meandarra Ornithological Field Study Unit (MOFSU) of the Department of Zoology at the University of Queensland. Since August 1976 members of MOFSU have concentrated their field effort at a site comprising parts of several properties but centered on 'The Dell', a 949-ha pastoral property 8 km southeast of Meandarra.

From June 1977 to January 1982 MOFSU systematically recorded all observations of birds made by its members and by visitors to the study site. Although our major studies were of two communally breeding species, the Grey-crowned Babbler and the Noisy Miner, we were interested in monitoring the avifauna generally. This has proved possible because we have had the most complete continuity of observers in this period and interesting because of the climatic extremes experienced by the region over the past five years.

STUDY AREA AND METHODS

Meandarra, 310 km west of Brisbane, is situated on Brigalow Creek, a tributary of the Condamine River and the closest reasonably permanent water to 'The Dell'. The Great Dividing Range, running south to north, is 200 km to the east; the range turns and runs from east to west 100 km north. The Darling Downs is on the plateau south of this 'elbow' formed by the mountain range (Fig. 1). Meandarra, with elevation 213 m, is in a transitional zone between semi-arid and sub-humid regions (Kalma 1974). The first European squatter arrived probably in 1840 (Ferguson 196?). Leichhardt (1847) explored the land a few kilometres to the east and his account suggests that some sheep-runs were then well established. Tara Shire, in which Meandarra is situated, suffered tremendous infestations of prickly pear *Opuntia inermis* following the drought of 1902 and into the 1930s (Ferguson 196?; Isbell 1962). Although there was earlier intervention by the Queensland Government ('The

* This paper is dedicated to Stephen Marchant, Past Editor of the Emu, who has provided members of MOFSU with his criticism, stimulation and friendship over the past decade.

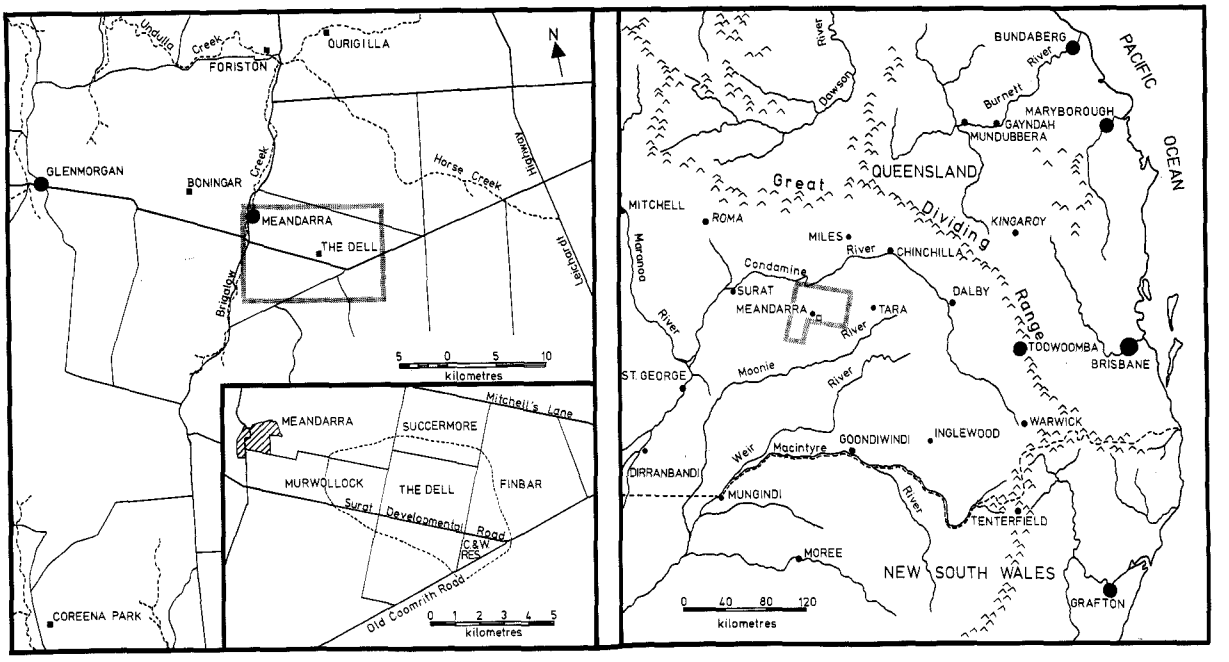

Figure 1. Left. The environs of Meandarra showing locations of sites mentioned in the text and (insert) and the main study site surrounding 'The Dell'. Right. Major topographic features that might influence the avifauna. The stippled border indicates the area enlarged in the left diagram.

Prickly Pear Selection Act of 1901'), it was not until the implementing of 'The Prickly-pear Land Act of 1923' and its ammendments and the introduction of *Cactoblastis cactorum* that the region became more heavily settled.

The land is flat in general aspect and is mostly covered in a heavy grey clay extensively pock-marked with roughly circular depressions up to 2.5 m deep and 10 m wide. These depressions are known to soil scientists by the aboriginal term 'gilgais' (Anon 1962; Gunn 1974) and to local residents as melon holes. They are separated by narrow ridges on which grow various trees and shrubs. Melon holes often hold water after rain and, along with several dams, provided the only standing water for birds at the study site.

Pastoralists traditionally cleared the land of brigalow *Acacia harpophylla* using axes but as the species regenerates by 'suckering' or in dense 'whipstick' stands, this time-consuming method is ineffectual on a large scale. The method of 'pulling scrub' pioneered near Jandowae, Queensland, in 1946 by stretching a cable between two army tanks, has been developed into a highly efficient technique in which a steel cable and chain are stretched between two powerful bulldozers or crawler tractors and dragged through the brigalow woodland (Johnson 1964). Up to 16 ha of timber per hour can be razed using this method (Isbell 1962). Intensive clearing of the native vegetation, although well under way, seems to have been stimulated by activity to the north under 'The Brigalow and Other Lands Development Act of 1962'. Most properties near Meandarra have been cleared and fenced for grazing cattle and sheep or, more recently, for the growing of wheat. Remnants of the original woodland have been left usually in strips or scattered stands to provide shade for stock. Most of the trees are brigalow and belah *Casuarina cristata*. In some paddocks, regenerating brigalow has created a patchy cover of shrubs. On scattered patches of more lightly textured red soil, poplar box *Eucalyptus populnea* is the most common species. Small trees and shrubs, mainly wilga *Geijera parviflora*, budda *Eremophila mitchelli* and wild lime *Eromocitrus glauca* are present throughout the area but most dense and diverse on the red soil. Ground cover is composed of grasses and herbs in melon holes and mainly herbs on their ridges.

Temperatures during the period of our observations ranged from −3° C to +47.5° C; these are seasonal extremes but it was not unusual for temperature to vary by more than twenty degrees within a 24-hour period. The region receives an average annual rainfall of 585 mm (1936 to 1976, excluding seven years with incomplete records) (Bureau of Meteorology 1977). Most rain falls from December to March. However, droughts are common, perhaps cyclical, and may be severe. Southeast Queensland was severely drought stricken during part of our study and we report here several coincidental changes in the populations of some species of birds.

Although 'The Dell' formed the centre of our study site because we lived on it, the adjoining properties ('Murwollock,' 'Finbar', 'Succermore', and an unnamed property south of Surat Developmental Road) were also visited regularly. In addition, our area contained a triangular stand of 136 ha of virgin brigalow forest, which has been set out as a Camping and Watering Reserve (R69). Subsequent references to 'The Dell' in this paper refer to the total area of approximately 2500 ha used in our local field activities.

While at the site, all field workers noted the presence or absence of each species known to occur in the region. Initially, we visited the site for at least one week during nearly every month. During the breeding season (July to December) our visits were more frequent and usually longer. Since January

1980 our schedule of field trips was expanded so that our pooled observations provide a nearly continuous record.

In the notes that follow, we refer to observations from peripheral localities and from the period 1969 to 1976 when they suggest different or unusual patterns of distribution. Observations have also been submitted to the R.A.O.U. Atlas of Australian Birds.

TERMINOLOGY

We characterize the species of birds that we saw on 'The Dell' in terms of their numbers and status. Nomenclature follows that of Schodde *et al.* (1978). The following symbols appear in the annotated list: C = common; U = uncommon; R = rare; Y = year-round resident; S = summer resident (September to February); W = winter resident (March to August); T = transient, occurring irregularly; V = vagrant, fewer than four records. For a few species observed peripheral to the main study site, no status is shown. Species known to breed are marked with an asterisk. Reproductive activities are listed: B = building; A = active nest, contents unknown; E = eggs; N = nestlings; F = fledgelings or downy young. Immediately following are the dates of observation of breeding with month and year separated with a slash. Although it may be more useful to express the seasonality of breeding by the date that clutches were begun, our records do not always allow an exact assignment of age to eggs, nestlings or fledgelings. Therefore, we report only what we observed and leave extrapolation to those who may wish to use the data in that way.

ANNOTATED LIST

Dromaius novaehollandiae Emu UY. Most common in 1977 and early 1978.

Poliocephalus poliocephalus Hoary-headed Grebe RV. On dams in July 1978.

***Tachybaptus novaehollandiae** Australasian Grebe UT. Singly or in small numbers on ponds and dams. B:11/78, 1/82

Pelecanus conspicillatus Australian Pelican UT. Occasionally seen in flight after heavy rains; six on dam in January 1982.

Anhinga melanogaster Darter RV. Two on dam in November 1981; three in January 1982.

Phalacrocorax carbo Great Cormorant RV. One flew over in October 1977; one on dam in November 1981.

Phalacrocorax sulcirostris Little Black Cormorant RV. Six flew over in January 1982.

Phalacrocorax melanoleucos Little Pied Cormorant UT. On dams. Became common in January 1982. Cormorants and other water-birds were more regularly seen along Brigalow Creek.

***Ardea pacifica** Pacific Heron CY. Seen most often on dams and near melon holes. Disappeared earlier than the White-faced Heron during dry periods. A:12/81 N:1/82

***Ardea novaehollandiae** White-faced Heron CY. Seen on dams and near melon holes. Seemingly more abundant and regular in occurrence than its congener. B:10/77 A:2/78

Ardeola ibis Cattle Egret RV. One in November 1981 after heavy rains.

Egretta alba Large Egret RT. Common after heavy rains in November 1981, when first seen.

Egretta intermedia Intermediate Egret UT. On dams and near melon holes after rain. Numerous birds in breeding plumage foraging on 'The Dell' and making regular trips southeast in January 1982.

Nycticorax caledonicus Rufous Night Heron UT. First seen September 1978; present until November 1979, then absent until November 1981. Extremely common thereafter and frequently flushed from daytime roosts.

Plegadis falcinellus Glossy Ibis RT. The least common of the ibises. A few first seen in December 1981 after heavy rain, usually associated with large flocks of Straw-necked Ibises. Large flocks (up to thirty-nine) and many small flocks in January 1982.

Threskiornis aethiopica Sacred Ibis UT. Usually formed mixed flocks with Straw-necked Ibises; after November 1981 commonly formed pure flocks of up to twenty.

Threskiornis spinicollis Straw-necked Ibis CT. Most common ibis, often in large flocks. Abundant after rains in November 1981.

Platalea regia Royal Spoonbill RT. Singly or in small flocks.

Platalea flavipes Yellow-billed Spoonbill UT. Absent between April 1979 and December 1980.

***Dendrocygna eytoni** Plumed Whistling Duck CT. Most numerous in wet conditions; often heard calling in flight at night. E:10/78, 10/79, 1/82 F:11/78

***Anas superciliosa** Pacific Black Duck CT. Most numerous in wet conditions. E:10/78 F:9/78, 11/78, 1/81

***Anas gibberifrons** Grey Teal CT. Mainly in wet conditions; flocks were usually small (ten to fifteen). E:1/82 F:11/78, 9/81, 10/81

Anas rhynchotis Australasian Shoveler RV. One pair throughout November 1981.

Malacorhynchus membranaceus Pink-eared Duck UT. Pairs or flocks of up to nineteen on dams after heavy rain.

Aythya australis Hardhead RT. Singly or in pairs on dams or flooded lowlands; became more common in January 1982.

***Chenonetta jubata** Maned Duck CT. Most numerous during wet conditions, but often found at other times. F:9/78, 8/81

Elanus notatus Black-shouldered Kite CY. One of the most common species of raptors at 'The Dell' until October 1977, when it disappeared. Similar dramatic irruptions and declines of populations, correlated with the abundance of prey, have been noted at other localities (Pedler 1976; Chinner 1977).

Aviceda subcristata Pacific Baza US. Absent after March 1979.

Milvus migrans Black Kite RT. Singly or in very small flocks. Populations invaded nearby areas from time to time. Fifty at the rubbish tip in Meandarra in July 1978.

Haliastur sphenurus Whistling Kite UY. Seen regularly until June 1980, rare thereafter.

***Accipiter fasciatus** Brown Goshawk UY. Probably more common than records suggest as birds often skulk in dense brigalow. Remains of four Tawny Frogmouths found beneath one nest. N:10/81

Accipiter cirrhocephalus Collared Sparrowhawk RV. One in August 1981.

***Aquila audax** Wedge-tailed Eagle UY. A nest found in July 1980 contained green branches, indicating recent activity. In January 1981 the remains of the following animals were found below the nest: four European Rabbits *Oryctolagus cuniculus,* three European Hares *Lepus europaeus,* two Eastern Blue-tongued Lizards *Tiliqua scincoides,* and one Bearded Dragon *Amphibolurus barbatus.* In February 1981 two immatures were frequently seen with two adults.

Hieraaetus morphnoides Little Eagle UV. All three sightings in summer.

Circus assimilis Spotted Harrier RT. Seen in small numbers in 1976 and 1977.

Falco peregrinus Peregrine Falcon. One at 'Boningar' in July 1971.
Falco longipennis Australian Hobby RT. One pair found regularly at same site for several years.
***Falco berigora** Brown Falcon CY. Numbers declined during drought. B:11/77, 8/78 A:7/79, 10/79, 10/81
***Falco cenchroides** Australian Kestrel CY. Numbers declined during drought. Rarely seen after February 1981. A:10/79, 11/79 N:10/79
Coturnix novaezelandiae Stubble Quail CT. Sightings most frequent when long grasses were present, viz. 1976, 1977, 1982.
***Turnix velox** Little Button-quail CT. Probably present earlier, but definitely identified in December 1981 after heavy rains, when this species flourished and bred. E:12/81
Turnix pyrrhothorax Red-chested Button-quail CT. Probably present from November 1981; abundant in January 1982.
Gallinula ventralis Black-tailed Native-hen UT. Noted at a dam at 'Foriston' regularly since 1969. First seen at 'The Dell' on a large dam after heavy rain in November 1981 and for the following two months. Impressive irruptions of this species after rain have been reported by others (Schrader 1974).
Porphyrio porphyrio Purple Swamphen. Occasionally seen along creeks in the district.
Fulica atra Eurasian Coot UV. Thirty-nine on one dam, five on another in January 1982.
Grus rubicundus Brolga. Three about 10 km east of the 'The Dell' in July 1980. Reported dancing at 'Foriston' (K. L'Estrange, pers. comm.).
Rostratula benghalensis Painted Snipe RV. One in 1976 at dam, one male at melon hole in January 1982.
***Vanellus miles** Masked Lapwing CY. Usually near dams. B:9/77 F:11/80
***Vanellus tricolor** Banded Lapwing UY. More likely than the previous to be encountered far from water. Often seen flying over. E:10/81 F:9/81
Erythrogonys cinctus Red-kneed Dotterel RV. First seen on 31 December 1980 after heavy rain. One in December 1981, four in January 1982 at dam.
Charadrius melanops Black-fronted Plover UT. One to six birds mainly at dams.
Himantopus himantopus Black-winged Stilt CT. First seen in February 1980 and extremely common after heavy rain in November 1981. Several adults performed distraction displays when approached but we found no nests.
Tringa nebularia Greenshank RV. One on dam in December 1981 and January 1982.
Gallinago hardwickii Latham's Snipe UT. Seen at dams or wet depressions at 'Boningar' in 1971, 'The Dell' 1978-1979, more commonly in 1981-1982 when up to five were seen in one day; 'Foriston' in 1981. All observations in summer.
Calidris acuminata Sharp-tailed Sandpiper RV. Three birds in February 1980 and January 1982 at dam.
Columba livia Feral Pigeon RV. One near shed on 20 April 1981.
Geopelia placida Peaceful Dove RT. All five sightings fall in the period August-January. Common in timber along Brigalow Creek.
Geopelia cuneata Diamond Dove UV. Seen in June 1977, then absent until December 1981, after which many were present.
Geopelia humeralis Bar-shouldered Dove RV. Usually encountered at woodland edge.
Phaps chalcoptera Common Bronzewing RT. Probably a resident of the heavily timbered reserve.
***Ocyphaps lophotes** Crested Pigeon CY. Usually singly or in pairs, but occasionally in large flocks. Built up to very large numbers in 1971, with over 500 estimated at 'Boningar'. A:9/77, 10/77, 9/79, 1/80 E:12/77, 11/78, 9/79, 10/79, 12/79, 1/80, 8/80, 9/80, 11/80, 8/81, 9/81, 10/81, 11/81, N:10/77, 11/77, 10/80
Calyptorhynchus magnificus Red-tailed Black-Cockatoo UT. No apparent seasonality. Most often associated with belahs.
Calyptorhynchus lathami Glossy Black-Cockatoo UY. Associated with belahs; rarely seen after November 1978.
Calyptorhynchus funereus Yellow-tailed Black-Cockatoo RT. No apparent seasonality. Associated with belahs.
***Cacatua roseicapilla** Galah CY. Often gathered in flocks of several hundred in evening on dams at 'Boningar' and 'Foriston' but such congregations were not seen at 'The Dell.' E:11/78 F:12/79, 11/80
Cacatua galerita Sulphur-crested Cockatoo. Common along creeks in the district.
Trichoglossus haematodus Rainbow Lorikeet RV. Two groups, of five and three birds, flew over in November 1980.
Alisterus scapularis Australian King-Parrot. One immature in November 1980 at 'Foriston'. Not seen at 'The Dell'.
***Aprosmictus erythropterus** Red-winged Parrot CY. Usually in pairs or very small flocks. F:9/81
***Nymphicus hollandicus** Cockatiel CY. Numbers declined in drought. Birds gathered in hundreds when wheat was being transported along road. F:10/81
***Melopsittacus undulatus** Budgerigar RV. Nested commonly along Brigalow Creek in 1969 and 1970. Absent after 1971, until January 1982 when flocks of eight and sixteen were seen at 'The Dell'.
***Platycercus adscitus** Pale-headed Rosella CY. Found in most vegetation types in the region. A:8/78 E:11/78 N:7/78 F:10/81
Barnardius barnardi Mallee Ringneck UY. Became more numerous in drought.
Psephotus haematonotus Red-rumped Parrot CY. More common in Meandarra; often in large numbers when wheat was being transported along roads.
***Northiella haematogaster** Blue Bonnet CY. Usually in open country with scattered trees. F:10/80, 10/81
***Cuculus pallidus** Pallid Cuckoo CS. A few birds in winter. One fledgeling fed by Willie Wagtails. F:11/80, 12/80
Cuculus pyrrhophanus Fan-tailed Cuckoo US. Some seen in winter. Absent from November 1979 until July 1981.
Chrysococcyx osculans Black-eared Cuckoo RV. One singing just west of the intersection of Surat and Meandarra roads in January 1970.
***Chrysococcyx basalis** Horsfield's Bronze-Cuckoo CS. Usually seen singing from prominent perch but sometimes seen on ground far from trees. One fledgeling fed by several Yellow-rumped Thornbills. F:11/80
Chrysococcyx lucidus Shinning Bronze-Cuckoo RV. One in September 1978. Another in October 1978 and possibly also in October 1980.
Eudynamis scolopacea Common Koel. Commonly heard singing at 'Foriston' from October 1980 to May 1981.
Scythrops novaehollandiae Channel-billed Cuckoo US. Sometimes heard at night, usually at dawn.
Centropus phasianinus Pheasant Coucal UV. Many present 28-29 December 1981. Absent thereafter.
Ninox connivens Barking Owl RV. Three or four heard barking and screaming in July and August 1980.
Ninox novaeseelandiae Southern Boobook. Occasionally heard in timber along Brigalow Creek south of Meandarra.
Tyto alba Barn Owl UT. One found dead near house on 'The Dell' on 21 January 1978. Heard occasionally thereafter.
***Podargus strigoides** Tawny Frogmouth CY. Remains frequently found but predators other than Brown Goshawk unknown. B:9/77 A:9/77, 9/78, 9/79, 10/79, 11/80, 9/81 E:10/77, 10/79 N:11/77, 10/79, 10/80, 10/81
***Aegotheles cristatus** Australian Owlet-nightjar CY. Usually heard at night, occasionally in daylight. Sometimes flushed. E:3/77
Hirundapus caudacutus White-throated Needletail CT. Usually seen October to April. Sometimes associated with Fork-

tailed Swifts.

Apus pacificus Fork-tailed Swift UT. Seen from December to April. Usually preceded or accompanied low-pressure systems.

***Dacelo novaeguineae** Laughing Kookaburra UY. Groups localized in big timber. N: 9/77, 8/79

Halcyon pyrrhopygia Red-backed Kingfisher UY. Usually seen in summer but several sightings in June and July. Absent since February 1980.

Halcyon sancta Sacred Kingfisher US. Some present each year. One immature in March 1978.

Merops ornatus Rainbow Bee-eater RV. First seen in September 1980. A group of five was present for several days in October 1981 and again in January 1982.

Eurystomus orientalis Dollarbird US. Last seen in November 1980. More common along creeks.

Mirafra javanica Singing Bushlark RV. Two in March 1979. Several in stubble fields on 'Foriston' in January 1981.

Hirundo neoxena Welcome Swallow RV. Three in July 1980. Common elsewhere in region.

Cecropis nigricans Tree Martin UT. One in July 1979, two in August 1979 and many in February 1980 and January 1982.

***Cecropis ariel** Fairy Martin. A colony of about fifty nests in an open-sided shed at 'Foriston' October 1980 to March 1981. Absent after April 1981.

Anthus novaeseelandiae Richard's Pipit CY. Numerous until November 1978, then scarce. Absent in 1981 except for one in May, then six in January 1982.

***Coracina novaehollandiae** Black-faced Cuckoo-shrike CY. Possibly less common in winter. Numbers declined in drought. B:9/78, 11/80 A:12/79 N:11/78

Coracina papuensis White-bellied Cuckoo-shrike. A single bird, in dark phase, seen well at close range at 'Foriston' in June 1981.

Coracina maxima Ground Cuckoo-shrike UT. Usually in small groups, two to seven birds, mostly on 'Murwollock'.

***Lalage sueurii** White-winged Triller CS. Not strictly seasonal but always absent for several months each year. In one area birds lived at very high densities, suggesting colonial breeding (see White 1952; Gannon 1953). B:9/81 E:9/81 N:10/78 F:10/78, 1/79

***Petroica goodenovii** Red-capped Robin CW. First seen only in winter. Gradually became more common in other months. Present in every month from April 1980 to January 1982. F:1/80, 12/81

Eopsaltria australis Eastern Yellow Robin RV. One on 16 June 1981.

***Microeca leucophaea** Jacky Winter CY. Usually in open country with scattered shrubs. N:11/80

Pachycephala pectoralis Golden Whistler RT. From June to September 1977; absent thereafter except for one male in June 1980.

Pachycephala rufiventris Rufous Whistler CY. Found in most wooded areas. N:12/79

Colluricincla harmonica Grey Shrike-thrush UY. Numbers declined in drought.

Oreoica gutturalis Crested Bellbird UY. Usually heard rather than seen; more common in drought.

Myiagra rubecula Leaden Flycatcher RV. One male on 22 October 1977 and another on 19 October 1979.

Myiagra inquieta Restless Flycatcher UW. Absent after April 1979.

Rhipidura fuliginosa Grey Fantail UT. Numbers and seasonality varied greatly.

***Rhipidura leucophrys** Willie Wagtail CY. Ubiquitous. B:10/79, 9/81 E:10/79, 11/79, 9/80, 10/80, 11/80, 12/80, 1/81, 9/81, 11/81, 12/81, 1/82 N:10/79, 11/80, 12/80, 1/81, 10/81 F:11/78, 2/80, 9/81

***Pomatostomus temporalis** Grey-crowned Babbler CY. A large proportion of the population was colour-banded. Breeding season was chiefly August to December, but eggs were found as early as April and nestlings as late as February. Details of breeding will be published separately.

***Pomatostomus superciliosus** White-browed Babbler CY. Home ranges of groups of this species sometimes overlapped those of Grey-crowned Babbler. Usually found in areas of dense shrubs rather than tall timber. B:10/79, 6/81 A:9/77, 10/77, 7/78, 11/81 N:7/79 F:9/78, 8/79, 12/79

Acrocephalus stentoreus Clamorous Reed-Warbler RV. One on 19 October 1978 in dense bullrushes in small pond.

***Cinclorhamphus mathewsi** Rufous Songlark US. Virtually absent except for a pair or two on 'Finbar' from October 1979 until September 1981, when it generally became common and vocal. Common on 'Foriston' in 1980. N:12/81 F:12/81

Cinclorhamphus cruralis Brown Songlark UT. First seen on 4 November 1980, again in February 1981 and from November 1981 to January 1982. Common on properties to the north.

***Malurus cyaneus** Superb Fairy-wren CY. Usually nested in wild lime. A:10/77 E:3/78 N:10/81 F:3/78

Malurus lamberti Variegated Fairy-wren UY. Found mainly in areas of shrubby brigalow regrowth.

***Malurus leucopterus** White-winged Fairy-wren UY. Usually associated with wild lime or other low shrubs. One group of twenty birds appeared to have only one male in breeding plumage. Not seen in the region before 1976, when it was noted on 'The Dell'. E:3/78

Sericornis sagittatus Speckled Warbler. Two at 'Boningar' in August 1976.

***Smicrornis brevirostris** Weebill CY. An active nest was found at 'Boningar' in January 1970. Presumably breeds at 'The Dell'.

***Gerygone fusca** Western Gerygone CY. Less noticeable in winter. B:10/81

Gerygone olivacea White-throated Gerygone RT. Absent since May 1980. More common near creeks.

***Acanthiza apicalis** Inland Thornbill CY. Often occurred in mixed flocks with Yellow Thornbills and Weebills. A:10/77 F:12/77

Acanthiza uropygialis Chestnut-rumped Thornbill UY. Usually in timbered areas away from deep melon hole country.

***Acanthiza chrysorrhoa** Yellow-rumped Thornbill CY. The most conspicuous species of thornbill; in flocks up to thirty. B:8/78, 9/78 A:10/77 N:10/78 F:9/78, 11/78

***Acanthiza nana** Yellow Thornbill CY. Probably the most numerous thornbill. Occurred in a wide range of vegetation. B:7/78, 8/80 A:9/77, 9/78 E:8/80 F:11/77, 11/78, 9/80, 11/80

Daphoenositta chrysoptera Varied Sitella UT. First seen on 15 September 1978 in brigalow reserve. Seven in June 1980 and a few in February and March 1981.

Climacteris picumnus Brown Treecreeper RV. One in July 1977 about 200 m west of brigalow reserve.

***Acanthagenys rufogularis** Spiny-cheeked Honeyeater CY. A few birds were colour-banded and resighted one year later. Numbers declined during drought. B:1/80, 9/81 A:10/81 N:10/81

***Plectorhyncha lanceolata** Striped Honeyeater CY. Numbers declined during drought. B:11/79, 8/81, 9/81 A:9/78, 12/79 N:9/81, 11/81, F:11/78, 1/80, 8/81, 9/81

***Philemon corniculatus** Noisy Friarbird CS. A few also seen during winter. E:9/81 F:11/78, 10/81

***Philemon citreogularis** Little Friarbird CS. A few also present during winter. F:1/79

***Entomyzon cyanotis** Blue-faced Honeyeater CY. Both nests examined were built in the tops of nests previously used by Grey-crowned Babblers. Once seen entering active Grey-crowned Babbler's nest. N:9/80, 10/81 F:10/79, 12/79, 1/80, 9/81, 11/81

***Manorina melanocephala** Noisy Miner CY. Many birds were colour-banded for a study of breeding biology. Most common in dense shade strips and timbered paddocks. Breeds mainly August to December. Details of breeding will be

published separately.

*__Manorina flavigula__ Yellow-throated Miner CY. Typically found in more open areas with scattered trees and shrubs. Home ranges abut those of Noisy Miners. Although hybrids were reported from 'Boningar' (Dow 1972) no interbreeding was recorded at 'The Dell', even though the two species nested in adjacent trees. A:9/77, 10/77, 3/78, 8/78, 9/78, 10/78, 4/79, 8/81 B:2/78, 10/78, 9/79, 9/81 E:8/78, 9/79 N:9/79, 12/79 F:3/78, 10/78, 11/78, 1/79, 9/79, 10/79, 10/80

*__Lichenostomus virescens__ Singing Honeyeater CY. Numbers appeared stable throughout study. E:9/80 N:9/80 F:9/78, 1/79

*__Lichenostomus penicillatus__ White-plumed Honeyeater RT. Irregular until January 1980, when as many as five birds were seen together until August 1980. Absent thereafter. Common in Meandarra and along Brigalow Creek; found breeding at 'Foriston'. N:10/80, 2/81

__Melithreptus brevirostris__ Brown-headed Honeyeater RT. At least six in February 1980. A flock of six regularly during April 1980. Absent thereafter.

__Lichmera indistincta__ Brown Honeyeater UW. First seen 6 June 1978. Abundant throughout that month and present until October 1978. A few in April and one in June and July 1979, then absent until March 1980. Increasing thereafter until October 1980. A few in May 1981; one in January 1982. When present, birds were often seen feeding on mistletoe.

*__Grantiella picta__ Painted Honeyeater CS. First seen on 7 October 1977. Birds disappeared in January or February each year, returning in August or September. Our records suggest that this species may feed solely on mistletoe. A:11/81 B:9/81, 11/81 E:9/81 F:11/81

*__Ephthianura tricolor__ Crimson Chat RV. Seen in flocks of up to thirty along roadsides in region in August 1969; several times in 1970. Absent until December 1981, when six were found in 1 sq km of wild lime. They had nested and disappeared by January 1982. E:12/81 N:12/81

*__Dicaeum hirundinaceum__ Mistletoebird CY. Numbers appeared stable throughout study. B:9/81 F:3/78, 2/80, 10/81

__Pardalotus striatus__ Striated Pardalote CY. Numbers appeared to fluctuate. Occasionally black-crowned forms were noted but the common form had a striated crown.

__Zosterops lateralis__ Silvereye RT. Singly or in small flocks in June, July, September, January and February.

*__Passer domesticus__ House Sparrow. Present year round in Meandarra.

__Emblema guttata__ Diamond Firetail RV. One on 16 September 1978.

*__Poephila guttata__ Zebra Finch RV. A colony of about thirty nested in wild lime at 'Boningar' in 1970. One at 'Foriston' in January 1981. A few at 'The Dell' in January 1982, when they nested. B:1/82

*__Poephila bichenovii__ Double-barred Finch CY. Seen regularly from June 1977 until April 1980. Since then seen in January 1981, December 1981 and January 1982. A:3/78 E:11/77, 12/81

*__Aidemosyne modesta__ Plum-headed Finch CY. Until April 1979, roosting in bullrushes in a small pond. Then absent until December 1981. A flock of more than 150, including begging young, in January 1982. E:12/81 F:1/82

__Sturnus vulgaris__ Common Starling RV. Two flew over on 7 July 1980.

*__Oriolus sagittatus__ Olive-backed Oriole UT. Irregular, without apparent seasonality. Absent each year for several months at a time. F:2/79

__Chlamydera maculata__ Spotted Bowerbird UT. Several bowers found. One bird carrying food on 27 August 1981.

*__Corcorax melanorhamphos__ White-winged Chough CY. Occasionally in very large flocks but group size smaller when breeding. B:2/78, 8/80, 9/80 A:10/77, 2/78, 8/78, 9/78, 10/79, 8/81, 12/81 F:9/78, 10/78

*__Struthidea cinerea__ Apostlebird CY. Numbers declined in drought. B:8/79, 8/80, 10/80, 11/80, 9/81 A:8/77, 10/77, 9/78, 12/79 N:11/78, 11/80, 9/81, 10/81 F:10/79, 11/79, 9/81

*__Grallina cyanoleuca__ Australian Magpie-lark CY. Ubiquitous. Eggs in one nest preyed upon by Apostlebirds (Whitmore 1981). A:8/78, 9/78, 10/78, 11/78, 11/79, 12/79, 8/81 N:10/79, 12/79 F:11/78, 12/79

__Artamus leucorhynchus__ White-breasted Woodswallow RV. First seen flying over on 23 September 1979; one bird carried nest material. Two in flight in October 1979.

__Artamus personatus__ Masked Woodswallow RT. A few birds with large flocks of White-browed Woodswallows.

*__Artamus superciliosus__ White-browed Woodswallow CT. Most common woodswallow, specially numerous in December 1981 and early January 1982, when they nested in hundreds. By 26 January 1982 virtually all had departed. B:11/78 F:1/79, 12/81, 1/82

*__Artamus cinereus__ Black-faced Woodswallow UT. First seen on 5 April 1980; present September to November 1980, November and December 1981; always with White-browed Woodswallows. F:10/80

__Artamus cyanopterus__ Dusky Woodswallow RV. Several in flight on 23 November 1981.

__Artamus minor__ Little Woodswallow. Many at 'Foriston' for more than a week in February 1981.

*__Cracticus torquatus__ Grey Butcherbird CY. In dense shade strips and closed forest. A:9/77, 10/77, 8/78, 9/79, 10/79, 10/80, 9/81 Y:9/78, 8/81 F:11/79, 10/80, 10/81, 11/81 B:8/78, 8/80, 10/80

*__Cracticus nigrogularis__ Pied Butcherbird CY. Found in more open country than its congener. A:9/81 Y:11/80

*__Gymnorhina tibicen__ Australian Magpie CY. Mainly in open country. A:9/78, 10/80, 8/81, 9/81 N:10/79, 10/80 F:1/78, 10/79, 11/79, 12/79, 10/81

__Strepera graculina__ Pied Currawong RV. First seen in March, then in August and October 1980.

*__Corvus coronoides__ Australian Raven CY. Slightly more common than Torresian Crow. B:7/80

__Corvus orru__ Torresian Crow CY. Commonly encountered.

DISCUSSION

There are virtually no other published annotated lists from localities within a radius of at least 100 km. The closest localities from which annotated lists are available are Chinchilla (Broadbent 1885), Kowguran (Sedgwick 1948) and the border region to the southwest (Elliott 1938). Some lists of one-day trips have been published from time to time in 'Urimbirra' by the Chinchilla Field Naturalists Club and of weekend camps by the Queensland Ornithological Society published in their Newsletter. A list of species without details is available for Southwood National Park (Jones 1974). Perusal of these lists suggests that about another seventeen species could be added to our list, mostly birds from heavily wooded areas nearer the mountain ranges to the north and east.

It is possible that over the five years of this study some rare vagrants may have been overlooked because observers were inevitably absent from time to time. A second possible bias concerns the recorded status of a few species of birds on 'The Dell', because in our studies

we did not visit all parts of the site with equal frequency; but we think that this bias would be small.

Our list comprises 172 species. Of the 160 species recorded from 'The Dell', twenty-three per cent were vagrants and thirty-one per cent transients. Of the 160 species, eleven per cent were added during the final three months of the study. The high proportions of vagrant and transient species may be explained in part by topography and climate. Meandarra is situated just north of the divide between two river courses: the Condamine-Balonne being the principal river system to the north and the Moonie to the south. As both of these rivers run essentially from east to west, their associated riparian woodland may be expected to provide major avenues for dispersing birds from both eastern and western avifaunas. There are no major topographic barriers in the region and this probably results in more subtle interdigitation of climatic and vegetation regimes, which may well add to the variable nature of the avifauna. The Great Dividing Range, closer to Meandarra in the north than the east, and thus essentially half surrounding this section of the Darling Downs, would be expected to provide a continual source for stragglers of the more eastern species.

Local conditions round Meandarra are highly variable with respect to soil type, vegetation and climate. Our observations suggest that complete bird lists obtained from other nearby localities may be quite different, although such differences are likely to be reflected more in the status than in the composition of species. But we would predict that such lists would be characterized by the same temporal variability that we found. Rainfall *per se* cannot account for all the variation in bird species or their numbers. It is more likely that many environmental factors interact to produce fluctuations in the avifauna. However, rainfall and drought are no doubt important short-term influences on virtually all populations of birds.

The environs of Meandarra and the area to the south have a local reputation as a dry belt with highly unpredictable rainfall. Using information on median rainfall published by the Bureau of Meteorology (1977) for more than 220 stations, we have constructed an isohyet map for the surrounding region (Fig. 2). This clearly shows how drier inland conditions extend closer to the coast between the latitudes of Meandarra and Goondiwindi. Our study site lies in a dry corridor while areas within 30 km receive almost ten per cent more rainfall. This interdigitation of moister and drier zones may influence the composition of the avifauna. Twenty-six species on the list can be characterized as typically western in southeast Queensland (i.e. not normally found east of the Great Dividing Range) while sixteen are eastern. Of these, five western and eight eastern species were recorded only as vagrants.

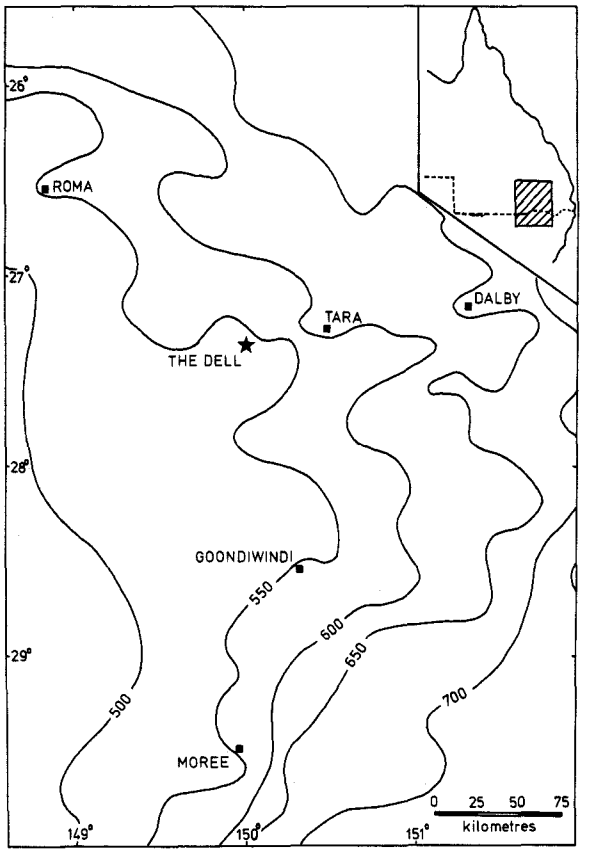

Figure 2. Median annual rainfall on the Darling Downs and adjacent regions. Isohyets are based on linear interpolation of data for over 220 stations (Bureau of Meteorology 1977).

Three pairs of species that replace each other on an east-west gradient reside on 'The Dell': White-throated and Western Gerygone, Noisy and Yellow-throated Miner, and Torresian Crow and Australian Raven. The western species predominate in the gerygones and the corvids. The Superb and White-winged Fairy-wrens, although not classical geographic replacements, interact in ways suggesting that they may be interspecifically territorial at 'The Dell'. Thus, although our site is only about 300 km inland, there is a considerable component of the avifauna that is associated with areas of low rainfall.

The rainfall records in Figure 3 are from the Meandarra Post Office, 8 km northwest of our study site. Although they give a general idea of the patterns and amounts of rainfall, many storms were very local in nature. For example, in January 1982 one storm dumped 98 mm of rain on 'The Dell' but the corresponding figure at the Post Office was 32.8 mm. Throughout

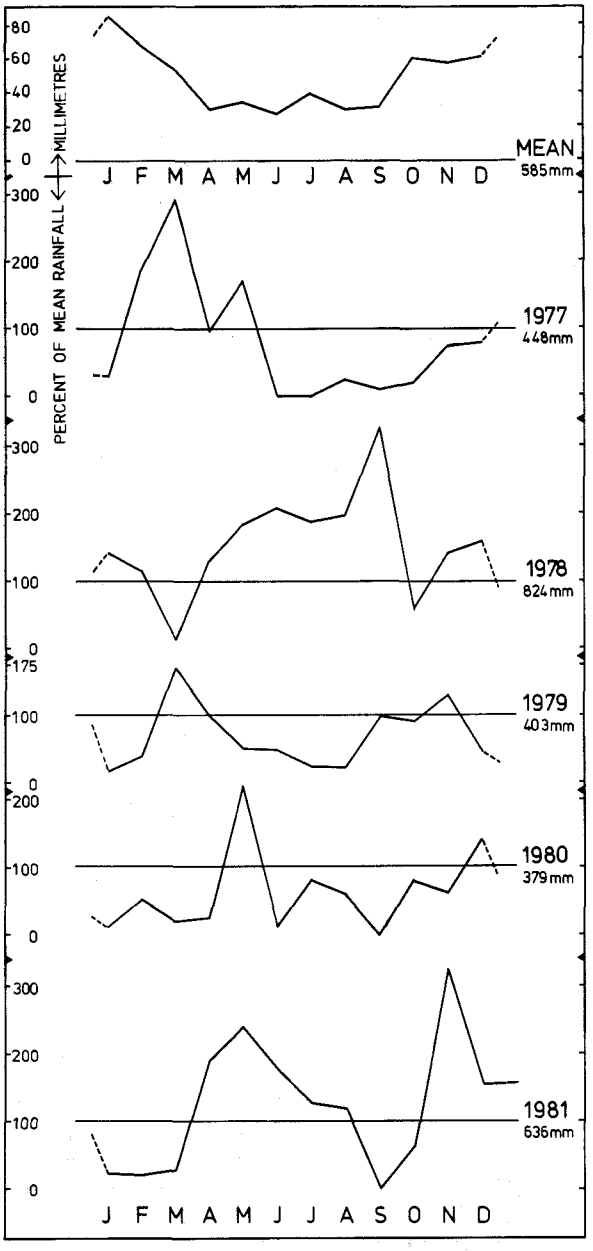

Figure 3. Rainfall records from the Meandarra Post Office. The top line shows monthly means for thirty-two years prior to 1977. Rainfall for each year of our study is expressed as a percentage of long-term monthly means and the actual annual total is shown to the right of each line.

1979 and 1980, many storms skirted our site but brought rain to nearby properties. During that period, most of the sizeable rainfalls we received resulted from single storms, with no follow-up rain.

As well as being drier, Meandarra may receive even more erratic rainfall than is expected at this distance from the coast. Although this region typically receives most of its precipitation during the summer monsoonal season, minor deviations in the normal weather pattern can cause the influence of the temperate regime (dry summer, wet winter) to extend this far north. In any given year, the area may experience either wet season, neither, or both (Fig. 3). At Meandarra the median and mean rainfall differ substantially (537 mm vs 585 mm over 35 years), indicating a bias towards moderately dry years with occasional very wet ones. In the two-degree block bounded by 149° E and 151° E longitude and 27° S and 28° S latitude, forty-five per cent of all stations (9 of 20) had mean rainfall at least five per cent greater than median rainfall. In the two degree blocks immediately north and south the figures are twenty-five per cent (7 of 28) and twenty-three per cent (5 of 22) (Bureau of Meteorology 1977). This rough measure suggests that our study area may experience greater extremes than is typical of the region generally. It was our good fortune, biologically, to experience one such extreme, drought.

It is difficult to define the period of drought at our site, but it probably began about May 1979. Certainly by January 1980 its effects were very obvious. These was virtually no herbaceous cover and a marked scarcity of insects, particularly grasshoppers, lacewings, mantids and lepidopteran larvae. Almost all standing water had disappeared. Tara Shire, including our study area, was officially declared drought-stricken on 24 March 1980.

Without resorting to a strict censusing method, it is difficult to assess accurately changes in numbers of particular species. Yet it seemed to us, with several years of impressions as a basis for comparison, that many species definitely declined in number during the height of the drought. We have mentioned some already; obviously the waterbirds and waterfowl are among them. But even normally common passerines, such as Apostlebirds, White-winged Choughs and Striped and Spiny-cheeked Honeyeaters became scarce. This may imply that not only a lack of surface water but also a shortage of food forced some species to seek refuge elsewhere.

Declining numbers of other species were less dramatic and may have resulted from poor reproduction in 1980 rather than from emigration. Some species showed no appreciable decline; these included Crested Pigeon, Willie Wagtail, Jacky Winter, Yellow Thornbill, Australian Magpie-lark, Grey Butcherbird and Australian Magpie. Finally, a few species appeared to increase during the drought. The Mallee Ringneck became temporarily common, as did Brown-headed Honeyeater and Black-faced Woodswallow, both of which may be nomadic. Red-capped Robins, initially present only in winter, were found year round in 1980.

Although Tara Shire was officially drought-stricken until February 1982, good rains fell from April to August 1981. Conditions improved thereafter and between July and December, when most breeding occurred, the vegetation was lush and food abundant. However, it was not until November 1981, immediately after heavy rainfalls, that we witnessed a major influx of waterbirds. Other species (e.g. Double-barred Finch, Crimson Chat, Zebra Finch and Budgerigar) that had been absent for many months reappeared about this same time.

We witnessed extreme changes in vegetation over the course of our observations, and many more subtle changes in the local availability of resources must have taken place. This variability and the juxtaposition of eastern and western avifaunas probably account for many of the irregular appearances and disappearances of many species, much of the unpredictable seasonality of others, and the high proportion of vagrants noted in the list.

There is no doubt that a high proportion of Australia's birds are nomadic (Keast 1959) and many see this habit as a behavioural adaptation to an unpredictable environment. Some species, such as the wood-swallows, are strictly characterized as nomads, but others may be capable of travelling long distances, if only occasionally, when conditions deteriorate or improve dramatically. It may be that more species of birds than we suppose are capable of nomadism when faced with very harsh conditions. Whether movements are attributed to the juxtaposition of different faunas, overall climatic factors, or local perturbations in weather, the status of many species at a particular locality may be highly unpredictable and the presence of others very brief. This, we believe, underscores the importance of intensive observations of the avifauna at a single locality over a time that encompasses a variety of environmental conditions.

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