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THE SUNBIRD

Volume 18 Number 3 September 1988

BIRDS OF NARAYEN RESEARCH STATION, MUNDUBBERA, SOUTH-EAST QUEENSLAND.

G.J. LEACH

ABSTRACT

Eucalypt and brigalow woodlands, pastures, crops and dams were opportunistically surveyed between 197Ø and 1986 to determine the species of birds at Narayen Research Station and their habitats. One hundred and sixty-six species were recorded, of which 3Ø water birds were associated only with dams or the Auburn River. Many of the land birds were observed in several habitats, but others were much more restricted. Most of the 18 species recorded only in brigalow associations are characteristic of wetter closed-forests; two-thirds of them were observed on only one or two occasions.

INTRODUCTION

The distribution and status of bird species in the Brigalow Belt of eastern Australia (Isbell, 1962; Bailey, 1984) is not well-known despite the wide extent of this vegetation complex in the 5ØØ-75Ø mm annual rainfall zone. Although the Belt is defined by the presence of major occurrences of Brigalow *Acacia harpophylla* (Johnson, 1984), the large areas of eucalypt woodlands within the Belt are also major habitat for birds. The region may be a significant wintering area for birds from southern Australia (Nix, 1976).

Observations on 229 species of birds at Coomooboolaroo Station, 110 km NW of Biloela in Central Queensland, between 1873 and 1925 were collated by Barnard (1925). More recently, Whitmore *et al* (1983) annotated 172 species recorded at Meandarra on the western Darling Downs from 1977–1982, and Crossman and Reimer (1986) provided brief notes on 209 species located in the Taroom shire from 1977–1979. Other information is generally based on visits of limited duration, e.g. Jones (1974). Accordingly, observations made at Narayen between 1970 and 1986 by the author, residents and other visitors are collated to extend information on the region.

STUDY AREA AND METHODS

The Research Station

Narayen (25°41'S, 150°52'E) is situated 45 km WSW of Mundubbera, Queensland, in the Auburn River catchment. The river and its tributary, Cheltenham Creek, form part of the southern and eastern boundary (Fig. 1). The 9150 ha were leased to CSIRO by the Queensland Government in 1966 to provide facilities for extensive research on sub-tropical crops and pastures (Coaldrake *et al*, 1972). Previously it was part of Hawkwood Station and subject only to light grazing by beef cattle.

The topography of Narayen is undulating to hilly, with Mt. Narayen (480 m) on the western side being the most prominent feature. It has an average rainfall of 716 mm, with 72% falling from October through March (Cook and Russell, 1983). Severe drought was experienced in 1968–69, and most years since 1976–77 have had below average rainfall. In contrast, summer rainfall was high in 1970–71 and 1975–76. Maximum mean daily temperatures range from 20.3°C (July) to 32.0°C (December). On average light frosts occur on 32 days, and heavy frosts on 14 days, from June through mid-September.

There were originally about 7530 ha with various eucalypt forest and woodland communities, and 1620 ha with brigalow–softwood scrub communities at Narayen (Coaldrake *et al*, 1972). The mixture of eucalypt and brigalow communities is therefore not unrepresentative of the Brigalow Belt as a whole. In this paper

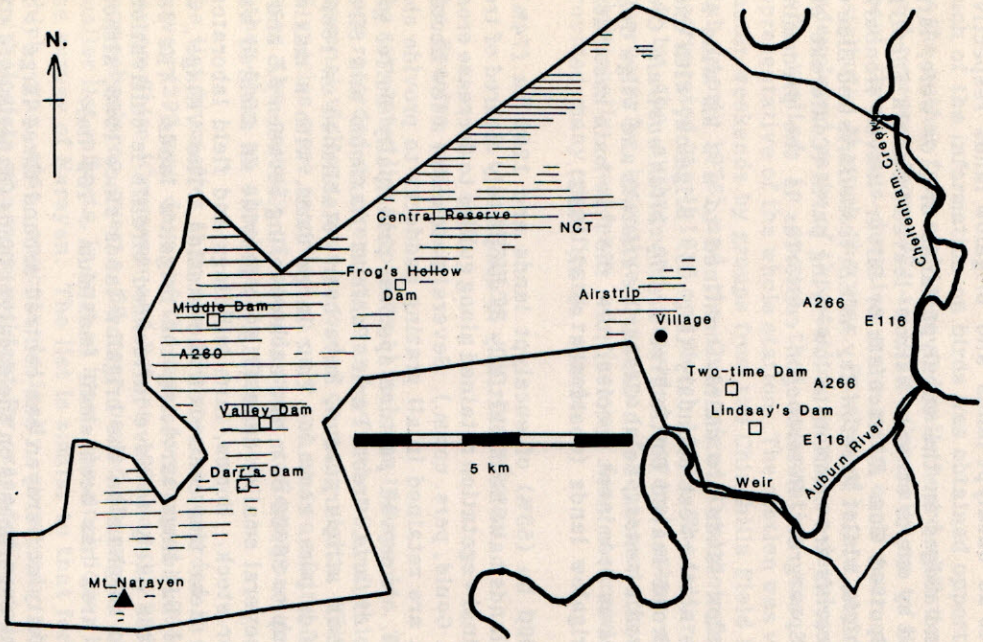

Fig. 1. *Narayen Research Station, showing the principal distribution of brigalow lands (shaded area - for details see Coaldrake et al* (1972)), larger long-term experiments (A26Ø, etc.)., dams, and other features mentioned in the text.

lands presently or formerly covered by these communities are referred to as 'eucalypt lands' and 'brigalow lands' respectively.

Slopes and ridges in the eucalypt lands are, or were, largely dominated by one or other of Narrow-leaved Ironbark *Eucalyptus crebra*, Spotted Gum *E. maculata* or Silver-leaved Ironbark *E. melanophloia*, whilst Moreton Bay Ash *E. tessellaris* and Blue Gum *E. tereticornis* are common in low-lying parts (Coaldrake *et al*, 1972). Speargrass *Heteropogon contortus* is the predominant grass.

The brigalow lands are mainly confined to a 2 km wide strip along the north-west boundary (Fig. 1). Brigalow, with one or more of Broad-leaved Bottle Tree *Brachychiton australe*, Crow's Apple *Owenia venosa*, Belah *Casuarina cristata* and Wilga *Geijera parviflora* as prominent species, form the five main associations of the brigalow lands (Coaldrake *et al*, 1972).

About 4ØØØ ha (53%) of eucalypt lands and 12ØØ ha (74%) of brigalow lands have been partially or completely cleared of trees, with original vegetation retained along gullies to decrease erosion risk (K.F. Gould, pers. comm.). Several patches of a few hectares in extent are retained in all grazing paddocks to provide shade for cattle. Improved pasture species, principally Buffel grass *Cenchrus ciliaris*, Green Panic *Panicum maximum* and Siratro *Macroptilium atropurpureum*, have been established on 166Ø ha (K.F. Gould, pers. comm.). Four large dams, with a maximum capacity up to 8ØØØØ cu.m and each covering between Ø.5 and 1.Ø ha, and several smaller dams (Fig. 1) provide an assured water supply for stock. Homes, farm buildings and field laboratories are sited near the centre of the station, 'The Village', with additional buildings servicing the brigalow lands. The other major factor likely to have influenced birdlife is cultivation of wheat and sorghum on the brigalow lands since 1968, although the total area has been small (maximum : 1ØØ ha).

Much activity at Narayen has centred around three large (> 2ØØ ha) grazing experiments on the eucalypt lands (Experiments A266, E116 and NCT) and a crop-pasture experiment on the brigalow lands (A26Ø) (Fig. 1). Many observations were made whilst travelling between the village and these experiments.

Survey Methods

Much of the information on birds was obtained opportunistically by the author from sightings and calls heard whilst undertaking field research from 1971 to 1979. Generally up to six visits of about three days duration were made each year, and evenly distributed through the year. Patches of intact vegetation, and undeveloped parts of the station, as well as developed country, were visited to ensure that information was reasonably representative of the whole station. The station was visited over Easter weekends by groups from the Chinchilla Field Naturalists Club (April 1976) and the Queensland Ornithological Society Incorporated (April 1985 and March 1986). The latter visits were led by the author and provided several other experienced observers for intensive coverage of representative habitats. Additionally, residents of Narayen (see Acknowledgements) provided many significant records.

RESULTS AND DISCUSSION

The Species List

The annotated list (Appendix 1) includes 166 species. Thirty-nine were recorded on every visit and a further 91, of which some are seasonal visitors, were recorded on many visits. The remaining 36 species were recorded on only one or two visits, but in some cases the paucity of records must reflect poor detectability rather than an absolute low frequency.

The list is smaller than the 2Ø9 species recorded in a two year survey (29Ø man days) of the much larger area (1865Ø sq.km) of Taroom Shire (Crossman and Reimer, 1986) or the 229 species at Coomooboolaroo over a 5Ø year period (Barnard, 1925). The smaller list reflects, in part at least, the much lower intensity of the survey of Narayen. The list is similar to that for Meandarra which was also opportunistically surveyed, although by ornithologists who were resident for extended periods (Whitmore *et al*, 1983), and larger than the Southwood list (Jones, 1974).

The RAOU Atlas (Blakers *et al*, 1984), based on observations between 1977 and 1981, included 169 species for the one degree grid square (11ØØØ sq.km) in which Narayen is located. All except 27 of the 169 species were recorded at Narayen either

before, during or after the Atlas period.

Regular observations in each of the 39 vegetation associations (Coaldrake *et al*, 1972) and the man-made habitats at Narayen should add species to the list beyond the 27 already in the Atlas but not yet recorded at Narayen. Most of the habitats in the Taroom Shire and at Coomooboolaroo are probably represented to some extent at Narayen, implying many more potential species. However, some of the species observed by Barnard (1925) declined markedly during his period of observation, some became locally extinct and one (Paradise Parrot *Psephotus pulcherrimus*) is believed to be extinct nationally (Schodde and Tidemann, 1986), so it is unlikely that as many species will ever be recorded at Narayen as at Coomooboolaroo. Regular systematic observations would also better define the frequency with which species occur, and particularly the arrival and/or passage of migrants.

Habitats In Which Species Were Observed

Forty-one species were associated with the river, its tributary and the dams, 30 of them solely (Appendix 1). All except three of the latter 30 (Azure Kingfisher, Tree Martin and Fairy Martin) are from recognized families of wetland birds (e.g. Ardeidae, Anatidae and Charadriidae). Representation of water birds is poorer than recorded by either Barnard (1925) or Crossman and Reimer (1986), and considerably less than in a sub-coastal region of southern Queensland over the latter half of the period (Leach and Hines, 1987). Because many of the dams are deep and have been in existence for less than 20 years, generally they have not developed sufficient diversity of aquatic and shoreline vegetation to attract some wetland birds. Cattle have direct access to the water at some dams and inevitably preferentially graze herbage at the margins, especially during the frequent droughts, so suitable habitats for species such as crakes and rails may never develop at these.

Ninety-four species are described as making some use of eucalypt communities (E) with or without other habitats (see Appendix 1) and 72 of brigalow communities (B) with or without other habitats, with 46 of these species common to both E and B. Thirty-three species are categorized as using only relatively unmodified tree communities of both eucalypt and brigalow (EB and BE, Appendix 1). Among these 33, passerines predominate (28 species), with the flycatcher, thornbill and honeyeater

families well represented. Fourteen species (7 with only 1 or 2 records) were predominantly confined to eucalypt tree communities and 18 (12 with only 1 or 2 records) to brigalow communities. Five honeyeater species were in the eucalypt communities, but no other family was strongly represented in them or in the brigalow alone. Species confined to brigalow communities include Australian Brush-turkey, Eastern Yellow Robin and Lewin's Honeyeater which are all frequently recorded in wetter closed-forest nearer the coast.

Seven species were confined to grasslands (G), four to grass and croplands (GC or CG) and five to grass associated with wetlands (WG or GW). No species were solely associated with crops, although two (Glossy Black Cockatoo and Yellow-tailed Black Cockatoo) were associated only with crops and brigalow.

Occurrence And Habitat Use of Some Groups of Related Birds

Water Birds. No migratory waders were recorded. They are also poorly represented in Barnard (1925) and Crossman and Reimer (1986), suggesting that if they do use the suitable habitat here it may only be during spring and/or autumn passage, requiring adequate monitoring over a very narrow time-span to observe them. Ducks too were poorly represented, possibly because the dams were too deep to provide adequate food supply for filter feeders, for example, or the number of dams too few to provide alternative feeding sites when they were disturbed.

Diurnal birds of prey. Wedge-tailed Eagles were the most conspicuous, but Australian Kestrel was most often observed. Black-shouldered Kite, Australian Goshawk and Brown Falcon were also observed at high frequency. An abundance of macropods at times, and occasional mouse plagues, have ensured prey and carrion for birds of prey. Despite this, only 9 species were observed compared with 21 species at Coomooboolaroo (Barnard, 1925).

Pigeons and doves. The status and representation of pigeons and doves is similar to that in the Taroom shire (Crossman and Reimer, 1986). Common doves of south-eastern Queensland were well represented, especially the Crested Pigeon. The single observation of the Wonga Pigeon reflects its decline in the inland scrubs over many years (Barnard, 1925; Frith, 1982).

Parrots. This group, with 13 species, was well represented. The Red-tailed Black Cockatoo was not recorded by Barnard (1925) or Crossman and Reimer (1986), but each recorded two different additional species. The listed habitats indicate that this group has diverse requirements, although 11 of them utilised crops in part. Some proved troublesome, possibly because small areas of crops were being grown near suitable roosting trees in patches of Brigalow.

Cuckoos. Cuckoos were poorly represented in comparison with Coomooboolaroo, Meandarra or Taroom Shire (Barnard, 1925; Whitmore *et al*, 1983; Crossman and Reimer, 1986). This is probably because some are easily overlooked by observers unfamiliar with their calls and some are migratory.

Owls. The paucity of records almost certainly reflects the small number of nocturnal surveys. Owls were well represented on nocturnal surveys, particularly during mouse plagues, suggesting they were relatively frequent.

Robins, whistlers and flycatchers. The wide range of habitats seems to have ensured good representation of these species. The Eastern Yellow Robin and Golden Whistler appeared to be confined to the brigalow-softwood associations. Five species were recorded once only, possibly reflecting migrant or nomadic status.

Fairy-wrens, scrubwrens and thornbills. Ten representatives were observed, nine on several occasions. They tended to be associated with wooded habitats, sometimes extending to adjacent grassland, e.g. Red-backed Fairy-wren and Yellow-rumped Thornbill.

Honeyeaters. Fifteen species were observed, compared with 18 at Coomooboolaroo (Barnard, 1925), 12 at Meandarra (Whitmore *et al*, 1983) and 20 in Taroom shire (Crossman and Reimer, 1986). Both coastal and inland species utilised the extensive area of eucalypts. Lewin's Honeyeater was the only one associated with the brigalow-softwood scrubs, which is consistent with its preference for closed-forest in wetter districts.

Finches. Seven species of finch, including the introduced Nutmeg Mannikin but not the House Sparrow, were recorded. Flocks of 200 or more Zebra Finches, Double-barred Finches and Chestnut-

breasted Mannikins were regularly observed on rank pastures near dams, and they occasionally utilized sorghum crops as well.

Mud-nest Builders. This group is conspicuously well represented, as in other surveys in the Brigalow Belt (Barnard, 1925; Crossman and Reimer, 1986). Although they give the impression of having benefitted from station development, being often around dams and cattle camps, the observations of Barnard (1925) show that they were equally abundant under much more extensive systems of land use. The apparent increase in numbers of Magpie Larks in each autumn may represent migration and be support for Nix's (1976) view that this region could be a winter refuge for species from southern latitudes.

Woodswallows. In comparison with Coomooboolaroo where five of the six species were frequently observed (Barnard, 1925), only two of four species were frequently observed at Narayen. The recent lists of Whitmore *et al* (1983) and Crossman and Reimer (1986) are more consistent with the Narayen list, particularly regarding frequency of observations.

CONCLUSIONS

Although Narayen has not been systematically surveyed for birds, most of those recorded in other lists from the Brigalow Belt have been recorded there. There are indications that new dams are attracting some waterfowl, and pastures and crops attracting species such as the Australian Bustard and several parrots. Provided sufficient woodland, particularly brigalow associations, can be retained, it should be possible to at least maintain the current diversity of bird species. Narayen, after 20 years, offers a valuable opportunity to monitor changes in bird populations in relation to type and intensity of land use. Such information could be invaluable to land holders in the Brigalow Belt wanting to "replace" habitat largely lost in the initial wholesale clearing of much of the region.

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APPENDIX 1

Annotated List of Birds Recorded at Narayen Research Station 1971 - 1986

In the following list both scientific and vernacular names follow "Recommended Names for Australian Birds" (*The Emu* 77. Supplement. 1978).

Principal habitats are indicated by:

E - Eucalypt forest and woodland, usually with a grass understory.
B - Brigalow-softwood scrub.
G - Sown grasslands on former eucalypt or brigalow-softwood

scrub lands, with remaining trees sparsely distributed or confined to gullies and shade blocks.
C - Croplands, on former brigalow-softwood scrub land and principally growing wheat or sorghum.
W - Dams, water courses and their marginal vegetation.

The sequence of these letters gives the approximate ranking of species' occurrence in the habitats. Thus 'EG' means the species was more often seen in eucalypt woodland than in sown grassland.

Frequency of observation is indicated by:

+++ Observed on all, or nearly all, visits.
++ Observed on three or more visits, but not on the majority of visits
+ Observed on only one or two visits.

Observations which were not made by the author, or in the presence of the author, have the initials of the observer(s) following them (see Acknowledgements for names).

Emu *Dromaius novaehollandiae* EG, ++ Large mobs (5Ø+) in Green Panic pastures on brigalow lands in 1972, otherwise pairs or family groups.

Hoary-headed Grebe *Poliocephalus poliocephalus* W, ++ Larger dams on the brigalow lands.

Australasian Grebe *Tachybaptus novaehollandiae* W, +++ Most dams.

Australian Pelican *Pelecanus conspicillatus* W, + Middle Dam; Two-time Dam (DBC, PG)

Darter *Anhinga melanogaster* W, ++ Nesting at Darr's Dam, April 1985.

Little Black Cormorant *Phalacrocorax sulcirostris* W, ++ Flock of 18 on brigalow lands, March 1977. Dams, Auburn River and Cheltenham Creek.

Little Pied Cormorant *Phalacrocorax melanoleucos* W, +++ Dams, Auburn River and Cheltenham Creek.

Pacific Heron *Ardea pacifica* W, ++ Dams on the brigalow lands.

White-faced Heron *Ardea novaehollandiae* W, ++.

Great Egret *Egretta alba* W, ++.

Little Egret *Egretta garzetta* W, ++.

Intermediate Egret *Egretta intermedia* W, ++.

Rufous Night Heron *Nycticorax caledonicus* W, + Dead bird found in fence at Two-time Dam, December 1980 (DC).

Sacred Ibis *Threskiornis aethiopica* W, ++.

Straw-necked Ibis *Threskiornis spinicollis* WG, ++ Appears to feed in improved pastures to a greater extent than its congener.

Royal Spoonbill *Platalea regia* W, ++.

Yellow-billed Spoonbill *Platalea flavipes* W, ++.

Magpie Goose *Anseranas semipalmata* W, + Single individual at Valley Dam, August-September 1984 (DC).

Plumed Whistling-Duck *Dendrocygna eytoni* WG, ++ Flocks of over 50 individuals occasionally on pastures.

Black Swan *Cygnus atratus* W, ++.

Pacific Black Duck *Anas superciliosa* W, +++.

Grey Teal *Anas gibberifrons* W, +++.

Hardhead *Aythya australis* W, ++.

Maned Duck *Chenonetta jubata* WG, +++ Flocks of over 50 individuals occasionally on pastures.

Black-shouldered Kite *Elanus notatus* CGE, ++.

Pacific Baza *Aviceda subcristata* E, + E116 experiment, 1977 (GD).

Black Kite *Milvus migrans* G, + Over Frog's Hollow, 1973.

Whistling Kite *Haliastur sphenurus* EW, ++ Especially along Auburn River.

Brown Goshawk *Accipiter fasciatus* GCE, ++ Observations of hunting over rank pastures on brigalow lands.

Wedge-tailed Eagle *Aquila audax* EGCB, ++ Twenty-three on one day in 1974 (DBC); six on brigalow lands, April 1975.

Australian Hobby *Falco longipennis* GCE, ++.

Brown Falcon *Falco berigora* GCEB, ++.

Nankeen Kestrel *Falco cenchroides* GCEB, +++.

Australian Brush-turkey *Alectura lathami* B, ++ Active mounds in brigalow-softwood scrub, Central Reserve.

Brown Quail *Coturnix australis* G, ++.

King Quail *Coturnix chinensis* G, + Records from Buffel grass pastures in A266 experiment during summer 197Ø-71 (PD).

Painted Button-quail *Turnix varia* EG, ++.

Dusky Moorhen *Gallinula tenebrosa* W, ++.

Eurasian Coot *Fulica atra* W, +++.

Brolga *Grus rubicundus* G, + NCT experiment, December 1985 (PJ).

Australian Bustard *Ardeotis australis* GC, ++ Flocks of up to 2Ø occasionally, especially on brigalow lands.

Comb-crested Jacana *Irediparra gallinacea* W, + April 1985.

Bush Thick-knee *Burhinus magnirostris* EGC, ++ Heard, and also seen on station roads, at night.

Masked Lapwing *Vanellus miles* WG, +++.

Banded Lapwing *Vanellus tricolor* CG, ++ Small flocks on cultivated brigalow lands in autumn of 1972, 1975 and 1978.

Red-kneed Dotterel *Erythrogonys cinctus* W, ++ Especially dams on brigalow lands.

Black-fronted Plover *Charadrius melanops* W, ++ Dam margins.

Black-winged Stilt *Himantopus himantopus* W, ++ Valley Dam.

Latham's Snipe *Gallinago hardwickii* W, + At edge of Valley Dam, 29 January, 1979 and 6 April, 1985.

Peaceful Dove *Geopelia placida* EGC, +++.

Bar-shouldered Dove *Geopelia humeralis* EGCB, +++.

Common Bronzewing *Phaps chalcoptera* EB, ++.

Crested Pigeon *Ocyphaps lophotes* GCE, +++.

Squatter Pigeon *Petrophassa scripta* EG, + E116 experiment, near Auburn River, March 1971.

Wonga Pigeon *Leucosarcia melanoleuca* B, + Central Reserve, April 1980 (DBC).

Red-tailed Black-Cockatoo *Calyptorhynchus magnificus* B, + (DBC).

Glossy Black-Cockatoo *Calyptorhynchus lathami* CB, ++ Central Reserve, near Frog's Hollow, also on grain crops.

Yellow-tailed Black-Cockatoo *Calyptorhynchus funereus* CB, ++ Small flocks on grain crops occasionally.

Galah *Cacatua roseicapilla* CGE, +++ Regularly around grain crops.

Sulphur-crested Cockatoo *Cacatua galerita* CBEG, +++ Large flocks (200+) on grain crops occasionally.

Rainbow Lorikeet *Trichoglossus haematodus* EC, ++ Regularly visit grain crops.

Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus* EC, ++ Regularly visit grain crops.

Little Lorikeet *Glossopsitta pusilla* E, ++ Flowering eucalypts, mainly along Cheltenham Creek.

Australian King Parrot *Alisterus scapularis* BEC, ++.

Red-winged Parrot *Aprosmictus erythropterus* GCE, ++ Especially on the brigalow lands.

Cockatiel *Nymphicus hollandicus* CGE, +++ Regularly around grain crops.

Budgerigar *Melopsittacus undulatus* CG, ++ Occasional flocks of about 20 individuals on grain crops.

Pale-headed Rosella *Platycercus adscitus* EGC, +++.

Fan-tailed Cuckoo *Cuculus pyrrhophanus* EB, ++.

Shining Bronze-Cuckoo *Chrysococcyx lucidus* B, + Central Reserve, April 1984.

Common Koel *Eudynamis scolopacea* E, ++ Summer visitor.

Channel-billed Cuckoo *Scythrops novaehollandiae* EB, ++ Summer visitor.

Pheasant Coucal *Centropus phasianinus* BEG, ++ Particularly in the softwood scrub around Mt. Narayen.

Southern Boobook *Ninox novaeseelandiae* ECG, ++ Most sightings during mouse plagues.

Barking Owl *Ninox connivens* BE, + In brigalow at western boundary in June 1974, also on airstrip in April 1985.

Barn Owl *Tyto alba* CGE, ++ Most sightings during mouse plagues.

Australian Owlet-Nightjar *Aegotheles cristatus* GB, + Above Darr's Dam, April 1985.

White-throated Nightjar *Caprimulgus mystacalis* B, + Flushed in Central Reserve, April 1985.

Azure Kingfisher *Ceyx azurea* W, ++ Auburn River.

Laughing Kookaburra *Dacelo novaeguineae* EB, +++.

Sacred Kingfisher *Halcyon sancta* EW, ++ Especially in disturbed eucalypt communities alongside Cheltenham Creek and Auburn River.

Rainbow Bee-eater *Merops ornatus* EGCB, ++.

Dollarbird *Eurystomus orientalis* EGB, ++ Summer visitor.

Singing Bushlark *Mirafra javanica* G, ++ Especially associated with improved pastures.

Tree Martin *Cecropis nigricans* W, ++ Darr's Dam.

Fairy Martin *Cecropis ariel* W, ++.

Richard's Pipit *Anthus novaeseelandiae* G, +++.

Black-faced Cuckoo-shrike *Coracina novaehollandiae* EGC, +++.

White-bellied Cuckoo-shrike *Coracina papuensis* E, + At the village, April 1984.

Cicadabird *Coracina tenuirostris* EB, ++ Summer visitor.

White-winged Triller *Lalage sueurii* EG, ++ Pastures around Frog's Hollow.

Varied Triller *Lalage leucomela* B, + Central Reserve, April 1979.

Red-capped Robin *Petroica goodenovii* BG, + Frog's Hollow, July 198Ø (NG).

Hooded Robin *Melanodryas cucullata* EG, + E116, near Auburn River, April 1985.

Eastern Yellow Robin *Eopsaltria australis* B, ++ Especially around Mt. Narayen and in Central Reserve.

Jacky Winter *Microeca leucophaea* EGB, +++.

Golden Whistler *Pachycephala pectoralis* B, ++ Especially Central Reserve.

Rufous Whistler *Pachycephala rufiventris* EB, ++.

Grey Shrike-thrush *Colluricincla harmonica* EB, ++.

Black-faced Monarch *Monarcha melanopsis* B, + Central Reserve, April 1984.

Leaden Flycatcher *Myiagra rubecula* B, + Around Frog's Hollow Dam, April 1979.

Satin Flycatcher *Myiagra cyanoleuca* E, + Auburn Weir, January 1986 (PJ).

Restless Flycatcher *Myiagra inquieta* WEG, ++ Around margins of larger dams, also along Auburn River.

Rufous Fantail *Rhipidura rufifrons* BE, ++ Especially in Central reserve.

Grey Fantail *Rhipidura fuliginosa* EB, ++.

Willie Wagtail *Rhipidura leucophrys* WGE, +++.

Grey-crowned Babbler *Pomatostomus temporalis* GB, +++.

Tawny Grassbird *Megalurus timoriensis* GW, + In rank grass around Middle Dam – one of the earliest dams constructed.

Golden-headed Cisticola *Cisticola exilis* GWE, +++ Especially in rank grass around dams.

Rufous Songlark *Cinclorhamphus mathewsi* GC, + Near croplands on western boundary, April 1985.

Variegated Fairy-wren *Malurus lamberti* EB, +++ Purple-backed form at Frog's Hollow, October 1978.

Red-backed Fairy-wren *Malurus melanocephalus* EG, +++.

White-browed Scrubwren *Sericornis frontalis* B, ++ Especially around Mt. Narayen.

Speckled Warbler *Sericornis sagittatus* B, + Central Reserve, April 1973 and April 1984.

Weebill *Smicrornis brevirostris* EB, ++.

White-throated Gerygone *Gerygone olivacea* EB, +++.

Brown Thornbill *Acanthiza pusilla* EB, +++.

Buff-rumped Thornbill *Acanthiza reguloides* EB, ++.

Yellow-rumped Thornbill *Acanthiza chrysorrhoa* EBG, +++ Especially near the two main groups of buildings.

Yellow Thornbill *Acanthiza nana* BE, +++ Mainly on the brigalow lands.

Varied Sittella *Daphoenositta chrysoptera* EB, ++.

White-throated Treecreeper *Climacteris leucophaea* B, + Central Reserve, April 1975.

Brown Treecreeper *Climacteris picumnus* E, + Auburn Weir, January 1986 (PJ).

Spiny-cheeked Honeyeater *Acanthagenys rufogularis* E, + At least 4 in Spotted Gums near airstrip, June 1976.

Striped Honeyeater *Plectorhyncha lanceolata* EB, +++.

Noisy Friarbird *Philemon corniculatus* EB, ++ Large flocks on brigalow lands in April 1975.

Little Friarbird *Philemon citreogularis* EB, ++.

Blue-faced Honeyeater *Entomyzon cyanotis* EB, ++ Small flocks conspicuous in spring.

Noisy Miner *Manorina melanocephala* EB, +++.

Lewin's Honeyeater *Meliphaga lewinii* B, ++ Especially around Mt. Narayen and in Central Reserve.

Yellow-faced Honeyeater *Lichenostomus chrysops* EB, ++.

White-eared Honeyeater *Lichenostomus leucotis* EB, ++.

Fuscous Honeyeater *Lichenostomus fuscus* E, ++.

White-throated Honeyeater *Melithreptus albogularis* E, ++.

White-naped Honeyeater *Melithreptus lunatus* E, ++.

Brown Honeyeater *Lichmera indistincta* E, ++.

Eastern Spinebill *Acanthorhynchus tenuirostris* E, + Auburn Weir, January 1986 (PJ).

Scarlet Honeyeater *Myzomela sanguinolenta* EB, ++ Several localities, including the brigalow of the Central Reserve; occasionally at the village (DC).

Mistletoebird *Dicaeum hirundinaceum* B, ++.

Spotted Pardalote *Pardalotus punctatus* B, + April 1985.

Striated Pardalote *Pardalotus striatus* EB, +++.

Silvereye *Zosterops lateralis* EB, ++ Village gardens as well as less disturbed habitat.

Red-browed Finch *Emblema temporalis* EB, ++ Especially in under-growth of brigalow-softwood scrub.

Diamond Firetail *Emblema guttata* GE, + E116 experiment, July 198Ø (NG).

Zebra Finch *Poephila guttata* GE, +++.

Double-barred Finch *Poephila bichenovii* GE, +++.

Plum-headed Finch *Aidemosyne modesta* GWE, ++ Especially near water - e.g. Auburn River in March 1975 and Valley Dam in April 1979.

Chestnut-breasted Mannikin *Lonchura castaneothorax* G, ++.

Nutmeg Mannikin *Lonchura punctulata* GEC, ++ Near Auburn River, alongside E116 experiment, March 1975.

Olive-backed Oriole *Oriolus sagittatus* E, ++.

Figbird *Sphecotheres viridis* EB, ++ Occasionally at the village.

Spangled Drongo *Dicrurus hottentottus* EGB, ++.

Spotted Bowerbird *Chlamydera maculata* BG, + Frog's Hollow, April 1979 and above Darr's Dam, April 1985.

White-winged Chough *Corcorax melanorhamphos* BE, ++ Small flocks regularly in brigalow remnants on the western boundary.

Apostlebird *Struthidea cinerea* EGB, +++ Especially around shade trees in grazed paddocks.

Australian Magpie-lark *Grallina cyanoleuca* GEC, +++ Large flocks (40+) in autumn and early winter.

White-breasted Woodswallow *Artamus leucorhynchus* GB, ++.

Black-faced Woodswallow *Artamus cinereus* E, + Winter 1974.

Dusky Woodswallow *Artamus cyanopterus* GB, ++.

Little Woodswallow *Artamus minor* B, + Observed over Central Reserve, April 1976 (Hirst, 1976).

Grey Butcherbird *Cracticus torquatus* EB, +++.

Pied Butcherbird *Cracticus nigrogularis* EB, +++.

Australian Magpie *Gymnorhina tibicen* EGC, +++.

Pied Currawong *Strepera graculina* BE, ++ Especially in brigalow-softwood scrub remnants near western boundary.

Australian Raven *Corvus coronoides* B, + Heard, April 1985.

Torresian Crow *Corvus orru* GCE, +++.

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COUNTS OF INLAND WADERS IN THE BRISBANE REGION, 1972 - 1983, AND THEIR RELATION TO RAINFALL

PETER F. WOODALL

ABSTRACT

Changes in inland wader numbers were analysed using data from annual bird counts conducted by the Queensland Ornithological Society from 1972-1983 within an 80 km radius of Brisbane. Four species (Black-winged Stilt, Black-fronted Plover, Red-kneed Dotterel and Red-necked Avocet) showed a similar pattern of variation during the 12 year period, with population changes of the first two being significantly negatively correlated with changes in Warrego Region rainfall and/or Moreton Region winter rainfall. Counts of Masked Lapwing showed a variable pattern, not significantly correlated with climatic factors, and counts of Banded Plover and Latham's Snipe were low and relatively constant.

INTRODUCTION

Waders form an important part of wetland avifaunas and therefore are susceptible to the many forms of habitat degradation which threaten these areas. However, a good understanding of all the environmental factors which affect wader numbers is necessary before we can ascribe population changes to habitat factors.

Coastal waders are greatly influenced by tide positions which were not recorded during the QOS annual bird counts. Therefore, this analysis is restricted to those species of waders in the Brisbane region which are not found primarily on the coast, termed "inland waders", and attempts to correlate the counts of these species with climatic variables.

STUDY AREA AND METHODS

The data used in this study came from the Queensland Ornithological Society's annual bird counts. The survey areas, located within an 80 km radius of Brisbane, and methods used for

these counts have been described previously (Woodall 1985, 1987). The number of observers has varied from year to year (Fig. 1) and from area to area. With more members, teams would often divide to cover more ground. Over the 12 years, the total number of inland waders counted was significantly correlated with the number of observers ($r = Ø.695$, $n = 12$, $P < Ø.Ø2$). Therefore, the wader counts have been corrected by the numbers of observers in a particular year (i.e. number of waders counted/number of observers). However, it is obvious from Fig. 1 that the major changes in counts of some species bear no relation to the relatively minor changes in observer numbers.

Data on rainfall and dam levels were obtained from the regional summaries in publications of the Bureau of Meteorology (Anon. 1972–1983). Annual rainfall totals were calculated for the months November–October prior to the count. Rainfall from the Moreton region represented the area where the counts were made while rainfall from the Warrego region was chosen to represent inland areas in the south-west of Queensland. Rainfall totals from the Warrego were also highly correlated with those from the Far South-West Region ($r = Ø.863$, $n = 12$, $P < Ø.ØØ1$). Totals for Moreton Region winter rainfall (July, August, September) were also calculated as they could have a more immediate effect on wader numbers. Mean Moreton dam levels were calculated over the same period from five dams (Atkinson's in the Lockyer catchment; Borumba in the Mary catchment; Leslie in the Condamine catchment; Moogerah and Somerset in the Brisbane catchment).

When correlating environmental data with corrected wader numbers, K-values have been used:

$$K_t = \log N_t - \log N_{t+1}$$

where N_t is the corrected number of birds counted in year t (or rainfall in year t) and N_{t+1} is the corrected number of birds (or rainfall) in the following year (t+1). These K values represent the magnitude and direction of changes in numbers (or rainfall) rather than absolute numbers.

RESULTS

The rarest species was the Painted Snipe *Rostratula benghalensis* (not shown in the Figs.) which was only recorded in 1978 and 1982 from Areas 4 and 8 respectively. The Masked Lapwing *Vanellus miles* and Black-winged Stilt *Himantopus himantopus* were the two most commonly encountered species with the latter having much more variable counts (Figs. 1 & 2).

Counts of Black-winged Stilt had peaks in 1972, 1977, 1980 and 1982 and troughs in 1973, 1978, 1981 and 1983. Counts of the Black-fronted Plover *Charadrius melanops* were much lower and less variable but showed a similar pattern of changes with increases or decreases corresponding to the peaks and troughs of the Black-winged Stilt and the counts of these two species were significantly correlated ($r = 0.839$, $P < 0.001$). The Red-kneed Dotterel *Erythrogonys cinctus* also displayed a similar pattern and three of the four records of Red-necked Avocet *Recurvirostra novaehollandiae* corresponded to peaks in Black-winged Stilt counts. The fourth record (in 1978) was during a period of increasing Black-winged Stilt numbers.

The remaining three species show different patterns (Fig. 2) with variable counts for Masked Lapwing and more stable counts of Banded Lapwing *Vanellus tricolor* and Latham's Snipe *Gallinago hardwickii*.

It can be seen from Fig. 1 that peaks in Black-winged Stilt counts generally corresponded to low Warrego Annual Rainfall and Moreton Winter Rainfall and, conversely, low counts corresponded to high Warrego Annual Rainfall and/or Moreton Winter Rainfall. Corrected counts of Black-winged Stilt showed significant negative correlations with Moreton Winter Rainfall ($r = -0.747$, $P<0.01$) and Warrego Annual Rainfall ($r = -0.604$, $P<0.05$). The Black-fronted Plover also showed a significant negative correlation with Warrego Annual Rainfall ($r = -0.766$, $P<0.01$) but a lower, non-significant correlation with Moreton Winter Rainfall ($r = -0.576$, $0.01>P>0.05$).

Non-significant correlations were recorded between Moreton Annual Rainfall and numbers of Masked Lapwing ($r = 0.551$, $0.1>P>0.5$) and Latham's Snipe ($r = -0.573$, $0.1>P>0.05$).

Correlations between Moreton Dam levels and all species were non-significant (P>Ø.1).

DISCUSSION

These surveys were not strictly replicated from year to year and dividing the number of birds counted by the number of observers is not a fully satisfactory correction, so not too much importance can be attached to minor changes. However, the annual variation in counts of the Black-winged Stilt was very marked and there is no doubt that this survey, with all its shortcomings, did monitor these changes.

An explanation for the significant negative correlation between the Black-fronted Lapwing and Black-winged Stilt counts and Warrego rainfall may be that when Warrego rainfall decreases suitable habitat inland is reduced forcing these species to move to the coast and, alternatively, when Warrego rainfall increases more suitable habitat is created inland and birds on the coast can disperse inland. The significant negative correlation between Black-winged Stilt counts and Moreton winter rain may suggest that this is a proximate factor, triggering dispersal from the coast. Whether such dispersal can be sustained will depend on the availability of suitable habitat elsewhere (e.g. the Warrego region and inland Australia generally). Similar results were obtained for other species of waterbirds (Woodall, 1985).

Red-kneed Dotterel and Red-necked Avocet were absent for several years and their counts cannot be analysed in this manner but their absence coincided with troughs and their presence with peaks in the counts of Black-winged Stilt and Black-fronted Lapwing. Therefore, they are likely to be responding to similar environmental factors.

These results provide long-term confirmation of changes in numbers of waders recorded during the 1982 drought in much of eastern Australia. Analysis of national wader counts showed that numbers of Red-kneed Dotterels, Black-winged Stilts and Red-necked Avocets increased in coastal areas of south-eastern Australia as the drought intensified in 1982 but when the drought broke in 1983 and the inland flooded, these species left the coast and moved inland (Lane 1987). Lane (1987) indicates that the

Red-necked Avocet is better able to exploit the saline conditions of inland lakes than the Red-kneed Dotterel and this may account for its more sporadic occurrence on the coast.

Changes in counts of Masked Lapwing and Latham's Snipe appear to show some relation to Moreton Annual Rainfall (Fig. 2) but these correlations were not statisfically significant and it would be unwise to speculate on their causes.

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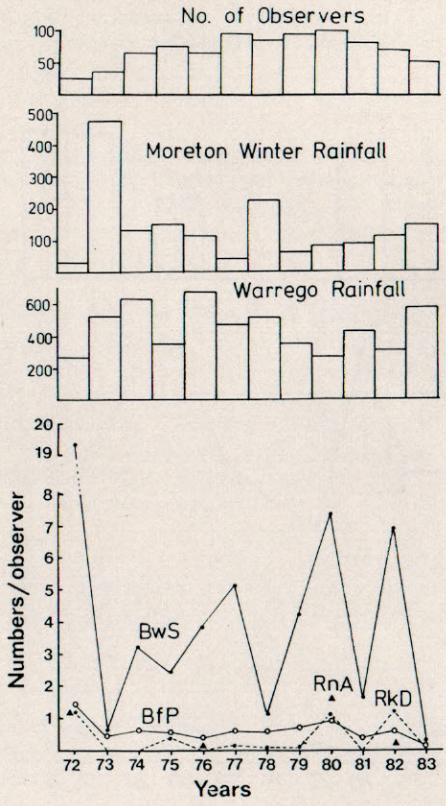

Figure 1. Annual variation in the numbers of observers, Moreton Winter Rainfall and Warrego Annual Rainfall (mm) and numbers/observer of Black-winged Stilt (BwS: •——•), Black-fronted Plover (BfP:•——○), Red-kneed Dotterel (RkD: •------•) and Red-necked Avocet (RnA:▲) in the Brisbane region.

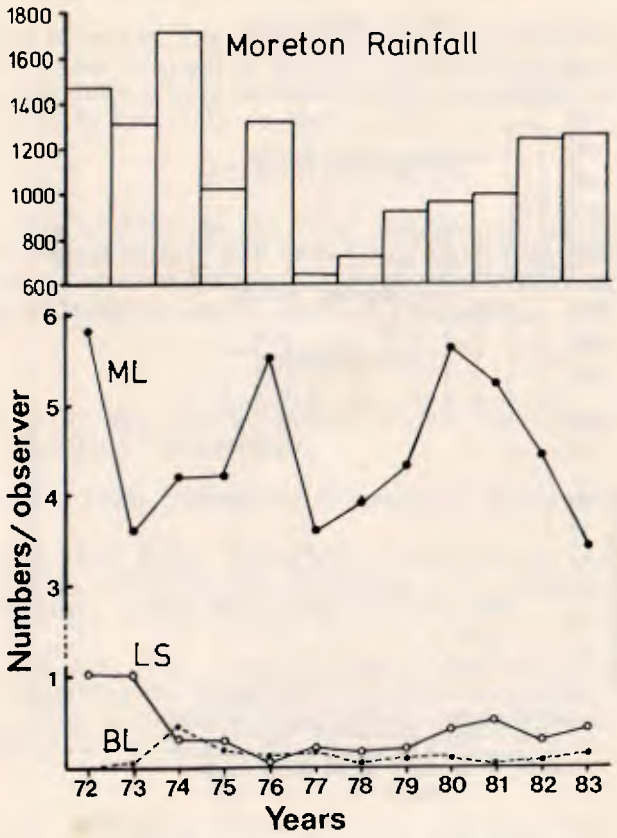

Figure 2. Annual variation in Moreton Annual Rainfall (mm) and the numbers/observer of Masked Lapwing (ML: •——•), Banded Lapwing (BL: •- - - - - •) and Latham's Snipe (LS: o——o) in the Brisbane region.

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SERVENTY, D., SERVENTY, V.N. & WARHAM, J. 1971. The Handbook of Australian Sea-birds. Sydney: Reed.

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