THE SUNBIRD

Volume 6 Number 1 March 1975

STUDIES OF THE APOSTLE-BIRD AT INVERELL PART 2: BREEDING BEHAVIOUR

MERLE BALDWIN

SUMMARY

Courtship,nest building,incubation and care of the nestlings and fledglings of the Apostle Bird *Struthidea cinerea* are described. Two broods are normally raised each year between September and February. Parents and auxiliaries are involved in most of the duties at the nest although the role of auxiliaries in feeding nestlings is minor. The incubation period is about 18 days, and young remain in the nest for about 15 days. The effects of weather on nesting success and on the duration of the nestling period are considered.

GENERAL INTRODUCTION

My previous paper (Baldwin, 1974) described the general behaviour, including feeding habits,calls, display and the social system, of the Apostle Bird *Struthidea cinerea* around my home at Inverell. In the present paper I describe aspects of the breeding behaviour of the same population. Details of the study area may be found in Part 1.

The Apostle Bird normally breeds in spring and may raise more than one brood during this period. Several birds assist with nest building, and the whole group *i.e.* the breeding pair plus the auxiliaries, assists the parent male and female to at least some extent with feeding of the nestlings (Frith, 1969).

At Inverell, Apostle Birds nest from September to February,and are double brooded. One attempt to breed a third time in a favourable season failed when hot, dry weather followed.

COURTSHIP

Courtship begins with an offering of food or a twig. These are not passed, but are dropped as the display develops.

One or both carry food, with feathers raised and bodies quivering as they walk side by side, the distance covered seemingly dependent upon the strength of the sexual drive. After a short walk food is dropped and normal activities resumed, but a long walk - 50 m has been measured - is followed by flight to a tree from which the birds fly out in circles of about 10 m in diameter. After circling eight times one pair plucked grass and placed it in a tree but no nest eventuated. However, remodelling of an old nest began eleven days later (Table 1, Nest L.).

Prior to copulation the quivering display, which is usually begun by the male, becomes intense. Both birds stand stiffly erect, chests prominent, body feathers raised, wings extended with tips of remiges touching the ground; the tail is spread and also drags on the ground; the bill is wide open, and a hoarse whisper is emitted. This quivering display is maintained as the male steps high towards the female, who, if willing,displays in a similar manner until their bills touch. The pair stand with wings beating rapidly for about one minute before the male mounts and the pair copulate quickly.

When one male was in display a female with fluffed feathers brushed beneath his chest, pecked him hard on the toes and then fled.

NEST-BUILDING

All members of the unit help to build the nest, although the juveniles give little help. After helping to build the second nest auxiliaries keep away and may move beyond the territory for a day or two, but they return in time to feed the newly fledged chicks.

The nest is supported by a fork or node and is usually placed beneath thick foliage. It is composed of bunches of grass formed into rings each reinforced with mud and rounded in the smoothing process into a tiered cup.

Rix (1966) states: "From the number of tiers in the construction it appeared that it could have been used on previous occasions." However, the tiered look is normal and does not necessarily denote previous occupation.

Rain triggers mud gathering but warm weather is also needed for the mud to set. After the mud cup of Nest M was finished, fluctuating temperatures caused erratic building behaviour. The birds paid no attention to the nest on cold days but on warm days, instead of lining the cup, they worked feverishly applying more mud

TABLE I.

The influence of weather on nesting success.[1]

Nest	Month	Mean Temp. max. °C	min. °C	Frost days no.	Rain total mm	Rain days no.	Thunder days no.	Remarks	Outcome[2]
1968 - 1969									
A.	Oct.	21	3	9	6	3		Cold	F
B.	Nov.	28	10		49	4	2	Moderate	S
C.	Jan.	30	15		82	7	8	Storms	F
D.	Jan.	31	15		156	10	5	Moderate	S
1969 - 1970									
E.	Nov.	25	11		85	5	3	Heavy Rain	F
F.	Dec.	26	13		61	7	3	Hail	F
G.	Jan.	26	7		1	1		Dry	F
1970 - 1971									
H.	Sep.	17	7	3	164	9	4	Cold	F
I.	Oct.	24	8	5	20	8	2	Cool	S
J.	Dec.	28	15		128	11	6	Moderate	S
K.	Feb.	28	14		10	4		Late	F
1971 - 1972									
L.	Oct.	23	6	8	91	7	4	Cool	S
M.	Dec.	28	13		58	3	2	Inter-ference	F

1. - Weather records supplied by the Commonwealth Bureau of Meteorology. For successful nests they are for thirty days prior to hatching. Records for unsuccessful nests are for the fourteen days after building commenced.

2. - S = Successful, *i.e.* eggs hatched to give one or more nestlings; F = Failure.

until a thick collar (40mm wide and 40 mm deep) overlaid the rim.

Times for collecting material are governed by the mud supply, which at Gilgai is dependent upon rain, and are usually in the morning with intermittent collecting in the late afternoon. In January 1972 after a sudden heavy storm in an otherwise dry period, the first day's work began early and finished at 18:15 by which time the nest was three-quarters completed.

The longest distance from a mud supply to a nest was 130 m. Grass was carried up to 80 m in bundles, either picked off the ground or plucked from growing stems.

During a peak in activity visits average one per minute. Plastering takes about ninety seconds a visit so two birds may work together. Bathing always follows mud gathering.

As shown in Table 2 eight nests were on the sheltered side of a tree with a north-west to east aspect, five faced south, but none west from where the roughest weather comes.

In the territory red gum *Eucalyptus blakelyi* and stringybark *E.macrorhyncha* predominate, with some yellow-box *E.melliodora*, apple-box *E.bridgesiana*, rough-barked apple *Angophora floribunda* and black pine *Callitris columellaris*, and one Camphor Laurel *Camphora officinalis*.

TABLE 2.

Location of nests.

Nest	Tree	Aspect	Height (m)
A.	Angophora	E	6.0
B.	Camphor Laurel	SE	7.5
C.	" "	NW	7.5
D.	" "	SW	6.0
E.	Gum sapling	S	10.5
F.	Apple-box	E	15.0
G.	Camphor Laurel	NE	7.5
H.	Apple-box	N	15.0
I.	" "	E	15.0
J.	Angophora	S	12.0
K.	Camphor Laurel	NE	7.5
L.	Angophora	S	12.0
M.	Camphor Laurel	NE	6.0

EGG-LAYING AND INCUBATION

When mud is plentiful nests are finished in six to eight days. Nests D and I were built in six days, followed by seven days of wandering about away from the nest. Eggs were then laid. Nest B was built in five days, with a rest period of ten days in hot dry weather.

Nest F, commenced on 12 December, was discontinued when temperatures rose and humidity decreased. From 22-24 December, 42 mm of rain fell and the birds worked rapidly to finish the nest in two days. Sitting began two days later and the eggs may have been laid before the nest was complete. At least some eggs were laid between 08:00 and 09:00. I assumed that brooding had commenced when a bird is on the nest before or after this morning laying

hour, and close attendants give the "Kreech" and "Chee-ow" calls.

On 1 January at 14:00 strong wind twisted a large limb off the apple-box tree leaving Nest F exposed to jagged hail and sheets of rain. The sitting bird flattened down on the nest until the storm subsided at 17:50. On 6 January all members of the unit were chattering about the nest and seemed to be turning eggs. The nest was deserted next morning.

All adults incubate and brood but the male appears to spend more time off the nest than the females. He will often sit close to a brooding female. It is possible that the male sits on the nest at night, like the dominant male White-winged Chough *Corcorax melanorhamphus*.

Incubation for Nests B, D and L lasted eighteen days.

NESTLINGS

Observations at five nests (Table 3) showed that chicks stayed in the nest for about 15 days (range 13 to 18 days). Fledging appeared to take longer in cold or wet weather.

Nestlings are left unattended between being fed unless the weather is cold or wet, in which case chicks are covered by adults and auxiliaries in rotation.

TABLE 3

The influence of weather on the nestling period.

Nest	Hatched	Mean Temp. max. °C	min. °C	Frost days no.	Rain total mm	days no.	Nest days no.
B.	30 Nov.	31	10		19	3	13
D.	5 Feb.	31	17		35	3	13
I.	28 Oct.	25	9	3	47	4	16
J.	12 Jan.	27	16		146	11	17
L.	18 Oct.	24	6	5	17	3	18

Chicks of one day are fed mostly with sugar lerps in spring; soft bodied insects such as grasshoppers were substituted in summer.

Artificial foods from the homestead (*i.e.* dry rolled oats, soaked bread, biscuits, grain sorghum, meat scraps) were gathered by the adults and given to the nestlings from the second day, but natural food was always added. After 11 days artificial food was given and, in one drought, dry rolled oats were fed exclusively. These chicks

flourished apparently without water.

Nest I was watched on Day 12 from 10:20 to 16:00 when four adults were feeding three chicks. Visits were one to eighteen minutes apart with most at three minute intervals. Natural food was given on one third of the visits, while natural food plus artificial food was given on half of the visits, and artificial food alone on the remainder. Wholly artificial food was fed by the male who had difficulty in catching insects because of a leg injury.

FLEDGLINGS

Fledging is a critical time for survival as chicks tend to scatter when they vacate the nest, leaving themselves open to attack by predators. Fledglings from Nests D and L were lost then; and, but for the vigilance of adults, at least one chick from Nest I would have fallen prey to a Laughing Kookaburra *Dacelo gigas*.

The large Camphor Laurel tree was used by two fledglings from Nest D learning to fly. When the third chick left the nest the party moved 12 m to a shrubbery for food and water,and there the youngest fledgling disappeared. This party returned to the laurel at about 17:30 for eight consecutive nights to roost,and on three occasions at least, chicks slept in the nest.

Three fledglings from Nest I were perched on a fallen branch beneath at 17:40 on the day they left the nest while five adults (the breeding unit of one male and two females plus two auxiliaries) flew about them. Two chicks followed two females to a small gum tree 20 m from the nest tree, and settled 1 m and 2 m from the ground. Each female sat close by a chick between feeds. Females appeared to return with food to the same chick.

From the second to the fourth day after leaving the nest two fledglings remained in the small gum tree. The third fledgling first moved to an *Angophora* , but on the fourth day rejoined the other two. During this period the young were defended by all adults against predation by a Laughing Kookaburra.

From the fifth to the twelfth day of fledging the fledglings moved to an *Angophora* and stringybark copse 100 m north where they stayed for two days before going another 100 m further on to a rocky,tree clad, rise for one day, then back to the copse for five days.

The party came to the Camphor Laurel near the house on the thirteenth and fourteenth days, and next day to the garden for food.

Fledglings are dependent on adults for food and protection for ten weeks - the usual interval between clutches. The solitary chick from Nest L was only fed by one female after the ninth day of fledging. This left the pair free to court and eventually build another nest.

Begging movements are subdued but calls are loud. While an adult gathers food the juvenile stays nearby and calls. Young birds may partly prepare begged food for themselves. The proportion of natural to artificial food given is about the same as that fed to nestlings.

DISCUSSION

Nesting at Inverell appears to be later than is reported in the literature (Cayley, 1959;Frith, 1969). Nesting success appears to be low, with only five of the thirteen nests I observed producing fledglings. Of the eight failures, three were not finished and five were abandoned (see Table I; Baldwin,1974). Bad weather seems to be responsible for at least some of the abandonments, but why certain nests were not completed is not clear.

Other aspects of breeding behaviour, such as incubation time, generally confirm published reports. However nestling time was very variable, and appreciably shorter than the 23 days quoted by Frith (1969). Weather may have contributed to the variability, and it is always possible that the abundant supply of artificial food around the homestead ensured more rapid growth and development of the young than would occur where birds have to fend for themselves on natural food.

Over a four-year period the breeding success of the Apostle Bird was similar to that of the White-winged Chough. The former raised ten fledglings, the latter raised nine. Each lost four young fledglings.

My own observations of solitary-pair species indicate that these raise approximately twice this number of chicks. It therefore seems that young of these two social groups have less chance of survival than those of pairs. We should ask ourselves why.

REFERENCES

Baldwin, M. 1974. Studies of the Apostle Bird at Inverell, New South Wales. 1. General Behaviour. Sunbird 5 : 77-88.

Cayley, N.W. 1959. What Bird is That? A Guide to the Birds of Australia. 3rd Edition. Sydney : Angus and Robertson.

Frith, H.J. (Ed), 1969. Birds in the Australian High Country. Sydney : Reed.

Rix, C.E. 1966. A New Record of the Apostle Bird for South Australia. Emu 66 : 352.

MS M. BALDWIN, Gilgai, via Inverell, New South Wales 2360

ANNUAL BIRD COUNT, 1974

QUEENSLAND ORNITHOLOGICAL SOCIETY

The Queensland Ornithological Society's fourth Annual Bird Count was held on 13 October 1974. Weather was mainly fine, but overcast on occasions, with isolated rain in some areas in the early morning and evening.

The area surveyed and the areas worked by individual teams are shown in Figure 1. The numbers used to designate areas correspond with those used in 1973 (Sunbird 5 (1): 1-9) except for minor boundary alterations. Two areas not surveyed in previous counts have been designated Area 7A and Area St.(North Stradbroke Island), to permit retention of the established numbering system.

A total of 256 species was recorded, exceeding the previous highest total of 241 species (Sunbird 4 (2): 19-29). The inclusion of Stradbroke Island contributed seabirds and some other species not recorded in former counts. Reef Herons, White-quilled Pigmy Goose, Spotless Crake, Double-banded Dotterel, Sanderling, Beach Stone Curlew, White-winged Black Tern, Squatter Pigeon, Scarlet Robin, and Black-chinned Honeyeater, as well as four species of shearwater, Australian Gannet, Brown Booby, Noddy, and White-capped Noddy have not been recorded in previous counts.

Twenty-eight species noted in previous counts were not observed in the 1974 Count. They were: Great Crested Grebe (1972/3, *i.e.* observed in 1972 and 1973), White-necked Heron (1972/3), Little Bittern (1972), Glossy Ibis (1971/2), Pink-eared Duck (1972), Musk Duck (1971), Collared Sparrowhawk (1972/3), Swamp Harrier (1972), Peregrine Falcon (1971/2), Little Falcon (1972), Stubble Quail(1972), Marsh Crake (1971/2), Red-kneed Dotterel (1972), Large Sand-dotterel (1971/2/3), Wood Sandpiper (1971), Broad-billed Sandpiper (1971/2), Avocet (1972), Wompoo Pigeon (1971/2/3), Red-winged Parrot (1973), Oriental Cuckoo (1972), Ground Cuckoo-shrike (1972/3), White-winged Triller (1972/3), Yellow-tufted Honeyeater (1972), Diamond Firetail (1973), Spice Finch (1971/2), Goldfinch (1971), White-browed Woodswallow (1972) and Little Wood-swallow (1973).

Observers participating in the count are listed below:

Area St.: C. Corben, A Smyth, R. Watson.
Total species recorded: 107
Species recorded only in Area St.: Sooty Shearwater,Fluttering Shearwater,Australian Gannet, Brown Booby, Reef Heron, Spotless Crake, Double-banded Dotterel, Common Sandpiper, Wandering Tattler, Beach Stone Curlew, Noddy, White-capped Noddy, Owlet Nightjar, White-cheeked Honeyeater.

Area 1: G. Harris, G. Porter, S. Porter, G. Porter, D. Quinn
Total species recorded: 110
Species recorded only in Area 1: Rufous Songlark.
Area 2: D. Perkins, H. Clase, J. Deakin, R. Matchett
Total species recorded: 116
Species recorded only in Area 2: Whiskered Tern, White-winged Black Tern, Black-tailed Godwit.
Area 3: B. Morgan, J. Bedard, D. & A. Dow, D. Watson
Total species recorded: 138
Species recorded only in Area 3: Bush-hen, Little Thornbill, Shrike-tit.
Area 4: I. & S. Reynolds, P. & D. Dawson, H. Briggs, A. Eacott, C. Eacott, R. Eley, J. Maunder.
Total species recorded: 168
Species recorded only in Area 4: King Quail, Spine-tailed Swift.
Area 5: M. More, R. & V. Wheeler, D. Cooke, T. Devine, D. Fleay, B. Gear, Mr & Mrs M. Glasman, S. Scudamore, H. Smith, L. Smith, R. Tate, P. Thomson, B. Wilson.
Total species recorded: 139
Species recorded only in Area 5: Yellow-tailed Black Cockatoo, Albert Lyrebird, Rose Robin.
Area 6: G. Leach, P. Haselgrove, G. Neilsen.
Total species recorded: 91
Species recorded only in Area 6: Painted Quail, White-eared Flycatcher, Masked Wood-swallow.
Area 7: W. & H. Horton, J. & M. Pearson, O. Pearson
Total species recorded: 100
Species recorded only in Area 7: Spotted Quail-thrush.
Area 7A: I. Venables, T. Lillingstone
Total species recorded: 111
Species recorded only in Area 7A: Little Quail.
Area 8: G. Roberts, G. Ingram, D. Miller.
Total species recorded: 134
Species recorded only in Area 8: White-breasted Sea Eagle, Banded Plover, Squatter Pigeon, Blue-winged Kookaburra, Satin Flycatcher.
Area 9: T. & M. Thornton, C. & A. Lloyd
Total species recorded: 131
Species recorded only in Area 9: Yellow-billed Spoonbill, Musk Lorikeet, Barn Owl, Australian Ground-thrush, Scarlet Robin, Red-browed Tree-creeper, White-eared Honeyeater, Black-chinned Honeyeater, Red Wattle-bird.
Area 10: J. & R. Walter, M. Jacobs, W. Jolly, N. McKilligan, E. Potts, R. Walter, S. Walter.
Total species recorded: 105
Species recorded only in Area 10: White-quilled Pigmy Goose, White-headed Pigeon, Glossy Black Cockatoo, Plum-headed Finch, Indian Myna.

The following list presents details of sightings in each of the twelve areas surveyed in the 1974 Bird Count. An asterisk beside the name of any species denotes nesting activity, and underlining indicates those areas in which nesting activity was noted.

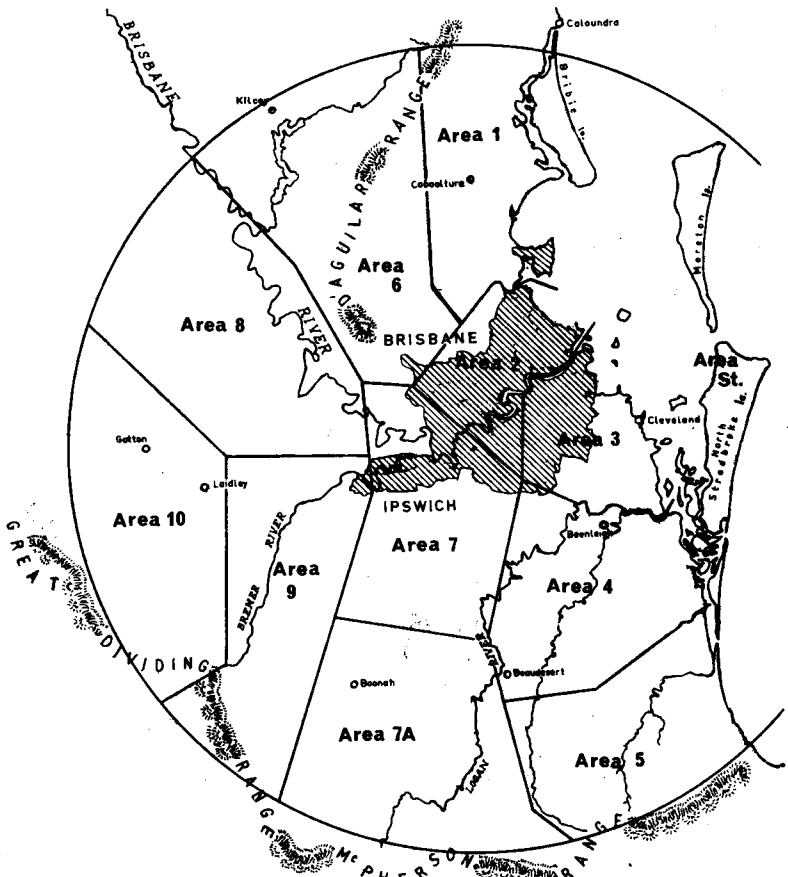

Figure 1. Total survey area and areas covered by individual teams during 1974 Bird Count.

LIST OF SPECIES

	Survey Areas											Total
	St.	1	2	3	4	5	6	7	7A	8	9	10	No.
Wedge-tailed Shearwater	23	0	0	0	0	21	0	0	0	0	0	0	44
Sooty Shearwater	3	0	0	0	0	0	0	0	0	0	0	0	3
Short-tailed Shearwater	78	0	0	0	0	3	0	0	0	0	0	0	81
Fluttering Shearwater	3	0	0	0	0	0	0	0	0	0	0	0	3
Australian Pelican	0	0	0	0	0	0	0	0	0	119	0	0	119
Australian Gannet	28	0	0	0	0	0	0	0	0	0	0	0	28
Brown Booby	1	0	0	0	0	0	0	0	0	0	0	0	1
Darter	1	6	8	1	10	6	1	3	0	7	20	8	71
Black Cormorant	2	1	1	2	7	16	0	0	0	0	100	5	134
Little Black Cormorant	1	3	40	32	49	55	3	7	36	25	0	4	255
Pied Cormorant	17	49	10	2	4	13	0	0	0	0	122	0	217
Little Pied Cormorant	5	18	28	3	43	3	10	22	12	25	7	15	191
*Little Grebe	6	22	10	4	40	30	5	14	24	60	41	120	376
*White-faced Heron	0	16	5	10	52	19	5	5	0	12	3	22	149
Mangrove Heron	4	1	2	0	4	3	0	0	0	0	0	0	14
Cattle Egret	0	60	20	67	44	95	0	0	0	0	0	0	286
White Egret	0	24	5	5	6	5	0	0	12	12	25	11	105
Little Egret	1	0	5	3	5	0	12	0	1	12	3	0	42
Plumed Egret	0	10	34	3	36	13	0	11	5	0	12	3	127
Reef Heron	3	0	0	0	0	0	0	0	0	0	0	0	3
Nankeen Night Heron	0	0	0	1	0	1	0	2	0	0	0	0	4
Jabiru	0	2	0	1	0	0	1	0	0	0	0	0	4
White Ibis	1	14	6	36	48	14	0	0	0	0	0	0	119
Straw-necked Ibis	0	0	0	0	26	3	0	0	0	20	0	0	49
*Royal Spoonbill	0	6	3	3	42	9	6	0	0	7	3	8	87
Yellow-billed Spoonbill	0	0	0	0	0	0	0	0	0	0	1	0	1
Grass Whistling Duck	0	0	1	0	35	0	0	0	23	60	0	0	119
*Black Swan	8	0	25	7	41	73	11	26	2	218	20	83	514
Black Duck	4	44	30	97	132	4	73	14	105	127	171	135	985
Grey Teal	0	2	3	23	11	0	0	10	25	31	32	148	285
Chestnut Teal	0	42	7	14	23	0	0	0	6	0	0	0	92
White-eyed Duck	0	0	2	0	0	0	0	0	0	12	0	0	14
Wood Duck	0	74	0	10	3	90	3	3	64	2	0	14	263
White-quilled Pigmy Goose	0	0	0	0	0	0	0	0	0	0	0	8	8
Black-shouldered Kite	0	0	1	3	1	0	0	0	10	1	3	9	28
Crested Hawk	0	0	0	0	2	0	2	0	0	0	2	0	6
*Red-backed Sea Eagle	3	0	0	0	7	6	0	0	0	0	0	0	16
*Whistling Eagle	8	1	8	7	18	13	1	3	0	4	1	4	68
Grey Goshawk	0	2	0	0	0	0	0	0	0	0	0	1	3
Australian Goshawk	0	0	0	0	0	0	0	0	2	2	0	0	4
Wedge-tailed Eagle	0	0	0	0	0	3	0	0	3	0	0	0	6
White-breasted Sea Eagle	0	0	0	0	0	0	0	0	0	2	0	0	2
*Osprey	3	0	0	2	0	2	0	0	0	0	0	0	7
*Nankeen Kestrel	0	0	1	2	25	3	4	6	37	16	12	28	134
Brown Hawk	0	0	0	0	4	0	0	0	2	0	0	0	6
Brush Turkey	0	0	0	0	2	54	0	1	0	0	0	0	57
Brown Quail	0	0	0	2	1	0	0	0	2	3	0	0	8
King Quail	0	0	0	0	1	0	0	0	0	0	0	0	1
Painted Quail	0	0	0	0	0	0	1	0	0	0	0	0	1
Little Quail	0	0	0	0	0	0	0	0	1	0	0	0	1
Brolga	0	6	5	0	0	0	0	0	0	0	0	0	11
Banded Landrail	0	2	0	1	0	0	0	0	0	0	0	0	3
Spotless Crake	1	0	0	0	0	0	0	0	0	0	0	0	1
Bush-hen	0	0	0	1	0	0	0	0	0	0	0	0	1
*Dusky Moorhen	0	5	74	21	275	65	73	48	76	30	20	507	1194
Swamphen	0	83	31	233	153	14	50	76	57	61	110	151	1019
Coot	0	0	16	10	5	0	0	150	0	0	16	151	348
Lotus Bird	0	4	0	6	25	1	4	3	0	5	1	13	62
Pied Oystercatcher	13	0	0	13	1	16	0	0	0	0	0	0	43
*Spur-winged Plover	4	23	21	26	35	30	13	7	49	19	9	39	275

LIST OF SPECIES (CTD)	Survey Areas											Total
	St.	1	2	3	4	5	6	7	7A	8	9	10	No.
Banded Plover	0	0	0	0	0	0	0	0	0	30	0	0	30
Red-capped Dotterel	30	6	2	10	3	24	0	0	0	2	0	0	77
Double-banded Dotterel	10	0	0	0	0	0	0	0	0	0	0	0	10
Mongolian Sand-dotterel	10	1	100	4	0	0	0	0	0	0	0	0	115
Black-fronted Dotterel	0	0	1	4	14	0	0	0	1	2	2	16	40
Eastern Golden Plover	3	9	29	7	5	0	0	0	0	0	0	0	53
Turnstone	10	28	1	21	0	2	0	0	0	0	0	0	62
Japanese Snipe	0	12	0	6	2	0	0	0	0	0	1	0	21
Whimbrel	1	14	2	2	4	1	0	0	0	0	0	0	24
Eastern Curlew	25	6	2	46	20	7	0	0	0	0	0	0	106
Little Greenshank	0	0	13	3	0	0	0	0	0	0	0	0	16
Greenshank	0	12	0	6	2	0	0	0	0	0	0	0	20
Common Sandpiper	1	0	0	0	0	0	0	0	0	0	0	0	1
Grey-tailed Tattler	8	104	0	35	6	6	0	0	0	0	0	0	159
Wandering Tattler	2	0	0	0	0	0	0	0	0	0	0	0	2
Terek Sandpiper	40	0	0	14	11	0	0	0	0	0	0	0	65
Knot	0	0	150	0	0	0	0	0	0	0	0	0	150
Great Knot	0	0	0	1	1	0	0	0	0	0	0	0	2
Sharp-tailed Sandpiper	0	216	134	7	15	0	0	0	0	23	0	0	395
Red-necked Stint	11	0	500	35	0	0	0	0	0	0	0	0	546
Curlew Sandpiper	2	112	230	8	0	0	0	0	0	5	0	0	357
Sanderling	10	0	0	0	0	2	0	0	0	0	0	0	12
Black-tailed Godwit	0	0	17	0	0	0	0	0	0	0	0	0	17
Bar-tailed Godwit	155	46	30	77	10	283	0	0	0	0	0	0	601
White-headed Stilt	0	0	6	185	6	0	0	1	3	5	2	3	211
Southern Stone Curlew	3	0	0	0	0	0	1	0	0	5	0	0	9
Beach Stone Curlew	2	0	0	0	0	0	0	0	0	0	0	0	2
Silver Gull	22	38	100	40	8	99	0	0	0	0	0	0	307
Whiskered Tern	0	0	1	0	0	0	0	0	0	0	0	0	1
White-winged Black Tern	0	0	40	0	0	0	0	0	0	0	0	0	40
Caspian Tern	1	3	1	2	1	7	0	0	0	0	0	0	15
Gull-billed Tern	2	0	0	0	3	1	0	0	0	0	0	0	6
Asiatic Common Tern	85	42	1	0	0	0	0	0	0	0	0	0	128
Little Tern	79	14	6	2	4	36	0	0	0	0	0	0	141
Crested Tern	327	30	0	20	6	212	0	0	0	0	0	0	595
Noddy	50	0	0	0	0	0	0	0	0	0	0	0	50
White-capped Noddy	1	0	0	0	0	0	0	0	0	0	0	0	1
Top-knot Pigeon	0	0	0	0	60	12	15	0	0	0	0	0	87
White-headed Pigeon	0	0	0	0	0	0	0	0	0	0	0	2	2
Domestic Pigeon	0	4	80	6	9	25	0	0	4	4	5	101	238
Brown Pigeon	0	0	0	1	7	6	6	5	10	0	0	0	35
*Spotted Turtledove	8	4	12	17	9	38	0	0	4	0	1	0	93
*Bar-shouldered Dove	8	3	14	2	9	36	0	0	27	6	2	7	114
Peaceful Dove	1	4	0	21	7	20	0	3	36	11	3	9	115
Green-winged Pigeon	5	0	0	0	0	6	0	4	0	1	0	0	16
Common Bronzewing	0	0	0	0	6	0	0	0	7	1	0	0	14
*Crested Pigeon	0	0	6	3	32	19	9	6	34	8	2	48	167
Squatter Pigeon	0	0	0	0	0	0	0	0	0	1	0	0	1
Wonga Pigeon	0	0	0	1	0	6	2	5	4	0	0	0	18
Rainbow Lorikeet	4	28	9	20	99	197	2	6	18	22	10	4	419
Scaly-breasted Lorikeet	2	36	53	6	99	95	26	51	27	36	21	33	485
Musk Lorikeet	0	0	0	0	0	0	0	0	0	0	6	0	6
Little Lorikeet	0	5	0	0	9	40	0	20	30	11	20	0	135
Yellow-tailed Black Cockatoo	0	0	0	0	0	5	0	0	0	0	0	0	5
Glossy Black Cockatoo	0	0	0	0	0	0	0	0	0	0	0	3	3
Sulphur-crested Cockatoo	0	0	0	0	1	5	0	1	0	2	3	0	12
Galah	0	1	1	1	19	24	0	0	2	16	17	14	95
Cockatiel	0	0	0	0	7	0	0	0	0	11	1	24	43
King Parrot	0	0	0	0	5	21	1	0	4	8	4	2	45
Crimson Rosella	0	0	0	0	4	72	9	0	2	6	9	30	132
Eastern Rosella	0	0	0	0	0	6	0	0	0	0	8	0	14
Pale-headed Rosella	0	4	2	11	45	24	19	8	52	14	19	31	229
Red-rumped Parrot	0	0	0	0	0	0	0	0	0	0	6	2	8
Pallid Cuckoo	0	0	1	1	12	0	1	0	0	3	0	0	18
Brush Cuckoo	0	2	1	4	6	3	0	5	0	2	0	0	23
Fan-tailed Cuckoo	0	0	2	3	3	6	7	4	1	0	8	0	34

LIST OF SPECIES (CTD)	Survey Areas												Total
	St.	1	2	3	4	5	6	7	7A	8	9	10	No.
Horsfield Bronze Cuckoo	0	3	0	0	3	1	1	0	0	0	0	2	10
Golden Bronze Cuckoo	0	0	1	6	1	4	0	1	0	1	6	4	24
Little Bronze Cuckoo	1	0	0	1	3	2	0	0	0	3	0	0	10
Koel	8	2	7	2	13	12	0	2	13	16	1	4	80
Channel-billed Cuckoo	0	0	0	0	3	1	0	2	0	10	1	0	17
Pheasant Coucal	3	3	2	3	12	4	2	7	15	7	2	13	73
Boobook Owl	0	0	0	0	0	0	0	0	1	2	0	0	3
Barn Owl	0	0	0	0	0	0	0	0	0	0	1	0	1
*Tawny Frogmouth	0	0	0	0	4	2	0	4	1	2	1	0	14
Owlet Nightjar	1	0	0	0	0	0	0	0	0	0	0	0	1
White-throated Nightjar	1	0	0	0	0	0	0	0	0	0	0	0	1
Spine-tailed Swift	0	0	0	0	9	0	0	0	0	0	0	0	9
Azure Kingfisher	1	0	0	1	2	4	1	0	0	1	0	0	10
Laughing Kookaburra	4	12	6	11	47	32	16	23	33	19	21	44	268
Blue-winged Kookaburra	0	0	0	0	0	0	0	0	0	1	0	0	1
Forest Kingfisher	1	18	3	3	4	4	1	1	0	0	0	0	35
*Sacred Kingfisher	4	5	10	28	82	33	7	12	30	12	25	12	260
Mangrove Kingfisher	2	3	7	1	6	0	0	0	0	0	0	0	19
Rainbow Bee-eater	38	4	3	5	34	10	3	8	27	20	15	80	247
*Dollar-bird	0	15	1	14	58	11	15	30	32	33	21	16	246
Noisy Pitta	0	0	0	0	5	8	5	0	0	0	0	0	18
Albert Lyrebird	0	0	0	0	0	2	0	0	0	0	0	0	2
Singing Bushlark	0	0	0	0	0	0	0	0	5	7	2	1	15
White-backed Swallow	0	0	0	0	0	0	0	0	10	0	0	2	12
*Welcome Swallow	22	55	52	26	157	179	56	19	57	44	34	16	717
*Tree Martin	7	0	6	0	151	95	0	12	70	5	2	25	373
*Fairy Martin	0	25	30	68	51	9	34	1	161	90	118	173	760
Australian Pipit	1	2	32	2	14	1	2	0	4	1	8	12	79
Black-faced Cuckoo-shrike	7	9	2	5	29	28	5	13	16	10	10	23	157
Little Cuckoo-shrike	1	0	0	0	0	0	0	0	1	0	0	0	2
Cicada-bird	1	0	4	4	3	0	0	4	0	3	0	0	19
Varied Triller	2	0	2	1	0	1	0	0	0	0	0	0	6
Australian Ground-thrush	0	0	0	0	0	0	0	0	0	0	2	0	2
Southern Chowchilla	0	0	0	0	2	15	2	0	0	0	0	0	19
Spotted Quail-thrush	0	0	0	0	0	0	0	1	0	0	0	0	1
Grey-crowned Babbler	0	0	0	1	10	0	0	8	20	19	9	2	69
Golden-headed Fantail-warbler	9	57	13	41	46	4	3	8	41	16	1	28	267
Little Grassbird	0	2	1	0	6	0	0	0	0	0	0	0	9
Tawny Grassbird	6	0	0	1	8	0	0	0	2	0	1	0	18
Reed Warbler	0	18	3	22	5	0	0	0	0	0	0	0	48
Brown Songlark	0	0	0	0	1	0	0	0	4	1	0	0	6
Rufous Songlark	0	1	0	0	0	0	0	0	0	0	0	0	1
*Superb Blue Wren	0	0	0	0	24	16	0	1	71	4	6	19	141
*Variegated Wren	0	16	0	4	4	13	0	1	19	7	4	2	70
Red-backed Wren	0	26	2	16	28	19	15	11	20	9	15	5	166
White-throated Warbler	4	0	3	2	15	5	3	5	12	9	15	0	73
*Brown Warbler	0	3	0	1	0	46	3	0	0	2	2	0	57
Mangrove Warbler	1	28	12	4	15	0	0	0	0	0	0	0	60
Weebill	0	0	5	2	8	0	0	4	1	9	0	6	35
*Striated Thornbill	0	0	0	0	9	0	0	0	0	8	8	0	25
Little Thornbill	0	0	0	7	0	0	0	0	0	0	0	0	7
*Brown Thornbill	0	3	0	3	7	36	4	1	0	4	39	14	111
*Buff-rumped Thornbill	0	0	0	4	1	0	0	0	10	12	6	0	43
Yellow-rumped Thornbill	0	0	0	0	10	0	0	0	4	7	2	11	34
*White-browed Scrub-wren	0	3	2	4	2	16	1	9	6	2	11	8	64
*Yellow-throated Scrub-wren	0	0	0	0	0	16	2	2	0	0	11	0	31
Large-billed Scrub-wren	0	0	0	0	13	12	2	0	0	2	4	0	33
Speckled Warbler	0	0	0	0	5	0	0	0	0	6	1	0	12
Jacky Winter	0	3	0	0	4	0	0	1	0	4	8	0	20
Scarlet Robin	0	0	0	0	0	0	0	0	0	0	1	0	1
Rose Robin	0	0	0	0	0	1	0	0	0	0	0	0	1
Northern Yellow Robin	8	3	1	3	3	17	4	5	3	2	18	13	80
Pale Yellow Robin	0	0	0	0	3	0	1	0	0	0	0	0	4
Grey Fantail	0	3	0	3	3	28	5	1	8	2	22	16	91
Rufous Fantail	0	3	0	0	2	11	3	6	5	1	25	8	64
*Willie Wagtail	1	8	5	18	40	29	7	17	44	9	21	37	236

LIST OF SPECIES (CTD)	Survey Areas											Total
	St.	1	2	3	4	5	6	7	7A	8	9	10	No.
Leaden Flycatcher	4	2	7	4	13	2	0	3	0	5	3	1	44
Satin Flycatcher	0	0	0	0	0	0	0	0	0	1	0	0	1
Restless Flycatcher	0	0	0	1	3	2	0	0	2	6	1	0	15
Black-faced Flycatcher	0	2	0	2	1	3	3	1	2	1	6	3	24
Spectacled Flycatcher	0	0	2	1	1	6	0	1	0	0	0	0	11
White-eared Flycatcher	0	0	0	0	0	0	1	0	0	0	0	0	1
Golden Whistler	2	0	0	2	4	10	4	6	3	3	17	6	57
*Rufous Whistler	1	3	3	27	34	11	0	30	16	21	19	3	168
Grey Shrike-thrush	3	7	3	8	18	13	11	20	6	10	7	10	116
Rufous Shrike-thrush	2	4	0	1	0	0	0	1	0	0	0	0	8
Shrike-tit	0	0	0	1	0	0	0	0	0	0	0	0	1
Eastern Whipbird	0	2	5	6	10	29	10	29	14	6	16	16	143
*White-headed Sittella	0	3	0	0	9	15	0	1	0	12	7	2	49
Brown Tree-creeper	0	1	0	0	0	0	0	0	3	0	0	0	4
*White-throated Tree-creeper	3	0	0	8	2	2	2	3	1	7	9	4	41
Red-browed Tree-creeper	0	0	0	0	0	0	0	0	0	0	1	0	1
*Mistletoe Bird	3	0	4	2	5	2	0	2	3	10	1	1	33
Spotted Pardalote	0	0	0	0	4	0	2	0	3	3	22	4	38
*Black-headed Pardalote	2	15	1	13	19	8	1	18	9	21	11	10	128
*Grey-breasted Silvereye	6	3	19	13	10	62	1	7	50	9	7	2	189
*Brown Honeyeater	33	3	6	6	16	22	1	26	0	13	7	9	142
Scarlet Honeyeater	9	0	4	11	38	1	10	91	69	50	26	0	309
*Lewin Honeyeater	0	5	11	6	14	57	13	9	31	13	15	9	183
Mangrove Honeyeater	3	3	10	3	12	0	0	0	0	0	0	0	31
Fuscous Honeyeater	0	0	0	0	30	0	0	0	0	0	10	0	40
Yellow-faced Honeyeater	2	0	0	5	3	0	4	4	0	11	15	4	48
White-eared Honeyeater	0	0	0	0	0	0	0	0	0	0	15	0	15
White-naped Honeyeater	0	0	0	0	0	0	0	0	1	3	13	2	19
White-throated Honeyeater	4	1	6	5	24	6	0	2	0	24	12	0	84
Black-chinned Honeyeater	0	0	0	0	0	0	0	0	0	0	2	0	2
Blue-faced Honeyeater	0	0	0	0	16	0	0	2	2	3	13	0	36
*Little Friar-bird	1	0	4	0	27	0	0	2	3	41	6	0	84
Noisy Friar-bird	13	7	0	6	42	30	2	3	7	18	10	39	177
White-cheeked Honeyeater	31	0	0	0	0	0	0	0	0	0	0	0	31
Striped Honeyeater	0	0	4	2	7	0	0	0	0	3	1	0	17
Eastern Spinebill	0	0	0	0	6	4	4	0	1	1	4	0	20
Bell Miner	0	0	12	0	0	0	14	0	50	0	43	0	119
*Noisy Miner	0	23	22	8	50	96	9	57	88	41	72	37	503
Little Wattle-bird	7	3	0	0	6	26	0	1	0	0	0	0	43
Red Wattle-bird	0	0	0	0	0	0	0	0	0	0	20	0	20
Red-browed Finch	0	10	2	8	13	27	61	71	43	17	8	22	282
Banded Finch	0	0	0	21	17	4	6	11	79	23	25	20	206
Zebra Finch	0	0	0	0	0	0	0	0	22	0	0	31	53
Plum-headed Finch	0	0	0	0	0	0	0	0	0	0	0	3	3
Chestnut-breasted Finch	0	0	15	0	5	0	0	0	87	34	4	4	149
*House Sparrow	40	14	59	129	40	123	0	30	40	6	6	35	522
*Starling	4	8	30	31	92	33	19	13	191	107	21	248	797
Indian Myna	0	0	0	0	0	0	0	0	0	0	0	48	48
Olive-backed Oriole	1	1	6	15	16	8	2	2	1	4	8	7	71
Southern Figbird	7	1	2	1	23	35	0	6	2	14	10	0	101
Spangled Drongo	0	0	4	0	0	12	8	8	5	4	0	0	41
*Magpie Lark	2	14	21	39	81	32	18	8	87	42	13	95	452
White-breasted Wood-swallow	15	6	1	2	5	0	0	0	0	0	0	1	30
Masked Wood-swallow	0	0	0	0	0	0	2	0	0	0	0	0	2
Dusky Wood-swallow	3	11	0	0	1	0	2	2	0	4	0	3	26
*Pied Currawong	0	0	0	0	10	60	20	1	6	6	19	21	143
Pied Butcher-bird	0	5	5	6	22	25	5	11	44	13	7	21	164
*Grey Butcher-bird	3	3	1	3	10	7	7	13	20	19	8	13	107
*Black-backed Magpie	1	16	11	16	117	51	17	20	93	32	18	84	476
Catbird	0	0	0	0	3	2	4	0	1	0	2	1	13
Regent Bower-bird	0	0	0	0	0	6	0	0	23	0	2	0	31
Satin Bower-bird	0	0	0	0	8	23	3	0	12	1	24	11	82
Paradise Rifle-bird	0	0	0	0	2	3	2	0	0	0	1	3	11
*Australian Crow	28	11	11	25	129	51	22	23	112	52	21	83	568

Compiled by D.L. PERKINS, Surveys Officer, Queensland Ornithological Society.

OBSERVATIONS ON THE BUSH-HEN AT CAMP MOUNTAIN, SOUTH-EAST QUEENSLAND

J. H. CLARKE

SUMMARY

The activities of a pair of Bush-hens *Amaurornis olivaceus* were observed at Camp Mountain from December 1972 to April 1973. Calls were first heard on 30 December 1972 and ceased by 24 February 1973. Three different calls were recognised. Food included grasshoppers, moths, small frogs and grass seeds. Nesting commenced in mid-January. Seven chicks all hatched on 9 February, then all vacated the nest immediately. Following nesting, the colour of the bill faded and the basal section of the upper mandible became shrivelled and lost its orange-yellow hue. The male played a major part in food-gathering for the chicks.

The Bush-hen is a secretive rail that is seldom seen, although it may not be as rare as the records suggest (Macdonald, 1973). It is distributed from New Guinea to approximately the Queensland - New South Wales border, usually along creeks where there is tall grass, but also in reedy forests and tall grassland. Little is known of its behaviour or its breeding habits. A nest was observed and photographed near Brisbane in April 1964 by Morgan and Morgan (1968) who also noted that both birds incubate the eggs.

On the morning of 30 December 1972, I heard unfamiliar bird calls coming from a clump of lantana *Lantana camara* surrounded by long blady grass *Imperata cylindrica* and couch grass *Cynodon dactylon* across the road from my home at Camp Mountain, South-east Queensland ($27^{o}24'S, 151^{o}52'E$). After about 15 minutes a Bush-hen *Amaurornis olivaceus* appeared in full view in short grass.

BEHAVIOUR AND CALLS

The Bush-hen was heard and observed on several occasions over the next few days. One night a few days after the first sighting, a loud, shrieking call was heard coming from within long guinea grass *Panicum maximum* beneath a large strangling fig tree *Ficus obliqua*. The same call of the Bush-hen was heard on the next night and again several times during the following day. From then onwards the calls were heard daily until 9 February 1973. This call consisted of eight to ten loud, harsh, shrieking notes each of one second duration, followed by five or six muted notes in quick

succession (Fig.1), and was made by both male and female. It was also uttered immediately following a sudden, unexpected, loud noise, *e.g.* a motor mower starting up, a noisy truck passing, the loud call of a Laughing Kookaburra *Dacelo gigas* or the passing of a low-flying aeroplane.

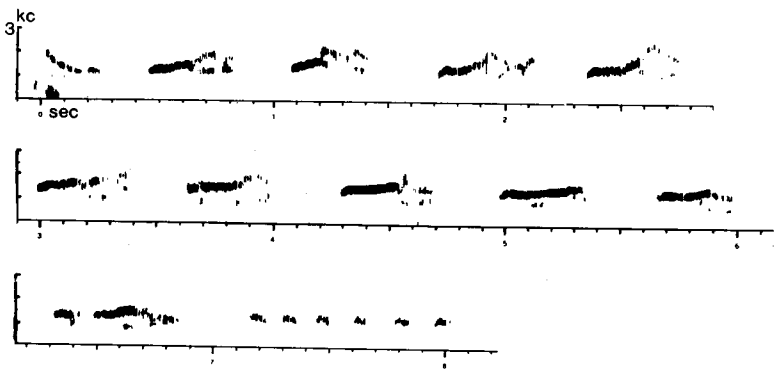

Figure 1. Sonagraph of a shrieking call. Horizontal axis - time in seconds; vertical axis - frequency in kilocycles (kc) per second.

Reference to male or female birds in this article is based on the observation that one bird, presumed to be the male, was slightly larger and more strongly coloured than the other. The other bird, presumed to be the female, constantly accompanied the chicks after hatching.

The shrieking call was also given as a duet between the pair of Bush-hens (Fig.2). The duet depicted in Figure 2 continued for 11 seconds. I suspect that a low introductory note by one of the birds may be concealed by tape-recorder noise at time 0. Thereafter follows a regular sequence of antiphonal calls. These decrease slowly in intensity, until the end of the call is reached after one bird breaks its shriek into four separate notes, in a manner similar to the call depicted in Figure 1. I do not know which call belongs to which bird of the pair.

A few days after the first sighting I saw a pair of Bush-hens emerge from tall, dense guinea grass and rhodes grass *Chloris gayana* at the back of my house and cross short blue couch to disappear in a large clump of cannas. The pair of Bush-hens was seen and heard daily, frequently using a piping call while they were feeding

in the long grass, during the following two weeks. These calls consisted of a series of low, single, piping notes uttered at about 0.2 to 0.3 second intervals (Fig.3).

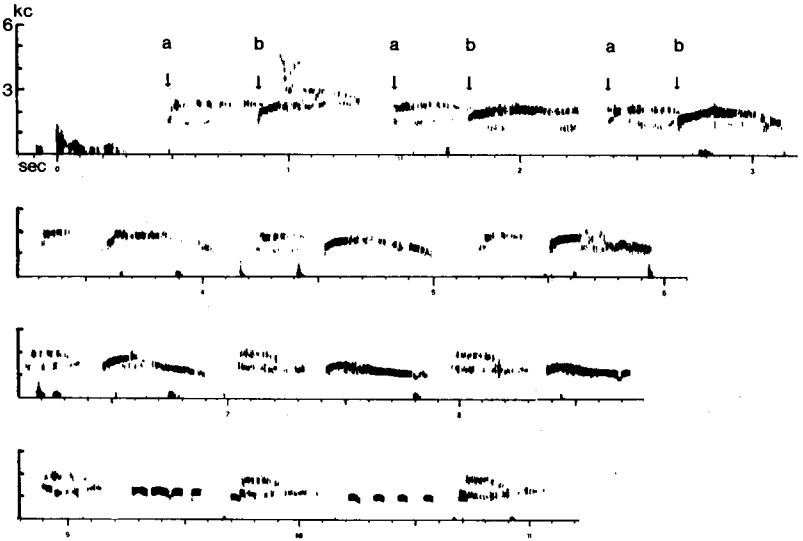

Figure 2. Sonagraph of an antiphonal call of a pair of Bush-hens. The commencement of the call by each member of the pair is indicated by arrows at 'a' and 'b' respectively for the first three couplets. Marks on the base line represent machine noise.

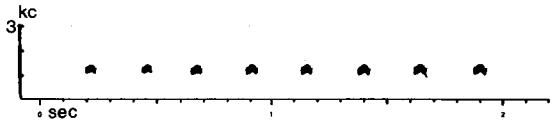

Figure 3. Sonagraph of a piping call.

I saw the birds reach up, and occasionally jump up, to snap a grasshopper from a tall stalk of grass. I also observed them catching and eating moths. On other occasions they reached, or jumped, to seize a seed head of grass: this was then run through the bill so that the seeds could be removed and eaten. One morning I was awakened at daybreak by a clicking sound on the ground outside my window. A Bush-hen was calling: as I watched, it darted forward, seized a small brown frog, crushed it in its bill, and then swallowed it. This clicking was used also as a contact call between adults and chicks. It was difficult to reproduce on a sonagraph and is not illustrated.

On the ground immediately in front of my raised verandah was a shallow galvanised iron tray half filled with water. One end of the 2 m by 1 m tray contained potted native trees and shrubs, and the tray was flanked by a thick clump of cannas and other vegetation. The Bush-hens came daily to bathe and preen in this tray. They had three regular bathing times - early morning, midday and late afternoon. On hot days they also bathed at other times. They came separately to bathe in the pool. At first they were very shy, darting under the house when my wife and I peered at them from the verandah. Eventually, however, they became accustomed to us and bathed and preened while we, motionless, observed them from 2.5 m away on the verandah. Now and again the bathing bird cocked its head on one side and eyed us for a few seconds before resuming its bathing, apparently reassured. If we moved, the Bush-hen walked quietly out of the tray to the cover of the verandah.

NESTING

The pair of Bush-hens were in company about my garden for about two weeks. During the second week they were seen together less frequently, and subsequently they were not seen together again for some time.

I suspected the female may have been nesting. For nearly a week I heard shrieking calls coming at infrequent intervals from an area of tall, thick blady grass. On 25 January 1973 I saw the female flying low from the front garden towards the patch of blady grass - a distance of 40 m. Later the same day I again saw her flying to the same area.

Aware that the birds might desert the nest if disturbed, I nevertheless decided to search for it, as so little information was available about this species. I found the nest in the blady grass. A Bush-hen was in the nest, but as I approached the bird slipped through the side to the ground where it was hidden from sight. The nest was built on two almost parallel branches of a small, very sparse lantana bush. The dome-shaped nest was made of blady grass leaves and the living grass was drawn together and loosely interwoven to form the sides and roof. Some of the grass blades were left protruding up through the walls of the nest.

The nest was 46 cm above the ground and was 30 cm in diameter,the cavity being 15 cm in diameter. It contained seven eggs which were 3.8 cm long by 2.8 cm in diameter at the larger end. The pale, pinkish cinnamon eggs had cinnamon and pale mouse grey spots (Ridgway, 1912, Plates XXIX and LI(d)). The spots were very small and sparse on the smaller end and larger and more concentrated on the larger end. After hatching, the shell was found to be very thin and brittle, while the inner membrane was quite tough. The nest and egg shells are now in the Queensland Museum.

Fortunately the birds did not desert the nest and I was able to visit it daily.

When I approached the nest on the afternoon of 9 February 1973, the Bush-hen eyed me for a few seconds, then slipped through the side of the nest to the ground. She moved through the grass to a spot about 2 m away and made a loud, fluttering noise in the grass, which was repeated three times at intervals of about 10 seconds. Three chicks had hatched. They were like little black balls of down, with black bills protruding, and dark eyes shining. They looked strong and lively. Next morning the remaining eggs had hatched, and mother and chicks had left.

On 22 February 1973 I located the Bush-hens in thick blady grass and lantana about 50 m from the nest. The male was making a subdued clicking call, the female responding with a very soft click. Now and then a soft, cheeping whistle was heard from the chicks. After about five minutes of continuous clicking, the male stepped out of the blady grass in front of me. He took fright on seeing me and ran back to the cover of some lantana, meanwhile clicking rather loudly. The female responded several times with very soft clicks. After about 10 minutes the male moved towards me again. His movements could be followed by the slight movement of the grass blades and also by the intermittent clicking calls. He flew up and perched on the third strand of a four-strand wire fence, from which vantage point he surveyed me for about a minute. He sprang to the ground on the other side of the fence and walked a few metres on my right, staring at me, clicking loudly, and continuously flicking his tail in agitation. He again retreated to the lantana, where his clicking was answered softly by the female several times. Once again he hurdled the fence and, apparently more composed, skirted my position by about 5 m, while keeping up an intermittent clicking. The clicking ceased and no more calls were heard for about 20 minutes. The sun was down and the light fading, when suddenly from a few metres behind me, in a thick clump of lantana, came a very subdued shrieking call which was answered immediately with a similar call by the female from her position in the blady grass just in front of me. I waited until dark but heard no more calls.

The following morning both parents and the chicks were in my front garden where the grass was mostly quite long but interspersed with

some shorter areas. At least one bird visited the bathing tray for about one minute and several piping calls were heard. The family then moved to the long grass at the back of the house. The male took the lead, followed by the female and six black chicks. Individual chicks ran swiftly from one area of tall grass to another. On several occasions the male jumped up in the long grass to capture grasshoppers for the brood in hiding. The Bush-hens were catching grasshoppers for two hours on this occasion, the male being much more in evidence than the female who kept under cover with the chicks most of the time, though occasionally her little soft clicks could be heard. The chicks did not call while they were being fed.

That night the Bush-hens roosted about 2.5 m above ground in a small bushy wattle under the strangling fig tree. Next morning at daylight they made their way to the long grass at the back of the house, where they were under observation until 08:30 before they disappeared from sight. The adults were assiduously hunting grasshoppers. The dew had been heavy, and just before the birds ceased their early morning activities, the female climbed 1.3 m up in a clump of stinking roger *Tagets minuta* and, perching there with wings partly spread, proceeded to preen and dry herself. Below her, perched on leaning stems of guinea grass, were three of the chicks. About 15 minutes later, they all climbed down to the cover of the thick grass.

During and prior to nesting, both birds had green bills with a yellow-orange frontal shield, the colour of the male's being brighter and more conspicuous. On 24 February it was obvious from a close sighting of the bird with the chicks, that the part of the upper mandible that was previously smooth yellow-orange, was a dull greyish brown and had a shrivelled appearance and the green of the bill had faded.

The Bush-hens were seen twice and never heard calling after 24 February 1973. At dusk on 13 April, I was walking along a track near the strangling fig tree when a Bush-hen flew out from tall guinea grass about 5 m away. The Bush-hen twice walked slowly and deliberately a few steps towards me then retreated, before advancing to a point about 2 m from me, pausing, then walking off into the cover of the guinea grass across the track. It seemed likely that the chicks were hiding in my immediate vicinity, but owing to the density of the cover and the failing light I could not locate them.

On 18 April 1973, while walking along the same track, I came across the dead body of an adult Bush-hen. I could not determine the cause of death.

Bush-hens were calling in this locality in the summer of 1973-74, but a nest was not located.

DISCUSSION

The loud shrieking call was used by both sexes prior to and during the nesting period. For a shorter period during this time, an essentially similar call was incorporated into antiphonal song. Antiphonal, or unison, song is known from at least six species of the family Rallidae (Thorpe, 1972). Diamond and Terborgh (1968) reported duets by the Bush-hen (Rufous-tailed Moorhen) in New Guinea. They noted however, that the call was always given as a duet and never individually. They also reported a "bk-bk-bk" call which I assume to be the same as the "click" call referred to above and that mentioned by Macdonald (1973) as "a short sharp grating 'tchek' repeated frequently". This is used as a communication call between adults and chicks, and before nesting as a contact call between adults. The piping call appears also to be used as a contact call between adults and is rarely heard after the chicks hatch.

A Bush-hen was seen on my property in the summer of 1970-71, but no calls were heard. In 1973, a chance sighting and the discovery of a dead bird in April proved the presence of the Bush-hen almost two months after any calls had been heard. Vocal activity of the pair under observation in 1972-73 had extended over a period of no more than eight weeks during the breeding period and was confined to a relatively small area based on the nesting site. Because of these facts, coupled with the furtive nature and dense habitat of the Bush-hen, I see no reason to doubt that the Bush-hen is sedentary as stated by Macdonald, despite the fact that I have neither seen nor heard it during the months of May to November. The possibility of migration, especially in this southern portion of its range (Storr, 1973), cannot be dismissed and offers an area for further investigation.

ACKNOWLEDGEMENTS

Grateful acknowledgement is made of the help given by David Gravatt and Jim Counsilman in the sonagraph analysis of the Bush-hen calls.

REFERENCES

Diamond, J.M. and J.W. Terborgh 1968. Dual singing by New Guinea birds. *Auk* 85 (1): 62-82.

Macdonald, J.D. 1973. Birds of Australia. Sydney : Reed.

Morgan, B and J. Morgan 1968. The Bush-hen in south-eastern Queensland. Emu 48: 150.

Ridgway, R. 1912. Color Standards and Nomenclature. Washington : The author.

Storr, G.M. 1973. List of Queensland Birds. Spec. Publs West. Aust. Mus. No.5.

Thorpe, W.H. 1972. Duetting and antiphonal song in birds. Its extent and significance. Behaviour, Suppl.16: 1-197.

MR J.H. CLARKE, Domrow Road, Samford, Queensland, 4520.

SACRED KINGFISHER FEEDS A FLEDGED DOLLAR-BIRD

HENK VAN BENNEKOM

While confined to a chair on my back verandah in December, 1974 I noticed how a Sacred Kingfisher *Halcyon sancta* attacked a Dollar-bird *Eurystomus orientalis* each time the latter approached its nest. This was situated in a big hollow in a dead tree in the reserve on the south bank of the Brisbane River at Goodna (27°36'S,152°54'E), and approximately 20 m above the ground.

It was evidently territorial strife between the birds and after intense observation the nest of the Kingfisher was discovered. It was located less than 2 m away from the other nest, in the same tree, and also in a hollow.

The Kingfisher's approach to its nest was very swift, without fuss or sound and with hardly a perceptible pause between fly-on,landing and disappearance into its nest. How different are the antics of the Dollar-bird! Its arrival "home" was almost as conspicuous as possible, its flight as if full of gaiety and its voice full of joy! The low intensity attacks of the Kingfisher did not seem to disturb or concern it in the least.

Two days later two young Dollar-birds appeared on the extreme edge of their hollow, soon to be followed by a third and after about an hour by the fourth and last. During the whole of the observation - for several hours each day during the next couple of days - the young were never seen to switch their perching positions on the rim of the hollow, each bird stuck to its own relative to the others.

Food begging was done in turn. Never more than two birds begged at the same time, usually only one begging with a strident, staccato sound. As soon as one stopped another would take over. At the approach of the parents it greatly increased in urgency and excitement.

The Kingfisher, perched on its usual branch nearby, now started to respond to the Dollar-birds' begging. It flew off and returned with a large worm which it offered them. The young one on the extreme left got hold of it before the others but dropped it. Soon however the Kingfisher returned once more with what seemed to be a grasshopper. It was offered only to the bird that had received the worm and withheld from the others. Indeed all through the observation, it seemed that only the one youngster was fed by the Kingfisher, at least only the one perched on the outside left. It was not possible to distinguish the one young from the other. It was also observed that the parent Dollar-birds would feed their

young, including the one fed by the Kingfisher, in turn starting with the one on the left to the one on the right and repeating the sequence. On the average however, the Kingfisher would offer food up to twice as often as the parent Dollar-birds. Since it only fed the same young bird, that one received and accepted food 8 - 10 times as often as the others!

With brooding their own eggs and keeping up the attacks on the Dollar-birds as well, the Kingfishers were very busy indeed.

After two days, three of the young Dollar-birds flew out, but this was not observed. One however remained behind and perched on the rim of its nest and was still being fed by the Kingfishers, but not by its own parents who apparently had abandoned it. One can only assume that this young was the one fed by the Kingfishers all along, it looked physically at least as healthy and strong as the others had done.

Three days later it too had at last disappeared, all that time having been very conscientously "served" by the Kingfishers.

MR K.H.L. VAN BENNEKOM, 169 Brisbane Terrace, Goodna, Queensland, 4300.

****

REVIEW

BIRDS OF AUSTRALIA - A SUMMARY OF INFORMATION by J.D. Macdonald. A.H. and A.W. Reed, Sydney and London, 1973. 552 pages, 24 coloured plates depicting about 250 species, plus many line drawings by Peter Slater, including range maps and index. Price $18.50.

This massive volume, inspired by the Harold Hall expeditions to Australia, is beautifully produced and richly adorned with coloured plates. It begins with a short account of the origin and structure of the Australian bird fauna by D.L. Serventy. Thereafter follows a family by family, and species by species, account. The family descriptions provide a good overall account of characters, distribution and biology, and the author mentions particular points of interest in the Australian representatives. Sometimes there is a family range map. The genera are introduced by shorter accounts along the same lines. With the families and genera thus defined the reader now goes on to a key to the species. How useful this will be in the field, as distinct from the cabinet, in genera where there are large numbers of species, is difficult to say.

The species section includes an excellent colour description, a brief note on variation, a summary of habitat, habits,breeding, nests and eggs, voice, and status. The range maps at the back are commendably large, however the ranges are indicated by stippling, not individual record plotting, as is needed in a work of this calibre.

We are thus provided with a good general account of Australian birds. The work however, has several real shortcomings, especially lack of references at the back and failure to incorporate more material from the abundant Australian bird literature. In effect it falls half way between a field guide and a handbook. If it had measurements it could approach the former *i.e.*, for a few extra lines, measurements of wing, bill, tail, tarsus, *etc.* in the two sexes could have been included for each species. Weights are available in the literature on many species, also information on immatures. The chance is missed to draw attention to species monographs. There still remains accordingly, an urgent need in Australia for a bird book that takes the reader further in informational content or, alternatively, gives the opportunity by means of a bibliography, to independently develop such information.

Allen Keast.

BOOKS RECEIVED

AUSTRALIAN BUSH BIRDS by Peter Slater. Published by Rigby Opal Books Ltd., Adelaide, 1974. 30pp, illustrated by the author. Recommended price $1.75.

(An introduction to birds for children of late primary school age, with accounts of some activities of 15 interesting species. - Ed.)

BIRDS IN BASS STRAIT by Ken Simpson. Published by A.H. and A.W. Reed Pty. Ltd., Sydney, 1972. 112pp, 36 colour and 18 black and white plates. Recommended price $5.95.

(An account of aspects of the biology of sea birds and some shore birds in this area: some of these birds also occur along the Queensland coast. The photographs show birds in close-up and in flight. - Ed.)