

MOULT BY THE GALAH *Cacatua roseicapilla* IN THE WHEATBELT OF WESTERN AUSTRALIA

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Received 14 August 1987

Primary moult by the Galah in the Western Australian wheatbelt extended over 155 to 185 days in 1972. Immature nonbreeding birds started earlier (October) and took longer (185 days) than adults. Breeding birds started to moult in November after most progeny were feathered but before they had fledged. Females took less time to moult than males, but started later so that both sexes (immatures and adults) tended to finish the moult at a similar time, in April. Primary No. 6 was the first to be renewed, and moult proceeded ascendently and descendently, simultaneously.

INTRODUCTION

In the course of an investigation into the pest status of the Galah *Cacatua roseicapilla* in the wheatbelt of Western Australia, 397 individuals were collected to determine what they had been eating (Rowley, unpublished data). In order to provide a year-round sample, 20 birds were taken each month throughout 1972 from within 20 km of our study area at Manmanning (30°51'S., 117°06'E.), in the centre of the wheat growing area. As opportunity presented, 149 other Galahs were collected from the pastoral (= Mulga) zone, outside the wheatbelt, to provide a measure of the diet of these birds before their spread into the farmland districts.

Among other measurements, details of moult were recorded, and the analysis of those data is presented in this paper.

METHOD

Body moult and the moult of regimes and rectrices were recorded in the field; no specimens were retained. These data were scored according to the simple numerical system described by Snow (1967) and adopted by the Australian Bird Banding Scheme (0 = old; 1 = feather missing; 2 = new, 1/3 grown; 3 = new, 2/3 grown; 4 = new,

nearly full grown; and 5 = new, full grown). This gives a total score of 100 for a bird with ten new fully grown primaries in each wing.

Primaries and secondaries were numbered from the carpal joint, outwards and inwards respectively, as was done by Stresemann and Stresemann (1966).

RESULTS

Galahs leave the nest when approximately 49 days old, before their primaries have finished growing. The juvenal plumage of fledgling Galahs shows grey feathers among the pink of the breast. A post-juvenal replacement of body feathers (terminology of Humphrey and Parkes 1959) during their first autumn leaves these immatures with a plumage indistinguishable from adults except that the remiges and rectrices, which are narrower and more pointed (R. Schodde, pers. comm.), remain unchanged until the bird enters its first major prebasic moult, when one year old. Thereafter moult is annual with the body feathers taking the longest time (c. 200 days). The pattern of moult in the secondaries appeared, complex and is not analysed further. Moult of the rectrices appeared to be centrifugal but there was so much

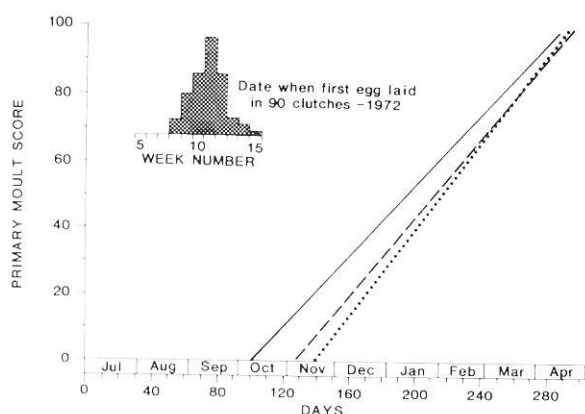


Figure 1. The timing of moult in the Galah by male (---) and female (.....) breeders and by immatures (—) in the wheatbelt of Western Australia during 1972-1973; the distribution of egg laying is also shown.

variation between individuals (presumably due to feather damage and out of sequence renewal) that no clear pattern emerged.

The moult of the primaries, however, did show a clear pattern and has been analysed in detail. Figure 1 shows the progress of primary moult in males, females and immatures throughout the 1972-1973 season. A histogram showing the week when clutches were initiated that year is included to illustrate the relationships between moult and the breeding cycle. (Week 1 starts 1st July).

Figures 2a and 2b show the individual scores of moulting adult males ($N=117$) and females ($N=66$), respectively, and the appropriate regression lines (which are those reproduced in Figure 1).

Table 1 shows the order in which 183 adult Galahs moulted their primary feathers. The sixth primary (innermost primary = No. 1) was the first to be replaced, followed by No. 5, and the moult continued simultaneously inwards and outwards from that point. Most birds were growing at least two primaries in each wing at the same time.

Data for birds from the pastoral areas of Western Australia showed a similar pattern of a pre-basical moult, after breeding was completed.

DISCUSSION

In 1972 it was obvious that breeding Galahs did not start to moult until the reproductive cycle was well advanced, with eggs hatched and young nestlings old enough to thermoregulate for themselves (more than three weeks old), and therefore not requiring further parental brooding. Nesting was late in 1972 and the moult started before the young had fledged. Females tended to take less time (c. 155 days) than males (c. 165 days) to complete the moult, but since they usually started later, both sexes finished at about the same time; the regression lines in Figure 2 are not statistically different. Immature, non-breeding birds took

TABLE 1

The order in which 183 adult breeding Galahs moulted their primaries: Manmanning, 1972-1973 (Primary No. 1 is the innermost feather).

Primary score	Number of birds examined	GROWING PRIMARIES*										Mean number of primaries growing
		1	2	3	4	5	6	7	8	9	10	
0	58	—	—	—	—	—	—	—	—	—	—	—
1-20	27	0	0	0	0	21	40	5	0	0	0	2.4
21-40	16	5	0	3	16	0	9	26	5	0	0	4.0
41-60	15	0	4	15	7	0	0	4	22	8	0	4.0
61-80	11	9	10	2	0	0	0	1	11	12	2	4.3
81-99	26	17	1	0	5	0	0	0	0	14	36	2.8
100	30	—	—	—	—	—	—	—	—	—	—	—

*Most birds were moulting several primaries at once, in each wing.

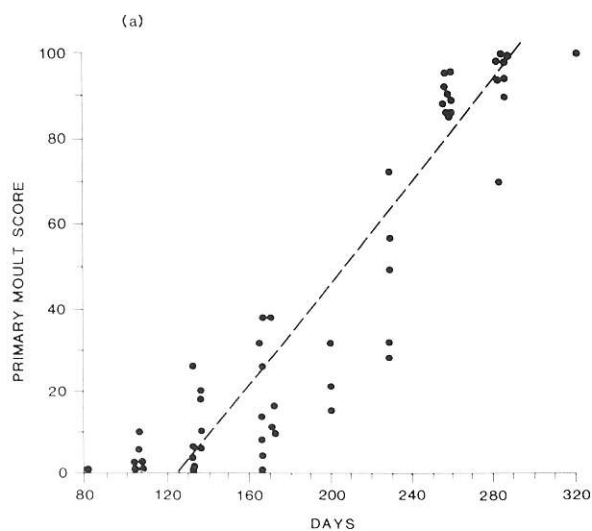


Figure 2(a). The progress of moult in male, breeding, Galahs during 1972-1973.

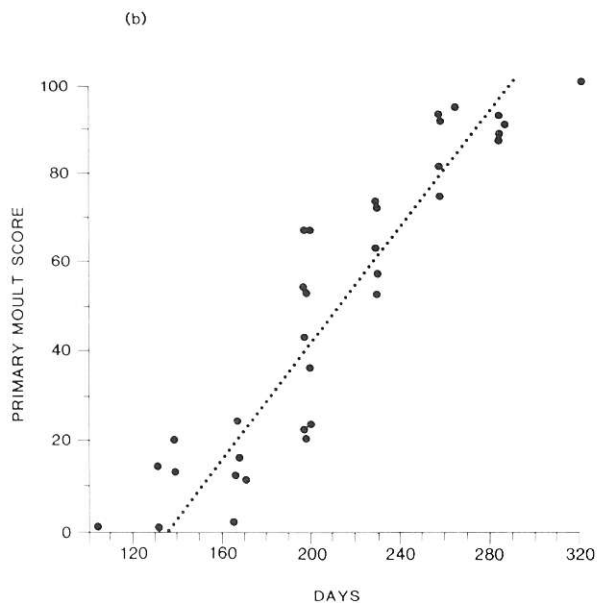


Figure 2(b). The progress of moult in female, breeding, Galahs during 1972-1973.

longer (c. 185 days) to moult and, since they started earlier, this meant that both sexes (adults and immatures) tended to finish the moult in April. Primary No. 6 was the first to be moulted and thereafter moult proceeded inwards and outwards simultaneously.

General moult is under hormonal control (Payne 1972) and is usually found to be incompatible with an active breeding cycle. Galahs are capable of relaying (after a first nesting attempt has failed) at any stage up to the time nestlings are about 21 days old, after which they do not relay (Rowley, unpublished data). That time of recalcitrance corresponds to the onset of moult and suggests that moult in the Galah starts when the gonads cease to be active.

The moult of parrots in the wild has been little studied. Wyndham (1980), considering the Budgerigar *Melopsittacus undulatus* in New South Wales, found no evidence of an annual cycle of moult. Moult occurred during the breeding season and there was no increase in intensity of moult following breeding. In one individual, a complete cycle of moult took six to eight months. A second cycle often started before the completion of the first, thus there was less than 12 months between cycles. In both sexes, birds with active gonads were often moulting (Wyndham 1980).

In a later paper, Wyndham (1981) described the moult of captive Budgerigars as starting with primary No. 5. He misquoted Stresemann and Stresemann (1966) as saying 'In parrots moult of the primaries starts with the middle feather (primary No. 5, numbering from the innermost, outwards).' In fact, Stresemann and Stresemann (1966) state that moult in parrots 'consists of a divergent course of moult from H6 to H1 ascendent and to H10 descendent' (p. 14 of translation). Later, (p. 356) from the works of H. Hampe, they coined 'Hampeschen Regel' or Hampe's Rule to describe this moult sequence, which is common to all the parrots that had been studied and which they write as:

$$\begin{array}{c} 6 \quad 7-8-9-10 \\ 5-4-3-2-1 \end{array}$$

A later paper dealing with the moult of the Eastern Rosella *Platycercus eximius* (Wyndham, et al. 1983) also found that primary moult started with the fifth primary (P5). They found that 'pre-adults' started their primary moult a month before the adults, but that there was no significant difference between male and female adults. Adults started their primary moult after most young had fledged and completed it before the onset of winter, in 114 days.

The pattern and timing of moult in the Galah is similar to that of the Eastern Rosella and that to be expected of a temperate resident species (as are breeding pairs). This places the annual renewal of feathers into the non-breeding part of the year, starting as soon as the young no longer need brooding and finishing before the onset of winter food shortages.

The Budgerigar, on the other hand, is a wide-travelling nomad, breeding as and where circumstances become favourable and thus moults continuously throughout the year on an eight month cycle.

ACKNOWLEDGEMENTS

G. S. Chapman and L. A. Moore provided assistance in the field; C. P. S. de Rebeira drew the illustrations; M. G. Brooker, D. A. Saunders and G. T. Smith read the manuscript which Claire Taplin prepared. I thank all these colleagues in the Division of Wildlife and Ecology.

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