

RELATIONSHIPS OF AGE, MOULT AND PLUMAGE IN THE WHITE-CHEEKED HONEYEATER NEAR BEVERLEY, WESTERN AUSTRALIA

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Wing and head/bill measurements of 415 White-cheeked Honeyeaters *Phylidonyris nigra* taken at initial capture and again at subsequent retraps are compared to establish growth patterns. A plumage sequence from juvenile to adult is presented. Molt records are examined to ascertain the role molt plays in the division of age classes into the three age groups of Juvenile, Immature and Adult. From the analysis of these data, some changes are suggested in the application of the present age codes used for banded birds, in order to relate them to the age groups and terms commonly used to describe age in birds.

INTRODUCTION

In my description of the White-cheeked Honeyeater in Bander's Aid (Rogers *et al.* 1986) I used three age groups: Juvenile (J), Immature (1, 2–) and Adult (1+, 2+ or more). Work on the measurements of the White-fronted Honeyeater *P. albifrons* (unpub. data) showed that anomalies are inherent in the composition of such age groups. The multiple retrap data recorded for the White-cheeked Honeyeater have resolved these, and supplied a good base to explore the relationship of age, growth and plumage.

METHODS

Using bands supplied by the Australian Bird and Bat Banding Schemes, I banded 1 997 White-cheeked Honeyeaters and recorded 1 166 retraps at four locations around Beverley, Western Australia, between June 1985 and 31 December 1988. Measurements of wing and head/bill were made using methods described by Rogers *et al.* (1986). From measurements of 415 birds, taken at their initial capture and again when they were subsequently retrapped, frequency distributions of unsexed birds were compiled, using the paired measurement data for each bird. All age classes, from juvenile to three years old or more, were represented; these are designated using the standard age codes of the Australian Bird Banders Manual (Lowe 1989).

Because wing lengths of known immature birds showed a mean increase when retrapped as adults (2+), I examined wing lengths of all birds that were of unknown age (1+) at banding and then were subsequently retrapped. Seventy birds

whose wing lengths had increased by 1 mm or more since initial handling were deemed to have been immature when banded; 48 that showed no increase were considered adults.

The frequency distributions of unsexed birds were compared using Mann-Whitney normal approximations. To check the application of these comparisons, I analysed wing and head/bill lengths of all birds of known age and sex.

As a measure of juvenality, I recorded the percentage of black in the crown of 317 birds and the colour and shape of the gape flange in 341 birds. I studied 484 records of primary moult as indication of post-juvenile and immature moults. From these I determined the age classes between which these moults occurred and the actual ages of the birds at the completion of primary moult. Plumage notes were made on known age birds to supplement the descriptions given in Bander's Aid.

RESULTS

Plumage and Soft Parts

The chief characteristics of a juvenile are a swollen yellow gape flange and a predominately brown crown (148), but in 16 birds the swollen flange was thinning. In the late juvenile period, birds have a predominately black crown (169). The yellow flange was thin and changing colour (108), while 67 birds had black flanges with only a trace of yellow at the hinge of the gape; primary moult had started in 57 of these. As full adult plumage is not acquired until the completion of immature moult, the age codes between post-juvenile and immature moults fall with the Immature age group.

The plumage and soft part colours used to age White-cheeked Honeyeaters in the field are given in Table 1, arranged in three age groups: Juvenile, Immature and Adult. Each covers a new generation of feathers and comprises two or more age classes.

Moult

The moult of the crown and lesser wing coverts in juvenile White-cheeked Honeyeaters marks the start of the post-juvenile moult. Four birds fledged in autumn were still juveniles at a mean of 66 days later, five had advanced moult of the crown and lesser wing coverts at 94 days (range 85–105 days), and four had started primary moult at 100 days (range 90–113 days). Birds fledged in spring may be aged as first year (1) in as few as 36 days, and start partial moult of their primaries in 50 to 60 days. The moult pattern in White-cheeked Honeyeaters is similar to that described by Paton (1982a, b) for New Holland Honeyeaters *P. novaehollandiae*. White-cheeked Honeyeaters start primary moult towards the end of September, usually completing it by mid April. By then autumn- and winter-fledged birds are 9–11 months old, but spring-fledged birds may be as young as five months. Of 189 records of post-juvenile moult examined, all were of birds in their late juvenile plumage, age code 1. Immature birds completed immature (post-nuptial) moult after their first breeding season, when they were from 18 months to two years old.

Measurements

Table 2 presents the results of the Mann-Whitney tests comparing wing and head/bill lengths between the juvenile age classes and the different age groups. There were no significant differences in either wing or head/bill lengths between the juvenile age classes, although the growth of the head/bill appears to be continuous through them. Wing and head/bill lengths of Immatures were significantly larger than those of Juveniles. Adults wing lengths were significantly greater than those of Immatures.

Table 3 summarizes the records of wing and head/bill lengths of all birds of known age and sex to 31 December 1988, in the same age class categories as Table 2. These confirm the findings shown in that Table.

TABLE 1

Key to plumage and soft part colours for ageing White-cheeked Honeyeaters.

JUVENILE	
J	1
Lower mandible pinkish; gape flange yellow, swollen, thinning.	Bill black; gape flange thin, becoming black, with only a trace of yellow at hinge.
Crown brown, moulting to black (50%); nape brown; lores tinged yellow.	Crown more than 50% black; a few black feathers appearing on nape.
Lesser and median wing coverts brown with pale edges; lesser wing coverts becoming increasingly black.	Lesser wing coverts moulting to black; pale edges to median and secondary wing coverts.
Tail feathers pointed until replaced during the post-juvenile moult.	
IMMATURE	
Bill and gape black; crown black; nape brownish black; pale edges persist on median wing coverts; tail feathers not pointed.	
2	2–
Primary coverts narrow, with marked yellow edges to outer vanes; some brown juvenile feathers may remain among wing coverts.	Some or all primary coverts brown; evidence of partial moult of primaries and secondaries from wear and colour.
ADULT	
Nape grey-black, rather than brownish black; upper wing with typical matte black appearance; primary coverts broad with faint yellow edges to outer vanes or showing no yellow; alula black and often prominent. Very occasionally adults of known age have pale edges to some median wing coverts.	

DISCUSSION

Wood (1946) defined a juvenile as 'a young bird that has left the nest, and is able to care for itself, but has not completed its post-juvenile moult'. Paton (1982b), describing moult in the New Holland Honeyeater, used completion of this moult as the end of the juvenile period. Rogers *et al.* (1986) restricted the term juvenile to a 'young bird that has left the nest site and is able to fly', with the purpose of pinning down as accurately as possible the time of fledging. In the terminology used in *The Birds of the Western Palearctic* (Cramp and Simmons 1977, pp. 30–31), juvenile plumage is defined as a bird's first pennaceous plumage. Thus a Juvenile is a bird in

TABLE 2

Comparison of head/bill and wing lengths compiled from paired measurements of the same birds (unsexed) at successive ages. Differences between measurements (determined by the Mann-Whitney test): NS (not significant: $p < 0.05$); *** (significant: $p > 0.001$).

Age Groups or Classes Compared	n	Initial Capture			Subsequent Capture			s
		Age codes	Mean	SD	Age codes	Mean	SD	
<i>Headbill Length (mm)</i>								
J with I	42	J	42.7	1.84	1	43.2	1.74	NS
Juvenile with Immature	131	J, 1	43.8	1.81	2, 2-	44.9	1.86	***
Immature with Adult	177	2, 2-	44.9	1.73	2+, 3+	45.0	1.76	NS
2+ with 3+ or more	66	2+	45.1	1.91	3+, 4+	45.1	1.94	NS
<i>Wing Length (mm)</i>								
J with I	39	J	68.7	2.86	1	69.0	3.07	NS
Juvenile with Immature	128	J, 1	69.9	2.55	2, 2-	72.8	2.81	***
Immature with Adult	169	2, 2-	72.7	3.03	2+, 3+	74.5	3.07	***
2+ with 3+ or more	63	2+	74.2	3.07	3+, 4+	74.4	3.04	NS

this plumage. This terminology is close to that used by Amadon (1966), and fits in well with the life cycle of most birds.

In White-cheeked Honeyeaters, post-juvenile moult is a gradual process, which takes from about 105 to 165 days to complete. During this, the colour of the gape flange and lower mandible change to black, sometimes with a touch of yellow remaining at the hinge of the gape. There is a replacement of all or part of the flight feathers and the tail. The late juvenile period starts when moult of the crown and lesser wing coverts becomes marked and the gape flange loses its swollen appearance. If the age code 1 is used to indicate this period, it is no longer applicable at the completion of the post-juvenile moult, when a new generation of feathers are grown and the bird becomes an Immature. Full adult plumage is assumed after the post-immature moult.

CONCLUSION

The relationship of age to growth and moult found in the White-cheeked Honeyeater underlines the difficulty in applying an age scheme without regard to the natural changes in plumage brought about by moult, some soft part change, and growth. It dictates that the age codes used by banders in Australia be changed for each age group and remain exclusive. It further points to the pressing need to relate these codes to the terms commonly used to describe age in birds and

TABLE 3

Measurements of head/bill and wing lengths of White-cheeked Honeyeaters banded in the Beverley area, Western Australia, between June 1985 and December 1988.

n = sample size; SD = standard deviation.

Age	n	Male		n	Female	
		Mean	SD		Mean	SD
<i>Head/bill Length (mm)</i>						
Juvenile						
J, 1	438	44.8	0.97	539	41.2	1.16
Immature						
2, 2-	660	45.6	0.95	324	41.9	0.94
Adult						
2+, 3+	426	45.8	0.99	123	41.9	0.92
<i>Wing Length (mm)</i>						
Juvenile						
J, 1	403	71.2	1.58	513	66.6	1.75
Immature						
2, 2-	640	74.1	1.83	314	68.9	1.94
Adult						
2+, 3+	393	75.9	1.53	122	69.7	1.44

to relate both codes and terms to the natural cycles that govern the changes in appearance and size in birds. Such a relationship is shown in Table 4, which is based on the Suggested Classification of Plumages and Molts of Amadon (1966), the nomenclature used in the Handbook of Australian, New Zealand and Antarctic Birds (Marchant and Higgins 1990, p. 29), and a modified form of the present age codes.

TABLE 4

A suggested modification of the age code, used by banders in Australia, relating age to terms commonly used to describe age in birds and to the natural cycle of moults.

I Young Birds

P = *Pullus*. A young bird, either in the nest or out of it, but which cannot fly.

Juvenile. A young bird in its first covering of true feathers following the down. The juvenile age group, containing two age classes, covers this plumage, which is replaced by the post-juvenile moult.

J = A young bird in juvenile plumage that has left the nest and is able to fly. The early juvenile period.

1 = A juvenile whose appearance has appreciably altered with moult and some soft part colour change. The late period.

Immature. A young bird whose plumage lies between that of a juvenile and that of an adult. There may be more than one immature plumage, all of which fall within the immature age group, which contains two or more age classes. It is terminated by immature (post-nuptial) moult. Immature age codes use a number with a minus sign (the exception is 2).

2 = An immature bird in its second pennaceous plumage, following a complete post-juvenile moult.

2- = As above, but following a partial post-juvenile moult. The age codes continue upwards, e.g., 3-, 4-.

II Adult Birds

Adult. A bird whose plumage does not change in appearance at subsequent moults (unless the bird has two moults in a year, in which case it has two alternating adult plumages). All adult plumages are covered by the adult age group, with age indicated by a number and a plus sign.

1+ = An adult whose plumage was acquired in its first year of life.

2+ = An adult in its second year of life or older. The age codes continue upwards, e.g., 3+, 4+.

III Birds of Unknown Age

X = A bird whose age is completely unknown.

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