NOTES ON MOLT AND JUVENAL PLUMAGE IN THE ACORN WOODPECKER

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Most woodpeckers, when adult, are sexually dimorphic in plumage coloration; a few species are monomorphic. Young woodpeckers before their postjuvenal molt follow three main patterns with respect to coloration. They resemble the adult female or their parent of respective sex, or they differ from both parents (Goodwin 1968). In very few birds in which adults are dimorphic do the juveniles of both sexes closely resemble the adult male (Harrison 1964).

This paper describes some aspects of juvenal plumage in the Acorn Woodpecker (*Melanerpes formicivorus*), a species in which the young of both sexes, in most of its races, resemble the adult male prior to the postjuvenal molt. Our findings are based on field observations of Acorn Woodpeckers made in a 3-year study of the behavior and ecology of this species at the Frances Simes Hastings Natural History Reservation, Monterey County, California, and on examination of skins from the Museum of Vertebrate Zoology, the British Museum of Natural History, the Moore Ornithological Laboratory, the Los Angeles County Museum, and the California Academy of Sciences.

Bent's (1939:215) description of postjuvenal molt in the Acorn Woodpecker appears to be essentially correct. Acorn Woodpeckers are hatched naked, and the juvenal plumage is acquired before they fledge. At Hastings, juveniles molt the head and body plumage from August to October but retain most if not all remiges and rectrices. Our observations indicate that the postjuvenal molt is begun about two months after fledging. Adults have one complete molt each year which may be quite protracted, sometimes beginning in May and continuing to August or September. In many cases, adults have a suspended molt; that is, there is a "temporary interruption in the sequence of feather replacement which is subsequently resumed at the point of suspension" (King 1972:13). When molt resumes, it begins with the next feather in sequence; feathers molted in the spring are not replaced again.

This situation is seen most clearly in individuals captured in the autumn and is most noticeable in the primaries and secondaries. The old feathers, that is, those replaced in the previous spring prior to suspension of molt, stand out sharply from the darker, less worn feathers that have been replaced recently and show a clear discontinuity. In a typical case, a bird captured on 24 November had the first two primaries of the right wing and the first three primaries of the left wing worn and brown, while the others were unworn and black. The first secondary on both sides was new, but the second, third, and fourth were worn and brown. The remaining secondaries were unworn and black. An examination of museum specimens confirms this molt pattern but its details, frequency, and ecological-physiological correlates remain unknown. Suspended molt has been found only in a few species (see Davis 1971, King 1972, Payne 1972).

Adult male and female Acorn Woodpeckers are dimorphic in plumage color. In the North American forms of this species (that is, those extending from Panama northward), the crown of the adult male is red, and forehead, white. Adult females differ from males only in that the red of the crown and the white of the forehead are separated by a black band. In the Colombian form (*M. formicivorus flavigula*), adult females have no red. In adult males, the head is tricolored like females of North American forms but the red is less extensive and is confined to a small band across the nape (Goodwin 1968, Ridgway 1914).

There are two clearly stated opinions concerning juvenal plumage in the Acorn Woodpecker. The first is that the young are similar to adults with the same sexual differences in color (Bailey 1915, Bent 1939, Gabrielson and Jewett 1940, Goodwin 1968, Ridgway 1887, 1914). The second is that the young of both sexes resemble the adult male prior to postjuvenal molt (Bailey 1928, Chapman 1927, Coues 1903, Hargitt 1890, Mailliard 1900, Mearns 1890, Ritter 1938, Swarth 1904). Our observations in the field, both of newly fledged young and of young taken from the nest prior to fledging (for the purpose of banding) and our examination of juvenile specimens indicate that in all races except *flavigula*, juveniles of both sexes resemble the adult male in coloration. It is not possible to distinguish the sex of these young woodpeckers on the basis of color patterns until after the postjuvenal molt, when they assume the adult color pattern. In the Colombian race a different situation appears to be the case. We know of no published reference to the coloration of juveniles in this race, but were able to examine four specimens labeled as juveniles in the Museum of Vertebrate Zoology and the British Museum of Natural History collections. Two were labeled male and two, female. Both females had head markings identical to adult females of that race, but the males resembled neither parent and showed instead the head pattern of males of the North American forms; that is, the entire crown is red and abuts the white forehead.

Bent (1939) listed various ways to distinguish birds in juvenal plumage from adults, including a weaker bill, duller colors lacking gloss, a softer plumage, the yellow of the throat less pronounced, the streaks of the breast less sharply defined, the tertials and scapulars tipped with white, narrow white tips on the two outer tail feathers on each side, and at least two white spots on each web of the outer tail feather. Criteria mentioned by other writers include tail spots (Swarth 1904), the black streaks on the side of the breast blurred in juveniles (Coues 1903); most workers also mention that the colors of the head are duller.

We checked all these features and others that seemed variable including behavior, eye color, and extent of red on the head to find what characters could be used reliably to distinguish adults from juveniles. It was found possible to make a distinction on a number of criteria, both in the field and with museum specimens.

1. Juveniles have duller colors lacking gloss and softer, "lacier" plumage. The breast band, scapulars, back, and neck, which are glossy in adults, are brownish in young birds. Additionally, the clean, white belly of the adults is light tan in juveniles. Breast streaks are black in adults, but brown in juveniles.

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TABLE 1. Bill length (in mm) in Acorn Woodpeckers, measured on birds captured between 14 May and 30 September.

	Bill length		
	Juvenile	Adult ♂	Adult ♀
Range	24.0–31.0	28.5–36.5	26.5–36.0
Mean	28.6	31.5	30.4
Sample size	29	71	50

2. Eye color, as a field character, is a good indicator of age. Juveniles tend to have darker irises than adults although cases are known where adults have darkly pigmented irises. The juvenile iris is usually very dark at fledging and gradually fades to the normal light color of the adult by the time the postjuvenal molt is complete.

3. The occurrence of white spots or bars on the tail feathers of juveniles has been commented on by several observers. Bent (1939:215) stated that "there are at least two white spots on each web of the outer tail feather, which are in evidence all through the first year; as the juvenile wings and tail are retained until the next summer molt, birds of the year may be thus recognized." From our observations, however, this type of tail spotting is quite variable. Most juveniles have this character but it is by no means invariably present in young birds. Additionally, some adults which have completed at least one postnuptial molt have tail spots or bars. The most extensively barred outer tail feathers we have observed were on an adult male which was two or more years old. The character is probably present in about 70–80% of the juveniles and in about 20–30% of the adults. Used alone, it is an unreliable indicator of age, but used with other features it may be of supplemental value.

4. The red color of the cap is duller in juveniles than in adults but care is needed when using this character, particularly in the field, since adults molt the head feathers through the summer, and in the process of molt their red caps often look as dull as those of juvenile individuals. The extent of red on the crown was found to be the same in adult males as in juveniles.

5. We found white-tipped tertials and scapulars to be absent in most birds, but present in juveniles more than adults.

6. The yellow on the throat is probably on average duller in juveniles than in adults, but this feature was found to vary and to be unreliable as an indicator of age.

7. Adults and juveniles differ in average bill length (from gape to tip; data in table 1) but there is considerable overlap between them. Although bill length is on average shorter in juveniles and is therefore of some value in aging birds, the overlap is too great to make it a useful character by itself.

8. The molt patterns of adult and juvenile Acorn Woodpeckers are different, as described previously, and are therefore reliable indicators of age.

9. Many behavioral differences between young birds and adults are good indicators of age. Juveniles have a different voice from that of adults, and their vocal repertoires contain some elements seldom included in the adult repertoire. Also, the young birds are dependent on the adults for food throughout most of the period prior to postjuvenal molt and any individual seen begging from another is probably a juvenile. After postjuvenal molt, behavioral differences continue but lessen with time. The juvenile voice and vocal repertoire become increasingly like those of the adults and are essentially indistinguishable by the time young are 4–5 months old.

Of all the characters examined, numbers 1, 8, and 9 are the best for distinguishing between adult and juvenile birds. The others are unreliable.

After completion of the postjuvenal molt, we have found no completely reliable way to distinguish all birds of the year from birds which have completed their first postnuptial molt. However, some features of the wing and tail, since these are retained by juveniles are of value in distinguishing the two age classes during the period between postjuvenal molt and mid-winter. Evidence of complete molt indicates that a bird is an adult. The presence of worn and brownish-tipped primaries, secondaries, and tail feathers in conjunction with new body plumage is a good indicator that a bird is in its first winter. These characters are not reliable indicators of age after mid-winter, when feathers of both adults and young birds become very worn. Although not commonly, some birds retain juvenal under tail coverts after molt which can be used to distinguish birds of the year from adults. Our measurements of wing length indicated little or no difference in this character between birds who have completed their postjuvenal molt and older birds.

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TEMPERATURES OF SOME PUERTO RICAN BIRDS, WITH NOTE OF LOW TEMPERATURES IN TODIES

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I measured cloacal temperatures of 20 species of birds at five localities in Puerto Rico (table 1). Although the altitudes ranged from 100 to 2,100 ft, in most cases I combined data on individuals of a given species, owing to small samples at each locality. Most of the birds showed no wing or tail molt, although some individuals had worn tips on their feathers.

Temperatures of the Puerto Rican Tody (*Todus mexicanus*) were unusually low, being even cooler than that of the Long-tailed Hermit (*Phaethornis superciliosus*), which has a similar weight (38.6°C, 5.6 g; Oniki, Condor 74:209, 1972). Todies in the hot scrub at Guanica (d) had higher and more usual temperatures than those in the cooler forest on the Rio Mameyes (b), except for one Guanica bird measured at 24.9°C in the early morning. McNab (Condor 68:47, 1966) reported that small birds have low body temperatures, like those of the relatively few mammals of the some weights. However, the temperature of the tody is below the expected value, which may indicate a low metabolic rate or poor insulation as an adaptation for subsisting on scanty or variable food supplies.

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TABLE 1. Temperatures of some Puerto Rican birds.

Species	Locality[1]	N[2]	Cloacal temp. (°C) Av.	Cloacal temp. (°C) Range	Weight (g) Av.	Weight (g) Range
Ground Dove (*Columbina passerina*)	d	6	41.4	(38.4–42.4)	35.4	(33.8–39.2)
Ruddy Quail-Dove (*Geotrygon montana*)	b	2	39.6	(38.2–40.9)	161	
Puerto Rican Emerald (*Chlorostilbon maugaeus*)	b	—	———		2.9	
Puerto Rican Tody (*Todus mexicanus*)	b	3	36.5	(36.3–36.6)	6.6	(6.0–6.9)
	d	4	38.6	(36.4–39.5)	5.5	(5.0–6.0)
Loggerhead Kingbird (*Tyrannus caudifasciatus*)	e	2	44.1	(43.8–44.4)	56.3	(54.1–58.5)
Stolid Flycatcher (*Myiarchus stolidus*)	d	20	42.3	(38.8–43.3)	23.0	(21.0–24.8)
Mockingbird (*Mimus polyglottos*)	d	1	44.0		45.0	
Pearly-eyed Thrasher (*Margarops fuscatus*)	c, d	5	41.8	(40.4–42.2)	101.0	(88.8–108.9)
Red-legged Thrush (*Mimocichla plumbea*)	d	5	42.5	(41.5–42.9)	73.3	(67.0–80.0)
Troupial (*Icterus icterus*)	d	2	43.6	(43.2–44.0)	73.8	(71.0–76.5)
Puerto Rican Vireo (*Vireo latimeri*)	d, e	8	41.5	(40.6–42.4)	11.8	(11.0–12.2)
Black-and-White Warbler (*Mniotilta varia*)	d	6	41.3	(40.2–43.0)	9.5	(8.6–10.0)
Northern Parula (*Parula americana*)	d	4	41.2	(39.2–42.7)	7.0	(6.2–7.8)
Prairie Warbler (*Dendroica discolor*)	d	3	40.5	(39.5–41.5)	6.8	(6.5–7.2)
Adelaide's Warbler (*Dendroica adelaidae*)	d	3	41.3	(40.9–42.0)	6.9	(6.8–6.9)
American Redstart (*Setophaga ruticilla*)	d	2	39.6	(37.8–41.4)	6.9	
Bananaquit (*Coereba flaveola*)	b, c, d, e	40	41.4	(38.4–43.9)	9.6	(7.4–12.0)
Puerto Rican Tanager (*Nesospingus speculiferus*)	a	1	42.0		37.0	
Puerto Rican Bullfinch (*Loxigilla portoricensis*)	b, d, e	45	42.0	(40.0–43.9)	32.9	(26.0–39.0)
Black-faced Grassquit (*Tiaris bicolor*)	d, e	11	41.4	(39.5–43.1)	9.4	(8.5–10.5)

[1] Localities, altitude, net-hours (one 12-m net/1 hr), and average ambient temperature as follows: a) La Mina Recreation Camp (18° 18′ N, 65° 47′ W), 2,100 ft, 21.4 n–h (17 Jan. 1972), 23°C; b) Rio Mameyes (18° 19′ N, 65° 45′ W), 700 ft, 309 n–h (18 and 19 Jan.), 23°C; c) El Verde (18° 19′ N, 65° 49′ W), 1,700 ft, 16.5 n–h (21 Jan.), 22°C; d) Guanica (17° 58′ N, 66° 52′ W), 150 ft, 433 n–h (24 to 27 Jan.), 26°C; and e) La Parguera (17° 59′ N, 67° 04′ W), 100 ft, 7 n–h (28 Jan.), 26° C.

[2] Weight and temperature were measured on the same number of birds except for Ruddy Quail-Dove (1 weighed), Puerto Rican Emerald (2 weighed), American Redstart (1 weighed), Puerto Rican Bullfinch (42 weighed), and Black-faced Grassquit (12 weighed).