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CAROTENISM IN THE HAIRY WOODPECKER

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On 3 January 2009, at Russian Gulch State Park in Mendocino County, California, LeValley encountered a female Hairy Woodpecker (*Picoides villosus*) with yellow outer rectrices. He and others hypothesized that the bird had acquired the yellow adventitiously through staining. Yet on 1 November 2010, LeValley was surprised to find what appeared to be a different female Hairy Woodpecker with yellow outer tail feathers at Little River, approximately 6.5 km south of the previous sighting. This bird remained in the area for much of the winter and was photographed in November 2010 and January 2011 (upper photo on this issue's inside back cover). On 25 December 2011, a male Hairy Woodpecker with yellow outer tail feathers was photographed at the same location.

When LeValley spread the word about these birds he received reports of a number of other sightings in Mendocino County. John Sterling had seen a bird matching this description at MacKerricher State Park on 18 March 2010. Becky Bowen observed a pair of Hairy Woodpeckers, both showing yellow outer tail feathers, along a trail between Highway 101 and Virgin Creek Beach on 2 January 2011. LeValley photographed the male on 2 January 2011 (lower photo on this issue's back cover), and multiple observers reported seeing it and/or the female on various dates through 2012. Other reports came from the Navarro River estuary, where Tim Bray photographed a male near a nest cavity on 19 April 2011 and Matt Coleman photographed a female on 28 April 2011.

LeValley received reports from other coastal counties in California as well. Sean Brophy photographed a yellow-tailed male in Carlotta, Humboldt County, on 26 December 2010; Beth and Tom Hamel found another, a female that had been present at least since 12 March 2011 (J. Morlan pers. comm.), at Golden Gate Park, San Francisco, on 26 December 2012 (photo on this issue's outside back cover); Steve Shunk photographed one at Point Lobos State Park, Monterey County, on 8 January 2009. Preceding these birds by nearly a decade was a pair with yellow outer tail feathers at Mountain Lake, San Francisco, on 9 July 2000 (Andrew Rush; J. Morlan pers. comm.).

LeValley also received photos of yellow-tailed Hairy Woodpeckers from outside of California. Sandy Shanks photographed one in Port Townsend, Washington, on 2 November 2012, and Shirley Powell photographed a juvenile at Kawortha Lakes in Ontario, Canada, on 27 July 2012. A yellow-tailed male had reportedly visited the feeder for years and was accompanied by the juvenile during the summer of 2012.

Hairy Woodpeckers with yellow outer rectrices apparently have not been reported in the literature previously (Jackson et al. 2002, Pyle 1997). Birds with yellow instead of red crowns occur from time to time (Putnam 1998), and exposure to tannins, soot, or pitch can stain the white feathers of the Hairy Woodpecker brown (Jackson et al. 2002). The subjects of our paper, however, with the exception of one individual (back cover), exhibited yellow only on the outer tail feathers. The confinement of yellow to the outer tail feathers and the apparent persistence of this plumage pattern from year to year suggest the aberration results not from staining but from carotenism.

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Carotenism is an environmental or genetic disorder affecting the normal expression of carotenoid pigments (red, yellow, and orange) in the integument of birds and other animals. The environmentally induced form in birds results from the intake or lack thereof of certain carotenoid-containing foods just prior to or during molt. It affects only birds normally pigmented with carotenoids. Carotenism can result from (1) a change in the normal distribution or extent of carotenoid pigments, (2) an increase or decrease in carotenoid concentration, (3) a change in type of carotenoid pigment, or (4) the total absence of carotenoids (Davis 2007). Abnormal yellow coloration has also been called xanthochroism, xanthochromism, xanthism, and flavism. Although those terms indicate yellow coloration, they obscure the mechanism responsible for the abnormality. That is, abnormal yellow coloration often results not from a change in carotenoids but from the absence of dark melanin, which reveals the presence of carotenoid pigmentation (Harrison 1966, Hailman 1984). The absence of melanin, however, is more aptly termed amelanism (Davis 2007).

A review of the literature and unpublished photos suggests that carotenism most commonly involves a change in the expression of carotenoid pigment type, whereby one color replaces another. Examples include yellow instead of red hind crowns in the Hairy Woodpecker (Putnam 1998), orange instead of yellow tail tips in the Cedar Waxwing (*Bombycilla cedrorum*; Mulvihill et al. 1992), orange instead of yellow lores in the White-throated Sparrow (*Zonotrichia albicollis*; Brooks 1994), red instead of orange plumage in the Baltimore Oriole (*Icterus galbula*; Flinn et al. 2007), and yellow instead of red plumage in the Northern Cardinal (*Cardinalis cardinalis*; McGraw et al. 2003). In the Cedar Waxwing, White-throated Sparrow, and Baltimore Oriole, the anomalies have been shown or suggested to result from environmental factors alone, through consumption of rhodoxathin-containing honeysuckle fruit just prior to and during molt. The aberration in the Northern Cardinal, however, is thought to result from a genetic mutation that disrupts the normal metabolic pathway for carotenoid expression. Genetic mutation would seem a reasonable explanation for the yellow instead of red hind crown in the Hairy Woodpecker as well.

Expression of carotenoid-based colors where none are normally present is less common. Examples include pink flushes in the plumage of the Ring-billed Gull (*Larus delawarensis*; Hardy 2003), yellow or orange-buff underparts in the White-throated Sparrow (Brooks 1994), and red underparts and rump in the Rose-breasted Grosbeak (*Pheucticus ludovicianus*; Pittaway and Iron 2006). Hairy Woodpeckers with yellow outer tail feathers would fall into this category. This plumage anomaly involves both a change in the normal distribution of carotenoid pigments (from hind crown alone to hind crown and tail feathers) and a change in carotenoid pigment type (from red pigments alone to red and yellow pigments). That the yellow is restricted to the outer tail feathers, which don't normally show carotenoid-based color, suggests a genetic mutation is likely responsible for this pattern. Likewise, that the plumage pattern seems to persist in individuals for years also implies the aberration results from a mutation rather than from an effect of diet prior to and during molt. We know of no other case involving manifestation of two carotenistic effects presumably triggered by a genetic mutation. Furthermore, most cases involving a change in carotenoid pigment type result in a change in color in normally carotenoid-colored areas. This case, however, resulted in a new color in a normally uncolored area.

The yellow-tailed Hairy Woodpeckers from coastal northern California could conceivably be attributable to a single mutant parent and its mutant progeny. However, the birds from Washington and Ontario suggest this genetic anomaly can arise independently. More information is needed to evaluate the cause, heritability, and persistence of this fascinating coloration. Please send reports and photos of such birds to the authors.

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Female yellow-tailed Hairy Woodpecker (*Picoides villosus*) at Little River Headlands, Mendocino County, California, 1 November 2010.

Photo by Ron LeValley



Male yellow-tailed Hairy Woodpecker (*Picoides villosus*) at MacKerricher State Park, Mendocino County, California, 2 January 2011. Note the presence of the normally colored hind crown.

Photo by Ron LeValley

