

ABERRANTLY-COLORED YELLOW NORTHERN CARDINALS

Nicholas A. Winstead
Mississippi Museum of Natural Science
2148 Riverside Dr.
Jackson, MS 39202

Larry Coleman contacted the Mississippi Museum of Natural Science during early January 2017 to report a yellow male Northern Cardinal (*Cardinalis cardinalis*) that was visiting his backyard feeder and his neighbor's yard at Raymond for a few days. The bird was photographed on 4 and 6 January (Figure 1). Coleman has not seen the bird since then.

This mutation is evidently rare, and appears to occur only in males. Additional observations have been reported from Louisiana (McGraw et al. 2003), Ohio (McCormac 2013), Illinois (cbbohl 2010, Young 2014), Kentucky (Scott 2011), Iowa (Watrous 2013, ragdoll9786 2013), and Missouri (Magee 2014). At least one other yellow Northern Cardinal has been found from Mississippi at Louisville, Winston County (Figure 2; Laurie Arnold, personal communication). The Louisville, Mississippi bird was seen over a period of about six years during the early 2000s, but has not been seen in recent years. Arnold once observed the bird feeding young that appeared normally-colored.

Normal Northern Cardinals obtain their red plumage by metabolizing four yellow or orange carotenoid pigments from their diet, and depositing these more oxidized red forms into growing feathers (McGraw et al. 2001). Results from a yellow Northern Cardinal from Baton Rouge, Louisiana indicated it incorporated into its feathers the yellow carotenoid pigments directly from its diet and other yellow pigments that oxidized via a different pathway than the pathway in normal cardinals that produces red pigments (McGraw et al. 2003). McGraw et al. (2003) assumed

this suggested a genetic mutation that prevented the aberrant cardinal from creating the red pigments and instead either shifted metabolism of some dietary carotenoids to other yellow pigments, or allowed those to be more evident due to a lack of red pigments.



Figure 1. Yellow male Northern Cardinal at Raymond, Mississippi from 4 and 6 January 2017. Photographs by Larry Coleman.



Figure 2. Yellow male Northern Cardinal at Louisville, Mississippi from around 2009. Photograph by Laurie Arnold.

Recent work (Lopes et al. 2016) has discovered a gene responsible for producing an enzyme that converts yellow carotenoids into red pigments in normal birds; although found in many bird species, it is turned on in different body parts for different species. The mechanism responsible for turning on the enzyme in the skin of red species but not yellow ones needs further study. Finding another yellow Northern Cardinal may help solve this question.

Literature Cited

cbbohl. 2010, September 25. Yellow cardinal. Message board post. <http://newmb.com/mb/index.php?mode=thread&id=27238>.

- Lopes, R.J., J.D. Johnson, M.B. Toomey, M.S. Ferreira, P.M. Araujo, J. Melo-Ferreira, L. Anderson, G.E. Hill, J.C. Corbo, and M. Carneiro. 2016. Genetic basis for red coloration in birds. *Current Biology* 26:1427-1434.
- Magee, A. 2014, May 4. Rare yellow Northern Cardinal. Video file. <https://www.youtube.com/watch?v=Py8uskWcNbw>.
- McCormac, J. 2013, March 10. Zanesville's yellow cardinal, revisited. Blog post. <http://jimmccormac.blogspot.com/2013/03/zanesvilles-yellow-cardinal-revisited.html>.
- McGraw, K.J., G.E. Hill, R. Stradi, and R.S. Parker. 2001. The influence of carotenoid acquisition and utilization on the maintenance of species-typical plumage pigmentation in male American Goldfinches (*Carduelis tristis*) and Northern Cardinals (*Cardinalis cardinalis*). *Physiological and Biochemical Zoology* 74:843-852.
- McGraw, K.J., G.E. Hill, and R.S. Parker. 2003. Carotenoid pigments in a mutant cardinal: Implications for the genetic and enzymatic control mechanisms of carotenoid metabolism in birds. *Condor* 105(3):587-592.
- ragdoll9786. 2013, April 18. Red Northern Cardinal and yellow Northern Cardinal. Video file. <https://www.youtube.com/watch?v=c3irBdewWrc>.
- Scott, W. 2011, February 9. Rare yellow cardinals spotted in Boyle. *Lexington Herald Leader*. <http://www.kentucky.com/living/home-garden/article44078892.html>.
- Watrous, J. 2013, April 13. Very rare yellow cardinal sighted in Des Moines, Iowa, USA. Video file. <https://www.youtube.com/watch?v=EBSkmOkLu9g>.
- Young, C. 2014, January 14. Reader photographs unusual yellow cardinal. *Prairie State Outdoors*. http://www.prairiestateoutdoors.com/pso/article/reader_photographs_unusual_yellow_cardinal.