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CAROTENISM IN CASSIN'S FINCH

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The red hues of a typical male Cassin's Finch can be described as crimson. In March 2009 I noted an aberrant male, with yellow-orange coloration instead of crimson visiting seed feeders in the company of a large flock of normally colored Cassin's Finches 19 km west-southwest of Livermore, Larimer County, Colorado, elevation 2440 m.

In almost all birds, plumage coloration is determined by two primary types of pigments, melanins and carotenoids. Melanins are responsible for black, gray, brown and chestnut feathers and are synthesized by the birds and deposited as granules in the skin and feathers. Carotenoid pigments produce colors ranging from pale yellow to scarlet red. For the most part birds cannot synthesize these pigments and must obtain them from food in the diet. These fat-soluble pigments are non-granular and are deposited during a feather's growth before its keratinization is complete (Gill 1990). Many different carotenoid pigments may be responsible for a particular shade of color in a bird, and a diet unbalanced in one or more of these necessary pigments may produce an aberrant yellow, orange, or red color. An abnormality of carotenoid pigmentation, called carotenism, "results from one or more of four causes: (1) change in the normal distribution or extent of carotenoid pigments; (2) increase or decrease in carotenoid concentration, resulting in a change in color or color intensity; (3) change in carotenoid pigment type and therefore a change in color; and (4) total absence of carotenoids from all or part of the plumage or skin" (Davis 2007).

Xanthochromism (or xanthochroism or flavism) is another term that has been applied to this type of aberrant coloration where a bird's normally red plumage is yellowish or orange. According to Wapedia (<http://wapedia.mobi/en/Xanthochromism>), "xanthochromism is a term that may be applied to birds, fish and other animals whose coloration is unusually yellow through an excess of yellow pigments, or possibly a loss of darker pigments that allows yellow pigments to be unusually dominant. It is often associated with the lack of usual red pigmentation and its replacement with yellow." In aviculture, several species of parrot have been bred for unusual yellow or orange variants. Wild birds in which xanthochromism has been identified include the Yellow Wagtail (*Motacilla flava*), Wood Warbler (*Phylloscopus sibilatrix*), Cape May Warbler (*Dendroica tigrina*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Evening Grosbeak (*Coccothraustes vespertinus*), Red-bellied Woodpecker (*Melanerpes carolinus*), Scarlet Tanager (*Piranga olivacea*), Northern Cardinal (*Cardinalis cardinalis*), Purple Finch (*Carpodacus purpureus*), Crimson-breasted Shrike (*Laniarius atrococcineus*) (Wapedia), and Eastern Bluebird (*Sialia sialis*; Welty and Baptista 1988).

It is well known that wild male House Finches (*Carpodacus mexicanus*) vary in plumage color from pale yellow to bright red. Hill (1992) found by experiment that the red in a male House Finch is dependent on the carotenoid content of its diet and that a normal red individual can be made to become yellow through manipulation of its diet. Variation in access to carotenoid pigments at the time of molt causes the variations in plumage color (Hill 1992). Inouye et al. (2001) proposed that variation in the red pigment of male House Finches may be due to differences in carotenoid metabolism, dietary access to carotenoids, or exposure to environmental factors, such as parasites, that may affect pigmentation.

In Cassin's Finch, carotenism has been reported rarely, and the photograph featured on this issue's back cover may be the first one of this aberration published. Van

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Rossem (1921) reported that an adult male Cassin's Finch collected in Sierra County, California, on 17 July 1916 had the normally red areas entirely replaced by lemon yellow. Arvey (1938) reported that a normal red captive Cassin's Finch grew yellow instead of red feathers while on an artificial diet. Once pyracantha berries were added to the diet, new feathers grew in as normal red, resulting in a mottling of yellow and red head and breast feathers.

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“Featured Photo” by © Nancy Bell of Livermore, Colorado: Xanthochroistic male Cassin's Finch (*Carpodacus cassinii*) near Livermore, Larimer County, Colorado, 26 March 2009, in which yellow-orange has replaced the normal red.

