KILHAM, L. 1982b. Common Crows pulling the tail and stealing food from a river otter. Fla. Field Nat. 10: 39-40.
MCINTYRE, N. 1953. Curious behavior of Carrion Crow. Brit. Birds 46: 377-378.
MCKENDRY, W. G. 1973. Carrion Crow persistently "playing" with object. Brit. Birds 66: 400.
SKEAD, C. J. 1952. A study of the Black Crow *Corvus capensis*. Ibis 94: 434-451.

Lawrence Kilham, Department of Microbiology, Dartmouth Medical School, Hanover, New Hampshire 03755.

Florida Field Naturalist 12: 33-36, 1984.

On describing color abnormalities in birds.—The interesting note by Richardson (1981) entitled "Xanthochromism in the Rose-breasted Grosbeak" raises questions about the terminology and interpretation of color abnormalities in birds. He observed a bird with normal black and white coloration but with a yellow rather than rose breast. Following the definition in the glossary of Van Tyne and Berger (1959), Richardson called this observation an example of "xanthochromism" (which should be spelled "xanthochroism"). The point I shall discuss is that this term has no stable meaning, and furthermore the grosbeak described is unlikely to be an example of the most commonly used meaning of xanthochroism.

Xanthochroism has been used to mean at least five different things. (1) At root (from the Greek *xantho-*, yellow, coupled with *chroa*, color) it should mean simply "yellow coloration," although rarely used thus. (2) In their glossary Van Tyne and Berger (1959: 586) define the term as "*abnormal* yellow coloration" (emphasis added), and taken thus Richardson's use is correct. (3) The commonest meaning in the literature is the more restricted view given by Van Tyne and Berger (1959: 100) in the text: abnormal yellow coloration that is "a special type of schizochroism." This latter term refers to the absence of one pigment from two or more that together produce the normal color, so that the resulting coloration is abnormal. Pettingill (1970: 193) takes a similar, but equivocal, view: "erythrism and xanthochroism *usually* result from the absence of melanin and the retention of red or yellow carotenoid pigments" (emphasis added). (4) The actual example of "xanthochroism" given by Van Tyne and Berger (p. 100)—yellow parrots resulting from the loss of blue in normally green species—may be yet another phenomenon. The authors say that the yellow "apparently results from loss of the dark pigment," but note later that "Blue in feathers is apparently never the result of blue pigment." There is a double problem here. First, a blue pigment *is* known from birds (rhodoxanthin, a xanthophyll producing the blue of fruit pigeons, *Ptilinopus*; see Buckley 1982: 61), although the blue of parrots is almost certainly not based on a pigment (biochrome), but rather is a schemochrome (structural color). Second, the classical notion that all blue-producing schemochromes are due to Rayleigh back-scattering by minute melanin particles is open to question(Hailman 1977: 100-101), as Dyke (1971) has proposed the physical basis to be thin-layer interference with no involvement of pigments of any kind in *Agapornis* parrots. Furthermore, even if the blue of parrots were based on minute melanin particles, loss of blue might not entail loss of pigment—rather it might result from other physical abnormalities in the feather. Therefore, although Van Tyne and Berger (1959: 99) define schizochroism as "the absence of one of the pigments normally present," their example is not clearly such a

case. Insofar as I can determine, the absence of a schemochrome resulting in abnormal coloration due to a remaining pigment has not been given a specific name. Perhaps this is what Van Tyne and Berger meant to infer with the phrase "*special type* of schizochroism" (emphasis added). Finally (5) I have found that some students incorrectly infer that xanthochroism means yellow coloration based on xanthophyll pigments; although this is probably often true, there is a variety of other pigment-types producing yellow coloration (Hailman 1977: 98, table 4-II).

Buckley (in review of the MS for this communication) suggested that a term be proposed for the unnamed phenomenon (4) of the above list. Buckley (1982: 69) pointed out that named schizochroisms are of the phaeomelanin-eumelanin or melanin-carotenoid types, so in parallel I believe phenomenon (4) might be designated a schemo-carotenoid schizochroism. Albeit awkward, the full descriptive term would therefore be "non-schemochrome schemo-carotenoid schizochroism."

An important recent reference should be consulted by anyone interested in avian coloration, Buckley (1982). Buckley recommends abandoning many of the traditional terms for avian coloration because of their ambiguity. In this case, he noted that "The biologist's terms xanthism and xanthochroism, as well as the aviculturist's lutino, are frequently used for birds abnormally colored yellow, but in most cases are used incorrectly, as the phenomenon under observation is usually schizochroism" (p. 68).

Richardson's grosbeak, however, is probably not schizochroic, as there is no evidence that one pigment has been deleted from the normal coloration, leaving a second pigment as the only basis for color. In his bird, it appears that a carotenoid pigment is expressed in a washed-out form. Following Buckley (1982: 68) these abnormalities should be termed "carotenism of degree (intensity)." The cases Richardson cited from Gross (1965) are clearly a mixed bag. One Evening Grosbeak (*Coccothraustes vespertinus*) was schizochroic, with normal melanin absent, but the other bird is not adequately described. Similarly, the Purple Finch (*Carpodacus purpureus*) is not described, but likely to be a carotenism of degree, as are the cited Ruby-crowned Kinglets (*Regulus calendula*) with yellow or orange crown spots in place of the normal red. The yellow female Northern Cardinal (*Cardinalis cardinalis*) is also probably a carotenism of degree, but the Eastern Bluebird (*Sialia sialis*) cited is not sufficiently described for identification of the abnormality. Frustratingly, Gross (1965) provided authors and years for each case, but no bibliography so that the original descriptions cannot be traced directly from his paper.

I have not attempted to review the literature since Gross (1965), but two studies are instructive. In a carotenism-of-degree case involving tropical tanagers with red and yellow rumps, Brush (1970) found only one pigment—an unnamed hydroxy-carotenoid—and suggested that red-rumped birds might be genetically homozygous while yellow-rumped birds would be heterozygous for the same gene. Other cases called xanthochroism in the original reports (e.g. Schnell and Caldwell 1966) probably *are* melanin-carotenoid schizochroisms (see Buckley 1982: 69-70).

In sum, it is perhaps more important than ever to report abnormally colored birds so that we can gain a greater understanding of the pigmental and genetic bases of avian coloration. However, terms that are used am-

biguously in the literature, or that connote an unwarranted interpretation of the coloration observed, should be avoided in descriptions. I recommend using straightforward titles such as "Yellow replaces rose in the coloration of a Rose-breasted Grosbeak" or similar descriptors.

I am grateful for comments on the manuscript by Paul A. Buckley, an unnamed reviewer, and Editor James Kushlan; their suggestions helped to make this complicated subject much clearer.

LITERATURE CITED

BRUSH, A. H. 1970. Pigments of hybrid, variant and melanic tanagers (birds). Comp. Biochem. Physiol. 36: 785-793.

BUCKLEY, P. A. 1982. Avian genetics. Pp. 146-149 *in* Diseases of cage and aviary birds, 2nd ed., (M. Petrak, Ed.) Philadelphia, Pennsylvania, Lea & Febiger.

DYKE, J. 1971. Structure and colour production of the blue barbs of *Agapornis roseicollis* and *Cotinga maynana*. Z. Zellforsch. 115: 17-29.

GROSS, A. O. 1965 Melanism in North American birds. Bird-Banding 36: 240-242.

HAILMAN, J. P. 1977. Optical signals: animal communication and light. Bloomington, Indiana and London, Indiana University Press.

PETTINGILL, O. S., JR. 1970. Ornithology in laboratory and field. 4th ed. Minneapolis, Minnesota, Burgess.

RICHARDSON, D. G. 1981. Xanthochromism in the Rose-breasted Grosbeak. Fla. Field Nat. 9: 11.

SCHNELL, G., AND L. D. CALDWELL. 1966. Xanthochroism in a Cape May Warbler. Auk 83: 667-668.

VAN TYNE, J., AND A. J. BERGER. 1959. Fundamentals of ornithology. New York, John Wiley & Sons.

Jack P. Hailman, Department of Zoology, University of Wisconsin, Madison, Wisconsin 53706.

Florida Field Naturalist 12: 36-38, 1984.

Further comments on a white Brown Pelican.—Nesbitt and Barber (1979, Fla. Field Nat. 7: 6) described several observations of an almost completely white Brown Pelican (*Pelecanus occidentalis*) near New Smyrna Beach, Volusia County, Florida, between December 1977 and July 1978. During July 1982, the current authors twice saw a white Brown Pelican in the same area. On 7 August, Fisher and Roberta Lawrence captured and banded (519-72124) this bird just north of the SR 44 bridge over the Intracoastal Waterway in New Smyrna Beach. This location was approximately halfway between the two given in the 1979 account and near the New Smyrna nesting colony that was active during the preceding three nesting seasons. This banded individual has been seen several times since, most recently in October 1983.

In August 1982, the bird was nearly completely white; the neck and back of the head showed traces of the brown that characterize adults in breeding condition. These characteristics were not observed in the bird seen in 1978. The underwings, leading edge of the wings, belly, and flanks also had some scattered brownish feathers. All brown plumage was lighter than the normal color. The irides were the same light greenish-cream, and the legs, pouch, and bill were yellowish as the previously reported pelican. The overall appearance