ALBINISM AND MALADAPTIVE FEATHER WEAR IN AMERICAN KESTRELS

JAMES W. PARKER

Albinism in North American Falconiformes has been most frequently reported (about 25 instances) in the Red-tailed Hawk (*Buteo jamaicensis)* (Gross 1965, Fremeyer and Fremeyer 1972, Oakley and Eltzroth 1980). Only three cases are recorded for the American Kestrel (*Falco sparverius*) (Ross 1963, Jenkins 1979). Here I describe two additional cases of albinism in kestrels and discuss associated abnormal feather wear.

In October 1976 I hand captured a partial albino female American Kestrel in Dunkirk, Chautauqua County, at a suburban residence near a large area of shrubby, open fields, and woodlands. The residents there had observed the bird, but they had no knowledge of its origins. The kestrel was unable to fly because of extensively worn albino flight feathers, but otherwise appeared healthy and active. It survived in captivity on a diet of live and dead birds and mammals, primarily live laboratory mice, for 25 months, behaved normally, and died on 24 December 1978. At death, it had paired ovaries, which seemed normal in other respects. Otherwise, the bird showed no pathologies or abnormalities. It is preserved as a study skin (JWP 432, University of Maine at Farmington).

Although most of the kestrel's plumage was pure white (Fig. 1), it had a few normally-pigmented, symmetrically positioned greater primary and secondary coverts, secondary remiges, rump feathers, and one normal rectrix. A few contour feathers with dull, dark gray tips occurred on the back, breast, and abdomen. Similar dull gray contours formed superciliary lines extending to the rear of the crown, and also formed remnants of the vertical black stripes of the face. About a third of the remiges and rectrices showed areas of dilute pale brown in the pattern of a normal bird, but all quills were white. The irises were dark brown, the bill was black, the cere and bare skin around the eyes were pale pink, and the legs and feet were dingy white. There was one partly black talon on each foot; the others were white.

When the kestrel was found, some of its flight feathers were so worn that only the quills remained, and some of these were broken. The condition of the plumage was apparently the result of normal activity in the wild; the circumstances of its capture did not suggest otherwise. During the bird's two years in captivity, it molted several times, producing new feathers in the original albino pattern. They were at first structurally intact, but within two or three weeks many of the white remiges and rectrices were excessively worn or broken. The bird was kept in a

cage of glass and smooth wood. Nevertheless, the wear and breakage of the feathers was the result of abrasion on the cage walls and wooden perch as the bird moved about the cage. Occasionally, albino feathers broke as blood quills, probably because they were unprotected by other intact feathers. The body plumage was always ragged and loose. A normal male American Kestrel was later maintained in the cage for more than two years and showed no excessive feather wear or damage.

Melanin apparently renders feathers more resistant to wear (Van Tyne and Berger 1976, Welty 1975, Burtt 1981). As Burtt (1981) summarized, it is not clear how this occurs, but in an earlier study (Burtt 1979), he demonstrated that melanic feathers are significantly less abraded by airborne aerosol particles than non-melanic feathers. Presumedly the abrading effects of larger structures would also be less for melanic feathers.

Van Tyne and Berger described a captive-raised albino American Robin (*Turdus migratorius*) afflicted, like the kestrel, with the problem of excessive plumage wear. Barrowclough and Sibley (1980) quantified the greater wear of albino primaries of a wild Yellow-rumped Warbler (*Dendroica coronata auduboni*) versus its normal primaries. They demonstrated a negative aerodynamic effect of this wear, but were not certain that it had significantly reduced the fitness of the warbler in the wild.

A major and anecdotal explanation for the short lives of most albinos is increased susceptibility to predators. Assuming the biochemical and physical composition of the kestrel's feathers was otherwise normal, the bird demonstrated another disadvantage. Compared to normal wild kestrels, it showed the ecological relevance of abnormally rapid feather wear; it seems to represent the first recorded demonstration of how the rapid wear of albino feathers, presumably by abrasion with physical structures, is maladaptive under natural conditions by rendering a bird flightless.

It is possible that the kestrel's feather structure was abnormal in ways unrelated to pigmentation, perhaps in amount of keratinization or in gross structure. Hormones, particularly androgens and thyroxine, affect melanin deposition in feathers, and altered thyroxine concentrations also affect the structure and growth of feathers (Ralph 1969). Keratinization of feathers depends on pituitary hormones (Yatvin 1966).

If the kestrel's albinism were the result of abnormal pituitary function or diet, it is possible that keratin structure might also have been adversely affected. However, when microscopically examined, the external and internal structure of the albino feathers appeared normal. More significantly, the kestrel's normally-pigmented feathers were clearly more resilient and longer-lasting than the white feathers. If something other than pigmentation was the cause of weakened feathers, both

Figure 1. An incomplete albino kestrel showing excessive plumage wear.

unpigmented and normal feathers would have been equally worn, which was not the case. Consequently, it is most likely that the excessive wear of the kestrel's feathers was the result only of a lack of melanin.

Personal communication in 1983 with Ada Potter, a wildlife rehabilitator from Topsham, Maine, provides another interesting case of kestrel albinism in which feather wear was also problematic. She maintained a male American Kestrel that produced normally-pigmented feathers until molt prior to its eighth year. At that time, the kestrel unaccountably produced a pure white feather coat. No change in diet

or aspects of care of the kestrel occurred. Regardless of why the change in pigment production occurred, Potter said the white feathers wore rapidly.

The absence of melanin might more significantly increase the rate of feather wear in a small species like the American Kestrel compared to a large species like the Red-tailed Hawk, simply because the kestrel has smaller feathers, for which the strengthening effect of melanin would probably be more important. Indeed, most bird species with white plumage are large. Feather wear, because of the abrading effect of dense vegetation, also might be more of a problem for raptors that forage in dense woodland habitat than for those that use open country. This would help explain why the largest number of cases of albinism for one raptor species is for the Red-tailed Hawk, which is large and hunts in the open. There are few records of albino accipiters which hunt within the woodland canopy, but all accipiters are less frequently observed for the same reason. Nevertheless, the situations with the two kestrels indicate that the effect of albinism on feather wear and its ecological implications warrant additional, preferably experimental, study.

LITERATURE CITED

Barrowclough, G. F. and F. C. Sibley. 1980. Feather pigmentation and abrasion: Test of a hypothesis. *Auk* 97: 881-883.

Burtt, E. H. 1979. Tips on wings and things. Pp. 75-110 in *The Behavioral Significance of Color.* E. H. Burtt ed. Garland STPM Press, N.Y.

— 1981. The adaptiveness of animal colors. *BioScience* 31: 723-729.

Fremeyer, H. and S. Fremeyer. 1972. A partially albinistic Red-tailed Hawk. *Bull. Kansas Ornith. Soc.* 23: 16.

Gross, A. O. 1965. The incidence of albinism in North American birds. *Bird-Banding* 36: 67-71.

Jenkins, J. 1979. White kestrel at Castial, Saskatchewan. *Blue Jay* 37: 227.

Oakley, S. M. and M. S. Eltzroth. 1980. The nesting of an albinistic Red-tailed Hawk (*Buteo jamaicensis*) in Oregon. *Raptor Research* 14: 68-69.

Ralph, T. 1969. The control of color in birds. *Am. Zool.* 9: 521-530.

Ross, C. C. 1963. Albinism among North American birds. *Cassinia* 47: 2-21.

Van Tyne, J. and A. Berger. 1976. *Fundamentals of Ornithology.* John Wiley, NY.

Welty, J. C. 1975. *The Life of Birds.* W. B. Saunders, Philadelphia.

Yatvin, M. B. 1966. Hypophyseal control of genetic expression during chick feather and skin differentiation. *Science* 153: 184-185.

Department of Sciences and Mathematics,
University of Maine, Farmington, Maine 04938