DECK-FEATHER MOLT IN BALD AND GOLDEN EAGLES IN RELATION TO FEATHER MOUNTING OF RADIO TRANSMITTERS

by
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Introduction

Of the many techniques being used for mounting radio transmitters on raptorial birds, one that seems to minimize disturbance to bird behavior, plumage, and movements is the tail-feather mount. Several types of tail mounts are in use, including drilling the feather shaft, tying the transmitter in place, and cementing the transmitter to the shaft.

There is some question as to the amount of weight that can be attached to a feather without causing it to drop out prematurely. In order to prevent such feather loss, some investigators attach one transmitter to be on center tail (deck) feathers, thus reducing the load on each feather. There are inherent drawbacks, including reduced mobility of the deck feathers when the bird fans or closes its tail and the possibility of molting these two feathers at different times.

Since transmitters mounted on tail feathers are lost when the feather is molted, knowledge of the molt sequence of these feathers is essential so that the life of the transmitter on the bird can be estimated. This paper presents the results of preliminary studies on deck-feather molt in Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*).

Methods

All work was done on captive eagles: two Golden Eagles of known age and five Bald Eagles tentatively aged using plumage characteristics and beak, cere, and eye color according to Southern (1964, 1967) and Servheen (1975). The yearly succession of plumages in the Bald Eagles studied followed Southern's age classes over a two-year period (e.g., third year to fourth, fourth year to fifth, etc.).

Molt was studied by wrapping a numbered plastic adhesive strip (W. H. Brady Co. Perma-Code wire markers) around the base of each feather shaft while the feathers were still on the eagle. Mews were checked daily; feathers were collected and recorded as to exact day of molt by noting the feather number.

The Golden Eagles were fed road-killed deer, rats, rabbits, and chickens. Bald Eagles were fed salmon, chickens, and rabbits. The Golden Eagles were manned and exercised on a creance or were flown free. The Bald Eagles were injured when they arrived at the holding facility but were not undergoing treatment during the research. The Bald Eagles were kept together in a flight cage and were not handled. All birds were kept outside and were subject to the natural climate and photo-period of Missoula, Montana (approx. 46° 50' latitude), for the Golden Eagle work, and Seattle, Washington (approx. 47° 30' latitude), for the Bald Eagle work.

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Assumptions

Extrapolation of molt timing from captive birds to wild birds is limited by several assumptions. A deficiency or reduction in food supply can disrupt the timing of a molt sequence or interrupt an ongoing molt (Payne 1972). All birds used in this work were fed what I considered an adequate diet in amount and nutritional content.

Captive birds may shed feathers abnormally after disturbance or handling (Payne 1972). Such feather loss, characterized as "fright molt," is quite striking with many feathers being dropped at once soon after the disturbance. I have never observed such feather loss in eagles, and I doubt that it occurs in them under most handling conditions.

Another factor is the effect of sex hormones on the timing of molt. Experimental work and observations on the timing of reproduction and molt indicate that sex hormones have an inhibitory effect on molt (Payne 1972). Thus, nonbreeding captive adults would be expected to molt sooner than wild or captive breeding adults. This expectation is yet to be verified in eagles, however. In this study, hormonal delay of molt was probably not a factor in any of the subadult birds because they would not normally be reproductively active.

Results and Discussion

Data on molt timing of deck feathers for Golden and Bald Eagles are presented in tables 1 and 2, respectively. Jollie's (1947) data on Golden Eagles are included with my results for comparison.

TABLE 1
Timing of molt of Golden Eagle deck feathers

	1 year female	2 year male	1 year[1] female	2 year[1] female
Right	15 July	13 Aug	3 May	7 June
Left	30 Aug	14 May[2] (2 yrs)	7 June	11 Aug

1 From Jollie (1947). This is the same bird in both years.

2 This feather was not molted after one year but was molted after two years.

TABLE 2
Timing of molt of Bald Eagle deck feathers

	3 year female	4 year male	4 year male	5 year male	6 year male
Right	16 Sept	30 July	1 Aug	...[1]	8 June
Left	12 June	13 June	...[1]	22 Sept	...[1]

1 No data. Eagle was removed from the experiment before the feather was dropped.

These results indicate a wide variation in the timing of deck feather molt. For example, Jollie's (1947) data on the molt of a year-old female were vastly different from my observations on a bird of the same age and sex. Apparently, the specific date when a feather is dropped is determined primarily by local factors and/or individual variation.

The only pattern that emerged from the Golden Eagle data is that the right deck feather was always molted before the left, and the period between the molting of the two feathers was never less than 35 days. Thus, the left deck may be better for transmitter mounting because of its later molt. It also appears that any old deck feather on a Golden Eagle is unsafe for transmitter mounting between 1 May and 31 August because of the danger of the feather's being dropped during that period.

For the two Bald Eagles that did molt both deck feathers before being removed from the study, the left feather was molted before the right, just the opposite of Golden Eagles. Further work is in progress to determine whether this pattern is characteristic of Bald Eagles. The period between the molting of the two deck feathers was not less than 47 days in the Bald Eagles. Because of the variation in timing observed in the three other Bald Eagles, however, this time interval between the molt of deck feathers can be regarded as only a preliminary figure.

On the basis of both the Bald Eagle and the Golden Eagle data, the conclusion is that the mounting of a transmitter on both deck feathers simultaneously could be detrimental to the eagle. The natural timing of deck feather molt in eagles appears to be such that both feathers are not missing at the same time. This is possibly an adaptation to avoid the reduced maneuverability that would result from a large gap in the tail if both deck feathers were missing. If a transmitter is attached to both deck feathers and one is molted, the result may be the loss of the remaining feather because of excessive weight and stress on its follicle. If the remaining feather is not lost, the molted feather that remains in position could damage or inhibit the growth of the new feather. Such damage could reduce the maneuverability of the eagle, especially when combined with a loose feather in the tail held in place only by the transmitter. Reduced maneuverability could affect the prey-catching ability of the eagle and might, under some conditions, reduce its potential for survival.

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