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# FURTHER EVALUATION OF MARKING METHODS FOR BLACK AND TURKEY VULTURES

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A safe and effective means for marking vultures has been sought since the suggestion by Henckel (1976) that lesions may be caused by fecal accumulation on leg bands used on Turkey Vultures (*Cathartes aura*) (Wallace et al. 1980). Use of patagial markers has been widespread and adapted to many species (Marion and Shamis 1977). Kochert et al. (1983) evaluated wrap-around patagial markers for their anatomical and behavioral effects and use on Golden Eagles (*Aquila chrysaetos*), Red-tailed Hawks (*Buteo jamaicensis*), Prairie Falcons (*Falco mexicanus*), and Common Ravens (*Corvus corax*) from 1970 to 1980. Mossman (1976) used cattle eartags as patagial markers on 6 Turkey Vultures.

Wallace et al. (1980) evaluated the use of cattle eartags and vinyl streamers on Black Vultures (*Coragyps atratus*) and Turkey Vultures. They used large Allflex ear tags to anchor a 15 × 8 cm vinyl streamer marked with a number and reported eartags to be good permanent anchors for attachment of large, highly visible vinyl streamers. Vinyl streamers are subject to wear and fading, however, and long-term studies entailing resightings of marked individuals require a more durable marking device. Because the Allflex cattle eartags are fade-resistent (Wallace et al. 1980), we evaluated the use of larger cattle eartags as patagial markers for Black and Turkey vultures. The intent was to use the numbers on the eartags for resightings, rather than to use the tag to anchor a marked vinyl streamer.

In this paper we evaluate the method of attachment of cattle eartags and their effect on the behavior and social status of Black and Turkey vultures. We also compare and evaluate the results of using metal and teflon leg bands on captive vultures.

## METHODS

We trapped Black and Turkey vultures from January 1982 through August 1984 using a cannon net or rocket net (Wildlife Materials, Inc.) and marked them with white large and maxi cattle eartags (Delta Plastics Ltd. of New Zealand; G. C. Hanford Mfg. Co., Syracuse, NY 13201). Our methods were similar to those of Wallace et al. (1980), but we did not affix vinyl streamers. Maxi tags were 7.5 × 10 cm, weighed 12.2 g, and were marked with a 3 cm high black alphabetic character followed by two 4.5 cm numeric characters. Large tags were 5.7 × 7.0 cm, weighed 7.8 g, and were marked with 3 cm high, 3-character alphanumerics. The message, "Write Wildlife, VPI, Blacksburg, VA 24061 USA and Bird Band, Washington, DC," was printed in 4 mm letters on the back (Fig. 1).

*Attachment of patagial tags.*—Eartags were attached through the pa-

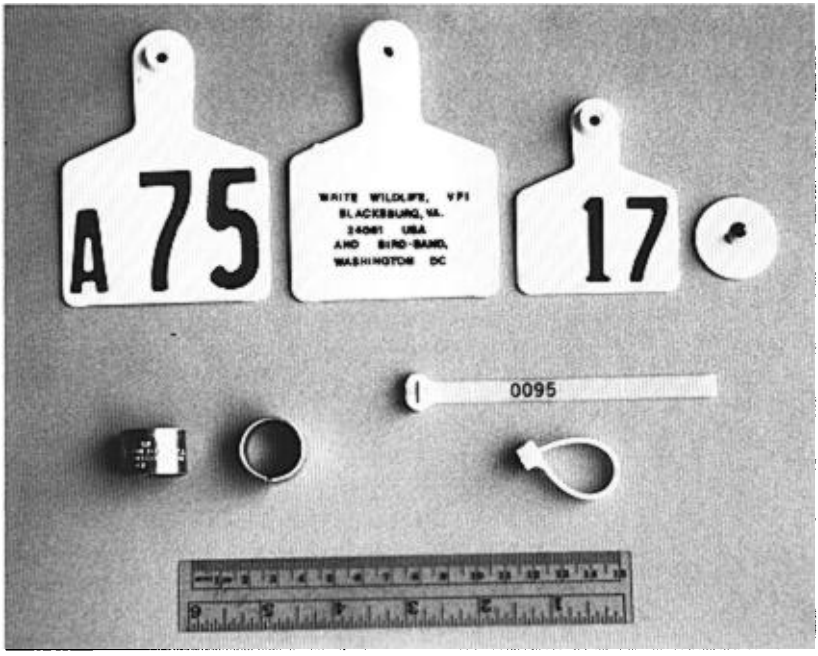


FIGURE 1. Vulture marking devices: Maxi and large Allflex tags and attachment button, metal and teflon bands.

tagium of each wing approximately 3 cm anterior to the humerus to radius-ulna articulation, with the large part of the tag on top of the wing. We were careful to avoid puncturing air sacs, blood vessels, muscles, the tendon of the *extensor patagii longus* at the leading edge of the wing, and the tendinous slip which crosses the patagium (Fisher 1946). Before applying tags, we wet the ventral surface of the patagia with alcohol so that the muscles, tendons, air sacs, blood vessels, and the tendinous slip were visible. Feathers were plucked when necessary to provide better visibility.

*Effect of patagial tags on vultures.*—Resightings of individuals marked with maxi tags were recorded at roosts and trap sites. We recorded the outcome of aggressive interactions between marked and unmarked vultures to evaluate the effect of tags on social status. We assumed that if tags did not affect social status, marked vultures would be dominant in half of the interactions observed.

The effects of patagial markers on flight were assessed by comparing the proportion of marked vultures (maxi tags) departing from a roost in the first half hour after sunrise with the proportion leaving in the second half hour after sunrise. We assumed that if tags impaired flight, tagged birds would tend to leave the roost later than untagged birds.

TABLE 1. Number of Black and Turkey vultures marked, number (%) resighted at least once, and total number of resightings in southwest Virginia, 1982–1983.

| Species | Number marked | Number resighted | Total resightings |
|---|---|---|---|
| Black Vulture | 204 | 170 (83%) | 2450 |
| Turkey Vulture | 76 | 68 (89%) | 589 |
| Total | 280 | 238 (85%) | 3039 |

Positions near two roosts that allowed a view of the wing tops were chosen to sample departing vultures. We also subjectively assessed flight patterns and ease of flight of marked and unmarked vultures.

The effects of patagial tags on vulture foraging capability were investigated by recapturing marked birds and comparing first and final capture weights. We assumed that if tags interfered with flight or foraging, birds would lose weight after tagging.

*Evaluation of leg bands.*—As an alternative to using metal leg bands, we evaluated the effects of plastic bands (teflon) to determine if they would cause lesions as Henckel (1976) found with metal leg bands. One Turkey and 3 Black vultures were kept in 6 × 4.5 × 3 m cages from 15 February 1983 through 10 February 1984; 1 Turkey and 1 Black vulture were kept from 11 November 1983 to 10 February 1984. We banded each vulture on one leg with an aluminum No. 28 (4.2 g, 2 cm inside diameter) metal leg band (National Band and Tag Supply, Inc.), comparable to a No. 8 USFWS leg band. The other leg was marked with a 0.8 cm wide, 4.6 g teflon locking loop band (1.5 × 3.0 cm elliptic, Thomas and Betts Co., Elizabeth, NJ; Fig. 1). The bands were inspected weekly to observe excrement accretion, and were replaced if the excrement caused constriction of the tarsus.

## RESULTS AND DISCUSSION

*Attachment of patagial tags.*—We attached 178 maxi tags to 89 birds and 370 large tags to 191 birds. The eartags were easily attached with little apparent pain to the vultures. Only once was bleeding observed at the site of attachment. Vultures immediately pulled at the tags with their bills, but this behavior was never observed more than one day after tagging.

*Evaluation of patagial tag visibility.*—The proportion of resighted Black Vultures was similar to the proportion of resighted Turkey Vultures ($\chi^2 = .1$, df = 1, $P = .75$, Table 1). We resighted 78 birds with maxi tags 438 times and 191 birds with large tags 2601 times. The eartag alphanumerics were easily read with a 20×–45× spotting scope at 200–300 m in direct sunlight. Use of eartags alone is sufficient if the purpose of marking is to observe vultures while perched, such as near roosts or nest sites. Eartag alphanumerics were readable in only 6 of 53 (11.3%) sightings of flying marked vultures. Reading tags of flying vultures was

TABLE 2. Outcome of aggressive interactions between marked and unmarked Black and Turkey vultures in southwest Virginia, 1981–1983.

| Species | Dominant bird: Tagged n (%) | Dominant bird: Untagged n (%) | Total n |
|---|---|---|---|
| Black Vulture | 34 (42.0) | 47 (58.0) | 81 |
| Turkey Vulture | 32 (57.1) | 24 (42.9) | 56 |
| Total | 66 (48.2) | 71 (51.8) | 137 |

limited by the frequency of opportunity to read the tags when the birds banked in flight. Tags were unreadable in 17 of 449 (3.8%) resightings of perched vultures because feathers covered part of one or both tags. The high percentage of resightings of marked individuals of each species suggests that the method is effective for this type of study.

*Effect of patagial tags on behavior.*—The proportions of individuals marked with maxi tags that were dominant in interactions were not significantly different from the expected values of 0.5 for either Turkey ($Z = .02$, $P = .73$) or Black vultures ($Z = .02$, $P = .15$, Table 2). This corroborates the findings of Wallace et al. (1980) in cases of aggressive interaction between marked and unmarked vultures. We found no evidence that the use of cattle eartags has any effect on the social status of Black or Turkey vultures. We observed three successful Turkey Vulture nestings and 10 successful Black Vulture nestings by tagged birds.

*Effect of patagial tags on flight.*—We recorded 5 samples of marked and unmarked vultures departing two roosts from 1 April 1983 through 30 August 1983. We obtained one sample at a roost of approximately 45 Turkey and 3 Black vultures and 4 others at a roost of approximately 200 Black and 100 Turkey vultures. We pooled the samples to test for differences in the proportion of tagged vultures of each species between the first and second halves of 1-h observations commencing at sunrise (Table 3). We observed no differences in the proportions of marked

TABLE 3. Period of departure (early = first half hour of departure, late = second half hour of departure) of Black and Turkey vultures, southwest Virginia, 1983.

| | Early | Late |
|---|---|---|
| Turkey Vultures | | |
| Marked | 4 | 6 |
| Unmarked | 18 | 14 |
| Total | 22 | 20 |
| Black Vultures | | |
| Marked | 0 | 2 |
| Unmarked | 5 | 4 |
| Total | 5 | 6 |

TABLE 4. Mean weights (g) at capture and days between captures of vultures trapped in south central Pennsylvania, 1983–1984.

| | n | Weight (±SD) | | Days (±SD) |
|---|---|---|---|---|
| | | 1st capture | 2nd capture | |
| Turkey Vultures | 3 | 2110 (±79) | 2174 (±148) | 369 (±331) |
| Black Vultures | 12 | 2219 (±102) | 2207 (±155) | 218 (±127) |
| Total | 15 | 2198 (±105) | 2201 (±149) | 248 (±180) |

and unmarked Turkey Vultures leaving in the first and second half of the observation periods ($\chi^2 = .81$, df = 1, $P = .37$). All samples were obtained when winds were less than 5 km/h. These conditions provided a good test compared to gusty conditions which allow relatively easy dynamic soaring. We frequently (n = 103) observed tags flapping up and down during flapping flight, but we have not observed such movement when vultures were soaring.

Too few departing Black Vultures were observed in the tests to allow an accurate estimation of the effect of eartags on their flight. Occasionally we observed Black Vultures with an eartag rotated 180°. The tag extended over the anterior wing edge and flapped as the vulture flew. This was observed in less than .5% of all observations of flying tagged Black and Turkey vultures.

*Recapture of tagged birds.*—We recaptured 25 birds and observed from within 3 m, 16 birds that had carried tags 3–795 days. The tags had yellowed slightly, but were still clearly readable. Examination of the captured birds revealed no injury or abrasion caused by the tags. Fifteen recaptured birds that had been tagged for 13–749 days ($\bar{x} = 248$) gained an average of 3 g (Wilcoxon signed rank $T = 59$, $P = .511$, Table 4), suggesting that tags did not interfere significantly with foraging.

*Tag retention.*—All birds were marked with either 2 tags or 1 tag and 1 radio. None of the recaptured birds had lost a tag. In some resightings, only one wing could be seen, but none of our observations of flying or perched birds suggested that any tags were lost.

*Evaluation of leg bands.*—During the banding test, 5 metal bands developed excrement accumulation that caused the foot to swell and the bands had to be removed (Table 5). No teflon bands developed this degree of accretion, but 2 teflon bands were found broken in the cages.

The results of using metal bands corroborate Henckel's (1976) findings. However, even though no potentially detrimental excrement accumulation was found using teflon bands, the tag loss observed suggests that current models may be unsuitable for marking vultures.

## SUMMARY

Cattle eartags are easily applied to patagia of Black and Turkey vultures. Particular care should be taken to avoid damaging the tendinous

TABLE 5. Replacements (n) and days between banding and replacement of metal and teflon leg bands on captive Black (BV) and Turkey vultures (TV), southwest Virginia 1982–1983.

| Species | Bands replaced (n) | | Days to replacement | |
|---|---|---|---|---|
| | Metal | Plastic | Metal | Plastic |
| TV | 0 | 1[a] | — | 44 |
| BV | 2[b] | 0 | 97, 136 | — |
| BV | 2[c] | 0 | 218, 107 | — |
| BV | 1[d] | 1[e] | 88 | 97 |
| BV | 0 | 0 | — | — |
| TV | 0 | 0 | — | — |
| Total | 5 | 2 | | |

[a] Band found broken in cage on 30 March 1983 and replaced immediately.
[b] Bands were replaced immediately upon removal of a band causing leg constriction due to excrement accretion on 21 May and 4 October 1983.
[c] Bands were replaced immediately upon removal of a band causing leg constriction due to excrement accretion on 20 September 1983 and 4 January 1984.
[d] Band was removed on 13 May 1983 and replaced on 21 May 1983.
[e] Band was found broken in the cage and replaced on 21 May 1983.

slip that crosses the patagium. We found eartags to be ideal for studies requiring identification of perched vultures. Tags were not easily read on flying birds. Eartag patagial markers are a useful alternative to leg bands. Teflon leg bands did not have detrimental effects on banded vultures, but band loss was high.

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## NOTES AND NEWS

**E. Alexander Bergstrom Memorial Research Fund.**—The Alexander Bergstrom Memorial Research Fund of the Northeastern Bird-Banding Association, Inc., promotes research on birds. Small grants, usually not exceeding $200, are available to cover expenses (but not salaries or overhead charges to institutions). Details and application forms may be obtained from Dr. Valerie M. Freer, Chairman, NEBBA Research Committee, Science Department, Sullivan County Community College, Loch Sheldrake, NY 12759. Deadline for applications is 15 February 1986.