Shrinkage of Spiral Plastic Leg Bands with Resulting Leg Damage to Mourning Doves[1]

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Abstract: Recaptures of mourning doves (*Zenaida macroura*) banded with spiral plastic leg bands revealed these bands were constricting and resulting in loss or severe damage to the legs of doves. Analysis of data from an experiment to determine the effects of color, environmental exposure, and treatment with acetone on the shrinkage of bands indicated that all 3 variables affected ($P < 0.01$) band shrinkage. Black bands experienced the greatest shrinkage of the 8 colors tested. Bands exposed to the environment shrank more ($P < 0.01$) than bands kept at room temperature or in a freezer. Acetone-treated bands shrank less ($P < 0.01$) than those without acetone treatment. We recommend that all spiral plastic leg bands used on mourning doves be treated with acetone.

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Beginning in 1978, a mourning dove banding program was initiated on the Texas A&M University Campus (Bivings 1980). Mourning doves were live-trapped using baited funnel traps on gravel-topped roofs of buildings (Bivings and Silvy 1979). All doves captured were given individual and group identity using a combination of size 3A Federal bands (U.S. Fish and

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Wildlife Service Bird Banding Lab, Laurel, Md.) and spiral plastic leg bands (Gey Band and Tag Company, Norristown, Pa.). Subsequent recaptures of banded doves indicated that the spiral plastic leg bands were constricting, resulting in loss or severe damage to the legs of doves. In response to this problem, treatment with acetone was used as a method for preventing shrinkage of the plastic spiral leg bands.

This paper describes the extent of the problem caused by constricting spiral plastic leg bands to mourning doves, discusses a laboratory experiment to determine the effects of band color and environmental exposure on band shrinkage, and tests the effectiveness of acetone at decreasing band shrinkage.

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Methods

Mourning dove recapture data from February 1978 through April 1982 were analyzed to determine the extent of damage caused by constriction of spiral plastic leg bands. Data were checked for information on leg loss, leg damage, and/or if bands had been removed due to constriction, but before acute swelling had occurred.

To gain insight into the possible cause of band shrinkage and to determine the effectiveness of acetone treatment for preventing constriction of the spiral plastic leg bands, an 8 by 3 by 2 factorial experiment was designed. Spiral plastic leg bands of 8 colors (black, red, yellow, green, light blue, dark blue, white, and pink), replicated 5 times, were randomly assigned to 3 environmental exposure treatments (freezer, room temperature, and outside exposure). Within each exposure treatment, 1 set (5 bands) of each color was treated with acetone (a drop of acetone was placed on each band and the coils held together until they fused) and 1 set of each color was kept acetone free. Inside diameters of these 240 bands were measured with a vernier caliper in June 1980 before treatment, and in August 1980 at the end of a 9-week treatment period.

The resulting data were analyzed using the Statistical Analysis System (SAS) computer package (Helwig and Council 1979). Although each treatment combination was replicated 5 times, the individual identity of each band was not maintained. As a result, no paired measurement existed for pre- and posttreatments, prohibiting use of standard covariance adjustment techniques (Steel and Torrie 1960). The initial band diameters were compared by color to determine if difference between colors existed prior to weather exposure

and/or acetone treatments. Because a difference ($P < 0.05$) was revealed by these comparisons, the pretreatment mean of each experimental unit was subtracted from each final observation of that respective unit to reduce the bias of initial size due to color. The resulting difference was used as the adjusted posttreatment value. These adjusted values were used as the response variable in a 3-way analysis of variance (ANOVA) with exposure treatment, acetone treatment, and color used as the classification variables. Hypotheses tested were that there were no differences due to the individual treatments (i.e., exposure, acetone, and color). Tests of interaction among various treatments were also conducted. Duncan's multiple range tests were used to distinguish differences between treatment means detected by the ANOVA.

Results

From 1 February 1978 through 30 April 1982, 5,621 doves were trapped and banded on the roofs of the Texas A&M University Campus. Originally, 1,202 doves were banded with multiple spiral plastic leg bands, followed by 1,964 with a single nonacetone-treated spiral plastic leg band, and lastly 2,455 with a single spiral plastic leg band that had been acetone treated.

A total of 3,803 recaptures of these doves revealed that 1,184 had multiple bands, 1,518 had single bands without acetone treatments, and 1,101 had single bands that had been acetone treated. Of the multiple spiral band recaptures, 201 (17.0%) had leg damage while 108 (7.1%) of the nonacetone-treated single band recaptures had damage, giving a total of 309 (8.1%) doves with leg damage (Table 1). No bands that had been acetone treated were observed to cause constriction.

An ANOVA on the data collected in the laboratory experiment indicated color, exposure, and acetone treatments all affected ($P < 0.01$) band

Table 1. Leg Damage to Mourning Doves Banded with Nonacetone-treated Spiral Plastic Leg Bands on the Texas A&M University Campus from February 1978 Through April 1982. A Total of 1,184 Doves had Multiple Bands and 1,518 had Single Bands

	Multiple Bands		Single Bands	
Damage	n	%	n	%
Leg lost	40[a]	3.4	14	0.9
Leg severely damaged	57	4.8	10	0.7
Leg swollen, bands removed	104	8.8	84	5.5
Total	201	17.0	108	7.1

[a] Three doves were found that had lost both legs.

shrinkage. In addition, there were interactions ($P < 0.01$) between color and acetone treatments and between exposure and acetone treatments. There were no interactions ($P > 0.05$) between color, acetone, and exposure treatments.

Mean shrinkage data indicated that black bands shrank more ($P < 0.05$) than did the other colors (Table 2). Bands exposed to the environment shrank ($\bar{x} = 3.9$ mm) more ($P < 0.01$) than did those exposed to room temperature ($\bar{x} = 0.6$ mm) or those placed in a freezer ($\bar{x} = -0.6$ mm). Acetone-treated bands shrank ($\bar{x} = -0.3$ mm) less ($P < 0.01$) than did those without acetone treatment ($\bar{x} = 2.9$ mm). However, acetone-treated bands only reduced shrinkage for bands exposed to the environment and to room temperatures and not for bands kept in the freezer where all bands shrank little. In the freezer, nonacetone-treated bands appeared to expand.

Under nonfreezing conditions, the shrinkage in all colors was greatly reduced with acetone treatment, although black bands still showed shrinkage. Red, pink, and light blue bands responded only slightly to acetone use, but shrinkage in these colors was relatively small without acetone treatment.

Discussion

Marion and Shamis (1977) noted that colored plastic and celluloid leg bands were developed to avoid problems associated with colored aluminum bands. They noted that several authors (Brackbill 1951, McEntee 1953, and Reed 1953) had cautioned that 2 or more metal bands on the same leg might cause the contacting edges of adjacent bands to "flange" and become harmful to the bird. Our study showed that plastic leg bands constricted and caused loss and/or damage to legs of mourning doves. Results from our study indicated that shrinkage increased as bands were exposed to environmental con-

Table 2. Effects of Band Color on Spiral Plastic Leg Band Shrinkage as Determined from Duncan's Multiple Range Tests of Treatment Means

Color	Sample Size	Mean Shrinkage (mm)[a]
Black	30	3.489A
Yellow	30	1.766AB
Green	30	1.345AB
Pink	30	0.936B
Light blue	30	0.882B
Blue	30	0.855B
White	30	0.785B
Red	30	0.437B

[a] Means followed by the same letter are not different ($P < 0.05$).

ditions. Shrinkage lessened with the use of acetone which fused coils of the band together to help prevent shrinkage.

Use of multiple plastic bands appeared to cause more damage than did the use of single bands. However, we did not use acetone on multiply applied bands; and therefore, cannot make predictions on the effect of these bands when acetone is used.

Legs of the mourning dove are much more "fleshy" than are those of most commonly banded birds. The fleshiness of the mourning dove leg probably increases the chance of leg damage. However, since no leg loss or damage was observed using acetone-treated bands, we recommend that all plastic bands be acetone treated when placed on any bird. Care should be taken to make sure that acetone treatment has securely fused band spirals together prior to release of the bird. Such treatment will not only decrease the possibility of leg damage, but should aid in retention of the bands.

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