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An Efficient and Effective Method for Sealing Darvic Color Bands

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ABSTRACT

Five methods to seal Darvic® color bands placed on Tricolored Blackbirds (Agelaius tricolor) *were evaluated. A small electric soldering iron plugged into a voltage inverter attached to an automobile battery was found to more rapidly and reliably seal color bands than the other methods tested and appears to provide an excellent method to seal even large numbers of color bands.*

INTRODUCTION

Colored leg bands are one of the simplest, most effective devices used to mark individuals uniquely to allow their subsequent identification in the field. Several types of plastic colored legs bands have been used for decades on a variety of species (Marion and Shamis 1977); and despite potential problems with storage (Jones 2002) and durability (Minton 2000, Hazlitt 2001), color leg bands of polyvinyl chloride (PVC, trade name Darvic®) have been preferred for long-lived species due to their resistance to fading (Anderson 1980; Ward 2000). However, despite their advantages, the rapid and reliable attachment of Darvic® bands to the bird's legs has been problematic, with some field workers reporting various problems, including band losses and foot injuries (Nisbet 1991).

In 2007, I began to color-band Tricolored Blackbirds (*Agelaius tricolor*) in California as part of a study to document spatial and temporal movements and fidelity to breeding colonies. I utilized Darvic® bands because they are reported to be more durable and color-fast compared to celluloid plastic bands (Anderson 1980; Nisbet 1991). Given the need to trap and band relatively large numbers (thousands) of birds, I required an efficient and effective method to seal the color bands to ensure their long-term attachment to the birds.

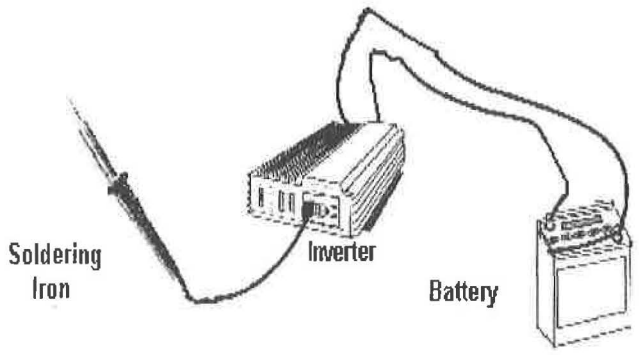
I evaluated five methods of sealing the Darvic® color bands and found the most efficient and effective method to be melting the band across the butt-end gap with a small electric soldering iron plugged into a voltage inverter attached to an automobile battery. Preliminary results suggest that bands so attached cannot be removed by the birds and remain attached to the birds' legs.

METHODS

Tricolors were banded at three locations in California's Central Valley in 2007 and 2008 (details of banding locations available in Meese 2007, 2008). Each bird received three bands: one size 2 USGS aluminum butt-end band attached to the left tarsus and two 4-mm inside diameter plastic bands of different colors ("Darvic®" size XBD bands; Avinet, Inc., P.O. Box 1103, Dryden, NY 13053-1103). The plastic bands were sealed in place to prevent their subsequent removal as Tricolored Blackbirds are known to be able to remove plastic leg bands (pers. obs.).

Five methods for sealing the plastic bands were evaluated: 1) "Superglue", cyanoacrylate liquid, 2) PVC cement, 3) butane-powered portable soldering irons (Weller WEP1, Weller WPA2 Pyropen, Weller P2C Portasol Professional), 4) a battery-powered portable soldering iron (Weller BP645MP), and 5) a 25-watt electric "hobbyist" soldering iron (Weller SP23LK) plugged in to a 400-watt voltage inverter (Black & Decker PI400AB) attached to an automobile battery (Fig. 1). All soldering irons had pointed tips that could melt a groove of approximately 1 to 2-mm width across the butt end of the plastic band.

Fig. 1. Schematic of recommended plastic color band sealing method.



The adhesives, three different butane-powered soldering irons, and one battery-powered soldering iron were evaluated in 2007, and the 25-watt electric soldering iron/voltage inverter/automobile battery was evaluated in 2008. The automobile battery was recharged following each banding session by attaching it to a battery charger (Deltran Battery Tender Plus; Deltran Corporation, 801 US Highway 92E, Deland, FL 32724) overnight.

RESULTS

In two seasons I banded 6,951 Tricolored Blackbirds: 1,772 in 2007 and 5,179 in 2008 (Meese 2007, 2008). The complete banding sequence, from the removal of the bird from the transport cage to its release following the sealing of the second color band, took up to several minutes per bird with the adhesives, battery-powered soldering iron, and propane-powered soldering irons, and about 75 sec per bird with the electric soldering iron/voltage inverter/automobile battery.

Both adhesives, the "Superglue," and PVC cement, were ineffective at sealing the plastic color bands. Neither adhesive appeared to form a reliable seal and both created delays in releasing birds due to the time required to apply and then to wait for the adhesives to dry. Both adhesives were used on a minimum of 50 bands, and in most instances the quality of the seal was uncertain. The use of adhesives to seal the color bands was discontinued after the first week of banding.

The soldering irons were used to melt two or three small grooves across the butt-end gaps, fusing 50-90% of the length of the gap, and thereby forming a complete ring around the bird's tarsus. The portable battery-powered soldering iron was ineffective due to the 60-90 second delays required to heat the tip to the minimum temperature required to melt the plastic and to the frequent need to change batteries. Battery-powered soldering irons may be useful in cases where small numbers of birds are color-banded or as a temporary "back-up" to other, more efficient methods of sealing plastic bands (e.g., Nisbet 1991).

The butane-powered portable soldering irons were all initially effective at sealing plastic bands; but after a few hours' use, they all became unreliable, were difficult to start and refill, did not maintain a consistent temperature, and became impediments to efficient banding due to the time required for their maintenance. I tried three different models (three of Weller WEP1, one Weller WPA2 Pyropen, one Weller P2C Portasol Professional), and although they, collectively, sealed ca. 3,000 Darvic® bands in 2007, all were ultimately abandoned due to the identification of a more rapid, reliable, and efficient sealing method.

I tried only one electric hobbyist soldering iron, a Weller SP23LK, and found that when attached to an automobile battery through a 400-watt voltage inverter, it worked quickly and reliably for weeks of intensive banding, sealing up to 2,000 bands per day. The soldering iron heated up in less than three

min and, once hot, maintained a constant temperature that was ideal for melting across the butt-end gap to seal the plastic color bands. The electric soldering iron required a few seconds to seal a band, and the tip of the soldering iron was small enough that even on the 4 mm inside diameter plastic bands used in this study, there was minimal risk to burning either the bird or the bander. No birds, and no banders, were injured while sealing ca. 10,200 plastic leg bands, and the only maintenance required of the electric soldering iron has been the removal of melted plastic that inevitably accumulated on the tip. Cleaning the tip with a stiff wire brush took, at most, a few seconds for every few minutes of banding. The original power inverter failed after less than one month's use, but was replaced with an identical model that worked well through the end of the 2008 field season.

The automobile battery could power a single electric soldering iron for at least 10 hr; but on one occasion, an assistant and I used two identical soldering irons attached to the power inverter simultaneously and the automobile battery was completely discharged and incapable of heating the soldering irons in ca. 6 ½ hr of constant use.

The automobile battery was recharged nightly by attaching it to a small battery charger, and the soldering iron/power inverter/automobile battery combination proved a very reliable and efficient means to seal the plastic color bands.

DISCUSSION

Previous banders have reported various problems with color bands, including band loss (e.g., Anderson, 1980) and, in some cases, band loss was likely due to ineffective attachment methods (e.g., Hatch and Nisbet, 1983). My preliminary results confirm those reported by Nisbet (1991) and suggest that melting small grooves across the butt end of Darvic® bands may be a reliable method to seal the bands and reduce the incidence of band loss. I evaluated a small, battery-powered electric soldering iron, as did Nisbet (1991), but apparently the model I evaluated did not perform as well as did his, and I do not recommend the model I evaluated unless a very small number (< 50) of plastic bands is to be sealed. My results suggest that relatively large numbers of Darvic® or similar plastic bands can efficiently and effectively be sealed by melting small grooves across the butt-end gap with a small electric soldering iron plugged into a voltage regulator attached to an automobile battery, and none of the color legs bands we sealed with this method is known to have been lost after 18 mo. If the size and weight of the automobile battery prohibit its use, as in more remote locations where field equipment must be carried relatively long distances, perhaps a motorcycle or similar smaller 12-volt battery could serve as an acceptable substitute. However, the increased portability would come at the cost of a decrease in the number of bands that could be sealed.

An alternative technique would be to plug the soldering iron in to a voltage inverter plugged directly into an automobile's cigarette lighter/ power port; but although simpler, this method would restrict mobility and, if used for several hours, risk draining the car's battery.

The requirement to recharge the 12-volt battery after each banding session may restrict this method to those locations where electricity is readily available; but since a single charge can power the soldering iron used in this study for at least 10 hours, this may be a problem for very few banders.

The failure of the original voltage inverter after only one month of use suggests that keeping a spare voltage inverter may be necessary. Also, as only a single model of a 400-watt voltage inverter coupled with a 25-watt soldering iron was evaluated in this study, others may wish to evaluate an inverter providing lower wattage, as this may power the soldering iron for longer intervals and decrease the battery recharge frequency.

My work with Tricolored Blackbirds may place relatively extreme demands on the sealing equipment used, as I have sealed up to 2,000 color bands in one day; those sealing a smaller number of plastic color bands would likely find a similar combination of automobile battery + voltage inverter + hobbyist electric soldering iron entirely

satisfactory. After 18 mo and 16,000+ bands, I have yet to confirm the loss of any color band sealed using this method.

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Common Tern
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