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A TECHNIQUE TO SPRAY DYES ON BIRDS

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Abstract.—A device for spraying dyes onto nearby birds for individual identification is described. The technique was used to color-mark Common Terns (*Sterna hirundo*) without trapping. Refillable hairspray bottles, filled with dye, are activated from a distance in order to spray dye towards a bird sitting in an appropriate position. This technique can be used for any medium- to large-sized species that regularly uses artificial or natural resting or nesting sites.

TÉCNICA PARA ROCIAR TINTES SOBRE AVES

Sinopsis.—A fin de lograr una identificación individual, se desarrolló una técnica que permite marcar individuos sin necesidad de capturarlos. La técnica fue utilizada para marcar individuos de *Sterna hirundo*. El marcador fue cargado en botellas atomizadoras instaladas en sitios específicos, en los cuales las aves se posaban habitualmente. Las botellas fueron activadas a distancia en el momento apropiado, a fin de rociar el tinte sobre las aves. La técnica puede ser empleada para marcar especies de tamaño grande o intermedio, que utilizen regularmente sitios artificiales o naturales para anidar o descansar.

A number of techniques are used to mark birds individually, including color bands, bands with letters that can be read from a distance, tags on various parts of the body, radio transmitters, and others (reviews by Bub and Oelke 1980, Calvo and Furness 1992). In most cases it is necessary to catch birds for marking, causing disturbance and stress. Furthermore, at least in colonial-breeding seabirds, the most successful way of catching individuals is to trap them on the nest. This means that individual identification is not possible early in incubation, because in many species trapping at this time can cause nest desertion (Kania 1992).

For short-term identification, dyes have also been used, either on trapped (e.g., Stiles and Wolf 1973) or on incubating birds (Arctic Terns, *Sterna paradisaea,* Uttley 1992; Cattle Egrets, *Bubulcus ibis,* Paton and Pank 1986; and gulls, Belant and Seamans 1993; Burger 1984; Cavanagh et al. 1992). In contrast, to identify birds during incubation in our studies on Common Terns (*Sterna hirundo*), it is necessary to color-mark adult terns immediately after their arrival at the colony site for individual identification during the entire breeding season. Therefore, we developed a technique to color-mark birds individually not only on their nest but also at roosting locations, using a remotely operated spraying mechanism.

METHODS

A precondition for color-marking birds was to have them sit on particular roosting locations. The colony site investigated (90–100 breeding pairs each year) consisted of six artificial concrete islands. Each island was 5 × 11 m and surrounded by a wall (about 50-cm high and 20-cm wide). We attached 4–6 resting boxes per island on those walls. The space

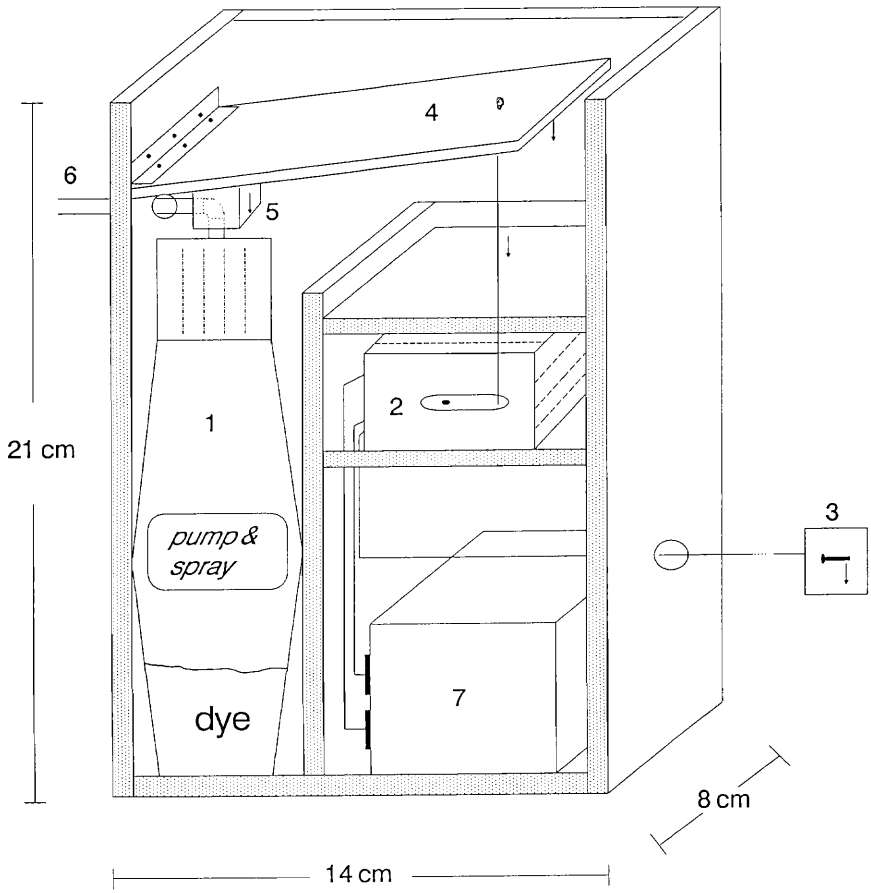

FIGURE 1. Construction of a device for spraying dyes onto birds by remote control. Parts of the device are as follows: 1, hairspray bottle with dye; 2, servo; 3, servo-tester (in field station); 4, lever connected with a hinge to the box; 5, plastic button; 6, plastic tube (up to 100 cm; outlet directed toward the bird sitting on the resting box); 7, 6V power supply.

between the boxes was blocked by wires, so the birds could only roost on the boxes. We placed the dyeing-devices (Fig. 1) beside the resting boxes. These were controlled either electrically or by a wireless radio set from a field station on the mainland about 25 m off the first island.

The construction and function of the dyeing-device, made of wood and sheltered by a plastic bag, was as follows (Fig. 1). A refillable hairspray bottle (item 1; Pump & Spray, available from different manufacturers) filled with dye was pumped up to set it under pressure. The arm of a servo-motor (item 2), normally used in radio-controlled model ships or aircrafts, can be lowered remotely by using a radio-control set or via cable

by a servo-tester (item 3), a device producing the same signals as the radio receiver does. These components can be purchased in any model supply shop. Due to disturbances of the radio control set by two-way radios, we had to shift to the servo-tester for operating control. This version is presented in Figure 1. The arm of the servo-motor was connected to a one-armed lever (item 4) that, after activating the motor, pressed down a plastic button (item 5; replacing the spray-nozzle) and opened the bottle's valve. The plastic button (about 1 × 1 × 1 cm) was self-made and connected the bottle with the tube (item 6), up to 1-m long and 1-mm inner diameter. The dye was pressed through the tube and sprayed on the bird when sitting in an appropriate position on the resting box. In our case, the distance between the end of the tube and the bird was between 5–15 cm. Possible distances depend on the pressure in the bottle and the diameter of the tube's outlet. More than 1 m can be reached, but aiming becomes difficult and wind influences accuracy. Therefore, the distance should be minimized in relation to the size of the target to avoid accidents such as spraying dye into the bird's eye. Due to the short spraying distance and the excellent monitoring conditions in our tern colony, the dye never reached a bird's eye. The servo-motor (and the receiver) need 6V DC which can be provided by 4 × 1.5V batteries (7) or via cable from a power supply in the field station (not shown in Fig. 1). The exact size of the box and its components (approximate data presented in Fig. 1) depended on the size of the hairspray bottle available.

We used picric acid (yellow) and silver nitrate (brown) as dyes. These two dyes have proved to be the most permanent among several dyes that we tested for use in terns, which have a water-repellant plumage (see also Belant and Seamans 1993, Bub and Oelke 1980). When a tern sat in an appropriate position on the roosting site (breast or wings towards the tube) the dyeing-device was activated and the dye was sprayed on the bird. It produced marks that differed in position, size, shape, and intensity. Depending on the amount of dye that reached the feathers, the dyes faded out with time (silver nitrate lasted longer than picric acid). However, in most cases the dye was visible during the entire breeding season (about 15 wk), probably even up to the next molt. The device could be activated about 15–20 times before the pressure in the bottle was too low for spraying. The bottle was pumped up every 2 d during checks of clutches and chicks.

RESULTS AND DISCUSSION

Using four dyeing-devices we color-marked 80–90 individuals each year (1991–1994) with minimum disturbance while installing and checking the device. When sprayed most birds flew off and washed their plumage, except when spraying occurred during extensive courtship behavior on the boxes. Thereafter, an increased rate of preening of the plumage could be observed, which agrees with observations of Dickson et al. (1982), Moffitt (1942), Stiles and Wolf (1973) and Swank (1952) in other species.

During the subsequent intensive observations no obvious changes in

the birds' behavior or in their social interactions were recorded, similar to reports of other authors (Brown and Brown 1988, Raveling 1969, White et al. 1980).

In 1992, we caught 33 adult terns on their nest and individually color-banded them for long-term identification. Twenty-two of them were previously color-sprayed during the courtship period. The return rates in 1993 were 90.9% for color-marked birds, and 81.8% for birds that had not been color-marked in 1992. There was no statistical difference in the return rates after one year between the two groups ($\chi^2 = 0.569$, $P > 0.05$, $n = 33$). There was also no long-term negative influence of the dyes on the birds' health, since the return rates after 3 years (1995) also did not differ between the two groups (color-marked: 59.1%, not color-marked: 54.5%; $\chi^2 = 0.062$, $P > 0.05$, $n = 33$).

During incubation, by spraying dyes on roosting birds away from the nest, the eggs have no contact with the dyes. This is a further advantage of our technique compared to those that put dyes on eggs, since dyes may increase the risk of damaging developing embryos in eggs (Belant and Seamans 1993).

Although we used this technique on terns sitting on artificial roosting sites, the technique should be applicable to any medium- to large-sized bird species which regularly use artificial or natural roosting sites (e.g., perches or rocks). In addition, this technique could be used at nest sites, although this may cause more disturbance.

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