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TECHNIQUES FOR PROLONGED CONFINEMENT AND TRANSPORT OF SMALL INSECTIVOROUS PASSERINES

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Abstract.—Existing methods for holding passerines after capture and before handling were unsatisfactory for introducing captured Nashville Warblers (*Vermivora ruficapilla*) into long-term captivity. Significantly ($P = 0.02$) more warblers (90/98) survived confinement by a new technique described herein than by previously used methods (43/54). The new technique combined three factors that may have contributed to successful introduction to captivity: (1) a dark, quiet environment; (2) prompt provision of food and water; and (3) reduced handling time. The transport technique was 100% successful in 188 bird-trips of 612 km each.

TÉCNICAS PARA EL CONFINAMIENTO Y TRANSPORTE DE AVES INSECTÍVORAS PEQUEÑAS

Sinopsis.—Los métodos existentes para inmovilizar paserinos, luego de su captura y previo a ser manipulados, resultaron insatisfactorios para mantener en cautiverio por un período prolongado a individuos de *Vermivora ruficapilla*. Un número significativamente mayor de individuos ($P = 0.02$) sobrevivió (90/98) el confinamiento luego del uso de nuevas técnicas (a ser descritas) al compararse esto con los métodos previamente utilizados (43/54). La nueva técnica combina tres factores que pueden contribuir a la introducción exitosa de estas aves al cautiverio: (1) un ambiente tranquilo y oscuro, (2) el proveer prontamente agua y alimento, y (3) reducir el tiempo de manipulación. La técnica de transporte resultó ser 100% eficiente en 188 viajes de 612 kms cada uno.

Bird banders and other researchers have developed techniques for the brief confinement of birds. These techniques are designed to restrict a bird's movement and keep it calm during the short period between capture and release. If birds must be held for prolonged periods, however, then the cages and methods must be altered. The birds have to adjust from the freedom of the wild to the confinement of captivity (e.g., they must learn to eat and drink within a cage). Though researchers have worked with wild birds in captivity, I have not seen a description of procedures for introducing birds to captivity or transporting birds long distances, and I do not know the success rate of the techniques used by other researchers. I have developed a successful technique for the prolonged confinement and transportation of a small, insectivorous passerine.

An efficient technique for introducing warblers into captivity was necessary for two reasons. First, the technique was to be used on an endangered species. As more rare and endangered species are placed in captive breeding programs, low risk techniques for handling them will be essential. Second, the temporal window for catching local, juvenile warblers was very narrow, i.e., between independence and migration. An efficient method for the long-distance transport of the warblers was also important. Research or breeding facilities are often far from the local environments where birds are captured.

METHODS

Juvenile Nashville Warblers (*Vermivora ruficapilla*) were captured in the late summers of 1986–1988 for development of a reintroduction technique for the endangered Kirtland's Warbler (*Dendroica kirtlandii*). Birds were captured in north-central Michigan (44°30′–44°45′N, 84°03′–84°28′W) with mist nets, held in captivity for 2–35 d, and then transported to central Ohio (44°09′N, 83°09′W) to an aviary.

Introduction to captivity.—After a warbler was removed from a net, it was placed in a cotton bird bag and taken to a central banding station, where it was introduced into a small (46 × 46 × 46 cm) holding cage (Fig. 1), usually two birds per cage. The cage was completely covered with a dark, cotton cloth (approximately 32 threads per cm) that allowed air circulation but let little light into the cage. The cage was then placed away from the netting activities.

The holding cages were made of wood and 0.6-cm-mesh polyester netting. A 0.6-cm-diameter perch was mounted in the wood frame, spanning the cage diagonally. The cage bottoms were lined with paper and cut branches that provided additional perches and cover. Each cage held prepared food, live mealworms and water. The mealworms were spread around the cage to maximize the visual stimulus of live food.

After about 20 min, the birds were briefly disturbed for evaluation, and an initial decision to keep or release each bird was made. Birds that were fluffed, crouched and lethargic were released. After about an hour, birds were evaluated again. In addition to the physical appearance of each bird, the color and texture of feces were used to determine the bird's condition. White feces with solid matter indicated the bird had taken both food and water. White liquid feces indicated the bird had taken only water. Greenish liquid feces indicated the bird had taken neither food nor water (R. S. Greenberg, pers. comm.). Birds that consumed neither food nor water were released. When netting was completed, all the caged birds were taken to the temporary holding facility (my homestead), where their condition was again evaluated. The first 6 h of captivity were the most critical, and if a bird survived this period it would likely accept its captive environment. A bird that survived for 24 h was considered to have accepted captivity.

Throughout the first year, birds were introduced to captivity using a common method for brief confinement, as suggested by bird banders and other researchers. After extraction from a net, birds were placed in cotton bird bags and taken to the central banding station. Each bird was then placed in a paper bag (17.5 × 30 × 43.5 cm), and the top of the bag was rolled tightly, providing a small, dark space in which the bird tended to remain calm. Birds were held in the bags for no more than 1 h. While one person continued netting, another person shuttled the bags with birds to the holding facility, where the birds were finally placed in the temporary cages. The birds were observed for about 20 min. The cages were provisioned the same, and the evaluation criteria were the same as in the

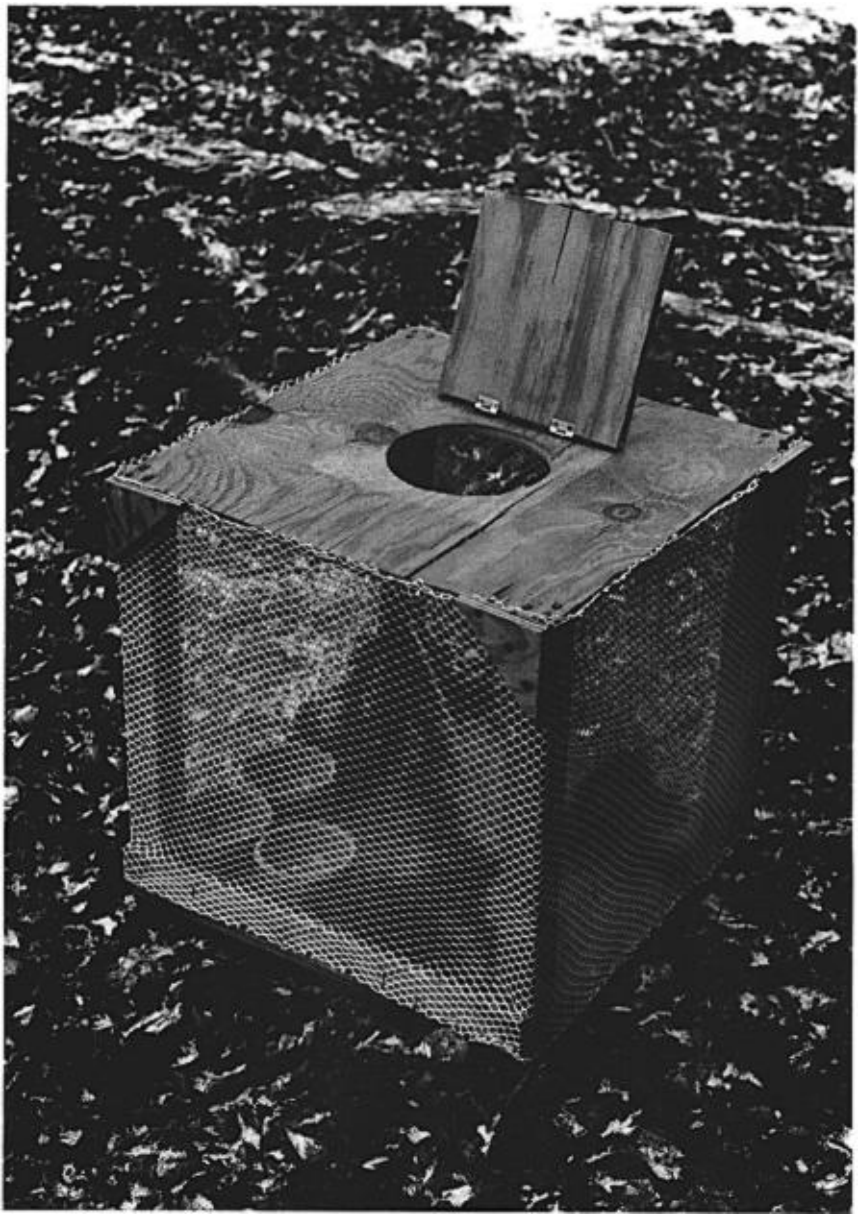

FIGURE 1. Holding cage used for prolonged confinement and transport of Nashville warblers.

new technique. In the following 2 yr, I used the new technique for introducing warblers to prolonged captivity.

Once a bird accepted captivity, it was held in the holding cage until all birds were captured and transported to the aviary. The birds were given fresh water, live mealworms and a prepared mash (developed by Columbus Zoo, Powell, Ohio) daily. The paper on the bottom of the cage was changed every other day, while the birds were in the cage. The paper was slipped in and out through a slot in the front of the cage (Fig. 1).

Transport technique.—Warblers were transported in large groups, two or three birds per cage. The cages were stacked in a vehicle (small pickup truck with cap, van or station wagon) and provisioned with food, water and branches. The entire stack of cages was covered with dark cloths. A window was opened very slightly to provide ventilation and a cool temperature (about 18 C), but not enough to cause a draft directly on the birds. The birds were transported at night between 2200 and 0500 hours.

RESULTS

In 1986, when the original technique for introducing Nashville Warblers to captivity was used, 43/54 warblers accepted the captive environment. Six birds that did not accept captivity were released, and five died. In 1987 and 1988, when the new technique for introducing warblers to captivity was used, 46/52 and 44/46 warblers, respectively, accepted the captive environment.

The proportion of warblers (90/98) accepting captivity under the new technique was significantly greater than the proportion (43/54) under the original technique (binomial $P = 0.02$).

The transport technique was 100% successful for long distance transportation. A one-way trip was 612 km, and a total of 188 bird-trips were made without fatality.

DISCUSSION

Evaluation of the original technique for introducing warblers to captivity suggested that three factors were important to success. (1) A dark, quiet environment allowed the birds to calm down. (2) Prompt provision of food and water allowed the birds to replenish energy quickly. I observed that if a bird ate, it usually accepted the captive environment. (3) Minimal handling time reduced stress. The new technique more efficiently provided these three factors. With the new technique warblers often were introduced to captivity in pairs. The presence of a conspecific may have been helpful. I observed that if one bird in the pair ate a mealworm, the other bird was often stimulated to eat.

I changed several features of the original technique at the same time, and used the techniques in different years. Therefore, I cannot conclude which feature, if any, caused the greater success rate for introducing birds to captivity in 1987 and 1988. I do suggest, however, that the new technique combines several features that help birds adjust to captivity.

Several features of the transport technique may have contributed to its success. R. S. Greenberg (pers. comm.) warned of mortality from stress caused by heat and excitement. Factors that may have minimized stress were: (1) night travel, which provided dark, cool conditions, and a natural calm period given the daily rhythms of the birds; and (2) familiar cage conditions, which permitted the birds to forage and perch as usual.

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