LITERATURE CITED

FORBUSH, E. H. 1925. Birds of Massachusetts and other New England states, Vol. 1, Mass. Dept. of Agric.
HARRINGTON, B. A., AND R. I. G. MORRISON. 1979. Semipalmated Sandpiper migration in North America. Studies in Avian Biology 2:83–100.
PAGE, G., AND A. L. A. MIDDLETON. 1972. Fat deposition during autumn migration in the Semipalmated Sandpiper. Bird-Banding 43:85–96.
SOKAL, R. R., AND R. J. ROHLF. 1969. Biometry. W. H. Freeman and Co., San Francisco.
STORER, J. H. 1948. The flight of birds. Cranbrook Inst. Sci., Bull. 28.
VEPSÄLAINEN, K. 1968. Winglength of Lapwing before and after skinning. Ornis Fennica 45:124–126.

BRIAN A. HARRINGTON AND AVERY L. TAYLOR. *Manomet Bird Observatory, Manomet, Massachusetts 02345.* Received 13 July 1981; accepted 21 Jan. 1982.

Do Birds Use Color Bands in Recognition of Individuals?—The use of color bands by researchers to recognize individual birds in behavioral studies has posed the criticism: if researchers use unique color combinations to recognize individual birds, the birds could be using these clues in a similar way. Usually, such recognition would not present a serious problem in studies where recognition abilities are not being tested (however, see Burley, Science 211:721–722, 1981). In contrast, several of my studies test individual recognition among sparrows (Harris' Sparrows, *Zonotrichia querula*; White-crowned Sparrows, *Z. leucophrys*; White-throated Sparrows, *Z. albicollis*; and Dark-eyed Juncos, *Junco hyemalis*), and the possibility that birds could facilitate individual recognition by using color bands required testing. I was particularly concerned with respect to the White-crowned Sparrows, since this species has little inter-individual plumage variation and, as adults, individuals of the same subspecies are essentially monomorphic. Thus, I designed the current study to evaluate the effect, if any, of color bands on individual recognition in a group of captive White-crowned Sparrows.

Adult White-crowned Sparrows were captured during spring migration (April 1980) in Norman, Oklahoma, and banded with colored plastic leg bands. They were maintained together in an indoor aviary until October 1980, when this study was conducted. Birds were fed a mixture of ground dogfood and seeds and were provided with water for drinking and bathing. Dominance relationships were determined from analysis of supplanting and avoidance encounters of birds at a food dish on 3 October and again the morning of 10 October. Total observation time these 2 days was 135 min. The dominance matrix shown in Figure 1 (constructed following Brown, The Evolution of Behavior, W. W. Norton & Co., New York, 1975:86) shows that the hierarchy is essentially linear (only 2 dominant relationships occur beneath the diagonal) and that few reversals (attacks of subordinates on dominants) occur. At noon on 10 October, color bands on all birds were removed and switched to other individuals in the group. In this manner, each bird's identity, based on color bands, had been switched with another bird's identity. Table 1, which lists birds in order of dominance rank, indicates the color band combinations of the 10 birds before and after the switching of their bands. Each bird is referred to by a number which corresponds to its original rank. My choice of identities to be switched included those with similar and those with very different color combinations as well as those close in rank and those with large differences in rank. If confusion over identity had occurred for some birds and not others, the importance of similarity in rank and/or color of bands could have been investigated further.

Immediately after the bands were switched, all birds were released into the aviary, and subsequent dominance encounters were scored (numbers in parentheses to the right in Figure 1). Birds were observed 125 min. It was critical to observe the possible mistakes in individual recognition immediately after reintroduction of birds with switched bands since, otherwise, the birds could learn the new identities from band combinations over a period of time through social interactions.

TABLE 1. Color band combinations for 10 White-crowned Sparrows used in the band switching experiment. Individuals are listed in order of dominance rank.

Bird number	Color band combination	
	Original	Experimental
1	Orange	Black and orange
2	Light blue	Pink and purple
3	Pink and purple	Light blue
4	White	Black and red
5	Green and white	Green and pink
6	Black and yellow	Red and purple
7	Black and orange	Orange
8	Black and red	White
9	Green and pink	Green and white
10	Red and purple	Black and yellow

LOSER

WINNER

Bird Number	1	2	3	4	5	6	7	8	9	10
1		3	4	3(1)		3(1)	3(2)	2		2(1)
2			3	1(3)	4	3	3(1)	4(2)	3(1)	3
3				4(1)	4(4)		3(2)	2(3)	1	(2)
4					6(1)	3(2)	1(3)	4(5)	1^R	4(3)
5						3	5(2)	4	1(6)	3
6							1(2)	1(1)	1(1)	5(3)
7			2^R	1				4(2)	11(4)	8(2)
8									4(4)	4(4)
9	1(1)			7(2)						6(2)
10					1^R					

FIGURE 1. Numbers of dominance encounters between pairs of 10 White-crowned Sparrows in which one is the winner and the other is the loser. Numbers in parentheses are dominance encounters occurring after color bands were switched on all individuals. No reversals (R) occurred after switching, and dominance ranks of individual birds remained the same.

My results show that color bands were not a critical cue to White-crowned Sparrows for recognition of individual birds. If birds had been using color bands as cues, interactions would have occurred between individuals in the opposite manner of previous interactions. Since the numbers of interactions below the diagonal (R's) in the dominance matrix did not increase, I conclude that the birds were using a different method of individual recognition than the color bands.

Burley (Science 211:721–722, 1981) found that Zebra Finches (*Poephila guttata*) selected mates based on band color. Zebra Finches naturally have orange legs, and the preferred band colors were red and orange. It is not surprising that species with colorful legs would respond to colored leg bands. The legs of White-crowned Sparrows are not brightly colored, and there is no a priori reason to assume they would respond to changes in color on their legs.

Guhl and Ortman (Condor 55:287–298, 1953) found that disguised features of the head and neck were more effective in producing a loss of recognition between domestic chickens (*Gallus gallus*) than were those of areas of the trunk. In other studies (unpubl. data), I found that White-throated Sparrows made initial mistakes in individual recognition after head markings were altered using colored pens. In light of the present study, it is likely that individual recognition in White-crowned Sparrows is based on characteristics located elsewhere on the body, posturing of the body, or vocal attributes.—DORIS J. WATT, *Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019.* Received 20 May 1981; accepted 13 Oct. 1981.

An Easily Assembled Tree-top Blind.—Ethological studies of canopy nesting birds are often difficult to conduct because of the need to build blinds at tree-top height. A blind must accommodate the needs of the observer and the sensitivity of the birds. Blinds should be of simple construction because the builder must deal with limited maneuverability, fatigue, and safety problems. Generally the more elaborate and intrusive a blind is, the greater the disturbance to the birds. Blinds described in the literature are for use on the ground (Robins, Bird-Banding 43:218–219, 1972; LeCroy, Bird-Banding 46:166–168, 1975) or on top of a tower (Herrick, Auk 49:306–323, 1932; Pettingill, Ornithology in Laboratory and Field, 4th ed., Burgess Publ. Co., Minneapolis, Minn., 1970). Tree-top blinds of which I am aware are generally suitable only for short photography sessions, or are heavy complicated structures that must be laboriously constructed over a long period of time. I present here a design for an inexpensive blind that can be rapidly and easily assembled by one person.

I have used 2 tree-top blinds in a study of the breeding biology of Bald Eagles (*Haliaeetus leucocephalus*) in northern Saskatchewan. The blinds were 25 and 26 m above ground in white spruces (*Picea glauca*). They were usually occupied for 10 h at a time, and easily supported at least 82 kg even during strong winds (about 35 km/h) without noticeable stress to the materials or the trees. The trees used were approximately 20 cm in diameter at blind level. I cannot recommend a safe minimum size of tree-top suitable for all species, but I suspect that diameters less than 20 cm could prove dangerous. To date my blinds have remained in place for 2 summers and 1 winter and show no signs of deterioration.

Materials and preparation.—The key component is a section of galvanized steel tower of the type commonly used to support television antennas. It is sold in 3 m sections which may be cut into thirds with a hacksaw to produce supports for 3 blinds. One-third of a section consists of 3 tubes encircled at 2 points about 46 cm apart by flat metal braces. At one end of one of these I made 2 orthogonal saw-cuts along each of the tubes (see insert Fig. 1). These cuts allowed the tube-ends to be bent backwards (during assembly) forming an effective flange which secured the platform. Three pieces of 6 mm rope, 4 m long, were used to tie the tower section to the tree.

A piece of 10 mm thick plywood, 1.2 m × 1.2 m was used for the platform. As this by itself was not strong enough to bear the weight of an observer, and since thicker material was too heavy to haul up a tree, support was largely provided by two 1.3 m