J. Field Ornithol., 52(1):10–15

AGE AND CONDITION BIAS OF DECOY-TRAPPED BIRDS

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Decoy traps allow the capture of large numbers of birds in a short period of time with relatively little effort. Thus, decoy traps have been used extensively in avian studies, particularly in banding studies that require large numbers of birds (often tens of thousands) to be handled to establish a workable data base. The success of decoy traps is attributable to the principle on which they work. Many species of birds, and certainly those vulnerable to decoy trapping, feed by "local enhancement" (Hinde 1961) whereby the feeding activity of individuals serves as a signal to those individuals seeking food. Once a food source is located it is rapidly exploited by the local population. By placing live birds in a trap which provides easy entrance but impossible exit for birds, one artificially creates the signal of food abundance. This is true whether food is abundant or not because the localized activity of the decoy birds appears to be the important stimulus. Traps that use bait rather than decoys function in the same way in that once a few individuals locate the food and enter the trap, they become decoys.

Given the basis on which decoy traps function, it seems reasonable that some individuals may be more likely to be caught than others. In species where male and female feeding behaviors differ, one sex may be more gregarious and therefore more prone to trapping (see Ward and Zahavi 1973, for a discussion of gregarious feeding). In addition, food stressed individuals may be more likely to be trapped than those that are well fed. If younger birds are less efficient at foraging than older birds, young birds may be disproportionately caught because they are on the average hungrier.

In this paper we examine trapping bias relative to age, sex, and condition using data collected from decoy-trapped Red-winged Blackbirds (*Agelaius phoeniceus*), Starlings (*Sturnus vulgaris*), Common Grackles (*Quiscalus quiscula*), and Brown-headed Cowbirds (*Molothrus ater*).

MATERIALS AND METHODS

The study was conducted near St. Etienne de Beauharnois, 25 km SW of Montreal, adjacent to the largest known blackbird and Starling roost in Quebec (Weatherhead et al. 1979). In 1979, 3 decoy traps were operated from 21 May to 28 July and 6 were operated from 29 July to 25 August. "Wings Inn" traps, which are very similar to the "New York Starling Trap" (U.S. Dept. Interior, unpubl. report, 1962), were used. All traps were located within 5 km of the roost. Five decoy birds were kept in the traps at all times with the species of theses birds varying with the species being most abundant in the trap at any time. Cracked corn and water were supplied ad libitum.

Traps were cleared daily, either by us or by the farmers who owned them. The data presented here are only from checks we made, and

account for 207 trap-days in the first trapping period and 98 trap-days in the second trapping period. Birds removed from the trap were sacrificed as part of a study to test the merits of decoy traps in reducing bird damage to crops (Weatherhead et al. 1980a), thereby preventing the possibility of birds being retrapped. Sex and age of birds were recorded where possible. The methods of Selander and Giller (1968) and Payne (1969) were used for age determination of Red-winged Blackbirds.

On 16 and 27 July and 12 August, weights of HY (hatching-year) male Red-winged Blackbirds were taken at 1500 for comparison with weights of the same sex and age class birds mist-netted at 1930 on those dates in the roost. The stage of molt of each bird was also recorded. Two experiments had been conducted the previous summer to determine weight change of birds while in decoy traps. On 25 August, four AHY (after hatching-year) male Red-winged Blackbirds were placed in a decoy trap for 24 h and their weights recorded every 6 h. On 27 August, seven AHY male Red-winged Blackbirds were placed in a trap for 36 h and their weights recorded every 12 h. On both occasions, food and water were supplied ad libitum.

RESULTS

In 305 trap-days, 307 Brown-headed Cowbirds, 153 Common Grackles, 140 Starlings, and 277 Red-winged Blackbirds were caught, Because of some uncertainty in readily distinguishing HY male cowbirds from AHY females, the cowbird data can only be used to determine sexual bias and only prior to 27 June when HY birds began appearing in the trap. Of the 73 cowbirds caught prior to that date, 50 (67.1%) were male. Grackles and Starlings were not sexed, so a sex bias could not be determined. A strong age bias occurred for both species, however, because all individuals caught were HY birds.

Prior to the post nuptial molt, 3 age classes of male Red-winged Blackbirds can be distinguished and, therefore, the Red-wing data are separated into breeding (20 May–28 July) and post-breeding (29 July–26 August) periods. During the breeding period few HY birds were caught because few were yet available. Eleven SY males were caught compared to 2 ASY males and only 2 females were caught. During the post breeding period 233 HY birds were caught compared to only 26 AHY birds, indicating a strong age bias. No apparent sex bias was observed however, as 51.1% and 61.5% of the HY and AHY samples respectively were male.

On all 3 occasions for which sufficient samples of HY male Red-winged Blackbirds were caught both in traps and at the roost, roost-caught birds were significantly heavier (Table 1). In an analysis of fat reserves of roost-caught and decoy-trapped Brown-headed Cowbirds, Good (1979) found that decoy-trapped birds had 50% less body fat, suggesting a likely explanation for the weight differences we found in HY male Red-wings.

TABLE 1. Weight comparison of HY male Red-winged Blackbirds caught in decoy traps with those mist-netted in an adjacent roost.

Date	Capture location	Sample size	Mean weight (g)	Standard deviation	Significance[1]
16 Aug. 79	Traps	23	60.9	3.61	$P < 0.01$
	Roost	3	66.8	2.84	
27 Aug. 79	Traps	8	59.1	7.05	$P < 0.001$
	Roost	11	68.3	3.09	
12 Sept. 79	Traps	24	61.1	5.04	$P < 0.001$
	Roost	41	68.9	3.30	

[1] *t*-test comparisons of mean weights of birds caught in traps with those caught in the roost on the same date.

Only once (27 July) was there an apparent difference between the molting stage of HY male Red-wings caught in the roost and those caught in the traps, with the former individuals appearing to be closer to completion of their molt. However, in a study of the molt of HY male Red-winged Blackbirds in this area, the period required for all individuals of that age class to complete their molt as estimated from decoy-trapped birds was eight days shorter than the same period estimated from birds mist-netted in the roost (Greenwood and Weatherhead, unpublished data).

The weight difference reported in Table 1 appears to reflect a real difference between the condition of birds entering the decoy trap and that of the general population. The experiments to assess trap effects on weight indicated such effects were minor. Mean weights of individuals in the two groups remained relatively constant over 24 and 36 h respectively, with only 3 of 11 individuals demonstrating an absolute weight change in excess of 1 g. The mean absolute change on 25 August was 0.63 g and on 27 August, 1.43 g.

An interesting result for which there appears to be no obvious explanation is the high variance among weights of birds trapped on 27 July and 12 August. Both values are significantly greater than the variances for the respective roost-caught birds on the same dates (F-test, $P < 0.01$) and the variance of birds trapped on 27 July is significantly greater than that of birds trapped on 16 July (F-test, $P < 0.01$).

DISCUSSION

Certainty of the biases.—In order to ascertain if a trapping bias exists it is necessary to make certain assumptions about the population. For example, trapping 3 times as many males as females does not represent a bias if it reflects the ratio of males to females in the trapping area. That more male than female cowbirds were trapped can therefore not

be said with certainty to represent a trapping bias, as we do not know the composition by sex of the cowbird population in the area of the study.

The same is not true however, of the age biases found for Red-winged Blackbirds, Starlings, and Grackles. In an analysis of band recoveries for all 3 species, Weatherhead, et al. (1980b) found that very little migration from the southern Quebec–eastern Ontario region occurs before the end of September. This supports similar findings by Dolbeer (1978) for Red-winged Blackbirds and by Meanley (unpubl.) for Common Grackles. That large numbers of HY birds of the 3 species were present in the study area can, therefore, be taken as evidence that a large number of adult birds of the 3 species were also present. This was confirmed by casual observation of birds entering and leaving the roost. Thus, there was a pronounced bias in favor of younger birds being trapped for all three species for which age was recorded.

Several explanations other than trap bias might explain the consistent condition difference between trapped birds and those mist-netted in the roost, although none of them appears reasonable. It seems unlikely that the mist nets preferentially caught heavier birds. The roosting vegetation was *Phragmites* and, thus, the vertical distribution of all birds within the roost was below the top of the nets. Netting was conducted while the birds were entering the roost and nets were placed in areas through which most birds appeared to move upon entry. It therefore seems reasonable to assume that the mist-netted samples were randomly collected.

Two other explanations are that there could have been trap-induced weight loss or that the weight of free-flying birds could cycle on a diurnal basis and the mist-netted samples were collected when the weight of the birds was at a peak. The former explanation appears invalid based on the results of our experiments to detect trap-induced weight loss. The latter explanation also seems insufficient to explain the weight differences. Fisher and Bartlett (1957) found a maximum daily weight change of 4.8% for male Red-winged Blackbirds collected in winter. We would expect less daily weight fluctuation at the time of our study, however, since energetic losses of roosting birds in late summer would not be as great. Greenwood (unpubl.) found a mean weight difference of only 2.6% between male Red-winged Blackbirds sampled in the evening and following morning at the Beauharnois roost in August.

Implications of the biases.—A recognized bias is much less a problem than one which goes undetected. Thus, a sexual bias is unlikely to cause a serious problem as it can usually be detected, even in species with limited sexual dimorphism. Once detected, steps can be taken in the analysis of the data to compensate for the bias. For species lacking cues that allow one to distinguish sexes easily, however, the potential for a sexual bias when using decoy or bait traps should be recognized.

Other than distinguishing between HY and AHY age classes, age determination is often impossible in birds. If food stressed individuals are more likely to enter a decoy trap and foraging efficiency is age related,

then younger AHY individuals may be more likely to be trapped than older individuals. When the ages of AHY birds cannot be differentiated, such a bias would go undetected. This bias could have serious implications if the data were used for a demographic study.

Perhaps the most significant of the biases is that of the physiological condition of birds caught in decoy traps. Since the fat reserve differences reported by Good (1979) for Brown-headed Cowbirds support our results for Red-winged Blackbirds, and these results are also consistent with predictions based on principles of group foraging, it is expected that such a bias would occur with any species that can be caught in bait or decoy traps. In principle such a bias could be easily detected, but in practice it will often prove difficult to collect a random sample of individuals from the population for comparison with trapped birds. If a condition bias exists, one will always be dealing with the weakest segment of the population.

Several research needs are suggested. First, it is necessary to know to what extent the results of this study can be generalized from Icterids and Starlings to other groups such as waterfowl where trapping is an important means of capturing birds for research purposes. Second, we should attempt to determine in what way, if any, a trapping bias will be manifested in terms of data interpretation. For example, how do migration behavior and longevity vary with condition and age? The answers to these types of questions will determine whether serious rethinking is required of our use of traps in avian studies, past, present, and future.

SUMMARY

Age, condition, and possibly sex biases were found for birds caught in decoy traps near a large blackbird roost in southern Quebec. Male Brown-headed Cowbirds were caught in greater numbers than females, and for Common Grackles, Starlings, and Red-winged Blackbirds, far more HY birds than AHY birds were caught. No apparent sex bias occurred for Red-winged Blackbirds, and the data did not allow determination of sex bias for grackles or Starlings or age bias for cowbirds. HY male Red-winged Blackbirds were the only group with sufficient numbers caught both in the trap and the roost to allow testing for a condition bias. Over three different occasions, roost-caught birds averaged 12.6% heavier than those trapped. This difference cannot be accounted for by daily weight variation of free-flying birds or trap-induced weight loss of trapped birds. The implications of these biases on data derived from birds caught in traps relying on a feeding response to attract them are discussed.

ACKNOWLEDGMENTS

We are grateful to A. Holzgang, D. Daoust, and J. P. Vinet for the use of their traps, to Serge Blondeau and Ray Alisauskas for their assistance in maintaining the traps, and to H. Boyd and G. Finney for

critically reading the manuscript. This research was supported by Agriculture Canada and le Ministère de l'Agriculture du Québec.

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