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GOLDFINCH PREFERENCES FOR BIRD FEEDER LOCATION

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Abstract.—Tests were conducted of American Goldfinch (*Carduelis tristis*) preference for tube feeders with sunflower seeds that were simultaneously available at high and low positions in a tree, or at low positions among tree branches and in the open. More birds visited the upper feeder in the height experiment, but there was no difference between low feeders in and far from the tree. Further study should determine whether other habitat features influenced results, and whether goldfinch preference for high feeders is sufficiently strong to justify recommendations to feeder owners.

PREFERENCIAS DE *CARDUELIS TRISTIS* POR LA LOCALIZACIÓN DE COMEDEROS

Sinopsis.—Se hicieron pruebas para determinar las preferencias de *Carduelis tristis* para alimentarse en comederos con semillas de girasol. Dos comederos fueron colocados simultáneamente uno sobre el otro entre las ramas de la parte alta y baja de un árbol y otros dos fueron colocados a 2.4 m de altura, uno entre las ramas de un árbol y el otro en un área abierta. En el experimento de altura, la mayoría de las aves utilizaron el comedero localizado en el área alta; no hubo preferencia de visitas entre el área abierta y la cobijada con ramas. Otros estudios podrían determinar si otras particularidades del habitat pueden afectar los resultados, y si las preferencias por comederos localizados en lugares altos son lo suficientemente fuertes como para justificar recomendaciones a las personas que proveen de alimento en comederos a estas aves.

Despite the popularity of feeding birds, few scientific studies have been conducted on the feeders and placements of feeders that best attract favored species. Anecdotal evidence is behind most of the recommendations given in guides to bird feeding. Our study was designed to test the preference of American Goldfinch (*Carduelis tristis*) for feeders at different heights in a tree, or for feeders at the same height hung in a tree or in the open.

METHODS

The study took place during January–March 1990 in Aurora, Ontario (44°00′N, 79°30′W), in a suburban yard with scattered mature trees. A flock of 15–30 goldfinches used the test feeders daily, while only an occasional visit was made by 1–3 individuals of other species (Black-capped Chickadee, *Parus atricapillus*; House Finch, *Carpodacus mexicanus*; and, rarely, Downy Woodpecker, *Picoides pubescens*).

Two newly-purchased tube feeders were filled with small black oil sunflower seed, and hung on a pulley system 3.4 and 6.1 m above the ground, one feeder directly below the other. Both were among the terminal twigs and small branches of a maple tree (*Acer saccarum*). The feeders came equipped with sleeves of plastic-coated hardware cloth, which served effectively as squirrel guards. The lack of perches and mesh size excluded certain species of birds that also frequented the study site (European Starling, *Sturnus vulgaris*; and House Sparrow, *Passer domesticus*).

We recorded the number of goldfinches clinging to each feeder during periodic observations that were made as opportunity arose, but all observations were separated by at least 10 min. Between 5 and 14 counts were taken during each trial (mean = 7.8). Trials ended every 2–3 d, at which time the amount of food remaining in each feeder was measured, feeders were refilled, and their position switched. Six trials were conducted (three each with a particular feeder in a particular location).

The experimental design paired test locations in each trial, controlling for effects of changing weather, flock size or behavior that might have affected results had tests of each site been made at different times. Switching feeders allowed us to determine whether one was preferred, regardless of location.

A second set of experiments, using the same methods, was done with the feeders hung 2.4 m above the ground. One was among twigs on the outside edge of a maple tree and the other was 2.4 m away over a driveway, in the open. As with the height experiment, six trials were run (with feeders switched at the end of each trial). In four additional trials, amount of food was measured, but no bird counts were conducted.

Number of birds and total of food used varied widely from trial to trial. To avoid biassing results towards trials with large numbers, data were converted to proportions. For each trial, the amount of food removed from each feeder was expressed as the proportion of the food removed from both feeders combined (arcsin transformed, Snedecor and Cochrane 1967). Similarly, the average number of goldfinches at each feeder during all counts in a trial was expressed as the proportion of the average number seen at both feeders combined.

Analysis of variance was used to test whether birds preferred one of the two feeders and whether location made a difference (Norusis 1986). If different spillage rates drew more birds from one feeder to the ground, such variation would be ascribed by ANOVA to feeder identity rather than to location.

RESULTS

Although 15–30 goldfinches frequented the feeding area, the number of birds on a feeder at once usually did not exceed four. Other birds perched on twigs or feeder suspension wires near each feeder, normally divided in the same proportions as the birds actually on the feeders.

In the height experiment, more goldfinches were observed on the higher feeder, but the amount of food removed from the upper feeder was larger only when feeder "A" was on top (Table 1). Subsequent examination showed that Feeder A had slightly larger holes, probably making food easier to extract and more likely to spill on the ground. We used ANOVA to control for the effects of feeder identity (A vs. B) while testing the significance of feeder location (high vs. low). Number of birds and amount of food removed were significantly higher for the upper feeder, even after controlling for the effect of which feeder was uppermost (Table 2).

In the side-by-side experiment, there was an apparent tendency towards

TABLE 1. Percent of birds on, or food removed from, each feeder, according to feeder identity and location (average of results for each trial). Percents are untransformed.

Feeder location	% of birds seen		% of food removed	
	Feeder A high or in tree	Feeder B high or in tree	Feeder A high or in tree	Feeder B high or in tree
Height experiment				
High	84.1	67.6	85.6	47.0
Low	15.9	32.4	14.4	53.0
Side-by-side experiment				
In tree	66.6	49.4	74.2	37.0
In open	33.4	50.6	25.8	63.0

preference for the feeder in the tree only when feeder A was positioned there (Table 1). Significance tests showed that there was no preference for one location over the other (Table 2). There was a much greater proportion of unexplained variation in the side-by-side experiment than in the height experiment (Table 2).

DISCUSSION

Goldfinches at the study site fed on the ground below the feeders, as well as at all test sites. Birds on the ground frequently flew up to the tree in minor alarms, however, while those at the highest feeder sometimes continued to feed even as the feeder was being lowered for refilling. Moreover, arriving flocks flew first to the top of the tree before dropping to feeders, and the high feeder was normally visited before flock members spread to other sites. We suspect the height preference documented in this study was largely a result of self-protective behavior.

We were surprised to find no preference for the tree site over the open location during the side-by-side experiment, as the tree site should have offered more protection and perching sites for goldfinches. The impetus for the experiment was an observation that few goldfinches visited a feeder in another part of the yard, about 10 m from any tree, and perhaps our experimental feeder was not far enough from the tree to demonstrate a real preference.

In conducting our study, we became aware of several problems in controlling such experiments. First, we demonstrated the importance of controlling for possible differences in attractiveness of individual feeders, regardless of location. Golden-crowned Sparrow (*Zonotricia atricapilla*) and Fox Sparrow (*Passerella iliaca*) are known to develop preferences for individual sites on a single feeder (Pearson 1979), so in certain types of experiments (e.g., food choice), these preferences must also be controlled.

We were lucky in having essentially one species visiting the feeders. If many species were present, amount of food removed from feeders would be meaningless in assessing preferences of individual species, and site preference could be influenced by the presence of other species. Next, it

TABLE 2. Results from ANOVAs of percent of birds on feeder and percent of food removed: proportion of variation accounted for by feeder identity and location, and significance.

Source of variation	Height experiment		Side-by-side experiment	
	% birds	% food removed	% birds	% food removed
Feeder identity	0.09*	0.56***	0.25	0.48**
Feeder location	0.79***	0.42***	0.22	0.05
Interactions	0	0	0	0
Main effects	0.89***	0.98***	0.47	0.53**

* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

is difficult to assess the effects of surrounding habitat. Our results might have been affected by the presence of houses, for example, or by a lack of conifers.

Despite these problems, further studies should be conducted, both on goldfinches and on other species. Our experiments could be repeated easily in a variety of circumstances to determine whether goldfinch preference for high feeders overrides local habitat conditions. Further studies might record the number of birds feeding on the ground, to determine whether the ground is as attractive as aerial feeders. Lastly, it should be determined whether preferences for feeder location are strong enough to justify recommendations for feeder owners. Possibly the same number of birds could be attracted regardless of feeder location if no choice of sites is offered, although this is difficult to test rigorously.

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