Foraging of Wintering Songbirds at a Feeding Station

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INTRODUCTION

The coexistence of species in a particular time and place is determined by a variety of ecological factors, including food choice. If food is an important limiting resource, avian communities should be structured to minimize interspecific competition through food partitioning (MacArthur 1958, Cody 1974, Schoener 1974). This partitioning may be achieved by horizontal or vertical habitat selection, food specialization, or temporal differences in feeding (Cody 1978, Davis 1974, Desrochers 1989, Petit et al. 1990).

Many overwintering passerines in the northeastern United States feed on dry seed and are ecologically similar (Pulliam and Enders 1971). These diurnal foragers accomplish partitioning of food resources through seed choice and spatial foraging preferences (Davis 1974, Desrochers 1989). Overlap of foraging strategies has been demonstrated in a number of other studies (Pulliam and Enders 1971, Brown and Lieberman 1973, Orians and Horn 1969). Pulliam (1985) suggested that when seeds are scarce, sparrows are apt to have broadly overlapping diets.

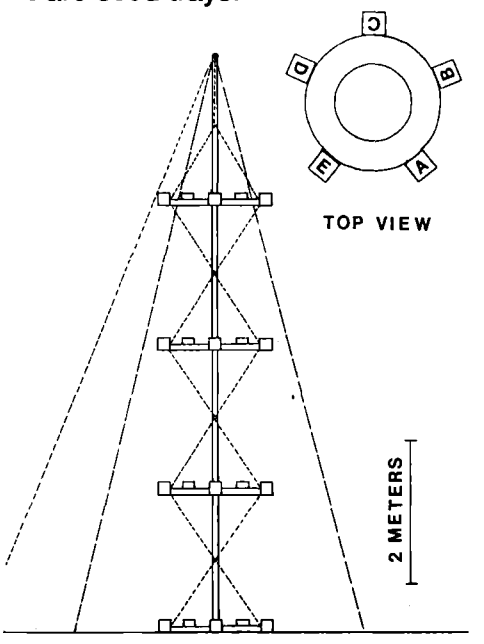
This study describes the foraging choices of several wintering bird species: Black-capped Chickadee *(Parus atricapillus)*, House Finch *(Carpodacus mexicanus)*, American Goldfinch *(Carduelis tristis)*, White-breasted Nuthatch *(Sitta carolinensis)*, American Tree Sparrow *(Spizella arborea)*, Tufted Titmouse *(Parus bicolor)*, and Dark-eyed Junco *(Junco hyemalis)*. We made observations at a feeding station to determine if each species made specific food and height choices.

METHODS

We observed birds at a feeding station from 30 January through 27 February 1991. We made a total of 41 (15 min.) observations and recorded a total of 3717 visits by seven species. Individuals were not captured or marked.

The station was located at the edge of a forested area southwest of Marion Center, Indiana County, Pennsylvania. It consisted of a 9 m pole made of three sections of 6.25 cm electrical conduit, stablized with four guy wires. We suspended four doughnut-shaped masonite platforms (60 cm outer diameter, 30 cm inner diameter) around the pole and used a central rope and pulley to raise and lower them. On each platform, we uniformly attached five removable (3 cm X 9 cm X 9 cm) plastic trays to hold seed (Figure 1).

Figure 1. Feeding station and top view of platform. A-E are seed trays.



Before beginning observations, we filled plastic trays with 60 ml of one of five seed types: striped sunflower, niger thistle, cracked corn, white millet, and canary seed. We raised platforms (each offering all five seed types) to heights of 6 m, 4 m, 2 m, and a fourth platform remained on the ground.

We made observations in 15 min. sessions at various times during the morning and late afternoon. We limited our observations to four 15 min. successive sessions to avoid an uneven depletion of seed types. Since the seed itself could not usually be seen, we counted the action of the bird lowering its head to take a seed as an individual observation entry. We determined seed selectivity by the number of visits to each plastic food tray by each species. In addition, since individuals were not marked, to avoid a bias in the sample, a minimum of 790 observations were taken at each height. If an individual bird sat at the tray for an extended period of time, it was counted once every ten seconds as the feeding platform was scanned. We recorded at least six individuals of each species except for Tree Sparrows and nuthatches (three each).

RESULTS

For all species, individual foraging at heights differed significantly from an expected equal distribution (X^2=742.41, df=18, p< .01). Results were compared with Ryan's procedure (Linton and Gallo 1975) (p< .01) (Table 1.) The Ryan's procedure was used to make specific comparisons within the X^2 table and to keep the experiment-wise error rate constant. Chickadees fed most at ground level; goldfinches, titmice, and juncos at 2 m; Tree Sparrows at 4 m; and nuthatches and House Finches at 6 m.

Table 1. Visits at each height for each species. (number of observations and percent)

	SPECIES						
HEIGHT	TS	JO	HF	NH	GF	CH	TM
Ground	113 16.4% c	95 24.5% b	38 5.2% d	0 0% e	30 8.6% d	419 41.4% a	96 32.1% b
2m	142 20.9% l	148 38.3% ghij	188 25.8% ijkl	74 27.6% hijkl	181 52.6% f	330 32.7% ghijk	126 42.1% ghi
4m	260 38.3% m	92 23.8% op	236 32.4% n	86 32.1% no	62 17.9% pq	148 14.6% q	37 12.4% q
6m	164 24.2% s	52 13.4% tu	266 36.6% r	108 40.3% r	72 20.9% st	114 11.3% u	40 13.4% tu
Values sharing a letter (a, b, c, etc.) are not different (p < 0.05).							
(TS) Tree Sparrow, (JO) Junco, (HF) House Finch, (NH) Nuthatch, (GF) Goldfinch, (CH) Chickadee, (TM) Titmouse.							

Seed choices also varied significantly from the expected equal distribution (X^2=3250.28, df=18, p< .01). Ryan's procedure comparisons are listed in Table 2. Tree Sparrows and juncos did not significantly differ in their choice of seed type, feeding mostly on millet and canary. Nuthatches, goldfinches, chickadees, and titmice did not significantly differ in their choice of millet and canary, but choices of corn, thistle and sunflower varied. Chickadees selected sunflower almost exclusively; titmice and nuthatches chose sunflower and corn in different proportions; and goldfinches chose sunflower and thistle.

Table 2. Visits for each species at each seed type. (number of observations and percent)

	SPECIES						
SEED TYPE	TS	JO	HF	NH	GF	CH	TM
THISTLE	35	36	125	4	61	7	8
	5.2%	9.3%	17.2%	1.5%	17.7%	0.8%	2.6%
	bc	b	a	cd	a	d	cd
CANARY	230	133	50	0	1	5	0
	33.8%	34.4%	6.8%	0%	0.3%	0.6%	0%
	e	e	f	g	g	g	g
MILLET	317	163	86	0	5	1	0
	46.7%	42.1%	11.9%	0%	1.4%	0.2%	0%
	h	h	i	j	j	j	j
CORN	87	52	9	95	6	2	35
	12.8%	13.4%	1.2%	35.3%	1.7%	0.3%	11.8%
	l	l	m	k	m	m	l
SUNFLOWER	10	3	458	169	272	996	256
	1.5%	0.8%	62.9%	63.2%	78.9%	98.1%	85.6%
	n	n	o	o	p	q	p

Values sharing a letter (a, b, c, etc.) are not different ($p < 0.05$).

(TS) Tree Sparrow, (JO) Junco, (HF) House Finch, (NH) Nuthatch, (GF) Goldfinch, (CH) Chickadee, (TM) Titmouse.

DISCUSSION

We found distinct food and height choices being made by each species in our observations. Several species selected sunflower, perhaps due to the energy gains available and the ability of the species to efficiently handle the large seed size (Pulliam 1985). The 2 m elevation was most frequented by all species.

Even though our feeding station was artificial, for example we used commercially available seeds and pre-determined heights, species clearly partitioned their use of the resource conditions we made available, at least to a limited extent. Tree Sparrows and juncos did not differ significantly in seed choice, but differed in elevation choice; Tree Spar-

rows feeding at 4 m and juncos at 2 m. House Finches did not differ significantly from nuthatches in choice of elevation and sunflower seed, but House Finches were generalists, eating more thistle, canary, and millet than nuthatches. Chickadees fed almost exclusively on sunflower and partitioned their choice by feeding on the ground. Goldfinches and titmice were not significantly different in their choice of sunflower seed, but differed significantly in their choices of thistle and corn. Titmice fed significantly more on the ground.

Overlap in foraging preferences may be due to a number of factors. Horizontal spatial relationships were not tested in this study, and proximity to trees and shrubs may be an important factor in niche separation (Pulliam and Mills 1977). Some overlap may be due to preferences of individuals of each species since we did not have large numbers of birds. Feeding behavior of different species could have separated their foraging into small blocks of time. The Black-capped Chickadee and Tufted Titmouse have identical food and height preferences, but never spend more than a few seconds at the feeder. Winter communities tend to contain more generalists because resource abundance is low (Cody 1974), and this may contribute to a large number of species preferring the energy rich sunflower seed.

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