

FEEDING STRATEGIES AMONG SYMPATRIC PASSERINES IN WINTER

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Abstract

Five bird feeders offering various types of food were observed during a five-day period in winter to determine food preferences of American Tree Sparrows (*Spizella arborea*), American Goldfinches (*Carduelis tristis*), and Evening Grosbeaks (*Coccothraustes vespertinus*). Quantification of visiting frequencies of each species to each food type revealed a significant preference of a specific food type on the part of each of the three species. The goldfinches and grosbeaks preferred sunflower seeds, while tree sparrows visited millet feeders with higher frequency. It was determined that competition avoidance can be present among sympatric species on the basis of differences in food selection, or in a possible temporal cycling of foraging for the same food type.

Introduction

Geis (1980) measured relative attractiveness of various seeds used to feed wild birds. He determined that feeding preferences among various species were strikingly different. Harrison (1979) substantiated the findings of Geis in a similar study that encompassed a broader geographical range. Certain passerines exhibit feeding preferences on the basis of microhabitats (Morse 1970). Ricklefs (1973) discussed the ecological parameter of competition avoidance as the mechanism influencing the foraging behavior of Morse's (1970) warblers (Parulidae). More recently, Morse (1980) investigated foraging, nesting and territorial behavior of two sympatric warblers.

The objectives of this study were to quantify intrafamilial food selection among sympatric birds on winter territories, and to measure degrees of europhagy and stenophagy among three species of seed-eating birds.

Methods and Materials

Observation was conducted from 20-25 January 1981, at feeder stations on Butternut Road near New Paltz, Ulster County. Five square wooden feeding trays measuring 20 x 20 cm were placed on top of poles 1.2 m in height. The supported feeders were positioned at intervals of 2.5 m along the edge of an open field comprised of vegetation no higher than 1 meter. Five food types: sunflower seed, millet seed, corn, bread, and suet were placed separately in each tray and rotated on a daily basis to avoid sample biasing. Visits to the feeders by American Tree Sparrows (*Spizella arborea*), American Goldfinches (*Carduelis tristis*), and Evening Grosbeaks (*Coccothraustes vespertinus*) were ob-

served and tallied until each species had accrued 20 visits for each position of the feeders, totalling 100 visits for each species during the five-day study period. One individual perching on a feeder and pecking at the tray constituted one visit. Birds were identified by species using field glasses from a distance of 36 m, and identification verified by field characteristics described by Peterson (1980) and Robbins *et al.* (1966).

Data were compiled and analyzed using chi-square (X^2) and 2×2 contingency tables (Bailey 1972) to determine significance of food preferences among the three species. Significance was fixed at $p < .05$.

Results

Total numbers of visits to each food type by each species are illustrated in Table 1. American Tree Sparrows visited the millet feeder with a significantly greater frequency than any other food type ($X^2 = 50.0$; $p < .001$). American Goldfinches and Evening Grosbeaks preferred sunflower seeds to the other available food types ($X^2 = 109.52$; $p < .001$; $X^2 = 46.08$; $p < .001$, respectively). Comparison of preferences of the two latter species for sunflower seeds did not vary significantly ($X^2 = 1.41$; $p > .05$), indicating that both goldfinches and grosbeaks prefer the same food type during foraging.

Discussion

Competition avoidance between tree sparrows and other seed-eaters may be attributed to the distinct differences in patterns of food selection among the various species. Although all three species visited the millet feeder, the high frequency of visits by tree sparrows (Table 1) suggests that this species has no significant competition for this specific food item. Avoidance of competition for food in goldfinches and grosbeaks cannot be explained by differences in food preferences, since both species visited the sunflower feeder with the greatest frequency (Table 1). All three species exhibited a high degree of stenophagy as indicated by the relatively high values of chi-square during statistical analysis of the data. This eliminates the possibility that of the two species preferring the same food type, one was utilizing a broader food base to avoid direct competition with the other species. The two possible mechanisms functioning to reduce or eliminate direct competition between the goldfinches and grosbeaks may be the temporal cycling of feeding patterns and the saturation of feeding territories with abundant food. Although observations of the diurnal cycling of visits to the feeders by various species were not recorded, it appeared that grosbeaks frequented the feeders in greater numbers during early morning hours soon after sunrise, and tapered off during mid-morning and later morning hours. Goldfinches appeared to start feeding later than the grosbeaks, reaching their greatest numbers around mid-day. The disparity between the apparent densities of the two species at different times of

the day may indicate that the goldfinches and grosbeaks are to some extent avoiding direct competition for sunflower seeds by staggering their feeding cycles during the day.

Saturating the feeding territory with large quantities of preferred food items may reduce competitive behavior, such as agonistic encounters when different species feed together. Reduction of the quantities of food types at each feeder may shift the pattern found in this study, forcing one or more species to use a wider food base to avoid interspecific competition. Further investigation of feeding cycles and of food *vs.* population density is required before it can be determined that either of these hypothesised mechanisms is operating to reduce competition among these species, and is beyond the scope of this study.

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**Table 1. Frequencies of visits to five food types
by three species of seed-eating birds.**

	Sunflower Seeds	Suet	Corn	Bread	Millet
American Tree Sparrow	0	0	9	16	75
Evening Grosbeak	74	0	1	1	14
American Goldfinch	81	0	9	4	6