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Some Factors Influencing Feeder Selection by Black-capped Chickadees and Red-breasted Nuthatches

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Introduction

An extraordinarily large invasion of Black-capped Chickadees *(Parus atricapillus)* and Red-breasted Nuthatches *(Sitta canadensis)* occurred during the winter of 1980-81 at my Adirondack banding station. In order to satisfy the increased demand for sunflower seed, more feeders than are normally used were erected, thereby creating an opportunity to study the birds' preference for several feeder locations. Also studied were the changes in preference caused by changes in feeding activity through the season.

Methods

I have maintained a year-round feeding/banding station at a summer cottage at Jenny Lake, near Corinth, Saratoga Co., N.Y. since 1970. It is located at 380 m elevation in a forest clearing surrounded principally by white pine *(Pinus strobus)*, Eastern hemlock *(Tsuga canadensis)*, sugar maple *(Acer saccharum)*, beech *(Fagus grandifolia)*, and white spruce *(Picea glauca)*. The winter feeding season is arbitrarily defined as 1 November to 30 April. In the winter of 1980-81, I made 21 visits to this station to measure seed consumption, and to operate one 12-m and one 6-m mist net set near the feeders. I used 154 kg of sunflower seed during that period and accounted for 368 chickadees (284 banded, 62 returns from previous years, and 22 repeats of birds banded prior to 1 November), 80 Red-breasted Nuthatches (64 banded, 4 returns, 12 repeats), and 7 White-breasted Nuthatches *(Sitta carolinensis;* 6 banded, 1 repeat). The total number of captures was 1034 chickadees, 201 Red-breasted Nuthatches, and 8 White-breasted Nuthatches, or a grand total of 1243 captures.

Seed consumption through the season is graphically represented in Figure 1. Each data point was determined by weighing the seed needed to refill the feeders and dividing that amount by the number of days elapsed since the previous filling. Also represented are the total number of individual Black-capped Chickadees, Red- and White-breasted Nuthatches captured on those days.

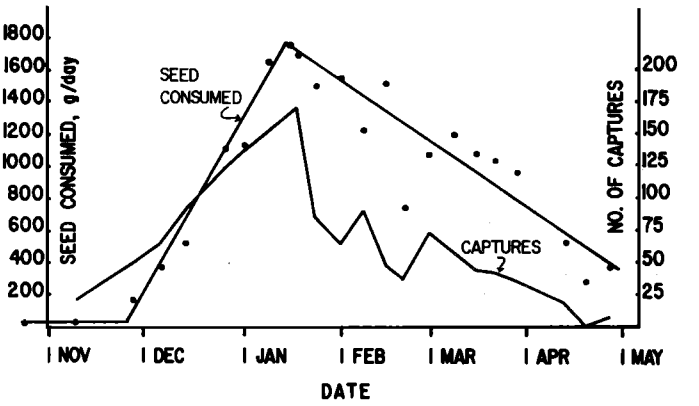

Figure 1. Seasonal changes in seed consumption and capture rate. Regression analysis of the seed consumption data gave a rising line equation of: Seed Consumption = −763.8 + 32.3(Day), index of fit = 0.9681; and a declining line equation of: SC = 2628.3 − 12.6(Day), index = 0.8069. The two lines meet at 15 January. Day refers to the elapsed time starting with 1 November as Day 1. The capture line represents the total number of individuals of the three species netted on the indicated date.

The locations of the feeders with respect to trees, cottage, etc. are given in Figure 2. From 1 November to 1 January, 3 feeders (CF-103, 104, and 105) were used at the positions noted in Figure 2. Due to a projected lack of capacity caused by rising seed use, a fourth feeder, CF-102, was put to use on 1 January. All feeders were mounted on pipes in the ground at 2 m above ground level. By virtue of their design they were free of use by mammals and other larger species of birds.

Table 1 shows the relative proportion of seed dispensed from these feeders at approximately one-month intervals. The percentage of use was determined by dividing the weight of seed used in each feeder by the total amount dispensed by all feeders in that particular period. These data are graphically represented in Figure 3. Figure 4 shows the relation between feeder use and the distance of the feeder from protective cover.

Table 1. Feeder shares based on sunflower seed usage

Time period	Period Mid-point	Percentage use by feeder CF-103	CF-104	CF-105	CF-102
12 Oct - 27 Nov	5 Nov	65.6	10.1	24.3	-
28 Nov - 1 Jan	16 Dec	42.1	26.3	31.6	-
2 Jan - 24 Jan	13 Jan	29.3	24.4	25.6	20.8
25 Jan - 28 Feb	11 Feb	35.9	20.6	26.1	17.4
1 Mar - 28 Mar	15 Mar	49.7	22.6	20.0	7.7
29 Mar - 26 Apr	12 Apr	53.3	23.4	15.5	7.7

Results and Discussion

In early November, as birds were establishing winter territories, seed consumption was at a very low level (20 g/day). Figure 1 shows the consumption rising steadily to a peak in mid-January, followed by a more gradual decline to April. In April, the last of the winter visitors departed leaving those few members of these 3 species that breed nearby, and the newly arrived Purple Finches *(Carpodacus purpureus)* and others. Concurrently, Figure 1 shows rising numbers of captures, peaking also in mid-January, followed by a more precipitous decline to mid-April. The greater decline in captures, compared with that of seed consumption, appears to be due to the net shyness that some of these birds developed after repeated capture.

Through the month of January when seed consumption and the capture rate were at their peaks, the activity at these feeders was extremely intense. Approximately 75 or more chickadees and nuthatches were within the immediate area (within 10 m) of the feeders at any one time. There was a constant stream of birds to and from the feeders with, in some cases, birds lined up 5 and 6 at a time waiting access to a feeder.

Each feeder had 2 dispensing ports and could therefore accommodate 2 birds at a time. On the peak day of 18 January, seed consumption was 1683 g/day which was equated to 22400 visits/day, or one seed every 1.6 seconds! I accounted for 171 captures (142 chickadees, 26 Red-breasted Nuthatches and three White-breasted Nuthatches) in 4 hours for a yield of 32.3 birds/net-hour. The frenetic atmosphere was beyond description — chickadees streaming to feeders like bees to a hive. Based on the 171 captures, I estimated that approximately 250-300 chickadees and nuthatches were making daily use of the feeders at that time. This estimate is supported by the fact that, during the month of January, 221 of the season's total of 368 chickadees were captured.

At this January peak of activity, mist netting yields were exceptionally high. On several occasions I was not able to leave the 2 nets open continuously. It was not uncommon to catch 20-25 birds in the span of 10-15 minutes, thereby requiring furling until these captives could be processed. When first the nets were opened on the morning of 18 January, within minutes I had 35 chickadees and a net yield of 64.8 birds/net-hour. Never in my previous 10 years of operation of this station had I seen anything matching this situation. With that as background, from the quiet, orderly feeding of November to the frenzied peak of January and back to calmer times in April, the preferences demonstrated by these birds may be examined.

Early in the season, when feeding occurred at a very modest rate, CF-103 was clearly the preferred feeder by a substantial margin as seen by the 65.6-percent use rating in Table 1. As one of 3 feeders, its statistically predicted share of 33.3 percent was exceeded by a factor of about 2. As feeding activity increased, this margin of preference decreased. When feeding activity peaked in January, all of the feeders came the closest to their statistically predicted share of 25 percent, with values that ranged 20.8 to 29.3 percent. Some or all of the birds

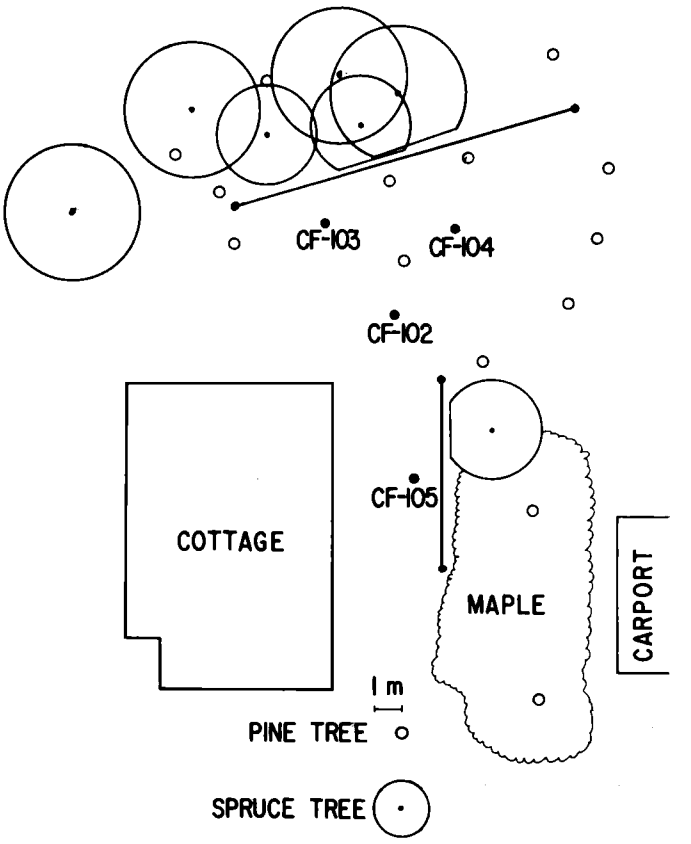

Figure 2. Locations of feeders, mist nets, spruce cover, maple cover, and pine trees. Feeders are represented by solid circles with CF designation, mist nets by the lines between solid circles, spruces by circles or partial circles with solid centers, pine trees by open circles, and maple cover is labelled.

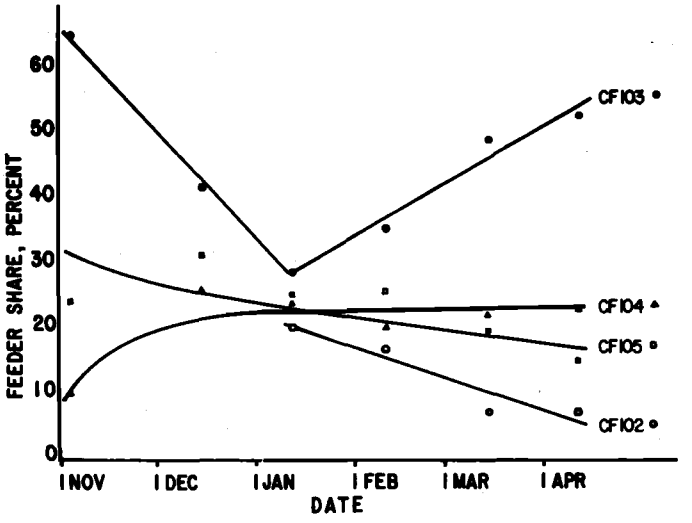

Figure 3. Changes in feeder use. The feeder use data in Table 1 gave the following regression lines:

CF-103 Use = 67.7 − 0.530 (Day)
Index of fit = 0.9964
CF-103 Use = 7.81 + 0.288 (Day),
Index of fit = 0.645
CF-104 Use = Day / (0.0396[Day] = 0.294),
Index of fit = 0.9570
CF-105 Use = 1 / (0.0308 + 0.000151[Day],
Index of fit = 0.5749
CF-102 Use = 33.0 − 0.165(Day),
Index of fit = 0.8995

where Day = elapsed time starting with 1 November and Day 1. The CF-103 lines meet on 13 January.

at the feeders had been pressed to abandon their selectivity in choosing a feeder. When the feeder activity waned after January, CF-103 again regained its preferred status, by again being used about twice as frequently (53.3 percent) in April as its predicted share (25.0 percent).

Graphic representation of these data in Figure 3 shows this change in use of CF-103 and its relation to the use of the other feeders. The decline and increase in the use of CF-103 coincide inversely with the changes in seed use and capture data in Figure 1. The peak dates of 13 January for minimum use of CF-103, 15 January for maximum seed consumption, and approximately 18 January for maximum captures are in close agreement with one another. Figure 3 shows also the relative positions of preference of CF-104 and 105 compared with 103. Through the season they were less preferred and underwent only moderate change in rank. There was a slight increase in preference toward CF-104 early in the season, followed by no significant change thereafter and a steady decline in preference for CF-105. However, since the index of fit of the CF-105 data is rather low, an exact assessment of this trend is not clear. The last feeder to be installed, CF-102, saw its greatest use during the peak demand of January but otherwise was an unpopular location and was little used when other more preferred locations were available.

These results verify that an intuitive decision I made 10 years ago in the placing of a feeder at the CF-103 location proved to agree with the birds' preferred location among all the locations subsequently chosen. At that time the CF-103 site was my preferred choice followed by the CF-105 site for year-round feeder locations. These results show that as I chose additional sites beyond that for CF-103, I was selecting progressively less favorable sites within the confines of this particular area.

In examining the reasons why the birds preferred the locations they did, one must refer to the feeder area topography in Figure 2, and the actions of the birds using the feeders. There was clearly a preference by the birds to use protective cover in their approach and departure from the feeders. Also, the feeding habits of these species required them to use perches on which they could hack open the seed hulls to get at the seed meats. Since almost all of the white pines located in Figure 2 are mature trees of approximately 50 years of age, with diameters at breast height (dbh) of 35.0 cm (range 29-45), from which all branches had been trimmed from ground level to an average of 6.1 m (range 5.2-7.0), they offered little if any haven at feeder height, except for perhaps the nuthatches. The principal cover and perch sites were afforded by the spruces and maple understory. The spruces near CF-103 offered the densest cover and greatest availability of perches. They are approximately 25- to 30-year-old trees averaging 13.1 cm dbh, some lacking branches up to about 1.5 m, but offering dense cover from 1.5 to 6.0 m. They averaged 6.2 m (range 4.6-7.0) in height. The spruce near CF-105 is a tree that was topped perhaps 15-20 years ago, and it provides dense cover from ground level to 2 m. The maple understory at this feeder is growth that measures 2.8-4.9 cm dbh, is about 3.6-4.0 m high and has been repeatedly trimmed to maintain a low, brushy growth. This maple is the more accessible cover at CF-105 because of its height, but it is not as dense as the spruce cover located at CF-103. Approximately 55 maples fill this area.

Thus, nearness to cover and the type of cover appear to govern the birds' choice of feeder. The denser spruce cover appears preferrable to the leafless maple understory; and feeders closer to cover are more preferred than those situated farther away. To better assess the effect of distance on the birds' choice of feeder, the

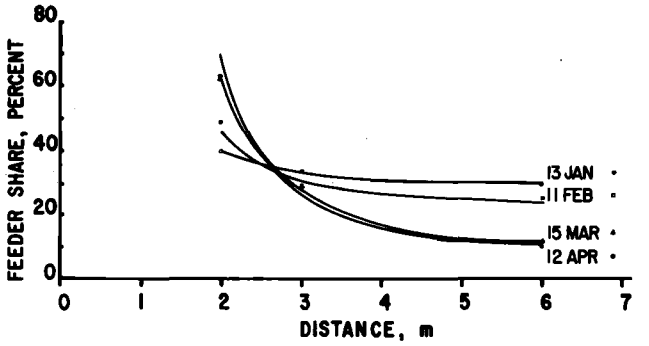

Figure 4. Dependence of feeder use on distance from protective cover. The use of feeders CF-102, 103, and 104 was compared with their distance from a common source of spruce cover. The data gave the following regression lines for the time periods indicated in Table 1:

13 Jan Use = Distance / (0.04099[Distance] − 0.03119), Index = 0.9997

11 Feb Use = Distance / (0.05473[Distance] − 0.06539), Index = 0.9492

15 Mar Use = 1/(0.02193[Distance] − 0.02886), Index = 0.9992

12 Apr Use = 1/(0.02376[Distance] − 0.03317), Index = 0.9987

results from the 3 feeders near the spruce habitat were examined further. CF-105 near the maple habitat was excluded to eliminate any complications that might exist due to differences in preference for the 2 types of habitat.

The use data for CF-102, 103 and 104 were combined and their respective shares were plotted against their respective distances (6, 2, and 3 m) from the nearby spruce cover. These are shown in Figure 4. They indicate a seasonal variability caused by changes in feeding activity. During a period of intense feeding activity, such as occurred in January, the distance of the feeder from protective cover has a relatively minor influence on feeder selection. During periods of less intense feeding activity, as occurred in March and April, there appears to be greater selectivity resulting in a marked preference toward use of feeders close to protective cover. Stated another way, the nearby, preferred feeders are used first, and to the extent that they cannot accommodate the increased use brought on by a rising user population, the overflow of users visit the less preferred, but now more available additional sites.

The idea of using nearby cover for the placement of feeders, traps, or nets is not new; however, few quantitative assessments of its impact on feeder use have been made. This assessment is presented to illustrate its quantitative significance to assist banders in planning more effective capture strategies.

Acknowledgement

I wish to thank my wife, Anne, for her assistance, understanding and indulgence at the peak of the black fly and mosquito season in the taking of the measurements used in Figure 2.

1527 Myron St., Schenectady, NY 12309