Winter philopatry in the Dark-eyed Junco

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Numerous displacement studies have been conducted to investigate the homing abilities of birds. Most of these, however, have been carried out on birds during the breeding season, when there is "motivation" to return to the home burrow or nest. This study, on the other hand, examined the homing performance of 116 Dark-eyed Juncos *(Junco hyemalis)* during the winter, using a feeding area as "home."

All homing experiments are based on essentially the same basic methodology: capture and mark the bird, displace it some distance from home (usually in a closed container), release the animal (hopefully at some unfamiliar location), return to the home area, and attempt to recapture the animal should it return. In this study, "home" consisted of a winter feeding area where sunflower seeds were provided daily at each of four feeding stations. The seeds were placed on the ground within a 2-celled Potter trap. Four such traps were used and placed in a square, forty yards on a side, with the traps at each of the corners. The feeding stations were located in a 7-year-old clear-cut area, approximately 2 miles long and 200 yards wide, that was virtually surrounded by miles of oak-hickory deciduous forest.

Upon capture, the birds were banded with a USFWS band, then transported to the release site in a wire cage covered with a piece of leather to prevent the bird from obtaining any visual clues. Upon reaching the release site, the cage was placed on the ground, the cover removed, and the bird allowed 15 minutes to acclimate to the area. At the end of this period the bird was released, and the initial heading (direction the bird flew upon release) was recorded. Release sites were located at distances of 1, 3, and 10 miles at each major compass point (north, south, east, and west). These release points were determined using U.S. Geological Survey topographic maps.

One novel aspect of the procedure used in this study was that a "recapture baseline" was calculated, and this figure was then used as a basis for comparison of the results. Ten juncos were captured at the traps, banded and released with the release site being the same as the point of capture. Of these 10 birds, 8 were subsequently recaptured, so that 80% recapture is the baseline rather than 100%. All work was done during 1974-1975 academic year from 1 December 1974 to 28 February 1975.

Table 1. Homing performance of the Dark-eyed Junco.

	East	West	North	South	Total
1. Birds released at 1 mile					
a. No. released	10	10	10	8	38
b. No. recaptured	5	7	8	7	27
c. % recaptured	50%	70%	80%	87.5%	71.06%
2. Birds released at 3 miles					
a. No. released	10	12	9	11	42
b. No. recaptured	7	7	4	4	22
c. % recaptured	70%	58%	44%	36%	52.36%
3. Birds released at 10 miles					
a. No. released	9	4	13	10	36
b. No. recaptured	0	0	0	1	1
c. % recaptured	0%	0%	0%	10%	2.77%

Results

Results of the displacement experiments are presented in Table 1. Simply stated, homing performance diminishes with increasing distance, from a recapture percentage of 71.06% at 1 mile to 52.36% at 3 miles to 2.77% at 10 miles.

While there was this correlation between distance of release site and performance, there apparently was no significant difference in homing ability with respect to the direction of the release site (Chi-square Analysis).

Other information gained during the course of the study included the fact that the sun seemed to play a very small role in the homing performance of the junco, for birds released on overcast days homed just as well as birds displaced on sunny days. There is experimental evidence to demonstrate that the sun is used by many bird species during migration and navigation.

Both sexes seem able to home with approximately the same ability, for 45% of females and 40% of males released were able to return to the feeding station.

Despite the fact that the displaced bird was given a period of time to acclimate to the new surroundings (hopefully allowing it to "get its bearings"), birds chose initial headings at random, and no correlation was found between choosing the correct initial direction and successful homing nor between correct initial direction and distance of displacement. In most cases, upon release, birds flew to the nearest dense vegetation regardless of its direction and relevance to homing.

Discussion

Since the percentage of returns decreases with increasing distance of displacement, it appears that the birds, when displaced, use familiar landmarks to find their way back to the feeding stations (Type I Orientation). Such behavior is further suggested by the fact that there is no correlation between the weather (presence or absence of the sun) and homing performance. Birds displaced at distances of 1 mile were probably released in or near the normal foraging area for this species, so the high percentage of returns is not surprising.

Birds released at 3 miles, were probably released in unfamiliar territory. However, by using random search behavior, the birds could easily locate the extensive, and ecologically distinct, clear-cut area and upon reaching this, use landmarks to return to the feeding stations.

At a distance of 10 miles, finding the clear-cut by random search procedures is a difficult task and probably explains the low percentage of returns.

Another important factor affecting the experimental results is the question of motivation. Is food supply a strong enough motive to "force" the birds to home? The bird might just seek food elsewhere after displacement.

The authors hope that this information will be of interest to the readers. We have learned that studying homing in wild bird species is very different from working with pigeons. Banding a 2-ounce bird in the middle of winter, in the middle of a forest, in the middle of a snowstorm, is more of a challenge than selecting a bird from the loft.

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