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Late winter bird populations in subarctic taiga forest near Fairbanks, Alaska.—The present study complements that of West and DeWolfe (1974) by estimating the winter bird population density in high latitude forest, for which they estimated the summer population. The census was conducted between 10 February and 24 April 1973, using the same sampling method and analysis West and DeWolfe used during summer in the same place. The census route ("trail A" of West and DeWolfe 1974) runs through a tract of mixed taiga that includes pure and mixed stands of spruce, birch, alder, and other deciduous tree species typical of the taiga forest of interior Alaska.

The census area was 250 m (820 feet) wide and 3.8 km long with a trail bisecting it longitudinally. An area 250 m wide and 4 km long equals 100 ha. The census area was divided into eight strips according to their distance on either side of the trail as follows: 0–50, 50–100, 100–200, and 200–410 feet. The boundaries of these strips were recognized by stationary landmarks and periodic checks.

I began traveling the trail on cross-country skis at sunrise on each census day, and proceeded at a rate of about 1 m per second, pausing only long enough to record information. For each individual or group of birds detected, I recorded species, the lateral distance from the trail (i.e. I located the bird(s) in one of the strips listed above), number of individuals, sex and age if distinguishable, how detected (heard or seen), time, position along the trail, and activity of the bird(s). The trail was skied in opposite directions on alternate census days.

The census was divided into two periods on the basis of field observations and conditions. The first period was from 10 February to 26 March; 24 census days were included in this 45-day period. Ambient temperature ranged from -28.3 to $+8.3$°C and averaged -13.8°C. The second period was from 27 March to 24 April; 13 census days were included in this 29-day period. Ambient temperature ranged from -10.0 to $+16.5$°C and averaged $+0.3$°C (Weather Bureau 1973). The separation between these two periods marked the beginning of nesting for the Gray Jays (*Perisoreus canadensis*) and the White-winged Crossbills (*Loxia leucoptera*), and flock size reduction and pairing in the redpolls (*Acanthis hornemanni* and *A. flammea*) and Black-capped Chickadees (*Parus atricapillus*).

A plot of the number of detections within each lateral strip for each species and period yielded an abrupt peak followed by a sharp decline. The inflection point, termed the "critical distance" by West and DeWolfe (1974) occurred in the first lateral strip from the trail in most cases.

It was assumed that the populations of species were distributed randomly in the habitat. Using the number of individuals detected within the "critical distance" as a base, I extrapolated to obtain the projected number (n) present on the 410-foot band on both sides of the trail. In order to determine the density of each species per 100 ha, I divided n by the number of 4-km intervals censused.

For period 1, which contained 24 census days, I censused 22.8 (3.8 × 24/4) 4-km distances. In period 2 I censused 12.4 4-km intervals.

The total number of individuals detected divided by n is defined as the "coefficient of detectability" (Emlen 1971) (Table 1).

The original census density figures would obviously be low in proportion to the incompleteness of detections within the critical distance. In other words, a "basal detectability adjustment" is necessary to correct the population estimate upwards (Emlen 1971). The magnitude of this adjustment can be determined by other census methods. I was able to determine "basal detectability adjustments" for two of the species I censused.

The "basal detectability adjustment" for White-winged Crossbills in period 2 was based on the sex ratio of the birds detected. In that period I detected 20 mature males and 4 birds that could have been either juveniles or females, based on plumage. From the ratio of period 1 (4 adult males, 5 juveniles and females), I assumed that the four birds in question from period 2 were juvenile males. Therefore assuming a 1:1 sex ratio in the sampled population, the "basal detectability adjustment" for the White-winged Crossbills in period 2 would be 2.0. The original census density figure (7.3/100 ha) × the "basal detectability adjustment" (2.0) = 14.6 White-winged Crossbills/100 ha in period 2 (Table 1).

TABLE 1

SPECIES DETECTED 10 FEBRUARY TO 24 APRIL 1973

	Detections: Span between first and last detection (days)	Detections: Total detections in census (n)	Coefficients of detectability: Period 1	Coefficients of detectability: Period 2	Population n/100 ha: Period 1	Population n/100 ha: Period 2
Redpoll[1]	73	1008	0.24	0.34	90.6	100.0
White-winged Crossbill	69	126	0.22	0.27	19.8	14.6[2]
Black-capped Chickadee	62	44	0.22	0.16	6.1	8.0
Boreal Chickadee	64	40	0.13	0.12	9.0	8.6
Gray Jay	65	19	0.22	0.49	0.9[2]	6.6[2]
Pine Grosbeak (*Pinicola enucleator*)	42	13	0.44	0.24	1.1	0.7
Willow Ptarmigan	1	5	—	0.06	—	6.5
Common Raven	73	5	1.0	0.29	0.6	3.3
Northern Shrike	1	1	—	0.12	—	0.7
Boreal Owl[3]	1	1	—	0.49	—	0.2
Goshawk	1	1	—	0.24	—	0.3
Northern Three-toed Woodpecker	1	1	0.12	—	0.4	—
TOTAL		1264			128.5	150.4

[1] Includes both *Acanthis hornemanni* and *A. flammea*, plus all sight and sound records where species could not be identified.
[2] Adjusted figure, see text for explanation.
[3] Distinguished by voice.

Adjustments for the Gray Jay are based on the assumptions that (1) all birds were paired during periods 1 and 2, and (2) that if a single bird was seen, another, the mate, remained undetected within the sample area. As there were four paired birds and two individuals detected in period 1, the required adjustment is 6 (birds detected) + 2 (birds undetected)/6 = 1.3. The original density figure (0.7/100 ha) × "basal detectability adjustment" (1.3) = 0.9 Gray Jays/100 ha in period 1 (Table 1). A similar "basal detectability adjustment" can be calculated for period 2 when four paired birds and seven individuals were detected. In this case the "basal detectability adjustment" (1.7) gives 6.6 Gray Jays/100 ha in period 2 (Table 1).

Emlen (1971) indicated that the census method he described and I used here is not applicable to flocking species. This category would include the redpolls and White-winged Crossbills in period 1. He further considers it to be poorly suited for wide-ranging species. These would include the Common Raven (*Corvus corax*), Boreal Owl (*Aegolius funereus*), Northern Shrike (*Lanius excubitor*) and Goshawk (*Accipiter gentilis*) from my census. The presence of captive Common Ravens, Black-capped Chickadees, and redpolls near the southeast end of the census trail may have influenced the results. Of the individuals of those three species censused, 20.0%, 30.0%, and 12.2% respectively were detected within 200 feet of the cages holding the captive birds of that species. I am not confident in the density and "coefficient of detectability" values for the last seven species of Table 1 because of their small number of detections.

As West and DeWolfe (1974) showed significant differences in population density of breeding birds in two adjacent areas of taiga woods, it is improper to extend my observations to other taiga areas.

Species detectability varies in relation to their behavior and the habitat type(s) in which they live (Emlen 1971, Brewer 1972, Richard and Richard 1972, West and DeWolfe 1974). In winter, redpolls primarily inhabit deciduous trees and shrubs (West et al. 1968), which makes them highly visible. Other species including the Boreal Chickadee (*Parus hudsonicus*) and White-winged Crossbills were less visible during the nonbreeding season in period 1 than I suspect they would be during the summer, as an accumulation of snow on the branches of conifers reduces visibility. At other times of the year some species become very obvious. The noisy, brightly colored, territorial male White-winged Crossbills I observed during period 2 were good examples. Nesting females, on the other hand, are generally very secretive (West and DeWolfe 1974).

The characteristics of late winter bird populations on the study area are quite different from those of summer populations (West and DeWolfe 1974). The density of redpolls and Black-capped Chickadees during late winter was three times their breeding density. The calculated "coefficients of detectability" of the redpolls are higher in late winter than summer, whereas the calculated values for the Black-capped Chickadees are quite similar in these two seasons. Five of the species I found were not detected during summer: Willow Ptarmigan (*Lagopus lagopus*), White-winged Crossbill, Northern Shrike, Boreal Owl, and Northern Three-toed Woodpecker (*Picoides tridactylus*). The so-called permanent residents that were seen in summer but not late winter included: Ruffed Grouse (*Bonasa umbellus*), Hawk Owl (*Surnia ulula*), Hairy Woodpecker (*Dendrocopos villosus*), and Bohemian Waxwing (*Bombycilla garrulus*). These variations might be best explained by the seasonal changes in habitat preference of the individuals of each species.

There is a definite need for continuing study during the spring and fall migration periods and early winter. Observations to check year to year variations might indicate that taiga bird populations change with birch seed crops (redpolls) or spruce seed crops (White-winged Crossbills).

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Arctic Loon "checking" nest.—In late June and early July 1967 I had the opportunity to watch the nest of an Arctic Loon (*Gavia arctica*) at Churchill, Manitoba. About 650 m inland from Hudson Bay, the nest was on a mossy hummock in the small fishless tundra pond shown just south of the western tip of the lake containing Arctic Tern (*Sterna paradisaea*) colony C on the map in Evans and McNicholl (1972). As I was checking nearby nests of Arctic Terns and Herring Gulls (*Larus argentatus*) at varying times of the day every 2 to 4 days, I was regularly able to observe the nest from a distance. On cool or windy days an adult loon was always on the nest when I was in the vicinity, but on warm still days the adults were absent, even though both parents incubate (Sjölander 1968). Every 12 to 15 min during these periods of absence, an adult loon would fly from the direction of Hudson Bay, circle over the nest, arch the head and neck towards the nest as if peering at the eggs, and return to the bay.

I was unable to find any directly comparable behavior in either the periodical literature on loons or the summaries provided in various regional avifaunal works and by Bent (1919) and Palmer (1962). L. M. Turner (*in* Bent 1919: 74) referred to a Red-throated Loon (*Gavia stellata*) as "hovering" in circles and calling over the nest in response to disturbance by him, but the above observation appears to be undisturbed behavior, and also differed in that the loon was silent while circling overhead. Sjölander (pers. comm.) has seen similar behavior by all four loon species "frequently accompanied by the croaking warning call" and only when disturbed by him. Such behavior probably results from conflict between escape and attack or nest defense tendencies. Yonge (pers. comm.) noted no such behavior while studying Common Loons (*G. immer*) in Saskatchewan; Middleton (pers. comm.) similarly recalled no such activities in an Ontario study; and McIntyre (pers. comm.) also has not seen it. A somewhat similar behavior by adult Caspian Terns (*Hydroprogne caspia*) was reported by Arthur (*in* Bent 1921: 207). They circled over young and either landed or flew off "on seeing they were safe." How much this behavior was influenced by disturbance is not clear.

As pointed out by Snyder (1957: 30–31) and by Dunker and Elgmork (1973), Arctic Loons frequently nest on fishless ponds and must forage elsewhere. At