BREEDING BIRDS OF AN ALPINE HABITAT IN THE SOUTHERN SNAKE RANGE, NEVADA

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Alpine ecosystems occur as isolated islands on the highest of the Great Basin mountain ranges. These include the Wassuk, White, Humboldt, Toiyabe, Toquima, East Humboldt, Ruby, Grant, Schell Creek, Snake, Deep Creek, and Stansbury mountains (Cronquist et al. 1972). Like other altitudinally zoned ecosystems of Great Basin mountain ranges, alpine ecosystems have been neglected in the past because of difficult access and false impressions of biotic sterility (Johnson 1978). Recently, more attention has been directed to the scientific study of these unique environments and to their wise use and management (Ives and Barry 1974, Thilenius 1975, Billings 1978, Johnson 1979, Braun 1980).

There are few quantitative assessments of alpine breeding bird populations. Such data are basic to understanding the ecology of alpine birds and to the preservation of their habitats (Freedman and Svoboda 1982). This paper describes features of the passerine breeding bird population of an alpine habitat in the southern Snake Range of east-central Nevada.

STUDY AREA

I conducted the study above timberline (about 3350 m) on Bald Mountain in Great Basin National Park, 62 km southeast of Ely, Nevada. Bald Mountain (3524 m) is shaped like a shallow inverted bowl and joined to the higher and larger mass of nearby Wheeler Peak by a long, narrow saddle. Wheeler Peak (3981 m), the highest peak in the eastern Great Basin, is the dominant feature of the local landscape.

Mean annual precipitation is about 76 cm, most of it falling as snow in late winter (Beasley and Klemmedson 1980). Large and persistent snowfields are on the north-facing slope of the alpine zone on Bald Mountain. Soils, derived mostly from quartzite, are shallow and rocky. Boulderfields and talus slopes are scattered throughout the area. Over 40% of the study site is covered by rock.

There has been little or no grazing by domestic livestock in the alpine environments of Bald Mountain and Wheeler Peak (R. P. DeMeule, pers. comm.). The only access is by foot or horseback. There is substantial recreational use, especially along developed trails.

At their lower elevational limits the treeless slopes of Bald Mountain grade into the mixed conifer forest of Engelmann Spruce (*Picea engelmannii*) and Limber Pine (*Pinus flexilis*) typical of the Snake Range. The alpine vegetation is open and scanty, consisting mostly of low perennial herbs. Common grasses and forbs include Alpine Fescue (*Festuca ovina*), Skyline Bluegrass (*Poa epilis*), Alpine Avens (*Geum rossii*), Powder Phlox (*Phlox pulvinata*), and Moss Silene (*Silene acaulis*). Blackroot Sedge (*Carex elynoides*) is locally abundant. Alpine Prickly Currant (*Ribes montigenum*) occurs in scattered clumps (M. E. Lewis, unpubl.).

METHODS

Using the Williams spot-mapping method (International Bird Census Committee 1970), I censused a 20-ha plot for breeding birds. Oelke (1981) summarized the methodological difficulties and limitations of this mapping method. I chose the plot location that best represented the alpine environment on Bald Mountain. In general, the square plot straddled the summit of the mountain with the sides of the plot sloping downward in all directions. The lower boundaries of parts of the plot approached timberline. The plot was surveyed and gridded in a Cartesian coordinate system with points numbered with stakes at 75-m intervals.

I made 10 census visits annually to the plot between 20 June and 21 July from 1981 to 1983 and did most of the census work from sunrise to late morning. With the exception of the large snowfields on the north-facing slope, I censused the plot by walking within 50 m of all points on the grid, varying the census routes through the plot. At the end of each annual sampling period, I marked concentrated groups of observations and coded activity patterns to indicate areas of activity or approximate territories. Fractional parts of boundary territories were included in the results. Species richness was expressed as the total number of bird species nesting on the plot.

Plant names are from Welsh et al. (1981). Bird nomenclature follows the 1983 AOU check-list (American Ornithologists' Union 1983).

RESULTS AND DISCUSSION

The density of breeding birds occupying the alpine census plot ranged from 3.7 to 5.2 pairs over the 3-year period of study (Table 1). There were 37 to 52 individual breeding birds/km^2. Total standing crop biomass ranged from 7.8 to 10.2 g/ha. Only two species, both passerines, were breeding birds on the study plot. The most common of these was the Water Pipit (*Anthus spinoletta*), which I found generally throughout the plot. The Rock Wren (*Salpinctes obsoletus*) was less common and found only in more restricted habitats. Rosy Finches (*Leucosticte arctoa*), although frequent visitors to the plot, apparently nested off the area in nearby cliff habitats. The Rosy Finches were *L.a. atrata,* which breeds in alpine habitats from central Idaho, Montana, and Wyoming south to southeastern Oregon, east-central Nevada, and central Utah (American Ornithologists' Union 1983).

Other species, observed as occasional visitors to the alpine zone (less than 10 observations annually), included the Broad-tailed Hummingbird (*Selasphorus platycercus*), Clark's Nutcracker (*Nucifraga columbiana*), American Robin (*Turdus migratorius*), Townsend's Solitaire (*Myadestes townsendi*), Mountain Bluebird (*Sialia currucoides*), and Dark-eyed Junco (*Junco hyemalis*).

Less frequently observed birds (less than five observations annually) were the Northern Harrier (*Circus cyaneus*), Red-tailed Hawk (*Buteo jamaicensis*), Golden Eagle (*Aquila chrysaetos*), American Kestrel (*Falco sparverius*), Violet-green Swallow (*Tachycineta thalassina*), Common Raven (*Corvus corax*), Mountain Chickadee (*Parus gambeli*), and Cassin's Finch (*Carpodacus cassinii*). Most of the visitors observed in or flying above the alpine habitat were inhabitants

of subalpine plant communities and visited the alpine only sporadically. Raptors occurred more commonly from mid-summer to late summer.

Water Pipit

The Water Pipit was the dominant breeding bird of the alpine zone in both numbers and standing crop biomass (Table 1). It was widely distributed on the study tract. Pipits established territories on a variety of topographies, but highest densitites were on the steep and relatively wind-sheltered, north-facing slope where territorial boundaries were contiguous and sometimes overlapping (Figure 1). Most of the breeding territories on the north-facing slope included parts of extensive snowfields that persisted summer-long on that aspect. The amount and distribution of snow in the spring are important in determining when and where birds breed in alpine habitats (Weeden 1960). Also, as noted by Pattie and Verbeek (1966), snowfields provide important habitats for the Water Pipit. Pipits on Bald Mountain often foraged for cold-numbed insects on the surface of the snow. Water from melting snowbanks contributed to a more mesic environment on the north-facing slope where grass and forb ground coverage was notably higher than on other aspects. I recorded Water Pipits least frequently on the windward side of the plot, where strong westerly winds were the rule and where vegetation was less abundant and boulderfields and talus more common.

I found two Water Pipit nests, one on 27 June that contained five eggs and the second on 6 July that contained four eggs. Incubating females were flushed from the nests when discovered. Nestlings were last observed on 20 July. Both Pipit nests were sunk in sloping ground and sheltered from above, one by an overhanging rock and the other by a thick mat of Alpine Avens. Nest locations fit Verbeek's (1970) descriptions as "rock nests" and "sod nests."

Table 1 Density, Standing Crop Biomass, and Other Attributes of Passerine Breeding Birds, Bald Mountain, Southern Snake Range, Nevada, 1981-1983

Species	Foraging category	Nesting substrate	Population density (pairs/20 ha) 1981	1982	1983
Water Pipit	Ground insectivore	Ground	3.5	3.7	3.7
Rock Wren	Ground insectivore	Rocks	1.7	+[b]	1.0
Rosy Finch	Ground omnivore	Cliffs	+	+	+
Number of breeding species			2	1	2
Total pairs/20 ha			5.2	3.7	4.7
Total individuals/km^2			52	37	47
Standing crop biomass (g/ha)[a]			10.2	7.8	9.4

[a]Species weights from Dunning (1984).

[b] + indicates that a species was only infrequently observed or that breeding territories could not be delineated.

Rock Wrens

Rock Wrens were irregular and relatively uncommon breeding birds on the alpine study plot (Table 1). I located all or parts of only five separate breeding territories within the boundaries of the 20-ha census plot during the 3-year

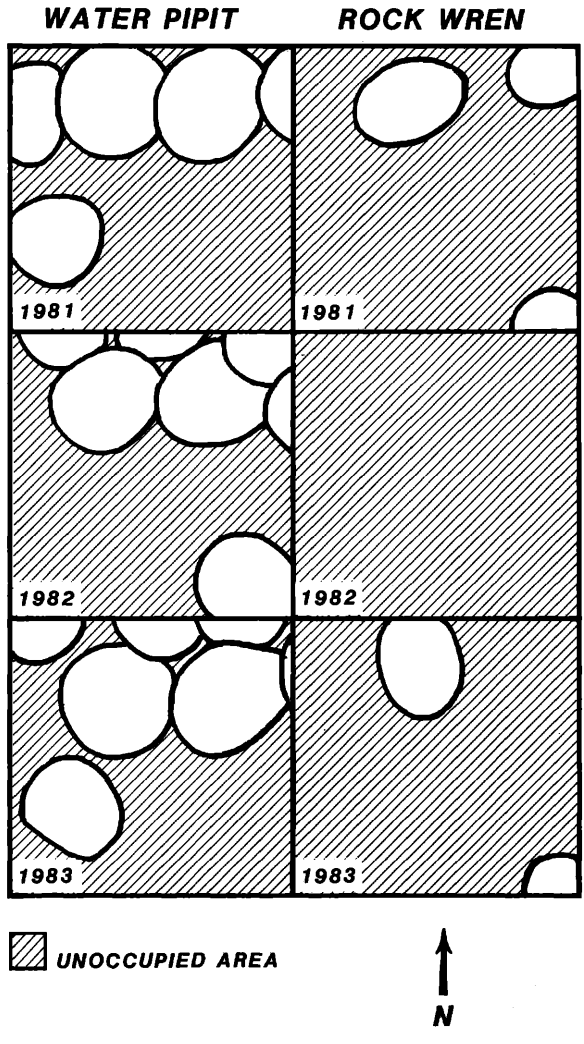

Figure 1. Annual dispersion patterns of Water Pipit and Rock Wren territories on the 20-ha alpine study plot.

study (Figure 1). These were centered on shattered outcroppings of exposed bedrock or, in one case, on a steep talus slope. Weather may have been a factor in the failure of the Rock Wren to establish breeding territories on the study plot in 1982. Spring was unusually late that year and alpine snowfields were larger and persisted longer. Snow still covered almost half the study plot in late June 1982.

I found no nests of the Rock Wren but observed territory establishment, singing, courtship, pairing, and other breeding activities. Later, I saw adult Rock Wrens carrying food items as they flew nearby.

Rosy Finches

I often saw Rosy Finches on the alpine zone of Bald Mountain both as single birds and in small groups of up to 10 or more. Paired birds or groups of three to five birds that included both males and females were most common. Finches were seldom seen below an elevation of about 3350 m.

Spot-mapping methods are inappropriate for censusing the Rosy Finch. The mapping method applies primarily to territorial and noncolonial passerines and other species of birds that have similar dispersion mechanisms and distribution patterns (International Bird Census Committee 1970). The "territory" of the Rosy Finch is centered around the female and varies in location and size with the movements of the female. It is the female rather than an area that is defended (French 1959). Thus, estimates of breeding densitities for the Rosy Finch are not listed in Table 1.

Rosy Finches did not nest on the Bald Mountain study plot. They apparently nested in the cirque headwalls, cliff faces, and talus slopes above treeline on nearby Wheeler Peak. Their flights to and from Bald Mountain were almost invariably in the direction of Wheeler Peak. French (1959) noted that nest sites of the Rosy Finch may be widely separated from feeding areas.

Rosy Finch activities on Bald Mountain were devoted largely to foraging. Most foraging took place on the surface of the snow, along the margins of receding snowbanks, or on snow-free areas adjacent to snowfields. Cold-numbed insects were apparently gleaned from the surface of the snow. Much of the food of Rosy Finches consists of seeds (French 1959), but insects can be a major food item, especially early in the breeding season (Twining 1940). I saw Rosy Finches most often on or near the snowfields that persisted on the north-facing aspect of Bald Mountain.

ACKNOWLEDGMENTS

I gratefully acknowledge the valuable field assistance of J. Russell Groves and Michael D. Carter. John Shochat of the Humboldt National Forest at Baker, Nevada, and Warren P. Clary of the Forestry Sciences Laboratory at Boise, Idaho, provided support and contributed in many other ways.

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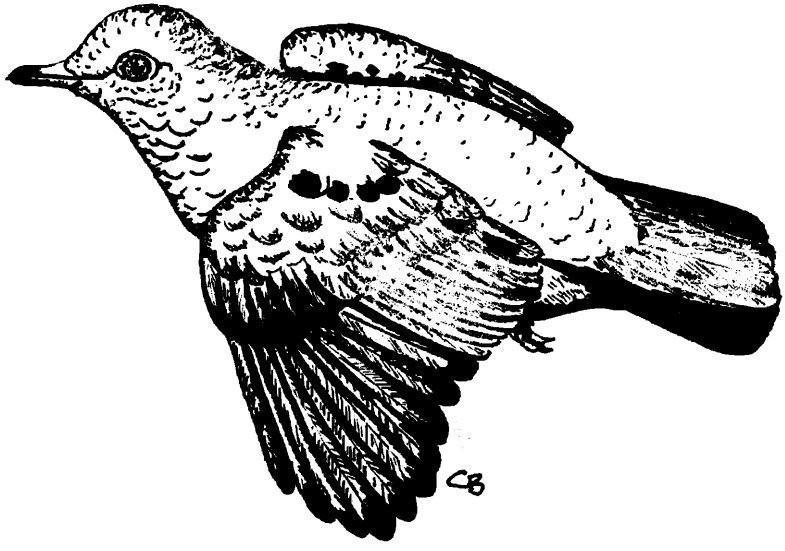
Accepted 3 October 1987

Water Pipit hatchling and egg. Frobisher Bay, Baffin Island, N.W.T., Canada.

Photo by Jeanne A. Conry



Common Ground-Dove

Sketch by Cameron Barrows