

SNOW BURROWING BY COMMON REDPOLLS (*Carduelis flammea*)

Joan E. Collins¹ and John M.C. Peterson²

¹P.O. Box 556, Long Lake, NY 12847

²477 County Rte 8, Elizabethtown, NY 12932

Abstract

The Common Redpoll (*Carduelis flammea*) is an irruptive winter visitant in New York State. A moderate invasion began in October 2001, reaching the study site at Long Lake, Hamilton County, by mid-January 2002, with flocks remaining there until late April. Observations made at the site within the Adirondack Park over a three-month period include snow bathing, subnivean¹ snow burrowing, what the authors call "snow snake" behavior, and the use of aptly-named "snow nests." Certain of these activities seem social in function, and while some have been previously reported from the Adirondack Park, Alaska, Finland, and Maine, others appear to be described for the first time.

Introduction

The Common Redpoll is a circumpolar cardueline finch, found nesting in both the Nearctic and Palearctic. In North America, the species nests from Alaska to Newfoundland in a habitat of tundra with dwarf trees, shrubby areas, and in taiga forest, although in the Old World those that nest as far south as the British Isles have begun to occupy hedgerows, "and even gardens" (Sharrock 1976). In New York State it is an irruptive winter visitant, absent to rare in some years, common to abundant in others (Bull 1974). Flocks of Common Redpolls arrive as early as October and may linger as late as May, feeding on birch catkins, in weedy fields, and visiting bird feeders, during those winters that they move south into the state (Well and Wells 1998).

A moderate invasion in the winter of 2001-02 began to reach the Adirondack-Champlain region on 28 Oct, when a flock of eight Common Redpolls were noted at Hadley Pond, Essex County. By November, they were widespread, soon becoming the most abundant winter finch, both at feeders and in the wild, across northern New York. On 16 Jan, a large redpoll flock of over 100 individuals arrived at the home of Collins on Tarbell Hill Road, Town of Long Lake, Hamilton County, with up to 150 birds present for much of the winter, the last lingering there until 21 Apr.

The winter of 2001-02 was exceptionally mild and snow-free across much of the state, due to a continuing drought and warming trend. Even in the Adirondack-Champlain region, the northern areas near Québec and eastern

¹ "under the snow," applied generally to zoological subjects, whereas "subnival" (or "sub-nival," cf. Cade 1953) refers to botanical subjects, or plants.

portions near Lake Champlain saw bare ground for much of the winter and seasonal temperatures some 8°F above average. In the western Adirondacks, however, including Long Lake, west of the shelter of the High Peaks, there was considerable lake-effect snow. Mid-winter saw snow depths of up to two feet (61 cm) on the ground. Even more importantly, as events were to show, the depth of the snow on roofs was 18 inches (46 cm).

On 18 Jan, two days after the arrival of the Common Redpolls at Long Lake, Collins began to observe their varied and interesting activities around the property, a former ecclesiastical retreat and school, now a family residence. These observations were to continue on an almost daily basis over the following two months, ending only with the arrival of spring and with the departure of the last redpolls in late April. The site of the observations is located on The Pinnacle at 1,938 ft (591 m), about 1.6 miles northeast of the (new) Long Lake Post Office. The current structures, which proved critical to many redpoll activities, include the two-story, wood-sided main house (30 ft. x 50 ft.), a garage 124 ft. away, another building 250 ft. away, an Adirondack lean-to 102 ft. from the house that was a center of much activity, and another lean-to and two outbuildings several hundred feet away. Except for a five-acre lawn, the house is bordered and surrounded by northern mixed forest. The habitat is a rich admixture of maturing second-growth balsam fir (*Abies balsamea*), red spruce (*Picea rubens*), Eastern white pine (*Pinus strobus*), quaking aspen (*Populus tremuloides*), yellow, paper, and gray birches (*Betula alleghaniensis*, *B. papyrifera*, *B. populifolia*), American beech (*Fagus grandifolia*), American elm (*Ulmus americana*), hawthorn (*Crataegus* sp.), common chokecherry (*Prunus virginiana*), striped, red, and sugar maples (*Acer pensylvanicum*, *A. rubrum*, *A. saccharum*), and white ash (*Fraxinus americana*). Redpolls frequented the sides of the house bordered by forest, and they were never observed on the open area of lawn.

Common Redpolls commenced their activities as early as first light (circa 7 a.m. EST during February in the Adirondacks, and as early as 6:15 a.m. by mid-March). Behaviors observed included snow burrowing, snow bathing and the possibly related construction of "snow snakes," and the use of "snow nests." These activities were carefully documented by daily notes, videotape, and still photography.

History

Snow bathing and the excavation of snow burrows by Common Redpolls have been previously observed in New York State (Furness and Peterson 1987). They noted earlier reports of these activities (Cade 1953, Clement 1968, Palmer 1949), but the burrowing in a snow-covered roof at Mineville, Essex Co., to construct small caves for roosting and apparent heat conservation which Furness and Peterson discussed seemed at the time to be a newly-described activity: "This appears to be the first recorded observation of such activity by Common

Redpolls, although the number of birds involved suggests that such protective burrowing may be a well-developed trait in this northern species." Life histories of Common Redpolls later published on both sides of the Atlantic (Cramp and Perrins 1994, Knox and Lowther 2000) revealed that such roosting in self-constructed snow burrows had previously been described from Finland (Siivonen 1963, Sulkava 1969), and there had even been an experimental study of temperature in snow-refuges (Korhonen 1981). Sulkava (1969) reported redpolls making tunnels 27-40 cm long, some 6-11 cm beneath the surface to a roosting chamber, breaking the roof of the chamber for departure. Except for the first-hand description of activity on a snow-covered roof on Mt. Desert Island, Maine, by Mrs. E.A. Anthony (Palmer 1949, Clement 1968, Furness and Peterson 1987), there seems little suggestion in the literature that this might be a social activity, as well as a search for shelter or food. The activities which the present authors describe as "snow snakes" and "snow nests," both of which were documented on videotape by the senior author, receive no mention in the major life histories of Common Redpolls, but appear to be regular behaviors, based upon the winter observations at Long Lake.

Snow Bathing

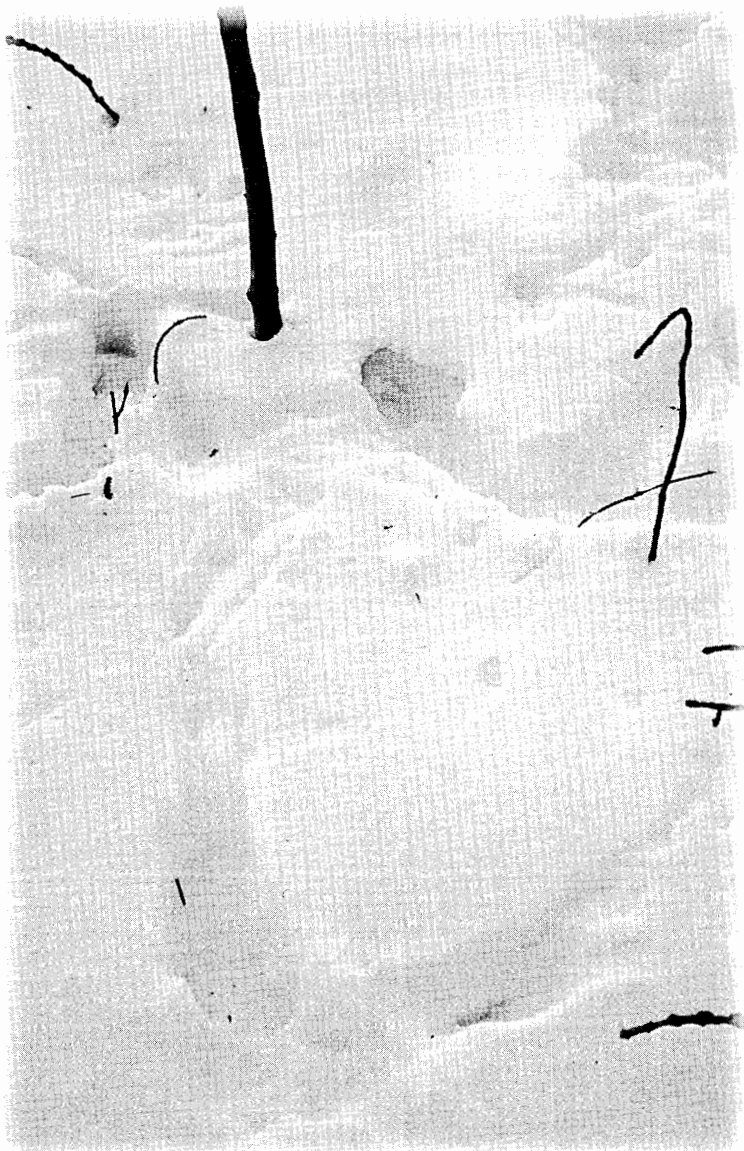
Snow bathing was first observed on 19 Jan, not at Long Lake, but at the Adirondack Park Agency Visitors' Interpretive Center in Newcomb, Essex County, where Collins observed several Common Redpolls from a larger flock, wing-fluttering and hovering in powder snow that covered a leaning tree, using their heads to dig at the snow, while fluttering their wings. Subsequently, such activity was observed frequently at the Long Lake study site, but included some interesting variations that went beyond simple bathing in surface snow on the ground or roofs. On 18 Feb, redpolls were observed snow bathing by flying up through conifer branches so the snow would shower over them. Wings flapped as if water bathing, and there was much aggression over spots with snow on trees. On 22 Feb, they engaged in snow bathing by flying from one branch to another to create a snow shower. On 27 Feb they showed much interest in snow-covered balsam firs and bathing in trees, birds showering themselves with snow up and down the branches, sometimes flying up through, but sometimes sliding down, a branch. The same day saw active bathing against snow-covered tree trunks and in branches of deciduous trees, as well as balsams, with as many as 150 redpolls involved, some hopping and sliding down drooping branches to lower branches and creating snow showers in the firs. This snow sliding and snow showering was repeatedly observed throughout the winter. By 8 Mar, while eating buds in a maple, they ate, preened, and snow bathed, sticking their heads under the snow on a branch, then showering themselves with snow and fluttering their wings. On 12 Mar redpolls would dig holes in the snow up to their heads, then throw back their heads to shower their bodies with snow, also snow bathing on the lean-to roof.

Following a fresh snowfall on 23 Mar, members of a flock of 200 Common Redpolls would hop along snowy branches, so there were continuous snow showers falling from the trees, while others hopped along the ground, wing-flapping and snow bathing.

Snow Burrowing

This subnivean activity was first noted on 18 Jan, when a flock of over 100 Common Redpolls was engaged in considerable activity on the roof of the nearest lean-to, then covered with over two feet of snow. They were creating holes, disappearing inside, and then redpolls would suddenly emerge from the snow in places all over the roof. This behavior seemed to attract Black-capped Chickadees, who flew over and found places to alight on the eaves. On 5 Feb, the lean-to was covered with 1 & 1/2 ft. of consolidated snow, a layer of ice, and 3 inches of fresh powder. Redpolls would land hard and predominately use their heads to excavate burrows. They also dug burrows on the porch roof of the house and against large white pine stumps, seeming to prefer surfaces with a bit of a slope and not quite vertical. Up to 15 birds were involved at a time, and the ideal snow conditions provided a perfect substrate for the activity to continue almost daily into late March.

The length of these tunnels was first suggested on 6 Feb when one of 10-15 Common Redpolls was observed tunneling from a hole, and its dark image could be seen moving horizontally just under the surface as the bird created a tunnel perhaps a foot long, before emerging suddenly from a new hole at the end. Burrowing was first noted on the main roof of the house 15 Feb, a day of feverish activity. Up to 15 birds on the lean-to would dig holes with their heads, slowly sinking out of sight as they dug deeper. There would be a frenzy of digging, followed by several seconds of quiet roosting behavior with only the heads, or even no parts, of the birds visible. One horizontal tunnel also appeared 1 & 1/2 ft. long, and was worked on by multiple individuals. On occasion, a redpoll would fly in and evict another that was digging, taking over the snow burrow. Several that day were simultaneously creating burrows in ground snow for the first time, using their heads to dig so deep that they slowly sank out of sight. Burrows against the snow on the sides of the pine stumps again showed the birds preference for less than vertical surfaces. When a redpoll would start this activity, it would attract others, and often an aggressive eviction of the digger would occur, seemingly similar to the reaction when a bird discovers another's food source. They also excavated burrows near emergent weeds protruding above the snow. The house and porch roofline edges and top surfaces were pocked with holes, and they frequently drilled into the eave of the lean-to, as well as on the actual surface of the roof.



3/23/02
Common Redpoll ground burrows and tunnels.
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By 18 Feb, there were at least 25 Common Redpolls digging and tunneling on the lean-to roof alone. Heads would pop up 1 & 1/2 feet from where they dove in. One redpoll would start the digging, and others immediately follow its lead. Aggressive behavior was regularly evident. One digging redpoll, for example, turned on an aggressor with the Threat-gaping display (Cramp and Perrins 1994, p. 649, Fig. E), an open-billed posture, and the aggressor backed down and started digging its own tunnel. All of this activity was highly social, and examination of the videotape, as well as first-hand observations, suggests a sense of play, a controversial subject in zoology. A high level of activity preceded the digging behavior, with a more subdued atmosphere after. The same day there were new burrows on both the house roof and porch roof.

Typical digging was performed by 15 Common Redpolls on 19 Feb. They would lean forward and use their heads to excavate the snow, moving forward with their feet and continuing to use their heads to dig. At times they would use their wings to hover until a good foothold in the snow could be secured, and this tended to happen near more vertical sections of snow. During seven minutes, between 7:48-7:55 AM., they would disappear completely from sight. Again, quite a bit of fighting was observed, both aggressive and defensive behavior, over the snow burrows, and after the digging, a lull in activity followed. Activity increased at 8:30 AM. and digging resumed at 8:42 AM., while redpolls were also going into and under the lean-to, in a typical burst of activity.

On 27 Feb, Common Redpolls were excavating snow burrows and tunnels on tree branches. One redpoll tunneled into the snow on a slight down slope, toward the end of the branch, for 1 & 1/2 feet, remaining in the tunnel for two minutes. The bird's head suddenly emerged; the bird stayed in this position for several more seconds, and then flew up, creating a new hole at the far end. The snow on the front porch roof was riddled with over 30 fresh holes. The following day, a redpoll tunneled through snow on a branch, its dark image visible beneath the surface as it progressed. The bird then remained still for a minute before the head appeared. Total time under the snow was just over two minutes. As one bird excavated snow on a branch, another redpoll suddenly popped up through the snow from a lower spot. Yet another used its feet to dig down until it could switch to using its head for digging. Another common strategy when digging on level snow was to utilize the momentum of a hard landing to gain a head start. A bird in a tunnel begun the previous day went under the snow twice for over 30 seconds, popped up six inches from where it started, only to have another head emerge three inches in the other direction.

Only a few inches of snow were left on the lean-to roof by 12 Mar, so just a few of the flock of ~100 Common Redpolls were digging there. With more snow available on 22 Mar, high winds, and a 9°F daytime temperature, digging was back in full swing, with holes, cavities, and tunnels everywhere. The three inches of snow on roofs was insufficient for tunneling, but birds did dig cavities. The eight inches on the ground, however, provided plenty of snow for tunneling.

In addition to the front, back, and side of the house, they were digging near downed trees, on the slopes of stumps and tree trunks, and near large boulders—anywhere they could find a sloped, snowy area. Near downed trees, the redpolls utilized areas under and all through them. They also dug near weeds, perhaps because snow is generally not as compacted there, and they may find hollow areas. There is no evidence that redpolls feed there (*contra* Cade 1953 and *per* Clement 1968). That so much digging was at or near ground level on 22 Mar, when earlier it had been predominantly higher, suggests that redpolls prefer to dig high— or at least off the ground— when conditions allow. By 23 Mar, some of the digging appeared to be related to bathing, with the redpolls tossing their heads up and showering themselves with snow and some wing fluttering.

For the purpose of measurements, we refer to “caves” and “tunnels,” to differentiate between simple cavities excavated downward into the snow and the longer excavations with a more horizontal axis, often with both entrance and egress points. A sample of measurements:

27 Feb

Caves, lean-to roof:

5-8 cm deep

Tunnels, lean-to roof:

36 cm long, 8 cm deep

40 cm long, 6.5 cm deep

60 cm long, 7 cm deep

Tunnel, front porch roof: 33 cm long, 6-7 cm deep

22 Mar

Caves, ground:

6-8 cm, occasionally 5.5 cm up to 12 cm deep

Tunnels, ground:

15 cm long, 8 cm deep, with 6 cm burrow cavity off the tunnel

26 cm long, 6 cm deep, 8 cm wide, with a 7 cm burrow cavity off the tunnel

30 cm long, 6 cm deep, with a 10 cm burrow cavity off the tunnel

23 March

Caves, ground:

6-8 cm deep

Tunnels, ground:

10 cm long, 6 cm deep

15 cm long, 6 cm deep, with a 7 cm cavity off the tunnel

31 cm long, 6 cm deep

40 cm long, 9 cm deep, with a 7 cm cavity off the tunnel

47 cm long, 6 cm deep

51 cm long, 6 cm deep

55 cm long, 9 cm deep

55 cm long, 7 cm deep* / 80 cm long, 7 cm deep*

*The last two measurements appeared to be one long tunnel, but took a 90° turn, so were measured as separate tunnels, and it is possible that two different redpolls worked on it. This was an amazing tunnel that was still mostly intact, even in the wind. If considered as a single tunnel, the entire length was 135 cm, or ~1.35 meters.

“Snow Snakes”

Although we can find no previous mention of this behavior, which we call “snow snakes,” after an old game played with sticks, that left similar, if larger tracks in the snow, it was relatively common to see after first being observed on 5 Feb. A Common Redpoll would land hard on the powder snow on the ground, so it would start out being up to its chest in snow. The bird would then hop or shoot to another spot, but never leave contact with the surface of the snow. The result was patterns of lines in the snow, all over the yard and woods, with interspaced round depressions from landings. Birds gave the impression that they were flopping around in the snow, shooting off in a straight line, only to curve left, then right, then in another direction. At times this was linked to feeding/foraging, but at other times they hopped in random directions with no apparent purpose. When the redpolls were done with this activity, it appeared that someone had drawn lines and curves all over the surface of the snow with a stick. This seemed to be an activity only engaged in when the large flock was present. Smaller numbers seemed more subdued and less exuberant. Unless somehow related to bathing, the only impression of their scooting around was of a purely social activity, as if for enjoyment.

“Snow Nests”

Again, we can find no mention of the use of clumps of surface snow on branches for various activities by Common Redpolls, yet it was witnessed numerous times at Long Lake, suggesting that this is a regular behavior in the species, given the correct conditions. First witnessed on 13 Feb, the redpolls created “snow nests” at the ends of branches of a balsam fir near the house. The snow was heavy in the trees, and much had collected on the ends of the branches. They would hop into the middle of these snowy areas, digging with their heads, and create what appeared to be nests of snow. The redpolls would nestle down and roost briefly in these, with one remaining for over a minute. They would eat the snow and occasionally flap their wings a bit. In one “snow nest,” five different birds took turns roosting in the nest for more than several minutes. At times, individuals would leave by choice, and at other times they would aggressively be evicted by another seeking the nest. Even when the wind had blown snow out of the trees by 14 Feb, the prior day’s activity had packed down the “snow nests” and preserved them, and the redpolls continued to use them.

Common Redpolls also took sunflower seeds back to these snowy spots on the ends of branches with fresh powder snow. On 18 Feb they would masticate the seed, then put it down, pick it up and chew at it, put it down again, and so forth, at their leisure. On the same day, while using the “snow nests” to eat seeds, they were also fighting over these spots. Redpolls seem to prefer eating seeds on snowy branches, even without “nests.” One hopped along a bare cherry branch until it came to a snowy spot that would hold its seed, as the redpoll picked it up and put it down several times. When there was no snow on branches, redpolls were observed taking seeds to snowy areas on roofs or the ground to eat. However, even with snow on the ground, on 5 Mar, when no snow was present on branches, they additionally used the branch ends with needles on balsams to hold seed, and continued to do so through 17 Mar. No redpolls were observed taking a seed to a bare branch to eat. Redpolls were not observed to use their feet to aid in eating sunflower seeds, as observed in Black-capped Chickadees, but rather used snow or conifer branch needles to hold the seeds, while they worked to open them with their bills.

Discussion

Common Redpolls have evolved to survive in harsh, snowy winter conditions. That they would devise strategies to endure is hardly surprising, and many of their evolutionary adaptations are well-studied, such as their diverticula—or expandable pouch in the esophagus—where they can store seeds for later regurgitation and swallowing (Knox and Lowther 2000). Little, however, has been published on winter activities and behavior. In order to conserve body heat, especially when fluffed out in night roosts, feathers need to be clean, so snow bathing is an obvious practice. The purpose of the subnivean caves and tunnels is less clear. Previous researchers, including the junior author, have suggested heat conservation. That may well have been the case at Mineville (Furness and Peterson 1987), where the birds roosted in snow caves with their heads outward. Yet the brief bursts of activity (and considerable expenditure of energy) in digging long tunnels is unclear, where the energy outlay seems to exceed any benefit. Observations, and later videotape review, suggest a social function, as well. So too with the “snow snakes” and to a certain extent with the use of “snow nests,” at least for simply sitting, as opposed to feeding. In flocking birds, such social interactions may be important for anything from bonding to hierarchy. Only recently have we begun to recognize the dominance order and social structure of Common Ravens in winter, and it may be some time before we understand the same in Common Redpolls. Meanwhile, they provide a delightful, if irregular, addition to the winter avifauna of New York State and northern climes.

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