Snow roosting behavior of immature Ruffed Grouse.[1]—During a radio-telemetry project in 1964 at the Cloquet Forest Research Center, University of Minnesota, Cloquet, Minnesota, I was able to watch the roosting behavior of wild Ruffed Grouse (*Bonasa umbellus*) of known age when faced with their first snow conditions.

Grange (Wisconsin grouse problems, Madison, Wisconsin Conserv. Dept., No. 328, 1948, p. 169) notes that "Ruffed grouse habitually plunge into loose snow after it attains a depth of ten inches." A powdery snowfall of 7.9 inches, with accompanying moderate northwest wind, began prior to dawn on 27 November 1964. This was the first snow of measureable depth at Cloquet and by 11:00 c.s.t., with ambient temperature of 7°F, it had drifted to over 12 inches deep in the lowlands. The snow accumulation persisted well into December. During this time an immature male and an immature female grouse were being monitered and tracked.

At 11:49 on 27 November when the male was being located, his transmitter signal was unusually strong considering the air temperature. Radio transmission is improved by height above base level and I assumed the bird was occupying a tree in a nearby alder (*Alnus rugosa*) swale, but even with binoculars I could not see him in any tree at the location point. As I moved closer to the location a null in signal reception indicated that the bird was within 25 feet. I then noticed the entrance of a grouse snow burrow in the surface directly in front of me. When I reached down to this depression a gray-phase grouse flushed 1 foot beyond the hollow. Immediately another grouse flushed from a similar burrow 20 feet away. As this second grouse flushed, the radio-marked male erupted 2 feet from it and flew, as did the others, into an adjacent stand of spruce (*Picea glauca*) and balsam fir (*Abies balsamea*) surrounded by a mixture of aspen (*Populus* spp.) and paper birch (*Betula papyrifera*). The radio signal quickly became steady upon landing, indicating inactivity. While I was checking his burrow, another gray-phase grouse flushed 3 feet away, also flying south into the conifer area. Grange (ibid.) notes that "the alarm of one (grouse) appears to notify the others of danger."

The four burrows were similar to those described in the literature, being hollows 2½ to 4 feet long, angling downward at 20 to 45 degrees from the surface. The direction of entrance indicated that the birds were traveling southeasterly, evidently coming from a clone of mature aspen 100 feet to the northwest where grouse often fed on the buds.

On 3 December I observed a feeding and burrowing sequence by the immature female. She fed in an overmature, staminate aspen from 16:46 to 17:04 and flew from the upland southwest to an alder, spruce-fir lowland. At 17:14, when it was quite dark (sunset at 16:21), I flushed her from the snow burrow. She flew directly south and alighted on the edge of a field where the snow depth was insufficient for a successful burrow. She then walked 52 feet southwest into a grove of balsam fir and spent the rest of the night in a slight depression, or "snow-bowl," at the base of a fir.

At 11:54 on 29 November I found this female in a different situation. She was under the lower boughs of a balsam fir where the snow was 6 inches deep. She had walked there after landing 20 feet to the northwest and then buried herself in the snow with only her head visible.

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[1] Paper 6998, Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minnesota 55101.

These radio-marked grouse were birds of the year and had never before experienced snow. Yet with the coming of the first snow of adequate depth, they did not hesitate to roost in it. Within a few hours after snowfall these birds started active burrowing and in a few days were seen using several snow roosting patterns.

A direct indication of the insulating value of a snow burrow is the increased signal strength of the transmitter, correlated to the warming of the power cell by retention of body heat in the burrow. The warming of the transmitter package resulted in optimal current output and maximum transmission strength.

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A method for obtaining food samples from insectivorous birds.—An analysis of niche differentiating mechanisms separating two sympatric species of swallows nesting near Ellensburg, Washington, prompted the development of a technique for analyzing the birds' food habits without destroying them. In this instance, a small population of Barn Swallows (*Hirundo rustica*) and Cliff Swallows (*Petrochelidon pyrrhonota*), nesting together under a bridge, was the object of the investigation.

The technique we developed, flushing the digestive tract and evacuating it completely with a warm 1 per cent saline solution, requires two men in the field, one to hold the bird and position the receptacle under the cloaca, the other to open the bird's mouth and insert the plastic tubing. A 10-cc disposable plastic syringe is filled with warm saline solution, and a flexible plastic tube, 16 cm long and 4 mm in diameter, is coated with Vaseline, and inserted gently into the esophagus until the tip rests against the stomach. The bird is held with a receptacle under the cloaca and its head downward to avoid filling the oral cavity with water and drowning it.

After the tube is inserted, the saline solution is forced gently into the digestive tract until it starts to flow from the cloaca. Pressure is then increased on the plunger, forcing the saline solution through the digestive tract, out the cloaca, carrying whole and particulate insects that are collected in the glass receptacle. Our samples consisted mainly of insect wings, heads, and elytra.

The technique works equally well on nestling and adult swallows. Nestlings present a special problem—if a fecal sac is present, it prevents the solution from flowing freely through the digestive tract. Often the nestlings eliminated the fecal sac during handling. When they did not, rubbing the abdomen in a posterior direction usually effected its elimination.

Marked adults continued normal nesting activity; follow-up observations made on the nestlings revealed no adverse effects. A few mortalities occurred during capture: 72 swallows (40 adults and 32 nestlings) were sampled with 6 mortalities consisting of 5 adults (6.94 per cent) and 1 nestling (1.38 per cent). In two of these birds dissected to determine the effectiveness of the flushing technique, the digestive tract was found completely evacuated except for a few food particles at the lips of the cloaca.

While useful in analyzing the food habits of insectivorous species of birds, attempts to apply the technique to adult seed-eating species were unsuccessful; apparently the gizzard inhibits the flow of the saline solution through the digestive tract.—DAVID T. MOODY, *Route 3, Box 111, Moses Lake, Washington 98837.*