

BLACK-BILLED MAGPIES (*PICA HUDSONIA*) CACHING FOOD IN SNOW

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ABSTRACT—I observed Black-billed Magpies (*Pica hudsonia*) in a residential backyard in Montana during November–December 2019 and February 2020, as they cached food 10 times in a snow cover 10- to 12-cm deep and recovered 3 caches from the snow. The magpies carried food items up to 7 m from a food source before caching them, and tended to cache more closely to the food source when alone rather than in the presence of other magpies. Most of the snow caches were on the ground, but 1 cache was made 1.5 m above ground in a snow-covered vine thicket, and a 2nd cache at the same height in snow accumulated on the roof of a parked trailer. Cached foods included chicken scratch (grains and cracked corn), sunflower seeds, crab apples, dried mealworms, and commercial suet. These observations appear to constitute the 1st report of Black-billed Magpies caching food in snow.

Key words: Black-billed Magpie, caching, food storage, Montana, *Pica hudsonia*, snow

Black-billed Magpies (*Pica hudsonia*) are quite adept at exploiting food resources that they encounter while engaged in other activities. Considered dietary generalists, magpies (including the Eurasian Magpie *Pica pica* and Yellow-billed Magpie *Pica nuttalli*) not only capture, scavenge, steal, and feed on a large diversity of plant and animal matter (Linsdale 1937, 1946), but they also hoard surplus food for future consumption (Goodwin 1976; Vander Wall 1990; Birkhead 1991; Trost 1999). Magpies usually cache food in the ground or on the ground in vegetation and under objects present on the surface (Hayman 1958; Simmons 1968; Henty 1975; Trost 1999); less often food is cached above ground in shrubs or trees (Buitron and Nuechterlein 1985). Caches created by magpies usually contain only 1 or a few items that are distributed in scattered locations (scatter-hoarded) rather than concentrated in larders at a single location (Vander Wall 1990; Birkhead 1991; Trost 1999). Storing surplus food for later retrieval is a behavior performed throughout the year, but especially during autumn and winter when food availability may be more restricted (Linsdale

1937; Simmons 1968; Deckert 1980; Buitron and Nuechterlein 1985; Birkhead 1991; Trost 1999).

I became aware that Black-billed Magpies were caching food in snow on 30 November 2019, when a group of 5 arrived in my backyard in Missoula, Missoula County, Montana (46.87228°N, 113.97787°W; 985 m elevation) at 08:55 MST. All of the observations I report here were made with the aid of a 10x binocular. At this time the ground and adjacent trees and shrubs were covered with 10 cm of soft new snow, and the ambient air temperature was –8°C, with light snowfall. The magpies settled to forage in a small, tarp-covered pen under a crab apple (*Malus* spp.) tree where we feed domestic chickens (*Gallus gallus*) at dawn. Foods available to the magpies included crab apples (in the tree and on the ground), sunflower (*Helianthus* spp.) seeds in the hull, cracked Corn (*Zea mays*), Proso Millet (*Panicum miliaceum*), wheat (*Triticum* spp.) and other grains, dried Mealworms (*Tenebrio molitor*), and commercial suet in a feeder suspended from the crab apple tree.

During 09:00–09:08 I saw 1 magpie cache 3 items in snow and recover 1 cache already in the snow. This magpie was the only bird with a small dark smudge on the white feathers of its right side, allowing me to distinguish it from the others. This same bird also displaced each of the other magpies when in the chicken pen with them, and performed a stretch display and flashed its white nictitating membrane in front of 1 of the other magpies, indicating that the uniquely-marked bird was a male (Trost 1999). Initially, this magpie fed on crab-apple fruit still attached to the tree above the pen. After plucking and holding the fruit against a limb with 1 foot and taking a few bites, it carried the fruit in its bill and flew about 4.5 m from the tree beyond the chicken pen to the snow-covered ground in the lawn. Here it made 2 to 3 sideways sweeps through the snow with its bill then poked the fruit into the snow pit to about bill-depth before making 2 additional sweeps through the snow to cover the cache. After

returning to the ground beneath the crab apple tree and picking up another fruit about 30 s later, the focal magpie flew about 5 m to the lawn <1 m from the 1st cache and cached and covered this fruit in the snow in the same manner as the 1st. From this 2nd cache it walked about 4 m without a fruit to a 3rd location, where it swept through the snow with its bill 2 times as though searching for something, took 2 to 3 steps and swept through the snow again, this time uncovering a crab apple or piece of crab apple, and ate 3 to 4 bites before flying to the chicken pen and joining the other magpies. Within 30 s it carried another crab apple into the apple tree and ate a few pieces before holding the fruit in its bill as it flew about 5 m to the snow-covered ground, whereupon it cached the fruit in a snow pit and covered it with snow using the same process observed twice before.

After rejoining the other group of magpies in the chicken pen, this same caching male flew by itself at 09:11 to the ground beneath a sunflower-seed feeder about 10 m from the pen and began consuming sunflower seeds. During the next 3 min it twice walked about 1 m from where it had been feeding and cached individual sunflower seeds about 0.5 m apart in mounded snow about 12-cm deep. The magpie, as with the crab apple caches, first swept aside snow with its bill before poking the seed in the pit, and then covered the pit with 1 to 2 sweeps of snow. At no time while the focal magpie was engaged caching crab apples or sunflower seeds did the other magpies show any interest in what it was doing or attempt to join it.

On 1 December 2019 a solitary magpie landed in the chicken pen at 09:32 and began foraging; the ambient air temperature was -14°C , with clear and calm conditions. This bird lacked the smudge on its right side, indicating it was probably not the same bird I observed making and retrieving caches the preceding morning. During the next 8 min, while this magpie remained in the pen, it paused foraging 3 times and walked to the 10-cm deep snow at the edge of the pen about 1 to 2 m away. On each visit it swept aside snow 2 to 3 times with its bill and poked its bill into the snow pit to deposit a piece of grain or corn, then did a couple more sweeps through the snow with its bill to cover the caches. Each cache took about 10 s to create and cover. In the absence of other magpies, this bird made its caches in the chicken pen only a short

distance from the food source and about 0.5 m apart, much like the sunflower-seed caches made by a different bird the preceding day.

At 08:31 on 18 December 2019, 2 magpies landed in the chicken pen and began foraging on the ground; ambient air temperature was -11°C , with clear and calm conditions and a 12-cm snow cover. At 08:34, while 1 magpie gathered a throat-load of seed and grain, the 2nd magpie picked up 3 dried mealworms in its bill, flew about 3 m from the ground to a perch 1.5 m above ground in a snow-covered Engelmann Creeper (*Parthenocissus quinquefolia*) along a fence at the edge of the pen, and immediately poked the mealworms into a snow pit about 5-cm deep with its bill, then swept soft snow 2 to 3 times over the cache to cover it before returning to the ground. This cache took about 20 s to create and cover after the mealworms were gathered. Neither of the original magpies appearing this morning was the distinctly-marked bird I observed cache-making on 30 November, but a magpie with this unique mark arrived with 4 others about 3 min after the mealworms were cached in the vine. At this time all magpies began foraging on the ground in the pen, and I observed no additional caching behavior.

At 08:30 on 19 February 2020, 2 magpies landed in the chicken pen; ambient air temperature was -8°C , with clear and calm conditions and an 11- to 12-cm cover of fluffy snow. The dominant individual gathered about 8 dried mealworms, then flew about 60 m to an adjacent yard and dropped to the ground out of my sight. While this bird was absent, the 2nd magpie continued to feed in the pen then departed. At 08:35, the 1st magpie returned to the pen, gathered several more mealworms in its bill, and flew 3 m to the roof of a parked trailer. The trailer roof was about 1.5 m above ground and covered with 11 cm of snow. The magpie jammed its bill about 5 cm into the snow then covered the cache with 3 sideways swipes of its bill through the snow and departed about 20 s after landing on the trailer. I photographed the undisturbed cache (Fig. 1A), then excavated it to verify its contents, which included fragments of about 6 mealworms (Fig. 1B), before covering the cache again with snow. The cache remained undisturbed until sometime between 08:05 and 12:05 the next day, when it was removed by a magpie (based on tracks in the snow) 23.5 to 27.5 h after it was made.

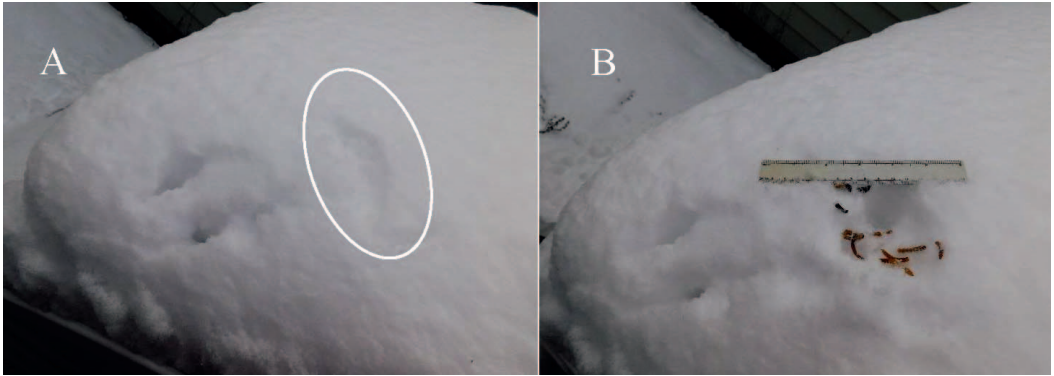


FIGURE 1. Food cache made in snow by a Black-billed Magpie (*Pica hudsonia*) in Missoula, Missoula County, Montana on 19 February 2020. (A) The cache site in 11 cm of soft snow atop a parked trailer, showing the 2 impressions left by the magpie's feet, and to their right the cache site in the oval showing the impression left after the magpie swept snow sideways with its bill and covered the cache; (B) The uncovered cache and its contents a short time after the magpie departed, showing fragments of about 6 dried mealworms (*Tenebrio molitor*) found at 5 cm below the snow surface; the ruler is 15 cm long. The cache was retrieved the following day, 23.5 to 27.5 h after it was made and the photos taken.

At 08:50 on 22 February 2020 (ambient air temperature was -7°C), I watched a lone magpie as it removed and swallowed 4 to 5 small pieces of commercial suet from a 5-cm-deep pit in a pile of snow about 30-cm deep that I had shoveled there 2 d earlier. It then ate 4 bites of snow and departed. The cache site was 7 m from a suet feeder, and was created no more than 48 h earlier. I could not find any more pieces of cached suet when I checked the site after the magpie left.

Similar to Eurasian Magpies (Birkhead 1991), as well as American Crows (*Corvus brachyrhynchos*) and Common Ravens (*Corvus corax*) (Kilham 1989; Heinrich 1999), distance between a food source and the location of a cache made by the Black-billed Magpies I observed appeared to be influenced by the presence of a nearby conspecific. When alone at a food source, caches ($n = 6$) were created a mean of 1.7 m ($s = 0.8$) from the source, but caches made in the presence of another magpie ($n = 4$) averaged 4.4 m ($s = 0.9$) from the source (two-sample t -test: $t = 5.05$, $df = 8$, $P = 0.001$). Based on this result it seems likely that the suet I saw retrieved on 22 February was also from a cache buried in snow when other magpies were in the backyard. The effect of conspecifics in influencing the distance caches are made from food sources is probably greater than that indicated here when considering all caches created using my yard as the

source of food. I could not see where caches were made much beyond my backyard, but it was obvious (based on swollen sublingual regions) that some of the birds were carrying food in their mouths out of the yard. Creating caches at greater distances from a food source when conspecifics are nearby is apparently an effort to reduce cache pilfering (Kilham 1989; Birkhead 1991; Heinrich 1999).

Other corvids living in northern latitudes sometimes cache food in snow. Common Ravens in Maine, New Hampshire, and Montana cache meat, suet, and bones in snow pits created in soft or crusted snow by thrusting the items carried in the bill directly into the snow, or first sweeping aside snow with the bill before placing the food in the snow pit (Kilham 1988; Heinrich 1999; P Hendricks, pers. obs.). In most cases, ravens cover the cached food with a few sweeps of the bill through the snow over the cache site. Likewise, American Crows in New Hampshire poke suet carried in the bill into pits made in soft or crusted snow (Kilham 1989), but have not been reported to sweep snow over their caches to hide them. For other corvid species living in similar regions and who cache large numbers of seeds or nuts for long periods of time, such as the Clark's Nutcracker (*Nucifraga columbiana*), a fresh snow cover appears to inhibit the creation of ground caches (Hendricks 2018), possibly because their long-term caches are placed in the

ground or other substrate but not the snow cover itself.

There are surprisingly few published reports of magpies of any species caching food in snow, and it is not mentioned at all in most comprehensive summaries (Linsdale 1937, 1946; Goodwin 1976; Birkhead 1991; Trost 1999). Birkhead (1991) noted that only 1 of 3184 caches made by Eurasian Magpies near Sheffield, England was placed above ground, in a drystone wall, which occurred when the study area was covered in snow, suggesting that the presence of a snow cover inhibited caching on the ground. Cramp and Perrins (1994) listed the few cases of snow caching by Eurasian Magpies, which include: (1) Deckert (1980) who noted that in Germany bones, bread, and fat remnants from garbage piles were hidden on the ground under leaves or in snow; and (2) Summers-Smith (1984) who watched 2 individuals in England as they cached bread and porridge oats 8 times in 15 cm of fresh snow on the ground at distances of 8 to 100 m from the food source, and then covered the caches with snow using a few sweeps of the bill. Trost (1999) wrote that Black-billed Magpies in Alberta gleaned live winter ticks (*Dermacentor albipictus*) from Moose (*Alces americanus*) during spring, and cached the ticks on bare ground rather than in nearby snow. The magpies I observed in Montana showed no hesitancy to cache surplus food in soft snow. However, use of a snow cover for creating caches may occur mostly when there is little snow-free ground available. On 25 February 2020, I watched a magpie cache the head of a female House Sparrow (*Passer domesticus*) in a snow-free patch of garden gravel and cover it with 4 pebbles. At the time, the backyard was about 10% bare ground.

Other than the comment by Trost (1999) regarding caching live ticks, I have found no mention of caching behavior by Black-billed Magpies as it relates to use of snow cover. Thus, the observations I made in Montana appear to be the 1st of snow caching by this magpie species, and agree in most essential details with those reported by Summers-Smith (1984) for Eurasian Magpies, including sometimes sweeping aside snow to make the cache pit, rather than pushing or thrusting the bill and food together when caching in the ground, which appears to be the common method (see editor's comment with Summers-Smith 1984; Birkhead 1991). One difference from Summers-Smith (1984) is that the

Black-billed Magpies I observed cached food in soft snow accumulated above ground on shrubs and other structures, as well as in soft snow on the ground.

Ravens, crows, and magpies often cache perishable items that must be retrieved within a few hours or days before they spoil (Buitron and Nuechterlein 1985; Vander Wall 1990; Birkhead 1991). With additional study, the duration of a snow cover and its specific characteristics (Pruitt 2005) may prove to be important variables affecting the frequency that snow is used by Black-billed Magpies as a medium in which to cache surplus food, as well as the length of time that caches remain in place before they are retrieved.

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