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Cavity-nesting by the Black-billed Magpie (*Pica hudsonia*)

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ABSTRACT.—We describe the first known instance of Black-billed Magpies (*Pica hudsonia*) nesting in a fully enclosed, pre-formed cavity. Magpies built an undomed nest of sticks in a nest box designed for Wood Ducks (*Aix sponsa*) near Olds, Alberta, Canada, in 2008. All nesting material was removed from the box after an apparently successful nesting attempt. Magpies built a new nest in the box and fledged at least four young in 2009. These observations indicate that cavity nesting is a distinct, novel behavioral trait that can arise in this species. We describe several potential costs of cavity nesting in this species, which may explain in part why this trait has not become established in any of the many studied magpie populations around the world. *Received 23 August 2010. Accepted 21 November 2010.*

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Species in many avian families nest in pre-formed cavities in trees, rocks, or other substrates. Cavity nesting presumably evolved in lineages in which nesting outside of cavities is ancestral (e.g., Hirundinae; Winkler and Sheldon 1993) when some individuals acted on a propensity to construct at least part of the nest within a pre-existing enclosed space. Cavity nesting then spread in the population because it resulted in relatively high fitness and was also heritable, either genetically or culturally.

Humans are rarely in a position to document the occurrence in nature of a distinctly novel, potentially adaptive behavior trait such as cavity nesting. We provide the first recorded case of Black-billed Magpies (*Pica hudsonia*) nesting in a fully enclosed, pre-formed cavity.

BACKGROUND AND OBSERVATIONS

Magpies of the genus *Pica* are permanent residents throughout much of the northern hemi-

sphere and are among the most studied bird species (Birkhead 1991, Trost 1999). Males and females typically work together to construct a large, domed structure made of sticks in a tree or shrub (Erpino 1968, Buitron 1988, Trost 1999). This dome is anchored by a grass-lined mud cup. The dome of sticks over the nest cup presumably decreases predation risk of adults, young, and eggs, especially by owls and larger corvids (Erpino 1968, Baeyens 1981). The dome usually has one, narrow, often difficult to identify entrance.

Our observations were in an area of mixed farmland ~8 km southwest of the town of Olds, Alberta, Canada (51° 45′ N, 114° 14′ W; 1,036 m asl). Magpies are common in this area and typically nest in willow (*Salix babbina*) trees, which grow throughout the local area in drainages and other untillable locations. KRS frequently observed magpies in late April 2008 near a wooden nest box constructed for Wood Ducks (*Aix sponsa*). This box had been erected in spring 2006 but was unused in 2006 and 2007. The box was mounted 4.1 m above ground on a live poplar (*Populus* spp.) tree, 25 m from open water at the edge of a slough. Magpies had built nests in several locations within 300 m of this tree in previous years although the nests were typically ≤3 m from the ground in willows rather than in other available poplar trees. The box was 60 cm tall and 26.7 cm deep and wide (floor area = 711 cm^2). A rectangular entrance hole 11.4 cm wide and 10 cm tall was centered 43.8 cm above the bottom of the box. The box contained a large undomed nest of twigs topped by a grass-lined mud cup when checked in September 2008. The cup was sufficiently high within the box that an incubating or brooding adult could see out the box entrance hole. The carcass of a fully feathered magpie nestling was in the cup. The cup was soiled with feces suggesting that at least several young had survived late into the nestling stage and probably fledged. All nesting material was removed from the box at this time.

Magpies again used the box in 2009. It seems likely the same pair was involved although this was not confirmed as the adults were unmarked. The nest contained four, possibly five, hatchlings when first checked on 13 May. One young had fledged to the tree near the box and at least three young were visible in the nest entrance on 10 June (http://www.youtube.com/watch?v=I53T1xtyqpM). All nesting material was again removed from the box on 15 August. The box was not used by any species in 2010.

DISCUSSION

This is the first report to our knowledge of a magpie using an enclosed, tree-like cavity with a relatively small entrance hole. Holyoak (1967) noted the presence of a nest of a Eurasian Magpie (*P. pica*) in a ''hole'' in a cliff on the Calf of Man in southern England, but provided no details on the nature of this hole, i.e., whether it was a true cavity or simply a crevice.

Whether a novel trait increases in frequency within a population depends in part on how that trait affects individual fitness. Use of a cavity for nesting has potential advantages for magpies including greater shelter from precipitation, solar radiation, and wind. The nest would also be better concealed from predators and probably would be more resistant than a typical nest to entry by certain predators, e.g., crows (*Corvus* spp.) and common raccoons (*Procyon lotor*). However, cavity nesting would also have several potential costs. Given their size, magpies would require relatively large cavities with large entrance holes, which will be scarcer than other types of cavities. Magpies rarely reuse nests (typically <25% of the time; Trost 1999, see also Antonov and Atanasova 2003), which exacerbates this problem. Magpies potentially could use many of the cavities created by nesting Northern Flickers (*Colaptes auratus*). Wiebe (2001) reported the mean ± SD diameter of entrance holes to flicker nests in western Canada is 6.42 ± 0.91 cm (n = 143). Measurement of museum specimens suggests that most adult magpies would fit through a hole of this diameter. The mean ± SD maximum diameter of six anatomically complete adults preserved in alcohol was 5.7 ± 0.5 cm (range: 5.1–6.3 cm) whereas that for 9 individuals prepared as stuffed study skins was 6.4 ± 0.3 cm (range: 5.9–6.7 cm). However, after entering a flicker cavity, magpies would be more confined than in a traditional nest. Mean ± SD floor area of 139 flicker cavities examined by Wiebe (2001) was 166 ± 77 cm^2 whereas data in Silloway (1900) suggests the area of the mud nest cup in a magpie nest is typically about a third larger than the floor area of flicker nests. Magpies using flicker cavities would also be in direct competition for nest sites not only with flickers (which reuse nest cavities) but also other species that use flicker holes, most notably American Kestrels (*Falco sparverius*), a cavity-nesting raptor. Kestrels would likely dominate

magpies in contests for cavities as, in Europe, Common Kestrels (*F. tinnunculus*) frequently usurp magpie nests for their own nesting attempts (Prokop 2004; see also Becker 1987).

In addition, both male and female magpies have elongated tail feathers that can grow to >30 cm in length. Tails could be prone to damage when entering and moving about in the confines of a cavity. Research in Spain suggests the extent to which a magpie's tail is damaged signals both age and individual quality and could affect social status and mating success (Blanco and de la Puente 2002). Magpies in Northern Ireland with unbroken and less abraded tails pair earlier and fledged more offspring than magpies with damaged tails; individuals with badly broken tails often remain unmated (Fitzpatrick and Price 1997).

The fate of a novel trait also depends on whether it can be inherited. Whether the propensity to nest in a certain location or to construct the nest in a certain manner is genetically or culturally transmitted to offspring in magpies is unknown. However, Trost (1999) noted that nest structure within populations varies substantially and suggested magpies may imprint on their natal nest structure.

Our observations indicate that cavity nesting is a distinct variation in behavioral form that can arise in Black-billed Magpie populations. This trait appears to be extremely rare or non-existent in the many populations of magpies studied to date suggesting this form is maladaptive, perhaps for reasons discussed above.

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