

A Novel Behavior in an Endangered Species: Black-capped Vireos Reuse a Nest after Brood Parasitism and Depredation

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Notes and Discussion

A Novel Behavior in an Endangered Species: Black-capped Vireos Reuse a Nest after Brood Parasitism and Depredation

ABSTRACT.—Reuse of ephemeral open cup nests by passerines is an uncommon behavior. We report the first case of nest reuse by federally endangered black-capped vireos (*Vireo atricapilla*). The initial use of the nest was unsuccessful because the clutch was parasitized by a brown-headed cowbird (*Molothrus ater*) during egg laying and then depredated during incubation. During reuse, apparently by the same pair of vireos, the nest escaped parasitism but was depredated when the nestlings were 7 d old. Although rare, this behavior may be an example of phenotypic plasticity in black-capped vireo nesting strategies. Despite failure in this instance, nest reuse may be adaptive if it reduces the risk of brood parasitism but could be maladaptive if it increases the risk of nest predation.

INTRODUCTION

Reuse of ephemeral open cup nests by passerines is uncommon and may be avoided because of several ultimate and proximate factors. Nest reuse may increase the likelihood of predation (Sonerud and Fjeld, 1987; Weidinger and Kočvara, 2010), nests may degrade and become unstable over time (Briskie and Sealy, 1988), ectoparasites may be more abundant in previously used nests (Clark and Mason, 1985), and the behavior of nest building may be required to induce ovulation (Cheng and Balthazart, 1982). Despite these negative consequences and constraints, nest reuse by passerines occasionally occurs both within and between breeding seasons, as well as hetero and conspecifically (e.g., Cavitt *et al.*, 1999; Redmond *et al.*, 2007; Ziełiński, 2012). This behavior may be adaptive if it conserves time or energy (Barclay, 1988; Gauthier and Thomas, 1993), nest material or sites are limited (Redmond *et al.*, 2007), or if it reduces exposure to predators and brood parasites that use parental nest building to locate nests (Norman and Robertson, 1975; Wilson and Brittingham, 1998). In species known to reuse nests, individuals typically do so between breeding seasons and avoid reusing nests that failed to produce young, particularly within the same breeding season (Styrsky, 2005; but see Marshall, 2001). Here we report the first case of a black-capped vireo (*Vireo atricapilla*), a federally endangered species, reusing a nest after being parasitized by a brown-headed cowbird (*Molothrus ater*) and later depredated.

STUDY AREA AND METHODS

We observed this behavior on the Fort Hood Army Reservation in Coryell County, TX (31°21'9"N, 97°47'40"W). The vegetation in the study site was typical of vireo breeding habitat in the region, with small stands (mottes) of early to middle successional woody plants, dominated by shin oak (*Quercus sinuata*) but also containing ashe juniper (*Juniperus ashei*), Texas red oak (*Quercus buckleyi*), Texas red bud (*Cercis canadensis*), and Texas ash (*Fraxinus texensis*), interspersed with herbaceous ground cover. Vireo breeding density in this area was ~1.5 territories/ha. Although cowbird control (via trapping and shooting) occurred on Fort Hood, the study location was >9 km from the nearest cowbird trapping station and no shooting occurred in this area. Consequently, brood parasitism rates were relatively high on the study site. In 2011–2012, >60% of 142 vireo nests were parasitized (K. Comolli and T.J. Boves, unpub. data).

We typically located nests by locating vireo pairs, observing behavioral cues, and following birds to nest sites. After initial discovery, we monitored all nests every 1–3 d to evaluate their status and determine their fate. We captured vireo pairs by erecting mist nets and playing recordings of conspecific songs and scolds, white-eyed vireo (*Vireo griseus*) scolds, and vocalizations of eastern screech owls (*Megascops asio*). Once captured, birds were banded and aged by examining molt limits and feather wear (Pyle, 1997).

OBSERVATIONS

On 30 Apr. 2012, we located a nest being constructed in a Carolina buckthorn (*Frangula caroliniana*) by a pair of vireos (Fig. 1A). After construction was completed on 4 May, a vireo laid three eggs

(beginning on 6 May). On 7 May, a cowbird laid an egg in the nest. The vireo began to incubate three vireo eggs and single cowbird egg on 9 May. At some point between 16–18 May, (7–9 d into incubation), all four eggs were removed (likely depredated). On 21 May (3–5 d post failure), while searching for a potential re-nest attempt by the pair, we observed one vireo egg in the same nest, with no apparent modifications having been made to the structure. The vireo laid four eggs in the nest and began to incubate on 24 May (Fig. 1B). On 7 Jun., two nestlings hatched and remained in the nest until 13 Jun. (6 d old; Fig. 1C), when they and the two unhatched vireo eggs disappeared, again probably due to predation.

We captured and banded the pair associated with the nest on 17 Jun. 2012. The male was an after second year individual and the female was a second year bird. Although the parents were not banded until after the nest failed, evidence indicates that this pair was responsible for the nest's construction and reuse. We intensively monitored the male in this territory from the day he arrived on 5 Apr. 2012 and all neighboring males (and several adjacent females) were banded. Additionally, this male had a unique vocal repertoire that allowed us to differentiate him from other individuals. The time between nesting attempts (≤ 5 d) also makes it unlikely that this male would have been able to attract a new mate in such a short period (T.J. Boves, pers. obs.).

The nest reuse was the third of four nesting attempts for this pair. Their first attempt occurred approximately 65 m away and ended on 29 Apr. when the female deserted the nest after their clutch of four eggs was removed and two cowbird eggs were laid. After their third nesting attempt (the nest reuse described here) failed, the pair initiated a fourth nesting attempt approximately 30 m from the reused nest (built with new materials) and successfully fledged four vireo offspring on 18 Jul.

DISCUSSION

It is possible that nest reuse represents phenotypic plasticity in breeding strategies by black-capped vireos. Black-capped vireos have been protected under the Endangered Species Act since 1987 (Ratzlaff, 1987) and are considered to be vulnerable to extinction due in part to the negative impacts of brood parasitism by brown-headed cowbirds (Grzybowski, 1995; Kostecke *et al.*, 2005). Because vireo young rarely fledge from cowbird parasitized nests, brood parasitism is a strong selective pressure that should promote the spread of adaptive behaviors (Peer *et al.*, 2005). Female cowbirds often locate nests by observing nest building by host species (Norman and Robertson, 1975). Thus, despite the failure of this nest, it may be adaptive for vireos to reuse nests if doing so eliminates exposure during typical nest building. Although cowbird and vireo ranges have likely overlapped since before European settlement (Peer *et al.*, 2005), vireos are currently thought to have evolved only one behavioral adaptation specific to brood parasitism, that being nest desertion (Grzybowski, 1995). The reuse of previously built nests, although not typically considered a host defense against parasitism (Peer *et al.*, 2005), could benefit vireos, particularly in May and Jun. when the probability of parasitism is highest. Alternatively, if predation is a greater selective pressure than brood parasitism, reuse of nests may be maladaptive, as this anecdotal event suggests. Predators may be more likely to locate reused nests because they are placed in the same location and thus share site characteristics that may be used as searching cues (Santisteban *et al.*, 2002) or individual predators may revisit nest sites because of short term memory effects (Weidinger and Kočvara, 2010).

Despite the adaptive potential of this behavior, it is undoubtedly rare (Grzybowski, 1995). On Fort Hood, vireo breeding has been monitored intensively from 1987 to present (Kostecke *et al.*, 2005). More than 4500 nesting attempts have been monitored during this time and no incidents of nest reuse have previously been documented (D.A. Cimprich, unpubl. data). In fact, to our knowledge, this is one of the few records of nest reuse by any member of the Vireonidae (see Greaves, 1987 for another case of nest reuse by least Bell's vireo; *Vireo bellii pusillus*). However, it is also possible that nest reuse by black-capped vireos may be more common than currently recognized. Most vireo nests are found by observers using behavioral cues during building, and if those cues are absent, nest reuse may go unnoticed. From a structural perspective, nest reuse is feasible because, although vireo nests appear quite delicate, a surprisingly large number of nests remain physically sound throughout the breeding season and even into the following year (T.J. Boves, pers. obs.). Nest reuse is a plastic behavior that is regularly observed, albeit uncommonly, in a number of species including brown thrashers (*Toxostoma rufum*; Cavitt *et al.*,



FIG. 1.—(A) Black-capped vireo (*Vireo atricapilla*) nest at Fort Hood Military Reservation that was used twice during the 2012 breeding season. (B) Second clutch of four eggs laid in the nest on 24 May 2012. The initial clutch associated with this nest was parasitized and later depredated. (C) Six-day old Black-capped Vireo nestlings in the reused nest on 13 May 2012

1999), western kingbirds (*Tyrannus verticalis*; Bergin, 1997), barn and cliff Swallows (*Hirundo rustica* and *H. pyrrhonota*; Barclay, 1988; Gauthier and Thomas, 1993), and wood thrushes (*Hylocichla mustelina*; Friesen *et al.*, 1999; Richmond *et al.*, 2007). Of these species, wood thrushes are the only common cowbird hosts (Hoover and Brittingham, 1993) and it has not been suggested that nest reuse could be a strategy in response to brood parasitism.

In addition to the possibility of parasitism avoidance, time or energy constraints may have been partially responsible for reuse, as this was a third nesting attempt and occurred at a relatively late date (although many vireos were still nesting at this time of the year). However, the putative pair associated with the reuse built a new nest after this one had failed for the second time. It is unlikely that nest reuse occurred because of site or material limitation. Black-capped vireos nest in a variety of woody plant species (although Carolina buckthorn was a relatively rare plant in the area) and numerous patches existed in this male's territory that would have provided appropriate structure. Furthermore, although vireos are known to dismantle previously used nests to re-use the materials they contain (Grzybowski, 1995; D.A. Cimprich, unpub. data), we observed no instances of this behavior on this site, which we would expect if nest material limitations existed. Finally, it is unknown how nest building influences ovulation in this species, but if required, this could further explain the rarity of nest reuse and restrict the chance of this behavior becoming more frequent (McGlothlin and Ketterson, 2008).

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