

**OBSERVATIONS ON THE RANGE AND NESTING BIOLOGY OF THE MEXICAN ENDEMIC RUFIOUS-CAPPED BRUSH-FINCH (*ATLAPETES PILEATUS PILEATUS*)**Harold F. Greeney^{1,2} · Jeff Port³ · Charles van Riper III¹

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Abstract · The Rufous-capped Brush-finch (*Atlapetes pileatus*) is a species endemic to Mexico, whose breeding biology has received little attention. We studied two nests of the nominate subspecies from the mountains of southern Sonora. Nests were untidy, broad, open cups, placed in low, thick vegetation. Clutch size at one nest consisted of three immaculate white eggs. The second nest contained two Brush-finch nestlings and one cowbird (*Molothrus* sp.) nestling. Both parents brought food to the nestlings, but delivered significantly more food to the cowbird nestling. Most of our observations of nest architecture, egg coloration, and adult behaviors are consistent with previous descriptions for Rufous-capped Brush-finch and other members of the genus *Atlapetes*. This is the first report of cowbird brood-parasitism on the Rufous-capped Brush-finch, as well as the first confirmed record of breeding by this species in Sonora.

Resumen · Observaciones sobre el rango y biología reproductiva del Atlapetes Gorrirrufo (*Atlapetes pileatus pileatus*)

El Atlapetes Gorrirrufo (*Atlapetes pileatus*) es una especie endémica de México cuya biología reproductiva ha recibido poca atención. Estudiamos dos nidos de la subespecie nominal en las montañas del sur de Sonora. Los nidos eran tazas abiertas, desordenadas, anchas, y colocados en vegetación baja y espesa. El tamaño de postura en un nido era de tres huevos blancos immaculados. El segundo nido contenía dos polluelos del Atlapetes Gorrirrufo y un polluelo del tordo (*Molothrus* sp.). Ambos padres llevaron comida a los pichones, entregando significativamente más comida al polluelo del tordo. La mayoría de nuestras observaciones sobre la arquitectura de los nidos, la coloración de los huevos y los comportamientos de los adultos son congruentes con las descripciones anteriores del Atlapetes Gorrirrufo y otros miembros del género *Atlapetes*. Este es el primer informe de parasitismo de nido de Atlapetes Gorrirrufo por un pájaro tordo, así como el primer registro confirmado de la reproducción de esta especie en Sonora.

Key words: *Atlapetes pileatus* · Cowbird · Egg · *Molothrus* · Natural history · Nest · Nestling · Rufous-capped Brush-finch · Sonora

INTRODUCTION

There have been a number of important contributions to the ornithology of Sonora, Mexico during the past century (Van Rossem 1945, Russell & Monson 1998, Flesch & Hahn 2005, Flesch 2008, Villaseñor-Gómez et al. 2010). Unlike neighboring portions of Arizona, United States, however, where a great deal of historical research has been carried out (e.g., Swarth 1914, Brandt 1937, Phillips et al. 1964, Monson & Phillips 1981, Witzeman et al. 1997, Rosenberg & Witzeman 1999, Corman & Wise-Gervais 2005), in many parts of Sonora the status and distribution of numerous bird species remain little known.

Among the poorly known species of northern Mexico is the Mexican endemic Rufous-capped Brush-finch (*Atlapetes pileatus*), a bird that inhabits the undergrowth of humid and semi-arid pine-oak forests and adjacent clearings between 900 and 3500 m a.s.l. (Howell & Webb 1995). The northern-most representative of its genus, the Rufous-capped Brush-finch is currently considered to include two subspecies (del Hoyo et al. 2018). The nominate race occurs southward from Sinaloa to Michoacán, Guanajuato, Hidalgo, and Veracruz, as well as Guerrero, Oaxaca, and Puebla. The range of the eastern subspecies (*dilutus*) extends from southwest Chihuahua to Durango, southeast Coahuila, Nuevo León, southwest Tamaulipas, and San Luis Potosí (Paynter 1978, Rising 2018). Although generally overlooked, there have been scattered records of the Rufous-capped Brush-finch from southern Sonora, but its status there has remained uncertain (Villaseñor-Gómez et al. 2010; see Discussion). Like in many Neotropical species, the breeding biology of the Rufous-capped Brush-finch remains poorly studied, with published information confined to the description of only a handful of eggs and nests (Rowley 1962, 1966, 1984) and several reports of immature birds (Sutton et al. 1942, Schaldach 1963, Rowley 1966, Martínez-Morales et al. 2013). Here we provide the

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first detailed information on the breeding biology of the Rufous-capped Brush-finch, and confirm its status as a resident and breeding species in the state of Sonora.

METHODS

From 30 July to 1 August, 2016, we studied two nests of the Rufous-capped Brush-finch that we found in a narrow canyon located at Km 260 on Highway 16, 11 km west of Yécora, Sonora (28°22'19.20"N, 109°02'51.00"W; 1690 m a.s.l.), a location that has been referred to as Arroyo Hondo (see xeno-canto.org). Vegetation in the area is typical for riparian zones at this elevation in the Sierra Madre Occidental (González-Elizondo et al. 2012), with an open understory and broken canopy dominated by oaks (*Quercus* spp.; Fagaceae) and sycamores (*Platanus* spp.; Platanaceae). For additional descriptions of this habitat type see Anderson et al. (2014) and Van Devender & Reina-Guerrero (2016).

Behavioral data at nests were collected using tripod-mounted digital video cameras with a camouflaged protective cover, placed 4–8 m from the nests. Nests dimensions were recorded to the nearest 0.5 cm with a standard ruler, and eggs were measured with digital calipers sensitive to 0.01 mm. Visit times are reported min:sec \pm SE.

Online databases and collections consulted and referenced in the text include eBird (www.ebird.org) and the Cornell Lab of Ornithology Macaulay Library (MC; www.macaulaylibrary.org).

RESULTS

Nests. Both nests were open cups with loose, messy exteriors and neatly woven internal portions (Figures 1–2). Nests were placed loosely upon supporting substrates such that they could have been easily lifted from their positions. On the morning of 30 July, the first nest held three young nestlings (see below). The nest was 50 cm above the ground, in a well-concealed position within a 1.5 m-tall tangle of vines, shrubs, and herbaceous vegetation. Externally, the nest was built primarily of long (10–20 cm), flexible, reddish brown pine needles (Figure 1). These were mixed with a few sticks and grass stems, as well as small scraps of dead plant material and dicot leaves. It was lined internally with fine, pale grass stems, tightly woven into a neat cup which included a few white, hair-like plant fibers in the innermost portion. On the morning of 30 July, roughly 0.5 km from the first nest, the second nest held three fresh eggs (see below). This nest was 85 cm above the ground, in a well-concealed position amongst the leaves of a 2 m-tall shrub (*Ribes* sp., Grossulariaceae). Externally, the second nest was also loosely built, composed of long, pale straw-like grass stems (15–30 cm long), a few dark leaf petioles and small twigs, and a few small dead dicot leaves (Figure 2). Internally it was built of progressively thinner grass stems to form a thick, tightly woven cup. The innermost portion included a thin layer of very fine, white, hair-like seed down. It was supported from below by several thin (c. 0.5 cm), overlapping, nearly horizontal branches. Measurements (cm) of the two nests, respectively, were as follows: external diameter (excluding protruding material) 17, 15; external height (thickness) 14, 14; internal diameter 5, 4.5; internal depth 4.5, 4.5.

Eggs and incubation. All three eggs in the second nest were unmarked, immaculate white (Figure 2). Two of them showed signs of slight development (vascularization) when held up to the light, while the third appeared undeveloped. Their linear measurements and weights were: 22.24 \times 16.35 mm, 3.2 g; 22.25 \times 16.71 mm, 3.3 g; 22.97 \times 16.78 mm, 3.5 g. We filmed adult behavior at this nest from 13:15–16:15 h on 1 August and from 07:00–14:00 h on 2 August.

Adults were recorded visiting the nest a total of 14 times. Visits (on-bouts) averaged 12:58 \pm 5:36 (N = 6) on 1 August and 42:08 \pm 12:39 (N = 8) on 2 August. The longer mean visit time on 2 August was influenced by a prolonged bout of rain where the adult remained on the nest for over two hours. Incubation breaks (off-bouts) averaged 15:36 \pm 5:54 (N = 5) on 1 August and 9:05 \pm 2:42 (N = 7) on 2 August. An adult was present on the nest 42.7% of the time observed on 1 August and 79.3% on 2 August.

Nestlings. All three nestlings in the first nest were young, with closed eyes, wing feathers only just beginning to emerge from the skin, and contour feathers still not breaking the skin on any pteryxae. One of them, however, was clearly larger and appeared to be that of a cowbird (*Molothrus* sp.). This nestling was pink-skinned, with pale gray natal down, and had bright white rictal flanges with a magenta mouth lining. Of the two species of cowbirds potentially found at our study site, the Bronzed Cowbird (*M. aeneus*) nestlings have white rictal flanges (Rothstein 1978), but those of the Brown-headed Cowbird (*M. ater*) may be either white or yellow (Ellison et al. 2007). We cannot, therefore, determine with certainty to which species the nestling may have belonged. The two *Atlapetes* nestlings were pink-skinned and had gray down, slightly darker than that of the cowbird. Their rictal flanges were bright yellow, slightly paler near the gape, while their mouth linings were a duller and paler red than the cowbird nestling's (Figure 1).

Parental care. We filmed the nest containing nestlings on 30 July, from 08:30–18:00 h, and on 2 August from 07:30–13:30 h. A total of 120 visits were observed over this period, averaging 2.0 visits/nestling/h. It was possible to reliably identify individual adults visiting the nest based on their relative amount of rectrix wear on 2 August due to improved camera proximity and angle. While we cannot confirm the sex of the adults, one individual had greater wear on the tips of the tail feathers, as is frequently observed in adult birds that have previously spent a large amount of time incubating (HFG pers. observ.). This individual was most likely the female, as females are reported to perform all incubation duties in the family Passeridae. On 30 July, adults made 39 feeding visits (mean = 0:44 \pm 0:11) with 13 visits for the purpose of brooding (mean = 15:23 \pm 2:04) and 12 visits we categorized as inspection visits, when neither adult brought food or remained to incubate (mean = 0:26 \pm 0:11). By 2 August, the number of feeding visits had increased (N = 51, mean = 0:31 \pm 0:05), and brooding time and frequency had decreased (N = 5, mean = 10:15 \pm 5:33).

Fifty-two food items were identified being brought to the nest, with the large majority Lepidoptera larvae but also including Gryllidae, Tettigoniidae, Phasmatodea, and adult geometrids (Lepidoptera) (Figure 3). Ranging in size from 2 to 4 cm, the largest caterpillars were often difficult for the



Figure 1. Nest of the Rufous-capped Brush-finch (*Atlapetes p. pileatus*) containing three nestlings on 30 July 2016, 11 km west of Yécora, Sonora, Mexico. One of the nestlings (center) is that of a *Molothrus* cowbird. Photo HFG.

nestlings to swallow. Adults would frequently place the large caterpillars in the mouth of a begging nestling only to remove it, masticate it briefly, and replace it in the mouth of the begging nestling. Occasionally, if the nestling was still unable to swallow the food item, the adult would remove the item and feed it to another nestling. A total of 88 successful feeds were observed with a known target nestling in 66 events. Nestlings were difficult to observe due to their small size on 30 July and the recipient of many of the feeds ($N = 20$) could not be reliably identified. By 2 August, nestlings were large enough to clearly identify and only 2 feeding events could not be associated with a finch or cowbird nestling, in those cases due to the body position of the adult while feeding. Six feeds were unsuccessful with the adult leaving the nest with the food item. Two instances of allofeeding were observed, with the arriving adult feeding the adult brooding.

Adults appeared to preferentially feed the putative cowbird chick first. The cowbird was fed more than twice as often as the finch nestlings (40 feeds compared to 26 feeds for two finch nestlings) and on eight occasions (30.8% of the successful finch feeds) the adult attempted to feed the cowbird nestling first before removing the food from the cowbird nestling's mouth and feeding it to a finch nestling.

One adult (the putative female; see Methods) was observed to make 33 visits to the nest on 2 August (mean $0:33 \pm 0:08$) and the other 15 (mean $0:30 \pm 0:05$; t -test, $df = 43$, $P = 0.36$). The putative male appeared to contribute to brooding activities in addition to feeding activities and was observed brooding after feeding on one occasion. The remaining four brooding visits on 2 August were performed by the putative female.

Adults regularly removed fecal sacs with a total of 28 removed from the nest environment and 3 ingested by adults prior to leaving the nest (0.73 fecal sacs/nestling/h). Thirteen fecal sacs were produced by the cowbird, nine by the two finch nestlings, and the remaining nine could not be associated with a specific nestling.

Other adult behaviors. Away from nests, adults (Figure 4) foraged in pairs, frequently in the company of Slate-throated Whitestarts (*Myioborus miniatus*). We observed them most frequently on or near the ground in dense vegetation, turning over leaves or gleaning arthropods from stems and the tips of leaves, as is typical of this species (Howell & Webb 1995, Rising 2018). When disturbed in the vicinity of their nest, the pair of adults that were attending nestlings dropped quickly to the nearest patch of dense vegeta-



Figure 2. Nest of the Rufous-capped Brush-finch (*Atlapetes p. pileatus*) containing three eggs on 30 July 2016, 11 km west of Yécora, Sonora, Mexico. Photo HFG.

tion, alarming and remaining concealed while moving away from the observer. Once they were 10–15 m from the nest and the observer they usually moved to more visible perches, in the upper portion of the vegetation, flicking their wings and tail, and continuing to alarm call while hopping quickly between exposed perches. In contrast, on both occasions when we flushed an adult from the nest with eggs, they dropped silently into the dense vegetation below the nest and disappeared. Although we did not spend much time near the nest, while measuring the eggs and nest we did not detect the adults' presence, even when they had just been flushed from the nest. On four occasions, we flushed an adult from its nest as we approached. An adult flushed from the nest with three nestlings waited until we approached to within 1 m of the nest, remaining motionless in its nest until we extended our hand to within 50 cm. The three other observations of flush distance were similar and involved the nest with eggs. On these three occasions, the incubating adult flushed at 75 cm, 50 cm, and 50 cm, respectively.

DISCUSSION

The first published report of a Rufous-capped Brush-finch from Sonora appears to be that of Russell & Monson (1998), who mention a sight record from the Hermosillo-Yécora road (27 November 1993). Subsequently, Villaseñor-Gómez et al. (2010) reported a second sight record from the mountains just west of Yécora (20 December 1998). Given the dates of these few records, the most recent review of the Sonoran avifauna considers the Rufous-capped Brush-finch to be a casual winter visitor to Sonora (Villaseñor-Gómez et al.

2010). Given the above-mentioned records, and photographic evidence of its presence during the winter (see Macaulay Library image ML-21507631; 19 December 2014, Eric Hough), it is clear that the Rufous-capped Brush-finch is a resident breeder in Sonora. The adults at our study site have dull, greenish upperparts and deep yellow underparts, heavily washed with olive (Figure 4; see also ML-21507631), suggesting they belong to the nominate race rather than the paler and smaller race, *dilutus* (Ridgway 1898, Paynter 1978). The two nests described here are very similar in architecture, placement, and composition to those described and depicted by Rowley (1962, 1966, 1984). Ours is only the second record of a three egg clutch for this species, as five of the six previously-documented clutches contained only two eggs (Rowley 1962, 1966, 1984). Although Rowley (1966, 1984) described eggs as pale blue, rather than white, the true amount of variation in color remains to be determined, but a similarly slight variation in the saturation of blue is found in the related Chestnut-capped Brush-finch (*Arremon brunneinucha*) (HFG pers. observ.). Our eggs were only slightly larger than the mean (22.14 x 15.88 mm) given by Rowley (1984) for 11 eggs. So far as is known, members of the genus *Atlapetes* build open-cup nests and lay white eggs with cinnamon or vinaceous spotting (Salaman et al. 1998, Opiel et al. 2003, de la Peña 2005, Biancucci & Martin 2008, Greeney 2009, Peraza 2009, Olaciregui & Botero-Delgadillo 2012, Forrester & Londoño 2016). With unmarked eggs, the Rufous-capped Brush-finch appears to be the exception, as the immaculate white eggs credited to the Santa Marta Brush-finch (*A. melanocephalus*) (Todd & Carriker 1922) are now considered to be an error (Paynter 1978, Olaciregui & Botero-Delgadillo 2012).

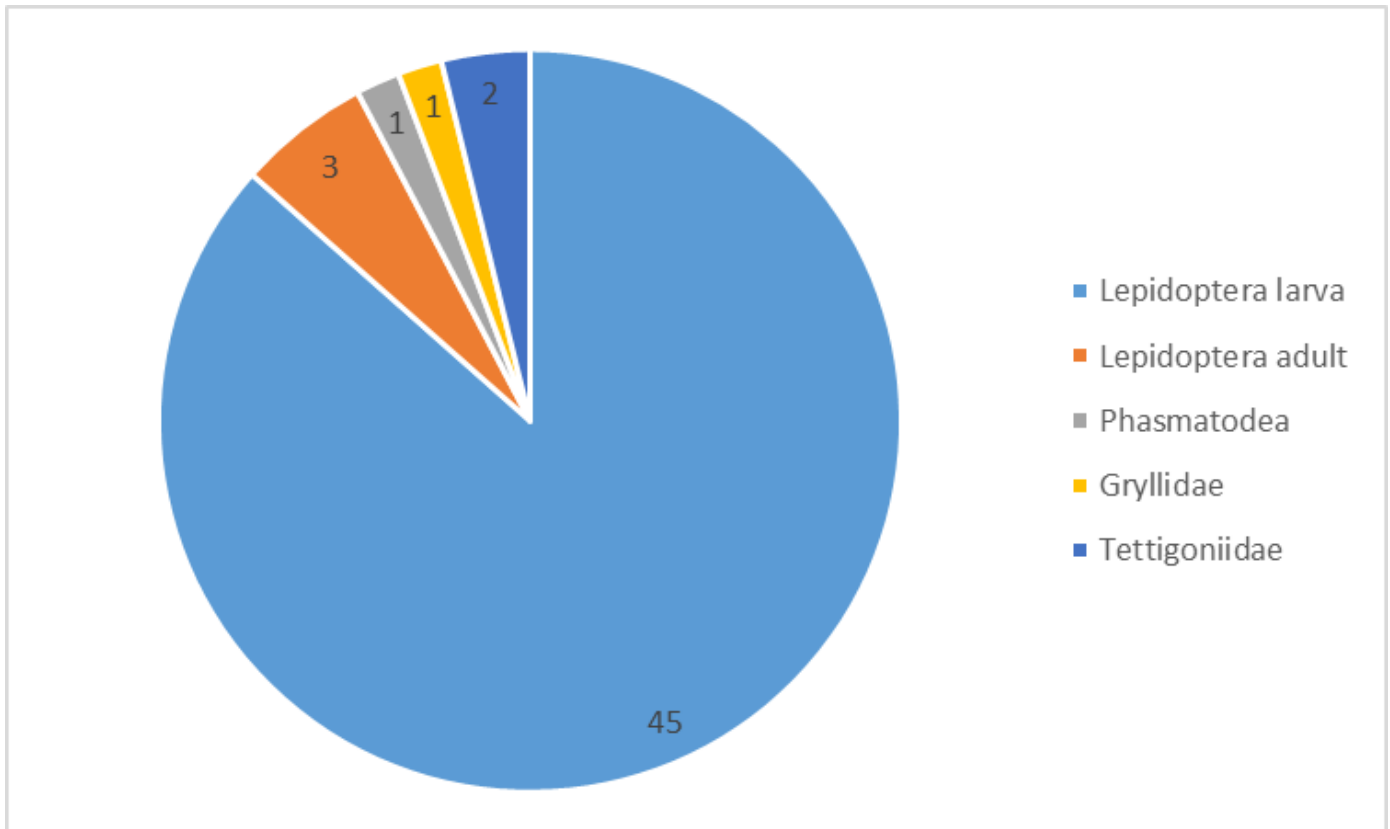


Figure 3. Relative proportion of 52 identified prey types delivered by parents at a nest of the Rufous-capped Brush-finch (*Atlapetes p. pileatus*), 11 km west of Yécora, Sonora, Mexico.

Our record is the first documented case of brood-parasitism of the Rufous-capped Brush-finch by *Molothrus* cowbirds (Friedmann & Kiff 1985, Lowther 2016). Based upon the appearance and vocalizations of the nestling *Molothrus* we observed, it seems most likely that the species involved is the Bronzed Cowbird (Rothstein 1978, Ellison et al. 2007, Ellison pers. comm. 2018), but further observations of this interaction are warranted to confirm the species involved. This is, however, only the fourth species of *Atlapetes* reported as a victim or host of cowbirds (Friedmann & Kiff 1985, Lowther 2016). Two subspecies of the White-naped Brush-finch (*A. albinucha*) are reported from Costa Rica (*parvirostris* and *brunnescens*; Friedmann 1963, Friedmann & Kiff 1985). The critically endangered Pale-headed Brush-finch (*Atlapetes pallidiceps*) is a known host in Ecuador (Opiel et al. 2003, 2004), as are Ochre-breasted Brush-finch (*A. semirufus*) and Yellow-striped Brush-finch (*A. citrinellus*) (Friedmann & Kiff 1985). In a single, opportunistically performed, and strangely prophetic, nest manipulation, Rowley (1962) replaced the eggs of a Rufous-capped Brush-finch with fresh eggs of the Russet Nightingale-Thrush (*Catharus occidentalis*). The acceptance, and continued incubation of the adult Brush-finches, despite the difference in ground color and maculation of the introduced eggs (Dainson et al. 2017, Luro & Hauber 2017), suggests the possibility that Rufous-capped Brush-finches may be susceptible to brood parasitism by both the Bronzed Cowbird (unmarked whitish eggs) and the Brown-headed Cowbird (spotted whitish eggs) (Fraga 2011). Our observations suggest the potential negative impact of cowbird parasitism on hosts is significant with far more feeds directed at the cowbird nestling relative to the finch nestlings and an apparent preference of the adults to feed the

cowbird first, even when the cowbird nestling had been recently fed. Waste disposal demands were also increased as adults removed more cowbird fecal sacs compared to those of finch nestlings (which may also be directly caused by the increased feeding). The ability of brood parasite nestlings to manipulate host feeding behavior has been well documented (Rivers 2007, Langmore et al. 2008, De Marsico et al. 2012, Gloag & Kacelnick 2013, Tuero et al. 2016) and while our study did not identify the mechanism through which host behavior may be manipulated, the increased frequency in feeding and overall attention provided to the cowbird nestling suggests active manipulation is likely occurring. With limited reports of cowbird parasitism of *Atlapetes*, it is difficult to know if this apparent manipulation is indicative of host-parasite co-evolution or reflects a relatively recent expansion of *Molothrus* parasitism to include *Atlapetes*. Grim (2006) suggested that nestling discrimination appears to be relatively rare in birds, and our observations suggest that Rufous-capped Brush-finches are unable to recognize *Molothrus* young, making them vulnerable to parasite manipulation (Yasukawa et al. 2016).

Our observations of adult behavior in the vicinity of nests are in some ways conflicting, and in other ways congruent, with the only previous descriptions of the reproductive behavior of Rufous-capped Brush-finches. Based on his observations of six separate pairs of breeding adults, Rowley (1984) stated that "it is a rare occasion to see one of these birds on a nest, or even to flush one from a nest," the obvious inference being that adults depart the nest well before an observer is within visual range. This is in marked contrast to the flush distance of 50–75 cm that we observed. Like Rowley (1984), we observed the tendency of adults to quiet-

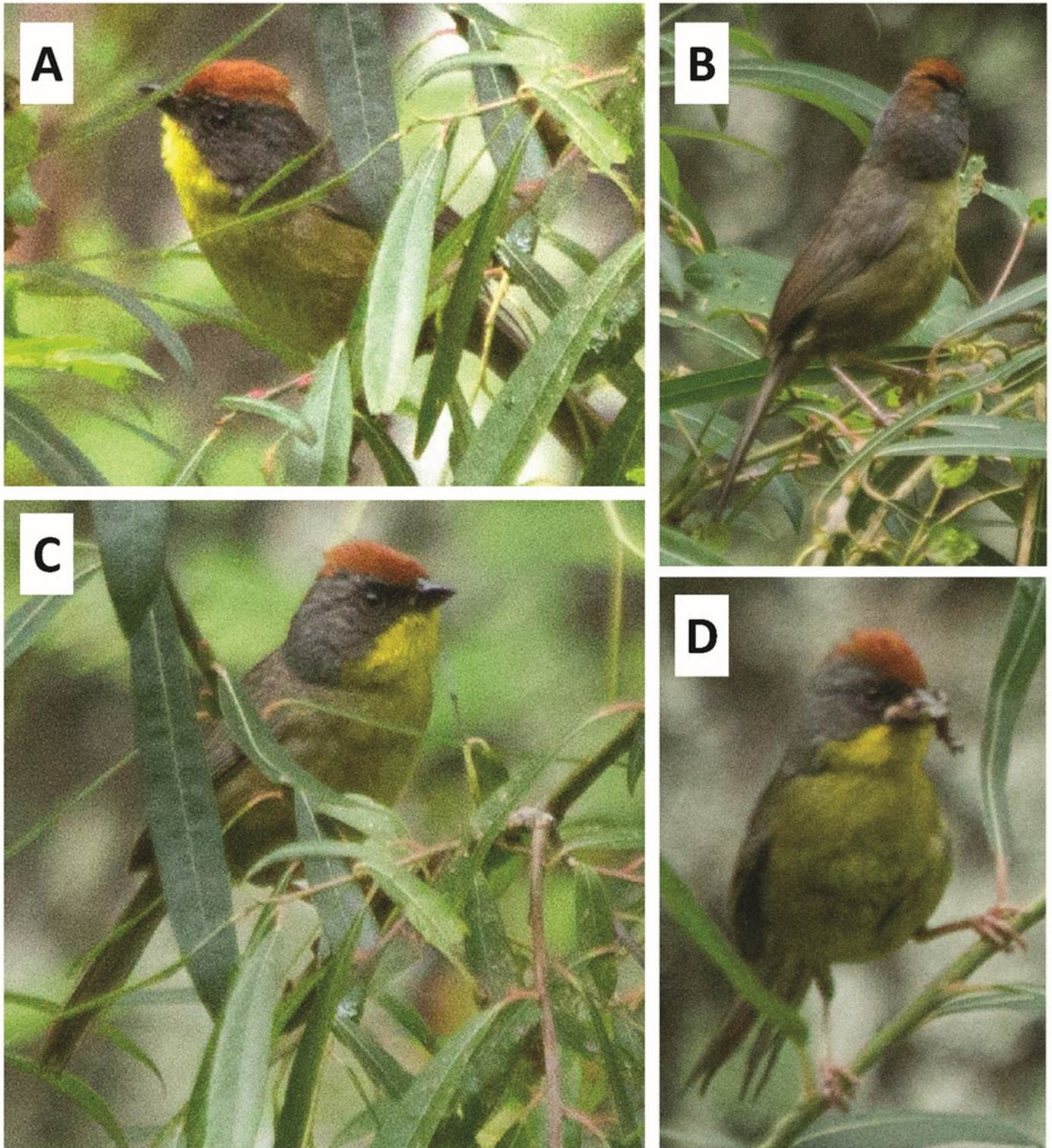


Figure 4. Adults of Rufous-capped Brush-finch (*Atlapetes p. pileatus*) photographed on their approach to a nest containing three nestlings on 30 July 2016, 11 km west of Yécora, Sonora. Photos HFG.

ly slip away, and to remain silent and hidden, when disturbed during the incubation cycle, in contrast to the scolding behavior we observed in the parents tending nestlings. Variation in nest defense intensity among individuals is commonly reported but poorly understood (Andersson et al. 1980, Knight & Temple 1986, Hobson et al. 1988, Siderius 1993, Hatch 1997, Morrell et al. 2016), leaving the observed variation in Rufous-capped Brush-finches not easily explained. With respect to adult incubation and provisioning behaviors, our observations appear to be fairly aligned with the behavior of the only other species of *Atlapetes* with com-

parable data available, the Black-faced Brush-finch (*A. melanolaemus*; Forrester & Londoño 2016). Duration of on and off-bouts during incubation is comparable, although based on a limited sample period and to a single nest. Both adults provisioned regularly, although one adult provisioned at a rate twice that of the other. Both adults also appeared to contribute to brooding, although again, one individual invested much more heavily than the other in this aspect of parental care. Nestlings were fed primarily Lepidoptera larvae, frequently requiring adult assistance with prey handling and ingestion, prolonging the time the adult spent at the

nest. We speculate that this reflects an evolutionary trade-off between feeding frequency and higher quality food items or may simply reflect the availability of prey at the time observed.

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