

NESTING AND SINGING BEHAVIOR OF COMMON BUSH-TANAGERS  
(*CHLOROSPINGUS OPHTHALMICUS*) IN SOUTH AMERICA

Comportamiento de Anidación y Canto del Montero Común (*Chlorospingus ophthalmicus*)  
en Suramérica

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**ABSTRACT**

We present new information on the natural history of *Chlorospingus ophthalmicus* based on field work conducted over several years in various localities in Colombia, Ecuador, Argentina, and Venezuela. Data on a total of 32 nests reveal that the species is rather plastic in nest-site selection; at the same locality, nests occupied contrasting microhabitats, such as earthen banks on pastures close to forest edges and cavities in moss-covered trunks in relatively dense forest. In spite of such local variations, the data are suggestive of differences between populations (e.g. nests in Argentina were often placed higher in trees than in other areas) that merit further study. Clutch sizes of nests found in this study and of those reported in the literature varied from one to three, and eggs from smaller clutches tended to be larger than those from larger clutches. Our observations on nesting sites, nest architecture and materials, egg coloration, and appearance of nestlings are largely consistent with data on other members of the complex and other congeners. Analyses of dawn songs of Colombian populations of *C. ophthalmicus* indicates that vocalizations of members of the so-called *flavopectus* group are notoriously more complex than those of members of the *ophthalmicus* group. The occurrence of taxa that appear to differ markedly in vocalizations and morphology in close geographic proximity in the Cordillera Oriental of Colombia highlights the importance of continued field study to resolve species limits in this difficult group.

**Key words:** Andes, *Chlorospingus ophthalmicus*, Colombia, breeding biology, geographic variation, vocalizations, neotropical birds.

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## RESUMEN

Presentamos información nueva sobre la historia natural de *Chlorospingus ophthalmicus* con base en datos obtenidos durante estudios de campo realizados a lo largo de varios años en Colombia, Ecuador, Argentina y Venezuela. Los datos de un total de 32 nidos indican que la especie es plástica en su selección de sitios de nidificación, pues en la misma localidad fue posible encontrar nidos en microambientes contrastantes, como barrancos de tierra en pastizales cerca de bordes de bosque y cavidades en troncos cubiertos de musgo en el interior de bosques densos. A pesar de estas variaciones locales, los datos sugieren la existencia de diferencias entre poblaciones (e.g. los nidos en Argentina a menudo se ubicaron a mayores alturas en la vegetación que en otras áreas) que merecen ser estudiadas en mayor detalle. Las nidadas documentadas en este estudio y en la literatura consistieron de entre uno y tres huevos, y los huevos de nidadas pequeñas tendieron a ser más grandes que los de nidadas grandes. Nuestras observaciones sobre los sitios de nidificación, la arquitectura y materiales de los nidos, la coloración de los huevos y la apariencia de los pichones fueron en general consistentes con las documentadas para otros miembros del complejo de *C. ophthalmicus* y otras especies del género. Análisis de los cantos del amanecer de poblaciones colombianas de *C. ophthalmicus* indican que las vocalizaciones de miembros del grupo *flavopectus* son notoriamente más complejas que aquellas de miembros del grupo *ophthalmicus*. La presencia de taxones que parecen diferir marcadamente en sus vocalizaciones y morfología en sitios geográficamente próximos en la Cordillera Oriental colombiana resalta la importancia de continuar realizando estudios de campo para resolver los límites entre especies en este grupo complicado.

**Palabras Clave:** Andes, aves neotropicales, biología reproductiva, *Chlorospingus ophthalmicus*, Colombia, variación geográfica, vocalizaciones.

## INTRODUCTION

*Chlorospingus* bush-tanagers are common and conspicuous members of mixed-species flocks occurring in moss and epiphyte-laden montane forests ranging from Mexico to Argentina (Isler & Isler 1999). Despite their commonness, the natural history of members of the genus is relatively little known. For instance, only until recently was it documented that one species (Dusky Bush-tanager, *C. semifuscus*) has an apparently unique social system among the New World nine-primaried oscines, in which males arrange themselves in linear singing assemblages that resemble leks (Bohórquez & Stiles 2002). Likewise, information on the nesting biology of bush-tanagers is relatively sparse; species for which data are available build cup nests that are well concealed inside clumps of mosses, ferns, or epiphytes on tree limbs and trunks, or among mosses, ferns, or dense grass on steep earthen banks (Isler & Isler 1999 and references therein; see also Christian 2001, Strewé 2001, Greeney 2005).

The Common Bush-Tanager *Chlorospingus ophthalmicus* is a highly variable and widespread taxon that ranges

from eastern and southern Mexico to northwestern Argentina (Isler & Isler 1999). As a consequence of the pronounced geographic variation exhibited throughout its distribution, as many as 25 subspecies of *C. ophthalmicus* have been recognized, and species limits in this complex have been somewhat controversial (see Olson 1983, Remsen et al. 2007). Recent work indicates that genetic differentiation among Mexican populations of *C. ophthalmicus* is extensive, indicating a long history of isolation (García-Moreno et al. 2004). Such isolation has allowed for the development of congruent patterns of morphometric and plumage variation that suggest that *C. ophthalmicus* likely comprises several species-level taxa (Sánchez-González et al. 2007). Moreover, ongoing molecular phylogenetic work with much increased sampling in terms of taxa and geographic coverage, indicates that as currently defined, *C. ophthalmicus* is polyphyletic with respect to other *Chlorospingus* species (J. Weir, E. Bermingham, and J. Klicka, unpublished data), suggesting that the taxonomy of the genus will require revision.

Although the extensive phenotypic variation within *C. ophthalmicus* and the possibility that the complex

may comprise multiple species have long been recognized, natural history information has not accumulated at the same pace for different parts of the geographic range of this taxon. Most of the published accounts of the nesting biology of *C. ophthalmicus* are from Central America and Mexico (Worth 1939, Edwards 1967, Rowley 1966, Skutch 1967, Rowley 1984), whereas the only published data for South American populations are a description of a set of eggs from Depto. Antioquia, Colombia (subspecies *exitelus*, Sclater & Salvin 1879), and notes on two nests from Depto. Puno, southern Peru (subspecies *peruvianus*, T. S. Schulenberg, in Isler & Isler 1999). Considering the uncertainty regarding species limits in this group, information on nesting biology for additional taxa may be useful once a taxonomic revision of the complex is undertaken, since nests and eggs can be informative from a systematics standpoint (e.g., Zyskowski & Prum 1999). Additionally, assessing geographic variation in breeding biology represents a necessary baseline that can allow the development of studies relevant to understanding the evolution of life-history strategies, for which comparative analyses across populations are of central importance (Martin 2004).

In addition to the wide variation in plumage that exists among populations of *C. ophthalmicus*, members of this complex are also known to differ markedly in vocalizations, especially in the quality and complexity of their dawn songs. In general terms, Central American populations have simple dawn songs, consisting of a series of unclear *psit* notes, while South American taxa typically have more elaborate songs, consisting of often complex combinations of *psits*, *chits*, *chid-its*, *chews*, and trills (Isler & Isler 1999). Within South America, however, songs of some members of the complex are notoriously more elaborate than those of others (Isler & Isler 1999). Thus, vocalizations have the potential of being informative with regards to the establishment of species limits in this group; however, the extent of vocal variation among populations has not been properly documented, and the songs of some taxa have not even been described in detail.

Here, we present new information on the natural history of *C. ophthalmicus* based on fieldwork

conducted over several years in various localities in four South American countries. We first describe observations made on nests of *C. o. flavopectus* and *C. o. exitelus* in Colombia, of *C. o. argentatus* in Argentina, of *C. o. phaeocephalus* in Ecuador, and of an undetermined subspecies (see Olson 1983) in Venezuela. We then present notes on the singing behavior and dawn songs of Common Bush-Tanagers occurring in different areas of Colombia based on observations and recordings made at several localities. In so doing, we highlight what appear to be substantial differences in vocalizations among Colombian members of the complex, hoping this will stimulate more research on these little-studied birds.

## METHODS

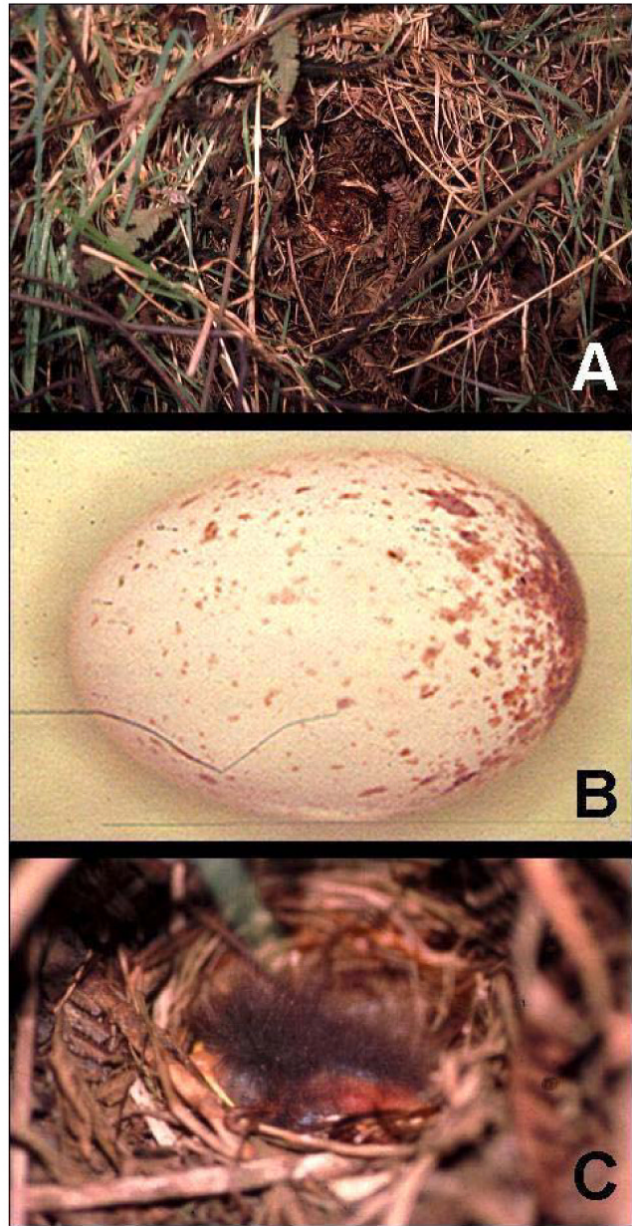
**NESTING RECORDS.-** We made observations on nesting behavior opportunistically while conducting general bird inventories and studies on avian community ecology at three different sites in the Colombian Andes. CDC and GAL worked at Finca Macanal, a ca. 500 ha private reserve located within the Municipality of Bojacá (vereda Santa Bárbara), on km 17 of the road that connects Bogotá with the town of La Mesa (4°39'N, 74°20'W; 2450 m elevation), Dpto. Cundinamarca. SCC and MPB made observations at Finca San Cayetano, also in the Municipality of Bojacá (vereda Fute, 4°37'N, 74°18'W; 2630 m elevation). This fairly undisturbed forest extends for ca. 50 km in north-south direction along the western ridge of the Bogotá plateau. Asteraceae, Winteraceae, and Melastomataceae dominate the 15 m tall canopy. The undergrowth is dense and epiphytes in the Orchidaceae and Araceae are predominant. DCF obtained information on nesting at Reserva La Romera, a 181 ha protected area located in the southeast flank of the Valle de Aburrá in the Municipality of Sabaneta (vereda La Doctora), Depto. Antioquia, Cordillera Central of Colombia (6°08'N, 75°35'W; 2100 m elevation). The forest at La Romera is mainly composed of Melastomataceae, Rubiaceae, Clusiaceae, and some Araceae; ferns in the Cyatheaceae are also notorious components of vegetation. The data from Colombia were complemented with information obtained by TEM and collaborators while conducting projects on avian breeding biology and life history evolution at field sites in Argentina, Ecuador, and Venezuela. Field work in Argentina took place in October through January 1997-2000 in yungas forest habitat at El Rey National Park, Salta (24°40'S,

64°35'W; 1000 m elevation). Details on this study site were published by Martin et al. (2000) and Martin (2002). Work in Ecuador was conducted between March 1 and June 5, 2001 in primary forest near Cosanga (0°36'S, 77°52'W; 2000 m elevation), Provincia de Napo. Fieldwork in Venezuela was carried out in March-July 2002-2005 at Parque Nacional Yacambú, Estado Lara (9°42'N, 69°42'W; 1750 m elevation).

**VOCALIZATIONS AND SINGING BEHAVIOR OF COLOMBIAN POPULATIONS.-** CDC and SCC made observations on the singing behavior of *C. o. flavopectus* during June-September 1998, throughout 1999, June 2001, and July 2002. Study sites included Finca San Cayetano, Finca Macanal, three other nearby forests in Dpto. Cundinamarca, and the Santuario de Fauna y Flora de Iguaque, a 6,750 ha protected area in the Municipalities of Arcabuco and Villa de Leyva, Dpto. Boyacá (05°41'N, 73°26'W; 2400-3800 m elevation). T. Donegan has also provided us with vocal data from birds of this taxon recorded during 2003-2006 at five study sites in Serranía de los Yariquíes, Depto. Santander (6°28'-7°00'N, 73°19'-73°22'N; 2000-3200m; see Huertas & Donegan 2006). In addition, in April 2002, SCC recorded songs at Vereda Sisavita, Municipality of Cucutilla, Depto. Norte de Santander (07°26'N, 72°50'W; 2000-2800 m elevation). Birds from this area are likely to correspond to subspecies *jacqueti*, but we consider this identification tentative owing to the existence of apparent intergrades between *jacqueti* and *eminens* in Norte de Santander (Olson 1983). Finally, in August 2005, DCF made recordings of *C. o. nigriceps* at Reserva Los Yalcones, a 7,700 ha forest reserve located in Vereda La Castellana, Municipality of San Agustín, Dpto. Huila (01°48'N, 76°20'W; 2400 m elevation). Recordings were digitized and sonograms prepared using the program Syrinx (John Burt, [www.syrinxpc.com](http://www.syrinxpc.com)). All recordings used to prepare sonograms have been archived with the Banco de Sonidos Animales, Instituto Alexander von Humboldt.

## RESULTS

**NESTING RECORDS.-** The first nest of *C. o. flavopectus* was found by GAL on August 15, 1999 in the border of a small pasture surrounded by cloud forest at Finca Macanal. The second nest of this taxon was found two days later by SCC and MPB in cloud forest at Finca San Cayetano. The nest at Finca Macanal was placed on the ground of the pasture firmly attached to a small (ca. 50



**Figure 1.** Nest (A), egg (B), and young (C) of *Chlorospingus ophthalmicus flavopectus*. Photos of nest and young are from Finca Macanal (GAL); photo of egg from Finca San Cayetano (SCC). Both localities are in Depto. Cundinamarca, Colombia.

cm tall) bank on a steep slope facing the forest among dense grass that provided a roof and obscured the nest from view. The bulky cup-shaped 15 cm tall nest was made of dry stems and fern leaves on the outside. The cup itself was tightly woven with dry grass leaves and thin fibers; it had an external diameter of 90 mm, an internal diameter of 45 mm, and the cup was 47 mm deep (Figure 1a). The nest found at Finca San Cayetano was located within forest with a 12 m canopy above and a dense understory of ferns and anthuriums. It was placed near the ground (ca. 30 cm) in a natural 104 mm



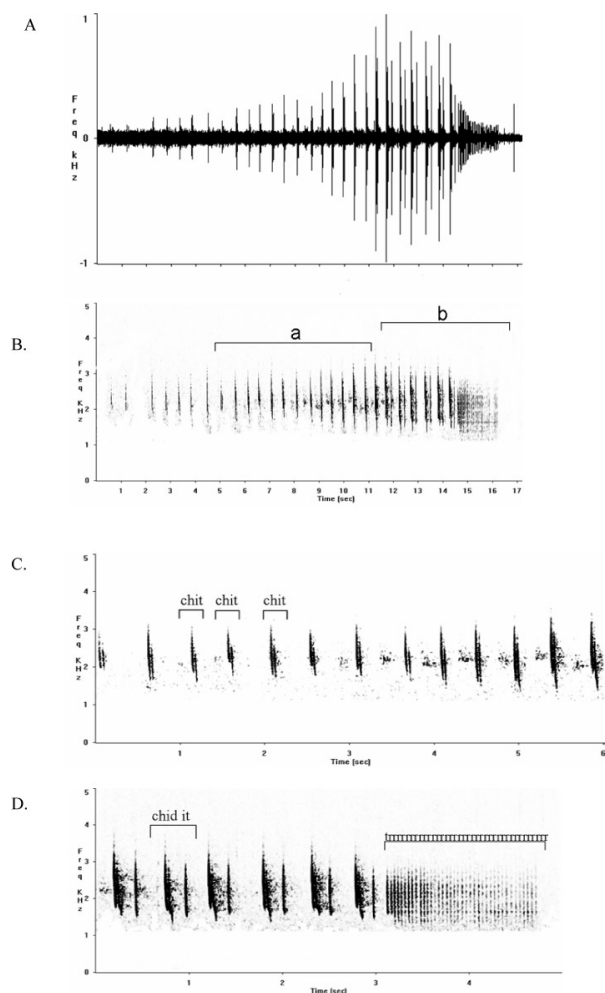
**Figure 2.** Nest (A) and eggs (B) of *Chlorospingus ophthalmicus exitelus*, from Finca La Romera, Depto. Antioquia, Colombia (photo by DCF).

wide and 150 mm tall cavity, located at the center of the base of a tree of 40 cm DBH and c. 50° inclination with respect to the ground. The cavity's roof was 70 mm above the nest. This nest was also cup-shaped; its outer part consisted mainly of fine roots and mosses and its inner lining was made of fine short fibers and some fern scales. Its dimensions were: external diameter 114.7 x 98.7 mm, inner diameter 54 mm, and depth 51.6 mm. The nest found at Finca San Cayetano contained one ellipsoidal creamy-flesh egg, which measured 23.6 x 16.7 mm and weighed 3.6 g, with small rusty red speckles more concentrated near the large end, forming a cap (Figure 1b). The egg was being incubated by an adult female. The Finca Macanal nest contained a single nestling, which was covered with grey downy plumage, had a bright yellow bill, and its eyes were still closed (Figure 1c). CDC and GAL visited Finca Macanal again on August 29, 1999 and found the nest empty. Subsequently, it was collected and deposited in the ornithological collection of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia (ICN nest collection number 141). The incubating female, egg, and nest from Finca San Cayetano were also collected and are deposited in the collection of the Laboratorio de Ecología de Poblaciones, Pontificia Universidad Javeriana, with catalog numbers 143, 145, and 146, respectively. The female weighed 22.5 g, had a 5.0 x 4.0 mm ovary and post-reproductive follicles of varying

sizes (maximum 1.7 x 1.7 mm), a completely ossified skull, some fat reserves on the interscapular region and flanks, and an empty stomach.

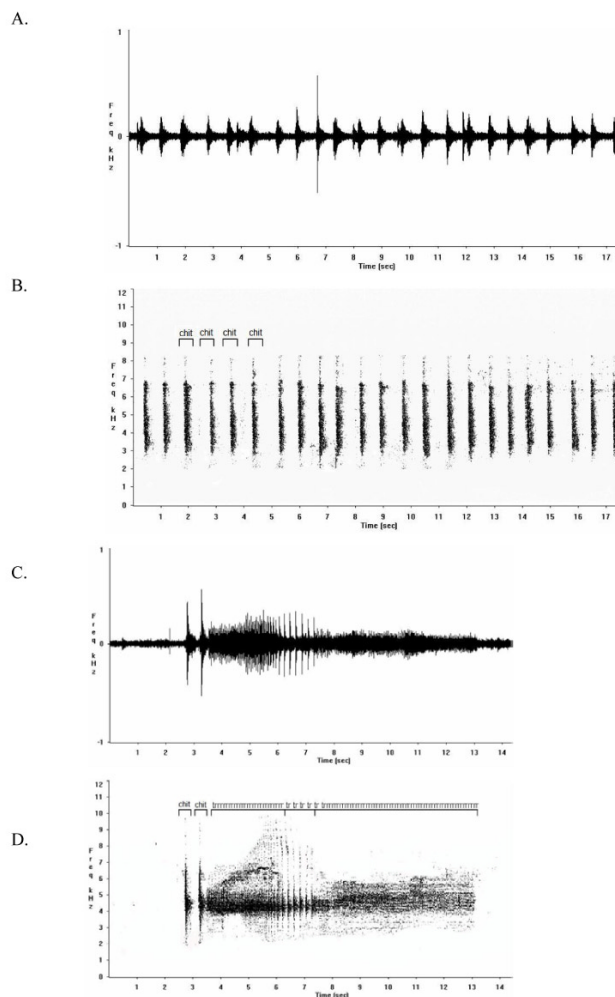
A nest of *C. ophthalmicus exitelus* was found on March 6, 2005 by DCF. This nest was located along a trail that crosses one of the small forest patches (ca. 15 ha) that form Reserva La Romera. This nest was built on a steep bank facing a low-traffic trail; it was placed 90 cm high and was totally embedded in a dense cover of grass, ferns, and leaf litter (Figure 2a). The cup-shaped nest was built with small roots, wide grass leaves, and some fern scales; a fine layer of thin fibers and grass leaves lined its inside. This nest had an internal diameter of 59 mm, and was 46 mm deep (Figure 2b). The nest contained two eggs that were being incubated by an adult bird. Like the egg found at Finca San Cayetano, these eggs were ellipsoidal, and covered by light brown blotches on a creamy-flesh background (Figure 2c). The eggs measured 19.4 x 14.9 mm and 19.4 x 15.1 mm, and weighed 2.3 and 2.4 g, respectively. DCF visited the reserve again on March 13, 2005 and found the nest empty and somewhat altered with respect to its original shape and position, suggesting it might have been preyed upon.

A total of 21 nests of *C. o. argentatus* were found during field studies conducted in 1997-2000 by TEM



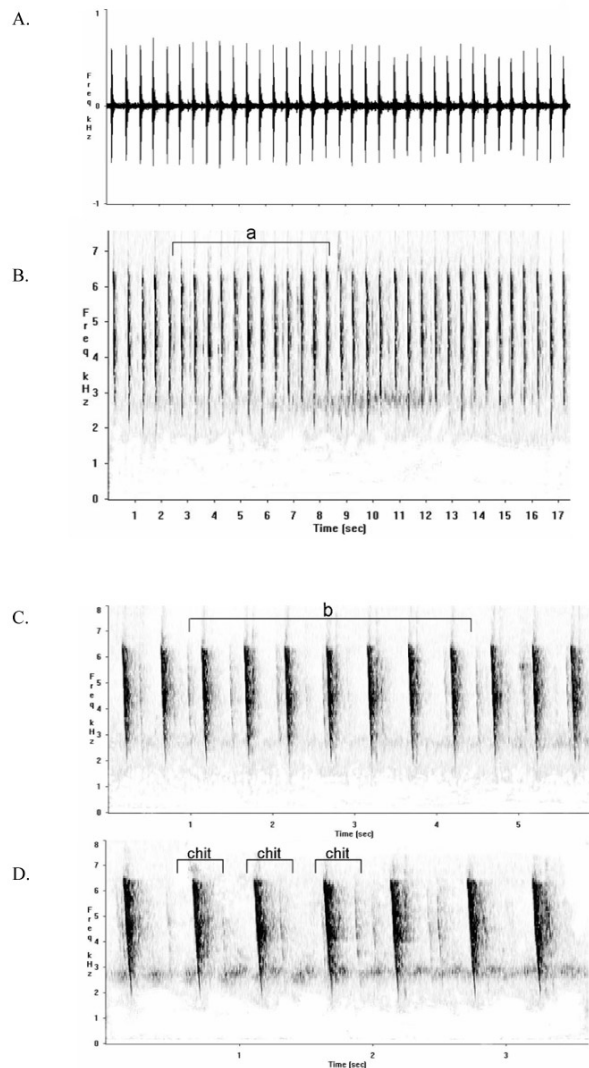
**Figure 3.** Dawn song of *Chlorospingus ophthalmicus flavopectus* recorded by SCC on 27 July 2002 at Santuario de Fauna y Flora de Iguaque, Sector Carrizal, Depto. Boyacá, Colombia. (A) waveform showing relative volume of song; (B) spectrogram of same portion showing a song of 17 s duration; (C) Detail of *chit* notes (portion a) of 6 s; (D) Detail of *chid-its* and final churring trill (portion b). This recording has been archived with the Banco de Sonidos Animales, Instituto Alexander von Humboldt, catalogue number BSA 13046.

and collaborators at El Rey National Park, Argentina. Nests found at El Rey could not be inspected in detail because in contrast to those we found in other areas, all were placed high in trees (mean nest height 13.1 m, range 4–22 m). Thus, data on clutch sizes and egg sizes and coloration are not available. Fates were difficult to determine fully because of the height, but eight nests found during building appeared to be abandoned prior to completion and egg laying. Of the remaining nests, five were depredated and the remainder either fledged young or were still active when monitoring was terminated. The daily predation rate was 0.0376,  $n = 133$  exposure days, 13 nests; the eight abandoned nests were excluded.



**Figure 4.** Dawn songs of *Chlorospingus ophthalmicus nigriceps* recorded by DCF on August 20 2005 at Reserva Los Yalcones, Mpio. San Agustín, Depto. Huila, Colombia. (A) waveform showing relative volume of 17 s of typical song; (B) spectrogram of same portion in A with detailed *chit* notes from a long persistent series, (C) waveform showing relative volume of complex song including *chits* and trills; (D) spectrogram of the same portion in C showing detail of two *chit* notes followed by a first *trrrrrrrr* trill, some *tr*, and a final, lower-pitched *trrrrrrrr* trill. These recordings have been archived within Banco de Sonidos Animales, Instituto Alexander von Humboldt, catalogue numbers BSA 16657 (A and B) and BSA 16656 (C and D).

Seven nests of *C. o. phaeocephalus* were found in primary forest near Cosanga, Ecuador by TEM and colleagues between March 1 and June 5, 2001. Nests were initiated (first egg laid) from mid-March thru mid-May. All nests and eggs were similar to those described above, but nests exhibited wide variation in placement, as indicated by their height above ground (mean 9.1 m, range 1–29 m; two were at about 1 m, one at 3 m, and the rest 9 m or higher). The three nests for which clutch size could be determined contained a single egg; egg weights were 3.138, 3.222, and 2.896 g (methods



**Figure 5.** Dawn song of *Chlorospingus ophthalmicus* aff. *jacqueti* recorded by SCC on 5 April 2002 at Sisavita, Mpio. Cucutilla, Depto. Norte de Santander, Colombia. (A) waveform showing relative volume of song; (B) spectrogram of same portion showing a song of 17 ss duration; (C) Detail of *chit* notes (portion a) and detail of *chit* notes (portion b). This recording has been archived with the Banco de Sonidos Animales, Instituto Alexander von Humboldt, catalogue number BSA 9931 (see also Córdoba-Córdoba & Alvarez-Rebolledo 2003).

for measuring egg mass are described in Martin et al. (2006). Of these seven nests, one was abandoned prior to laying eggs, three successfully fledged young, two were depredated during incubation and one during the nestling period. Nest attentiveness was monitored for six hours at one nest during late incubation; the female spent 70.7% of the time on the nest. Feeding rates were estimated at a single nest at about the day when primary feathers break their sheaths following methods in Martin et al. (2000). Both parents brought food to the

nest, at a rate of 3.94 feeding visits per hour during six hours of monitoring.

Finally, personnel associated with TEM found one nest of an undetermined subspecies of *C. ophthalmicus* (see Olson 1983) at Parque Nacional Yacambú, Venezuela during nest-building on May 29, 2004. This nest, similar in construction to those described above, was placed on a shrub and contained two eggs, each of which weighed 2.45 g (weights were taken within four days of being laid). The first egg was laid on June 4 and the second egg was laid the next day; the nest was depredated 6 days later during the incubation stage.

**VOCALIZATIONS AND SINGING BEHAVIOR OF COLOMBIAN POPULATIONS.**- At sites in Cundinamarca and Boyacá, several individuals (presumably males) were noted to sing persistently and simultaneously every morning, starting shortly after first light; individual birds consistently sang from the same exposed perches located along ridge tops on a daily basis. As is typical for *C. ophthalmicus* in South America (Isler & Isler 1999), singing was noted only at dawn, when birds seemed to be solitary; at other times, the species was invariably observed in groups of a few individuals, often accompanying mixed-species flocks. As in Cundinamarca and Boyacá, *C. o. nigriceps* in Depto. Huila sang early at dawn. Birds in this area sang simultaneously from perches as close as 8-10 m from each other. Our observations suggest birds may maintain singing territories along ridges during the breeding season, a behavior that in some ways resembles the social system described for *C. semifuscus* by Bohórquez & Stiles (2002).

The dawn song of *C. o. flavopectus* in Cundinamarca, Boyacá, and Santander consists of a series of *chit* notes of increasing volume, switching into an accelerating series of a higher pitched *chid-its*, that often finishes with a lower pitched churring trill *trrrrrrrr* of fading volume (Figure 3). Qualitatively, the complex song of *flavopectus* is similar to those of *cinereocephalus* as described by Isler & Isler (1999) and published by Schulenberg (2000), as well as to those of *hiaticolus* (Isler & Isler 1999) and *phaeocephalus* (Krabbe & Nilsson 2005).

The dawn song of *C. o. nigriceps* is qualitatively similar to that of *flavopectus*, consisting of a persistent series of *chit* notes of constant volume, shifting to a first *trrrrrrrr*

trill that ends with a few *tr* notes, before a final and lower-pitched trill *trrrrrrrr* (Figure 4). Birds frequently interspersed this complete song with monotonous bouts consisting only of *chit* notes that lasted up to 5 minutes. In comparison to all published recordings of dawn songs of members the *C. ophthalmicus* complex, the complicated song of subspecies *nigriceps* appears to be most similar to that recorded for subspecies *phaeocephalus* in the vicinity of Cosanga, Ecuador (Moore & Lysinger 1997).

The dawn songs of *jacqueti* and *venezuelensis* have been described a “simple rhythmic series of *chit* notes” (Isler & Isler 1999), whereas those of Venezuelan taxa in general consist of “a long, monotonic *chup, chup, chup*” (Hilty 2003; see also Boesman 1999). These descriptions agree well with our recordings of the simple song of aff. *jacqueti* from Norte de Santander, which lack the trills and *chid-its* observed in other Colombian taxa (Córdoba-Córdoba & Alvarez-Rebolledo 2003; Figure 5).

## DISCUSSION

Our observations on nesting sites, nest architecture and materials, egg coloration, and appearance of nestlings for Colombian, Argentinean, Ecuadorian, and Venezuelan populations of *C. ophthalmicus* are largely consistent with data on other members of the complex and other congeners. As described by Skutch (1967), we observed that *C. ophthalmicus* is relatively plastic in its nest-site selection; within the same geographical setting (Finca Macanal and Finca San Cayetano are only a few kilometers apart) the species might occupy quite different nesting microhabitats, such as earthen banks on pastures close to forest edges and cavities in moss-covered trunks in relatively dense forest. The ample variation in nesting height observed within a single locality in Ecuador and Argentina is also noteworthy. Geographic variation in nest-site selection is difficult to evaluate based on the limited amount of data available, but our observations suggest that birds may nest in upper layers of the vegetation more frequently in Argentina than in other parts of their range. Whether this behavioral pattern relates to differences in predation rates among populations remains an open question.

Both of the nests of *C. o. flavopectus* we encountered and the three nests of *C. o. phaeocephalus* that we could inspect had clutch sizes of one, whereas both

known nests of *C. o. exitelus* (Sclater and Salvin 1879; this study) and the single nest of *C. o. ssp.* from Venezuela we observed contained two eggs. Nests of *C. o. regionalis* from Costa Rica (Skutch 1967, *n*=2; F. G. Stiles unpublished data, *n*=3), of *C. o. novicius* from Panama (Worth 1939 *n*=1), and of *C. o. peruvianus* from Peru (T. S. Schulenberg in Isler & Isler 1999, *n*=2) had clutch sizes of two, whereas both of the documented nests from Mexico (*C. o. ophthalmicus* and an undetermined subspecies) contained three eggs (Edwards 1967, Rowley 1984). Sample sizes are too limited to ascertain whether this variation reflects real differences in life history strategies between populations, an issue that deserves further scrutiny through continued fieldwork. Although sample sizes are similarly limited, it is worth noting that considering all the nests we observed, eggs from smaller clutches tended to be larger than eggs from larger clutches (egg mass range 2.9-3.6 g in one-egg clutches, 2.3-2.45 g in two-egg clutches). The length of the major axis of the egg was also larger in a clutch with a single egg (23.6 mm) than in clutches of two (19.4 mm) or three (19.7 - 20.2 mm; Rowley 1984). A negative correlation between clutch size and egg size has been observed across 74 bird species in several regions of the world (Martin et al. 2006) and may be an important tradeoff in life-history evolution. We note, however, that body mass is variable among populations of *C. ophthalmicus*, so it is possible that the pattern we observed is a consequence of smaller birds, which are expected to lay smaller eggs, laying larger clutches.

Although our sample sizes are too limited to allow any definitive comparisons based on measurements of song attributes on spectrograms, we believe the available data are suggestive of the existence of marked differences in vocalizations between *flavopectus-nigriceps* (and other taxa occurring south of Colombia), which exhibit rather complex dawn songs, and aff. *jacqueti* (and other members of the *C. ophthalmicus* complex that occur in the northern sector of the Cordillera Oriental of Colombia and in Venezuela), whose dawn songs appear much simpler. Based on the available information, this suggests that there could be a clear distinction in song types that corresponds to the division of the complex into the so-called *flavopectus* and *ophthalmicus* groups (see Olson 1983). These two groups were originally treated as separate species (e.g. Hellmayr 1936) until merged by Zimmer (1947), a treatment that has been called into question (Olson 1983) but has remained



unchanged owing to the lack of relevant data (Remsen et al. 2007). In addition to the vocal differences noted here, *flavopectus* and *jacqueti* are readily diagnosable morphologically: *flavopectus* is characterized by a grey crown without any brownish tinge, by a white throat nearly without speckles, and by the absence of a white postocular spot, whereas *jacqueti* exhibits a grayish brown crown, a white postocular spot, and a throat tinged with buffy and covered with dark speckles (Olson 1983). The two taxa also differ in body mass, *flavopectus* being larger. In addition, Olson (1983) noted the occurrence of the phenotypically distinct *flavopectus*, *trudis*, and *jacqueti* within relatively short distances of seemingly continuous habitat in Deptos. Boyacá and Santander, and suggested that special attention should be given to contact zones between these taxa should they exist, as they may be behaving as separate species. We are unaware of any recordings of the dawn song of *trudis*, but our observations suggest that at least *flavopectus* and *jaqueti* may be vocally distinct, underscoring the importance of continued study of these taxa, involving recording vocalizations and collecting specimens and tissue samples for plumage and molecular analyses.

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