

Male and female parental care in the Golden-rumped Euphonia (*Euphonia cyanocephala*)

Cuidado paternal de macho y hembra en *Euphonia cyanocephala*

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Abstract

A single nest of the Golden-rumped Euphonia (*Euphonia cyanocephala*) was filmed for 72 hours near the Yanayacu Biological Station in Ecuador located in tropical montane forest. Recording was between 15–21 February 2014. We report the first observations of incubation and feeding behavior by individual parents. We use the collected observations collected during the six day period after hatching to analyze visit frequency, duration, time, and activity patterns during visits. Both male and female visited at similar rates (mean male = 20.2 ± 1.8 , mean female = 21.0 ± 1.3 visits/day) with an alternation of visits by members of the pair the typical pattern. Only the female was observed brooding and both sexes were observed feeding two nestlings. Males were documented performing flybys, although limited observations suggest females may also display a variation of this behavior. One member of the pair would often act as a sentinel while the other was visiting the nest. Behaviors observed were consistent with other members of the *Euphonia*.

Key words: Ecuador, flybys, Fringillidae, nesting behavior

Resumen

Presentamos los resultados de una grabación a un nido de *Euphonia cyanocephala*, filmada por 72 horas cerca de la estación biológica de Yanayacu, en un bosque nublado en el Ecuador. Realizamos la grabación entre el 15 y el 21 de febrero de 2014. Divulgamos las primeras observaciones de la incubación y del comportamiento de alimentación por los padres de manera individual. Utilizamos las observaciones por el periodo de seis días después de la eclosión para estimar la frecuencia de visita, la duración, el tiempo y los patrones de actividad durante las visitas. Tanto el macho como la hembra registraron una tasa de visita similar (promedio macho = $20,2 \pm 1,8$, promedio hembra = $21,0 \pm 1,3$ visitas/día) alternando las visitas entre la pareja. Solamente la hembra empolló la nidada, pero ambos sexos alimentaron a dos pichones. El macho fue documentado realizando sobrevuelos, aunque las observaciones limitadas sugieren que las hembras pueden también exhibir una variación de este comportamiento. Un miembro de la pareja solía actuar como centinela mientras que el otro estaba visitando el nido. Los comportamientos observados fueron consistentes con los de otros miembros del género *Euphonia*.

Palabras clave: comportamiento de anidación, Ecuador, Fringillidae, sobrevuelos

Introduction

The Golden-rumped Euphonia (*Euphonia cyanocephala*) is a small, largely frugivorous member of the Fringillidae family, reaching 11 cm in size and up to 16 g when fully grown. It has been reported to feed heavily on mistletoe (*Phoradendron* sp.) but is also known to ingest some insects (Blendinger *et al.* 2016, Hilty 2017,

Schulenberg 2017). This species exhibits a disjunct distribution along the Andes and occupy montane forest at elevations between 600–2,500 m asl (Hilty 2003) although occasionally are found down to sea level (Hilty 2017) with an apparently isolated population in the mountains of the Atlantic forest of eastern Brazil and northeastern Argentina. The species is known to prefer forest edges, second growth and disturbed areas, and

Table 1. Golden-rumped Euphonia (*Euphonia cyanocephala*) male and female nest visitation patterns based on a single nest observed for 6 days near Cosanga, Ecuador. Differences between visit frequencies of male and female and mean visit times per day were not significant. Mean feeding visit time calculated by combining male and female visit times.

Date	Number of male daily visits	Number of female daily visits	Male visiting twice in a row	Female visiting twice in a row	Male flyby	Mean feeding visit time mins \pm SE
15-Feb	15	17	0	1	2	0:55 \pm 0:03
16-Feb	21	22	0	1	1	0:53 \pm 0:04
17-Feb	26	26	3	4	1	0:49 \pm 0:04
18-Feb	24	23	1	1	0	0:55 \pm 0:04
19-Feb	16	19	1	4	10	0:59 \pm 0:04
21-Feb	19	19	0	0	14	0:59 \pm 0:03
Totals	121	126	5	11	28	

agricultural plantations (Hilty 2017). Breeding has been reported within their range between December-May and consists of typically two eggs laid in a globular nest constructed of grass and moss near the forest edge (Hilty 2017). Little remains known beyond basic natural history (Schulenberg 2017) and suspected migratory movements (Areta & Bodrati 2010). Very little has been reported regarding the nesting behavior of the species with reports largely limited to nesting records and egg and nest descriptions (Hilty 2003, Greeney & Nunnery 2006). We present the first observations of male and female parental care from a single nest of *E. cyanocephala* located near Cosanga, Ecuador.

Methods

Observations of a single *E. cyanocephala* nest were made at the Yanayacu Biological Station and Center for Creative Studies located near Cosanga, Napo Province, Ecuador (0°36'S, 77°53'W). All observations were made between 15 February and 21 February 2014. Video footage was not recorded on 20 February.

All recordings were made using a camera mounted on a tripod 3-4 m away from the nest.

Due to the camera angle and nest structure, recording of activity within the nest was limited. Observations were made between 06:00 and 18:00 each day.

Video footage was analyzed utilizing VLC software (VideoLan 2013). Time, number of visits, and duration along with the activity at the nest were recorded. The male was easily distinguished from the female by plumage differences, allowing for identification of individual sexes visiting the nest. A single visit was defined as the time an individual landed on the nest until it departed. Two tailed t-tests were utilized to compare male and female visitation patterns and were considered statistically significant when the P-value was less than 0.05. All means are reported \pm standard error (SE). Analysis of the nest was based on video observations during the nesting period.

Results

Nest and eggs.- The nest was located 2.7 m above the ground and built inside a clump of moss on top of a horizontal branch (4 cm diameter) of *Sambucus* sp. The tree was isolated in a regenerating pasture. The nest was



Figure 1. Image of a male Golden-rumped Euphonia (*Euphonia cyanocephala*) crossing the path of the female as she enters the nest (see hbw.com/ibc/1428531). This behavior, which we termed a 'flyby', was seen 22% of the time both male and female arrived at the nest together. Flyby begins upper left and continues clockwise to bottom left. Photo credit: Harold Greeney.

composed almost entirely of moss and rootlets, lined inside with a mix of mostly *Chusquea* bamboo leaves and a few dark rootlets intermixed. Three eggs were recorded on 14 February and two nestlings were observed the following day. The third egg did not hatch and was presumed infertile.

Parental care.- The majority of the visits alternated between the sexes with only 6.5% of all visits occurring with the same sex visiting twice in a row ($n = 247$). The female visited a mean of 21.0 ± 1.3 times per day. Male visits to the nest averaged 20.2 ± 1.8 times per day. There was no statistical difference between the number of visits by each sex (t-test, $t = 0.37$, $P = 0.72$; Table 1). The male was also recorded performing flybys before 22.2% of the female's visits. Flybys were flights where as one member of the pair flew to the nest the other would swoop past the nest, crossing the path of the first bird and causing a brief, confusing flash of wings and motion (Fig. 1, hbw.com/ibc/1428531).

It was not possible to distinguish all activities of the parents within the nest due to nest structure. However, the female appeared to brood in addition to feed, and typically spent longer on the nest ($n = 126$, mean = $06:31 \pm 0:50$ min/visit) compared to the male ($n = 121$, mean = $0:48 \pm 0:04$ min/visit; Fig.2; t-test, $t = 11.04$, $df = 124$, $P < 0.001$). The female appeared to spend slightly longer on the nest during feeding only visits ($1:03 \pm 0:02$ min/visit) on average, compared to the male ($0:47 \pm 0:02$ min/visit). The female typically fed prior to brooding but difficulty seeing inside the nest precluded the separation of female feeding and brooding times consistently. The female was the sole sex to brood, although brooding time decreased significantly starting 2 days after hatch (t-test, $t = 9.28$, $df = 125$, $P < 0.001$). The male was never observed brooding, with visits limited to feeding of nestlings and nest maintenance.

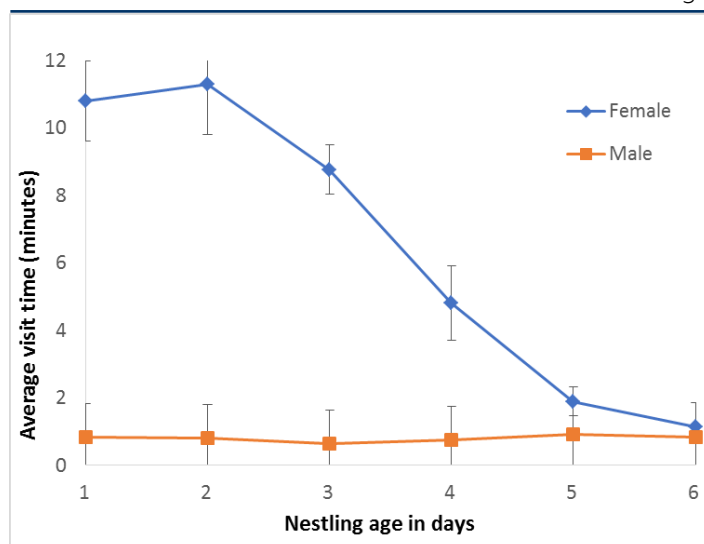


Figure 2. Comparison of average daily visit time of male vs. female *E. cyanocephala* from a single nest near Cosanga, Ecuador. Female visit times include both brooding and feeding times, whereas male only include feeding time. Male was never observed brooding. The male remained relatively consistent every day, the female decreased visiting time.

In addition, the male was observed ingesting a fecal sac a single time on day 3. The female was never recorded displaying this same behavior although it is possible she may have done so while on the nest brooding.

Discussion

We report the first observations of male and female parental care at the nest for *E. cyanocephala*. Both parents provided food to nestlings and typically alternated visits but only the female appeared to brood. Alternation of visits between the sexes has been observed in other *Euphonia* species and is often due to paired visits where the male and female arrive at the nest at the same time (Sargent 1993). As adult activity at the nest is known to increase predation rates (Ibáñez-Alamo *et al.* 2013) paired visits may reduce the frequency of parental visits to the nest allowing for fewer chances that a predator could follow them back to the nest (Skutch 1957, 1985, Isler & Isler 1987, Sargent 1993) or may be related to sentinel activity. Sentinel activity

observed among *Euphonia* and tanagers involves a single member of the pair on a nearby branch watching for any predators or intruders in the area. This allows for ample warning for the pair to escape or prepare to protect the nest from the intruder (Sutton *et al.* 1950).

Flybys, where one member of the pair flies by the nest entrance while the other enters, could be a strategy to distract predators and has been observed in several other species of passerines including Orange-bellied Euphonia (*E. xanthogaster*; Cisneros-Heredia 2006, H.F. Greeney, unpub. data), Purple-throated Euphonia (*E. chlorotica*; Kirwan 2009), Yellow-throated Euphonia (*E. hirudinacea*; Sargent 1993), and Ochraceous Attila (*Attila torridus*; Greeney 2005). Greeney (2005) interpreted this behavior as an attempt to distract predators as the resulting flash of motion and color made it difficult to follow the individual birds. Flyby behavior by males was clearly captured on video (hbw.com/ibc/1428531) and associated with 22% of female visits to the nest. Anecdotal observations suggest the female may exhibit similar behavior but because the male flybys were usually directly in front of the nest where the camera angle allowed for viewing, they were easily quantified, whereas female flybys were shorter and not as exaggerated, often occurring out of camera range.

The male was never observed brooding, a feature held in common with many *Euphonia* and tanagers (Prescott 1964, Sargent 1993). It is possible that males contribute with parental care during incubation, however our observations at this single nest were made after hatching, and there is no evidence of male incubation in other *Euphonia* (Isler & Isler 1987, Morton 1973, Sargent 1993).

As noted for many passerine species, average brooding times decreased significantly several days after hatch. While observations were limited

to six days post-hatch, we speculate this was the result of the increasing thermoregulatory abilities of the nestlings, although this typically does not occur until 8-9 days post-hatch (Schuchmann 1999, Dyrz & Greeney 2008, Ocampo & Londoño 2011). Additional studies are needed to determine if this early decrease in brooding behavior is typical for *E. cyanocephala* and if it is tied to thermoregulatory independence of nestlings.

The male did feed at an equivalent rate as that observed for the female, with a nearly identical number of visits ($n = 121$) over the period of observation as that documented for the female ($n = 126$). This matches patterns observed in other *Euphonia* (Morton 1973, Skutch 1985, Sargent 1993). The female spent slightly longer on the nest during feeding only visits compared to the male. Since these observations only represent the first 6 days post hatch, it is difficult to determine the importance of this difference. It is possible that the female is feeding a larger quantity than the male and additional observations will be necessary in order to determine whether there is support for this trend and hypothesis.

Feeding length bouts did increase slightly over the six-day period and this matches patterns observed in other *Euphonia* species (Table 1). Sargent (1993) documented a similar non-significant increase in *E. hirundinacea* over the nesting cycle and it is likely tied to the increased energetic demands of nestlings as they grow. Since *E. cyanocephala* feed through regurgitation, a longer period of time might be necessary to transfer larger amounts of food.

The male was documented consuming a fecal sac on 18 February. Due to limited visibility within the nest, it remains possible that both the male and female ingested fecal material while on the nest following feeding visits. Only the single fecal sac

consumption was observed between 15 February and 21 February. Fecal material consumption has been documented by both sexes in other *Euphonia* and tanagers (Potter 1985, Foster *et al.* 1989). *Euphonia hirundinacea* has been observed ingesting fecal matter, but rather than producing a fecal sac, nestlings present their cloaca directly to the parent for the parent to ingest (Sargent 1993). Soiling of the nesting area with fecal matter has potential to detrimentally effect nestling survival due to the olfactory and visual attraction of predators (Petit *et al.* 1989, Lang *et al.* 2002).

It is clear from this study that male *E. cyanocephala* contribute to parental care. However, significant gaps remain in our understanding of reproductive strategies in Fringillidae and other tropical songbirds. Further observational studies are needed to elucidate the degree and importance of male contributions to male and female fitness.

Acknowledgements

We thank R. Gelis, J. Simbaña, and other researchers at the Yanayacu Biological Station in Cosanga, Ecuador for their help in recording nest footage and nest information. We also thank anonymous reviewers for comments to improve the manuscript. The work of JLP and ZW was supported by grants from Bethel University. The field work of HFG is supported in part by Field Guides Inc. and by J. V. Moore and M. Kaplan through the Population Biology Foundation and his work while writing was supported by a fellowship from the John Simon Guggenheim Memorial Foundation.

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Recibido: 03 de agosto de 2017 *Aceptado:* 31 de octubre de 2017

Editor asociado

Orlando A. Acevedo-Charry

Evaluadores

Anónimo / Anónimo