# Breeding biology of Speckled Hummingbird *Adelomyia melanogenys* in eastern Ecuador

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El Colibrí Jaspeado *Adelomyia melanogenys* se encuentra comúnmente en los bosques nublados andinos entre Venezuela y Argentina, pero se conoce poco sobre su biología básica de anidación. Grabamos en video un nido entre el 23 de octubre y el 21 de noviembre de 2012 en el noreste de Ecuador, con el objetivo de cuantificar las actividades de incubación y alimentación. El ave empolló los días 1–7 después de la eclosión. Durante este periodo, el adulto gastó un promedio de 52% del tiempo total atendiendo el nido o cerca de él. La actividad de empollar cesó el día 8. A partir de ese día, las visitas de alimentación fueron breves, bajando al 5% del tiempo total observado. El adulto hizo una media de 2,5 visitas por hora, que estuvieron repartidas de forma regular durante todo el día y durante todo el periodo de anidación. Este estudio presenta el primer análisis cuantitativo de la biología de anidación del Colibrí Jaspeado.

Descriptions of nesting behaviour for Neotropical hummingbirds remain incomplete[6,11,17,18]. Speckled Hummingbird *Adelomyia melanogenys* inhabits Neotropical montane cloud forests, at elevations of 1,000–2,500 m, from Venezuela to Argentina[9,14]. Monomorphic, it is the only species in its genus, although recent evidence suggests populations either side of the Andes are genetically distinct[5] and eight subspecies have been described[4]. The species is typically solitary and does not gather with others to feed, even at flowering trees[13]. Speckled Hummingbirds feed on the nectar of flowers, often near the ground, either from short-tubed flowers or holes at the base of long-tubed flowers[3,19].

Incomplete descriptions of the nest[9] and eggs[20], including two nests in captivity[7,27] are available in the literature. Although nests have long been present in collections[15], a complete description of the species' nesting biology is lacking.

## Methods

All observations were made at the Yanayacu Biological Station and Center for Creative Studies (00°36'S 77°53'W), Napo prov., north-east Ecuador. For more complete descriptions of the area, see Greeney *et al*.[11] and Guayasamin *et al*.[12]. We observed behaviour of one adult hummingbird at a nest, located at an elevation of 2,050 m and sited 4.6 m above ground. We recorded 17 days of video footage between 23 October and 21 November 2012 using a video camera placed on a tripod 10 m from the nest. There was a gap in recording between 8 November and 17 November. We recorded between c.06h00 and 18h00 for a total of 85 hours, beginning during late incubation (23 October–31 October), hatching, into the brooding stage (1–7 November) and ending prior to fledging on 21 November. The adult laid two eggs, but a single nestling hatched. We believe hatching occurred between 31 October and 1 November based on subsequent measurements of nestling size and development, as well as nest visitation patterns.

While Speckled Hummingbird is monomorphic and not readily sexed using plumage, given that only one individual was observed incubating and feeding, we assumed this was an adult female. Males are not known to participate in nesting in any Trochilidae[20], and females construct the nest, incubate and rear the nestlings alone.

We recorded frequency and duration of each visit. Nest attentiveness was calculated as the total time the adult spent in the nest incubating, feeding or brooding. Nest attentiveness did not include time spent near the nest. During visits, unique behaviours were noted, when possible. Time spent perched outside the nest was also recorded, as well as entry and exit from the nest. Observations of nestling behaviours were limited by camera angle and nest construction, but some were noted and reported. Waste removal was quantified by marking the time of each observed defecation.

Quantification of visitation rates and duration was made via video analysis using VLC software (www.videolan.org) for playback. Index of Dispersion was calculated using methods outlined in Fowler *et al*.[10]. All other statistical analyses were performed using SPSS[25]. Results of two-tailed tests were considered significant at the 0.05 level and means presented ± standard deviation (SD).

## Results

*Eggs*.—We found two eggs, the first measured 12.4 × 8.7 mm and weighed 0.48 g, and the second 12.6 × 8.6 mm, 0.47 g. The first was found undeveloped, presumed infertile, and did not hatch. The second was approximately one-quarter developed at the time of measurement and subsequently hatched. These eggs are slightly smaller than those in the

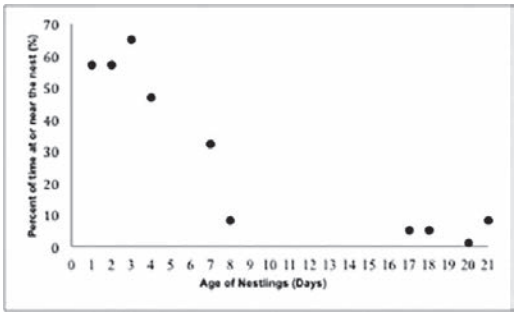


Figure 1. Amount of time spent in or near the nest during the nestling period in Speckled Hummingbird *Adelomyia melanogenys* as a percentage of the total observed. Each point represents the percent of time the adult was observed in or near the nest on each day. Days without observations represent days in which nest activity was not recorded.

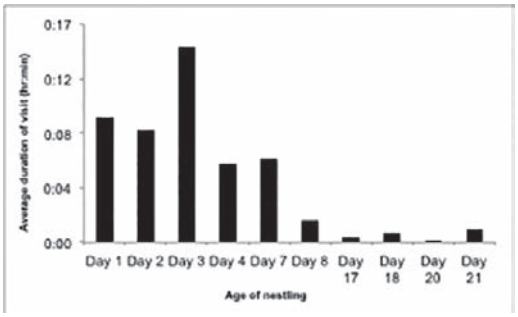


Figure 2. The average visit duration by the adult for each day after hatch. For days 1–7, both brooding and feeding were included, as separation of these behaviours was not possible. Days 8–21 represent mean feeding duration for each day. The time the adult spent on a nearby branch is excluded.

collection of the Western Foundation of Vertebrate Zoology (14.02 × 8.91 mm, collection no. 162.892-2) from Ecuador but are within the range reported by Schuchmann[20].

*Incubation*.—Nest attentiveness during the day averaged 54% ± 7 ($n$ = 34 hours 15 minutes). Frequency of visits averaged 2.44 ± 0.67 /hour/day ($n$ = 94) and were consistent throughout the period (Index of Dispersion[10]). Duration of incubation visits averaged 12 minutes one second ± one minute 52 seconds ($n$ = 94).

*Brooding and nest attentiveness after hatch*.—During the first seven days following hatching, the adult spent a mean 52% ± 13 of time observed ($n$ = 21 hours 59 minutes, ten seconds) in or perched near the nest. Time spent in or near the nest peaked on day 3 (Fig. 1). On day 8, the adult only visited the nest to feed the hatchling. By days 17–21, visits consisted of brief feeding bouts and time perched on a nearby branch. Prior to each feed, beginning on day 8, the adult perched on the branch before proceeding to feed the nestling. Instead of entering to feed, the adult perched on the nest rim, placed its head inside and regurgitated food into the nestling's gape. The adult would then leave the area. This behaviour was not observed on days 1–7 and was only recorded once on day 8, but was observed consistently on days 17–21.

Compared to the first seven days after hatching, time spent at the nest in the later stages of the nestling period (days 8–21) declined significantly to 5.4% ($n$ = 30 hours 32 minutes 33 seconds, range = 1–65% of time observed; two tailed t-test, $P$ < 0.001).

*Duration of visits*.—During the nestling period, nest attentiveness averaged five minutes 19 seconds ± five minutes one second ($n$ = 153), but declined with nestling age. After hatching and until brooding ceased (days 1–7), nest attentiveness averaged nine minutes 26 seconds ± three minutes 44 seconds ($n$ = 74) and did not differ significantly compared to incubation visits (two tailed t-test, $P$ = 0.14). Duration of attentiveness decreased significantly with development of the nestling to a mean of one minute 12 seconds ± 29 seconds once brooding ceased ($n$ = 79 visits; two tailed t-test, $P$ = 0.001; Fig. 2). Time observed near the nest was not included in overall nest attentiveness. Length of feeding visits averaged 37 seconds ± 24 during the post-brooding period (Fig. 2). Exact feeding time was not observable in the brooding stage, because feeding occurred in the nest and out of view.

Nestling provisioning rates averaged 2.5 ± 0.5 visits/nestling/hour ($n$ = 153). The frequency of visits showed no significant change throughout the period, though visit frequency had a near-significant change from brooding to post-brooding stages (two tailed t-test, $P$ = 0.06). Throughout the period, visits were regularly dispersed (Index of Dispersion[10]). Nest visit frequency was also quantified for each hour of each day. Visits were regularly dispersed throughout the day.

*Nestling defecation*.—After feeds, the nestling was observed defecating outside the nest entrance in a projectile manner. On average, this behaviour occurred 12 minutes 54 seconds ± eight minutes 27 seconds after each feed ($n$ = 30). Defecations were first observed on day 3, and occurred while the adult was present at the nest until day 7 ($n$ = 7). Beginning on day 8, this behaviour was observed more frequently, usually after feeds ($n$ = 23), and while the adult was not in the nest.

## Discussion

Nestling provisioning rates averaged 2.5 ± 0.5 visits/hour, a rate slightly higher than most other hummingbirds, which often visit the nest <2.5 visits per hour (e.g. White-crested Coquette *Lophornis*

*adorabilis*, 2.4 per hour[22]; Purple-throated Carib *Eulampis jugularis*, 1–2 per hour[28]; Glittering-bellied Emerald *Chlorostilbon aureoventris*, 1–2 per hour[16]; Swallow-tailed Hummingbird *Eupetomena macroura*, 1–2 per hour[17]; Bronzy Inca *Coeligena coeligena*, 1.1–2.0 per hour[6]). Feeding rates do not appear to increase with age, as reported for passerines[6,8]. Skutch[23] noted that, in general, parents that regurgitate, such as hummingbirds, feed less frequently than those that carry food in the bill. This may be a result of higher calorific content of food brought to the nest, or of high energetic demands of hummingbird metabolism, precluding more frequent nest visits[6].

Although the precise incubation length at the nest we studied is unknown, an incubation period of 17–20 days has been reported for Speckled Hummingbird[20], in accordance with other tropical hummingbird species, which average 20 days[8]. Nest attentiveness during incubation (54%) was lower than that reported for many tropical hummingbirds (62–77%). However, a lower percentage of attentiveness was found in some species including White-crested Coquette *Lophornis adorabilis*, although the exact stage of incubation in that study was not specified[8,22]. This is also significantly lower than temperate hummingbirds, probably because in tropical climates, eggs remain warm for longer while the adult is away from the nest[2,8,26]. Less frequent nest visits permit more time away from the nest, presumably to collect food. This is beneficial to Speckled Hummingbird, as the species often travels several km to forage alone, to avoid competition[7,24].

During the late incubation and brooding periods, the adult was observed picking at the nest with its bill on multiple occasions. While the purpose of this behaviour is unclear, other researchers have suggested that it is to collect insects caught in the nest[18] or to maintain the nest. This may include pushing sphagnum moss and spiders' webs into the roof to reinforce the structure[7].

Time spent brooding began to decline seven days after hatching. Brooding behaviour has not been described in detail for closely related genera such as *Oreonympha* and *Aglaiocercus*. However, other hummingbirds have been recorded to decrease brooding time at a similar rate[20,22]. For Bronzy Inca, Dyrzc & Greeney[6] reported a decline five days after hatching. Brooding behaviour in this study ceased in the middle of the nesting period, which is typical of other tropical hummingbirds[8]. Once brooding ceased, the duration of feeding visits decreased significantly, which may be a result of the nestling's developed ability to swallow food quickly, necessitating less time at the nest[6]. Furthermore, as the nestling gained the ability to thermo-regulate, the adult no longer needed to enter as frequently to brood. This may be an important survival mechanism, as reduced visit length may lower chances of predation[6].

Once brooding ceased, the adult often remained perched near the nest prior to feeds. Due to the angle of the camera, we could not confirm the zigzag and erratic approach flight observed in other hummingbird species, which may serve to distract predators from a nest's true location[6,21]. However, it is interesting to note the regular presence of the adult near the nest, potentially alerting predators to its location. Swallow-tailed Hummingbird has been reported exhibiting similar behaviour[17].

Continued research on Speckled Hummingbird is encouraged, especially behaviour away from the nest, before or after the nesting period. Although basic nesting information is presented here, our data come from just one nest. Future studies are required to better understand Speckled Hummingbird and closely related species' breeding ecology and their role in Andean cloud forest ecosystems. Previous studies suggest that hummingbird diversification may be linked to angiosperm floral specialisation[1]. Further understanding the foraging and reproductive ecology of species such as Speckled Hummingbird may help further elucidate this and other interesting questions in Andean cloud forest ecology.

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## References

1. Armbruster, W. S. & Muchhala, N. (2009) Associations between floral specializations and species diversity: cause, effect or correlation. *Evol. Ecol*. 23: 159–179.
2. Baltosser, W. H. (1996) Nest attentiveness in hummingbirds. *Wilson J. Orn*. 108: 228–245.
3. Chaves, J. A. & Sedgwick, C. (2011) Speckled Hummingbird (*Adelomyia melanogenys*). In: Schulenberg, T. S. (ed.) Neotropical Birds Online. Ithaca, NY: Cornell Lab of Ornithology.
4. Chaves, J. A. & Smith, T. B. (2011) Evolutionary patterns of diversification in the Andean hummingbird genus *Adelomyia*. *Mol. Phyl. & Evol*. 60: 207–218.
5. Chaves, J. A., Pollinger, J. P., Smith, T. B. & LeBuhn, G. (2007) The role of geography and ecology in shaping the phytogeography of the Speckled Hummingbird (*Adelomyia*

*melanogenys*) in Ecuador. *Mol. Phyl. & Evol*. 43: 795–807.
6. Dyrzc, A. & Greeney, H. F. (2008) Observations on the breeding biology of Bronzy Inca (*Coeligena coeligena*) in northeastern Ecuador. *Orn. Neotrop*. 19: 565–571.
7. Elgar, R. J. (1982) Nest building of a female Speckled Hummingbird *Adelomyia melanogenys*. *Avicult. Mag*. 88: 153–156.
8. Fierro-Calderón, K. & Martin, T. E. (2007) Reproductive biology of the Violet-chested Hummingbird in Venezuela and comparisons with other tropical and temperate hummingbirds. *Condor* 109: 680–685.
9. Fjeldså, J. & Krabbe. N. (1990) *Birds of the high Andes*. Copenhagen: Zool. Mus., Univ. of Copenhagen & Svendborg: Apollo Books.
10. Fowler, J., Cohen, L. & Jarvis, P. (1998) *Practical statistics for field biology*. Chichester, NY: Wiley.
11. Greeney, H. F., Dobbs, R. C., Díaz, G. I. C., Kerr, S. & Hayhurst, J. (2006) Breeding of the Green-fronted Lancebill (*Doryfera ludovicae*) in eastern Ecuador. *Orn. Neotrop*. 17: 321–331.
12. Guayasamin, J. M., Bustamante, M. R., Almeida-Reinoso, D. & Funk, W. C. (2006) Glass frogs (Centrolenidae) of Yanayacu Biological Station, Ecuador, with descriptions of a new species and comments on centrolenid systematics. *Zool. J. Linn. Soc*. 147: 489–513.
13. Hilty, S. L. (2003) *Birds of Venezuela*. Princeton, NJ: Princeton University Press.
14. Hilty, S. L. & Brown, W. L. (1986) *A guide to the birds of Colombia*. Princeton, NJ: Princeton University Press.
15. Oates, E. (1903) *Catalogue of the collection of bird's eggs in the British Museum of Natural History*, 3. London: Longmans & Co.
16. Oniki, Y. & Antunes, A. Z. (1998) On two nests of Glittering-bellied Emerald *Chlorostilbon aureoventris* (Trochilidae). *Orn. Neotrop*. 9: 71–76.
17. Oniki Y. & Willis, E. O. (2000) Nesting behavior of the Swallow-tailed Hummingbird, *Eupetomena macroura* (Trochilidae, Aves). *Rev. Bras. Zool*. 60: 655–662.
18. Ornelas, J. F. (2010) Nests, eggs, and young of the Azure-crowned Hummingbird (*Amazilia cyanocephala*). *Wilson J. Orn*. 122: 592–597.
19. Ridgely, R. S. & Greenfield, P. J. (2001) *The birds of Ecuador*. Ithaca, NY: Cornell University Press.
20. Schuchmann, K. L. (1999) Family Trochilidae (hummingbirds). In: del Hoyo, J., Elliott, A. & Sargatal, J. (eds.) *Handbook of the birds of the world*, 5. Barcelona: Lynx Edicions.
21. Skutch, A. F. (1958) Life history of the Violet-headed Hummingbird. *Wilson Bull*. 70: 5–19.
22. Skutch, A. F. (1961) Life history of the White-crested Coquette Hummingbird. *Wilson Bull*. 73: 4–10.
23. Skutch A. F. (1976) *Parent birds and their young*. Austin: University of Texas Press.
24. Snow, D. W. & Snow, B. K. (1980) Re1ationships between hummingbirds and flowers in the Andes of Colombia. *Bull. Brit. Mus. (Nat. Hist.), Zool*. 38: 105–139.
25. SPSS (2012) IBM SPSS Statistics. Version 21. New York: IBM Corporation.
26. Vleck, C. M. (1981) Hummingbird incubation: female attentiveness and egg temperature. *Oecologia* 51: 199–205.
27. Wittmann, M. (1981) *Adelomyia melanogenys*. *Trochilus* 2: 39–40.
28. Wolf, L. L. & Wolf, J. S. (1971) Nesting of the Purple-throated Carib Hummingbird. *Ibis* 113: 306–315.

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