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# PARENTAL CARE OF NESTLINGS IN THE SLATY-BACKED NIGHTINGALE-THRUSH (*CATHARUS FUSCATER*) IN EASTERN ECUADOR

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**Cuidado parental de polluelos del Zorzalito Sombrío (*Catharus fuscater*) en el este de Ecuador.**

**Key words:** Brooding, *Catharus fuscater*, Ecuador, nestling provisioning, Slaty-backed Nightingale-Thrush, Turdidae.

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## INTRODUCTION

The Slaty-backed Nightingale-Thrush (*Catharus fuscater*) (Fig. 1) is an uncommon to locally fairly common Andean thrush (family Turdidae). It is found in dense, mossy, humid montane forest, in foothills and lower temperate highlands at 600–3250 m a.s.l., from Costa Rica to northwestern Bolivia. The species prefers dense undergrowth and is often associated with riparian areas (Collar 2005). In Ecuador, it inhabits both Andean slopes, predominantly at elevations of 1200–2600 m a.s.l.; these populations belong to the nominate subspecies (Ridgely & Greenfield 2001).

The biology of the Slaty-backed Nightingale-Thrush is rather poorly studied (Collar 2005). Beltrán & Kattan (2001) found a single nest in Colombia's Central Cordillera, describing the nest, eggs, and some details of incubation and nestling provisioning behaviors, including a reported nestling period of 14 days. Recent work by Greeney *et al.* (in press) describes cooperative breeding in a single nest in Ecuador. Here we expand upon their observations with a detailed description of nestling care and nestling growth based on two nests (one the same as in Greeney *et al.* in press) studied in northeastern Ecuador.


FIG. 1. Female Slaty-backed Nightingale-Thrush (*Catharus fuscater*) incubating at nest 2 near Yanayacu Biological Station, Napo, northeastern Ecuador (photo: R. Mikusek).

## METHODS

We studied nestling provisioning and growth of the Slaty-backed Nightingale-Thrush in November 2007 and 2009 at c. 2100 m a.s.l., in the vicinity of the Yanayacu Biological Station and Center of Creative Studies (00°36'S, 77°53'W), 5 km west of Cosanga (Napo Province, northeastern Ecuador). For a more complete site description and characterization of the vegetation, see Valencia (1995). Our detailed observations on the reproductive behaviors of the Slaty-backed Nightingale-Thrush were made at two nests, each with two nestlings (hereafter referred as nest 1 and nest 2), on 20–26 November 2007 (nest 1) and 2–12 November 2009 (nest 2). Nests were found during incubation and checked daily up to hatch. At nest 1, our observations ceased on 26 November when we found the nestlings dead of unknown causes, and at nest 2 our observations ceased on 12 November when both nestlings were killed by a predator (see Results). At nest 1, we used video recordings made during the early nestling period from a tripod-mounted camera placed c. 10 m from nest. At nest 2, we gathered direct observational data during the earlier nestling period by watching the nest with 10x40 binoculars from a hide placed c. 15 m from the nest. Four adult birds seen on the nest were individually color banded prior to our observations. They were sexed using genetic markers (Greeney *et al.* in press). At nest 1, we recorded nestling provisioning on 3 days, with 12, 12, and 9 h of recordings on each day, respectively (nestlings 1–5 days old). At nest 2, we made observations on 8 days (nestlings 1–8 days old). Observations made at nest 2 totaled 56 h (4–10 h per day). The observa-

tions started in morning. All means are presented with ± SD.

## RESULTS

*Brooding.* At nest 1, one day old nestlings were brooded 44% of the observation period, but brooding time decreased to only 6% by 5 days of age (Table 1). Brooding was performed by at least two adult birds. While adults at nest 1 were not color-banded, we documented individuals exchanging positions at the nest and can confirm brooding was provided by more than one individual. At nest 2, the nestlings were brooded for some portion of the day until they were 6 days old, exclusively by a color-banded female. One day old nestlings were brooded during 46% of the observation period, decreasing until day 7 when brooding ceased altogether. Time devoted to brooding significantly declined with age of nestlings (linear regression: % time brooding = -7.16 x age + 55.46, n = 7 days, $t_6 = 11.57$ two-tailed, $P < 0.01$; Table 1, nest 2).

*Nestling provisioning.* At nest 1, nestlings were provisioned by at least two adults. Hourly feeding rates (n = 33 h observed) ranged from 1.5 to 5.5 visits/nestling/h, while daily averages ranged from 3.0 to 3.1 visits/nestling/h (n = 3 days, Table 1). At nest 2, nestlings were provisioned mainly (77% of visits; n = 244) by one, individually color-banded female. Sporadically, however, nestlings were fed by at least four other birds, including three color-banded males and 1–2 non-banded birds (Greeney *et al.* in press). The most actively provisioning female usually approached the nest from below, popping upwards to the rim with a quick flight, and subsequently departing downwards to near ground-level before flying away. Across the entire observation period (56 h), feeding rates ranged from 1.5 to 3.5 visits/nestling/h, with daily averages ranging from 1.2 to 2.9 visits/nestling/h (Table 1, nest 2). Feeding rates did not change significantly with increasing age of nestlings (feeding rate = 0.03 x age + 2.054, n = 8 days, $t_6 = 0.336$, $P = 0.78$, two-tailed). Feeding visits were randomly distributed with regard to time of day, with visitation patterns approaching a regular distribution only at nest 2, with 1 day old nestlings (Index of Dispersion; Fowler *et al.* 1998, pp. 62–66).

Intervals between feeding visits at nest 1, with 1 day old nestlings, ranged from 0 to 32 min (12 h of recording, mean = 9.68 ± 6.74 min, n = 68). For 3 day old nestlings, intervals ranged from 0 to 32 min (12 h, mean = 9.02 ± 6.86 min, n = 71), and for 5 day old nestlings intervals ranged from 0 to 25 min (8.5 h, mean = 7.73 ± 5.85 min, n = 52). At nest 2, across the entire observation period, intervals between feeds (n = 245) ranged from 1 to 58 min (mean of daily means = 13.7 ± 2.74 min). During the longest observed interval between successful feeds (2 day old nestlings) the female arrived at the nest with a large beetle (Coleoptera), trying several times to feed it to the nestlings before consuming it herself. Average intervals between feeds were longest (mean = 18.3 ± 10.46 min) for one day old nestlings.

*Nestling diet.* Regarding the diet of nestlings we can provide only limited (n = 19) observations. Adults were observed to feed nestlings with caterpillars (larval Lepidoptera) 8 times, with annelids (including at least one Lumbricidae earthworm) 5 times; and single observations concern a flatworm (Platyhelmintha), a leech (Hirudinea), a millipede or centipede (Myriapoda), a spider (Araneae), a beetle larva (Coleoptera) and one probable mayfly adult (Ephemeroptera). Many times we observed adults foraging on the ground not far from the nest looking for prey among litter and along the stream edge. One bird was observed hover-gleaning an insect from a leaf.

TABLE 1. Provisioning, brooding, and nest sanitation at two nests of the Slaty-backed Nightingale Thrush in 2007 and 2009 at Yanayacu Biological Station, Napo Province, Ecuador. Observations at nest 1 were conducted on 20–26 November 2007 and nest 2 on 2–12 November 2009.

| | Nest 1 | | | | Nest 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Nestling age (days) | Adult visits | Hours observed | Visits/nestling/ hour | Brooding time (%) | Adult visits | Hours observed | Visits/nestling/ hour | Fecal sacs removed | Fecal sacs eaten | Brooding time (%) |
| 1 | 71 | 12 | 3.0 | 43.6 | 25 | 10 | 1.2 | 0 | 1 | 45.8 |
| 2 | - | - | - | - | 54 | 10 | 2.7 | 0 | 9 | 39.2 |
| 3 | 74 | 12 | 3.1 | 38.9 | 20 | 4 | 2.5 | 1 | 4 | 37.5 |
| 4 | - | - | - | - | 38 | 9 | 2.1 | 2 | 14 | 25.9 |
| 5 | 55 | 9 | 3.0 | 5.9 | 18 | 4 | 2.2 | 4 | 4 | 25.8 |
| 6 | - | - | - | - | 47 | 8 | 2.9 | 14 | 6 | 13.5 |
| 7 | - | - | - | - | 21 | 5 | 2.1 | 9 | 1 | 0 |
| 8 | - | - | - | - | 21 | 6 | 1.8 | 10 | 2 | 0 |

*Nest sanitation.* We observed adults removing or eating fecal sacs from the nest (Table 1). The following observations correspond to nest 2 containing two nestlings. On the first day of nestlings' life, the female (which incubated and brooded nestlings) ate the fecal sac only once. The following day, when the young were 2 days old, during 10 h session fecal sacs were eaten by the female nine times. We observed the removal of a fecal sac for the first time when nestlings were 3 days old (4 h session); and the female ate sacs four times. On the fourth day of nestling life during 9 h session fecal sacs were removed twice (by two different adults) and eaten 14 times (mainly by a female but also by another adult). During next days the removal of fecal sacs increased while fewer were eaten (Table 1).

*Nestling development.* At hatching, nestlings were pink-skinned with a slightly orange cast, especially around the cloaca and on the legs. Their bills were dull yellow with brighter-white rictal flanges and with a dusky tip on the upper mandible and the mouth lining was bright yellow. On the back and crown, the nestlings had medium-length pale grey down. Four days later, their appearance had changed little, and nestlings still had no visible contour feather development but primaries and rectrices were just beginning to emerge approximately 2 mm through the skin. Their eyes remained closed. By 6 days of age, the mouth lining had become bright yellow-orange and their primaries and rectrices had emerged through the skin ca. 3–4 mm. Contour feathers were just emerging through the skin on the occipital and dorsal feather tracts, with similar development of contour feathers on the rest of the body. Eyes opened between 6–7 days after hatching. Primary feathers began emerging from their sheaths around day 8 along with contour feathers.

*Nestling fate.* At nest 1, nestlings were found dead in the nest when 6 days old with no visible cause of death. In nest 2, the two 9 days old nestlings were killed by a long-tailed weasel (*Mustela frenata*) (see Greeney *et al.* in press).

## DISCUSSION

Females brooded nestlings most intensively in their first day of life (hatch day) (Table 1). For hatchlings the brooding serves not only for warming but also to dry their downy feathers, which are still plastered against the skin by the fluids of the egg, until their filaments separate and cover and protect the body (Skutch 1976). The amount of time devoted to brooding decreased with the age of the nestlings. It seems likely that the increasing ability of nestlings to thermoregulate is the most important factor accounting for decreased brooding. These data agree with findings from other altricial passerines including American Robin (*Turdus migratorius*) and Hermit Thrush (*Catharus guttatus*) (Cheng & Martin 2012). Both of these species develop endothermy around 6–7 days of age, and the cessation of brooding in the Slaty-backed Nightingale-Thrush at this same time suggests a similar pattern in this *Catharus* species.

Patterns of brooding in the Slaty-backed Nightingale-Thrush appear similar to those of other passerines. The Carolina Wren (*Thryothorus ludovicianus*) was found to exhibit a similar decrease in percent of time spent on brooding 1–6 day old nestlings (Laskey 1948). Glutz v. Blotzheim (1988) reported that the Song Thrush (*Turdus philomelos*) broods nestlings up to their 6–7 day of life while Hill *et al.* (1999) noted a decrease in brooding activity for the Blackbird (*T. merula*) through day 8, although noted that brooding activity was positively associated with rainy and cold weather after day 8.

According to Gill (1990), normal rates of food delivery by small and medium-sized

landbirds average 4 to 12 times per hour. In our study, feeding rates amount to 1.2–2.8 visits/nestling/h which means 2.4–5.6 visits/brood/h, a figure close to the lower end of the above mentioned range. Beltrán & Kattan (2001) reported, for a single Slaty-backed Nightingale-Thrush nestling with dorsal tracts already developed, an average of 2.3 visits per h (n = 6 h), and Auer *et al.* (2007) reported mean feeding rates in the Spotted Nightingale-Thrush (*Catharus dryas*) in subtropical montane forest in northwestern Argentina of 5.6/h, and in Slaty Thrush (*Turdus nigriceps*) of 10.2/h and Rufous-bellied Thrush (*Turdus rufiventris*) of 9.0/h, respectively. Martin *et al.* (2000) reported that the number of feeds/nestling/hour in *Catharus* spp. were greater in Argentina (approx. 6) than in Arizona (approx. 2.5), and in the case of *Turdus* spp. these amounted respectively to approx. 9 and 6 feeds/nestling/h. It seems that feeding rates in the genus *Catharus* are generally lower than in the genus *Turdus*. Whether this is related to factors such as differences in food quality and availability or parasite load as suggested for differences between temperate and tropical species pairs by Martin *et al.* (2000) remains unknown.

It was rather surprising that the number of provisioning visits did not increase with nestling age (Table 1). In temperate zones, food delivery rates in thrushes increase with the age of young (Gill 1990), possibly due to increased energetic demands associated with rapid feather and body growth. Hill *et al.* (1999) reported an increase in provisioning with age for both Song Thrush and Blackbird. Blümel (1980; after Glutz v. Blotzheim 1988) reported for a Song Thrush nest in Germany with three nestlings, provisioning rates for one day-old nestlings were 1 feed/nestling/h, increasing to 2.6 feeds/nestling/h for 10 day old nestlings. Provisioning rates in *C. fuscater* did not increase with age during the early nestling period and, though data for Neotropical *Turdus* and *Catharus* are limited, reports from other Neotropical passerine species are varied. Increases in feeding rate over the nestling period are reported in a number of Furnariidae including the Rufous Hornero (*Furnarius rufus*; Massoni *et al.* 2012), Thorn-tailed Rayadito (*Aphrastura spinicauda*; Moreno *et al.* 2007), Olivaceous Woodcreeper (*Sittasomus griseicapillus*; Bodrati *et al.* 2012), and Spotted Barbtail (*Premnoplex brunnescens*; Port *et al.* 2014). However, in at least some other Neotropical passerines feeding rates do not increase with nestling age, such as in Bay-capped Wren-Spinetail (*Spartonoica maluroides*; Dias *et al.* 2009) and White-throated Woodcreeper (*Xiphocolaptes albicollis*; Cockle & Bodrati 2013). In a study of the Mountain Wren (*Troglodytes solstitialis*), also conducted near the Yanayacu Biological Station, the number of provisioning visits also did not change with nestling age (Dyrcz & Greeney 2010) but it is possible that prey size or prey items per delivery increase with nestling growth.

Altogether, we found that temporal patterns of brooding and average feeding rates in the Slaty-backed Nightingale-Thrush are similar to other studied species, but not the fact that feeding rates do not increase with nestling age. We encourage other field workers to publish their observations in order to provide more data on the mating system and incubation of this poorly known tropical bird.

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