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NEST AND PARENTAL CARE OF THE BERYL-SPANGLED TANAGER (*TANGARA NIGROVIRIDIS*) IN NORTHEASTERN ECUADOR

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El nido y cuidado parental del Tangara lentejuelada (*Tangara nigroviridis*) en el noreste del Ecuador.

Key words: Natural history, nest, Andes, feeding rates, cloud forest, nestlings, *Tangara nigroviridis*, breeding biology.

The 49 species in the genus *Tangara* (Sibley & Monroe 1990) make it the most speciose genus of Neotropical birds (Isler & Isler 1999). Found only in the New World tropics, as many as 10 species of *Tangara* may inhabit the same Andean forest (Isler & Isler 1999, Naoki 2003, Burns & Naoki 2004). Although *Tangara* species are well-known and loved by naturalists and birders for their beautiful plumage, ecological information is lacking for the genus. The foraging behavior, vocalizations, and nest sites of only a few species have been studied, and less than half the nests of *Tangara* species have been found and described (Isler & Isler 1999). Here we present data on the nest architecture and breeding biology of the Beryl-spangled Tanager (*Tangara nigroviridis nigroviridis*) in northeastern Ecuador.

The Beryl-spangled Tanager ranges from coastal areas in Venezuela through the Andes of Colombia to Bolivia at elevations ranging from 900–3000 m (Isler & Isler 1999). While the eggs of this species were described nearly 130 years ago (Sclater & Salvin 1879), the nest and other aspects of its breeding biology remained a mystery. Breeding data from Colombia and Peru (Miller 1963, Hilty & Brown 1986, Fjeldså & Krabbe 1990) indicate a great deal of variation in the timing of breeding from region to region. Scant data have been published for Ecuador, with fledglings reported in the northeast in September (Fjeldså & Krabbe 1990) and a nest under construction in June from the northwest (Greeney & Nunnery 2006). Here we present observations of a nest containing two nestlings from 21 July to 2 August 2005 at the Yanayacu Biological Station and Center for Creative Studies (00°35.95S, 77°53.40W, elev. 2100 m), Napo Province, northeastern Ecuador. In addition to collecting and

describing the nest upon fledging, we videotaped activity at the nest from 23 July to 2 August. We used a tripod-mounted camera placed 15 m from the nest, changing tapes every 4 h from c. 06:00 to 18:30 h daily. We missed filming the first 4.5 h on 23 July and a 1 h period on 25 July, recording a total of 118.7 h of behavior.

Nest. The nest was an open cup measuring 10.5 cm wide by 6.5 cm tall outside, with an inner egg cup measuring 5 cm wide by 5 cm deep. It was a fairly neat, mossy cup, with a few small fern leaves and rootlets used to bind it together. The inner lining was c. 0.7 cm thick and was composed predominantly of dead, pale *Chusquea scandens* (Poaceae) leaves interspersed with a few dark rootlets. The nest was overhanging a narrow dirt road at a height of 6.5 m above the ground and was saddled over a c. 45 degree y-shaped split in a branch measuring 1.3 cm in diameter at the nest. It was nestled into sparse surrounding moss and directly shaded by leaves of the substrate tree (*Cestrum* sp., Solanaceae) and a few nearby epiphytic ferns (*Elaphaglossum* sp., Dryopteridaceae). The nest was in the outer edge of surrounding vegetation and situated roughly 15 m below the canopy crown.

General observations. On 23 July, 10 days before fledging, the nestlings weighed 7.5 and 7.7 g. Two adults typically visited the nest in quick succession to feed the young, which is consistent with the observation that this species forages in pairs or large groups and is rarely alone (Isler & Isler 1999). Although other species of *Tangara* are known to have helpers at the nest (Skutch 1961, Snow & Collins 1962, Sick 1985, Long & Heath 1994, Gelis *et al.* 2006), we saw no evidence of a third adult during the observation period. On all observation days, including the night before fledging, an adult would return each evening no later than 18:26 h and brood until it was too dark to see the nest. In the morning the adult left the nest around 06:00 h. Therefore, we suppose an adult spent the night on the nest, but we do not know this for certain since we did not videotape at night.

Nestlings typically began begging before the adults reached the nest. On two occasions the nestlings did not beg when the branch supporting the nest shook from potential predators, e.g., a squirrel and a Russet-backed Oropendola (*Psarcolius angustifrons*). This suggests that movement of the supporting branch does not signal begging, rather, there may be a contact call between the approaching adults or a contact call from the adults to the nest that induces begging behaviors.

Brooding. We could not determine if one or both of the adults brooded. Adult(s) brooded during daylight hours from 23 July through 25 July and again on 27 July. They did not brood on 26 July during the day and perhaps only brooded on the 27th due to rainy, cool weather. The percent of daylight hours spent brooding ranged from 0.6 to 6%. Mean brooding bout duration ($\pm$ SD) was 1.9 $\pm$ 2.3 min. Adult(s) brooded facing the same direction on at least 22 of 24 brooding bouts. For the remaining two bouts we failed to note the position of the adult.

Nestling provisioning. Nestlings were provisioned 1700 times during a total of 118.7 h of filming for an overall rate of 7.2 feeds per nestling-hour. Feeding rates showed a decreasing trend from hour to hour throughout the day (Pearson correlation = –0.87, n = 12, $P < 0.001$). Specifically, over the entire observation period the daily feeding rates were highest in the morning with 11.6 feeds per nestling-hour from 6:00–7:00 h, with the lowest recorded feeding rates of 4.15 and 4.25 feeds per nestling-hour occurring from 16:00–17:00 h and 17:00–18:00 h, respectively. Generally, the last feeding of the day

occurred around 18:12 h, with the latest recorded feeding occurring at 18:17 h.

On 24 July we observed the adults feeding *Miconia* sp. (Melastomataceae) berries to the nestlings. The adults were gathering several berries at a time from a tree 3–5 m away from the nest. We were unable to identify other food items brought to the nest.

Fecal sacs. Nestlings produced a total of 606 fecal sacs during 118.7 h of observation for a rate of 2.6 fecal sacs per nestling-hour. There was no trend in the rate of fecal sac production over time (Pearson correlation = 0.38, n = 11, $P = 0.12$). Nestlings produced 100% of their fecal sacs in the presence of adults during the first four days of filming (23–26 July), however, this percentage dropped steadily until the day of fledging when only 20% of fecal sacs were produced in front of adults. Fecal sacs not produced in front of adults (n =112) landed on the rim of the nest or were forcefully ejected out of the nest, sometimes projecting over 15 cm. Of the fecal sacs not ejected out of the nest, the adults carried away the majority, consuming only 13.6% during the observation period. There was no trend in the rate of fecal sac consumption by adults over time (Pearson correlation = –0.42, n =11, $P = 0.10$).

Fledging. On 2 August, both nestlings fledged, with the first walking off the nest rim onto the supporting branch and out of camera view at 07:16 h. The second nestling followed in similar fashion 99 s later. The adults fed the nestlings on the morning of fledging, with the last feed just 30 s before the first nestling fledged. We did not note whether the adults vocalized.

Conclusions. This study covered the final 12 days of the nestling period. Because other reported nestling periods for the genus *Tangara* ranged from 14–16 days (Skutch 1954, Isler & Isler 1999), we suppose we observed nearly the entire duration of the nestling period for Beryl-spangled Tanager. Several differences are apparent when comparing our data with the detailed notes from Skutch (1954, 1981) on other *Tangara* spp. Our observations of the Beryl-spangled Tanager nest showed that diurnal brooding ceased 6 days prior to fledging, which is consistent with other *Tangara* species studied by Skutch; however, it appears that nocturnal brooding continued throughout the entire nestling period. This contrasts with Skutch's observations that nocturnal brooding ceased 2–4 days prior to fledging.

As nestlings got older, Skutch (1981) noted an increase in the proportion of fecal sacs carried from the nest rather than consumed by the adults. We saw no such trend for Beryl-spangled Tanager. Interestingly, we noted that the percentage of fecal sacs produced in the presence of adults dropped steadily from the first day of filming until the day of fledging. This suggests that fecal sac production may be linked to the presence of adults during the early nestling period and later becomes independent of adult presence.

A final difference between our data compared with other *Tangara* species is the very short period of brooding we observed for Beryl-spangled Tanager, even when nestlings were presumably quite young. While we report mean bouts of less than 2 min., Skutch (1954, 1981) found periods of brooding ranging from 10–14 min for 3–4 day old nestlings of other *Tangara* spp. Aside from these differences, most of our observations concur with those from other *Tangara* (Skutch 1954, 1981). Like other species, both adults of the Beryl-spangled tended to arrive together to deliver food, feeding in close succession (but see *T. gyrola* account in Skutch 1954). Feeding rates were also similar in that they were generally higher in the morning (Skutch 1954). Like 16 of 17 nestlings of Silver-throated Tanagers (*T.*

icterocephala) (Skutch 1981), the Beryl-spangled Tanagers in this study fledged in the morning.

While we observed only two adults provisioning nestlings, some *Tangara* show variation in the number of attending individuals per nest, even when comparing nests within a species (Skutch 1981). With a sample of only one nest, we hesitate to rule out the possibility of helpers at the nest for Beryl-spangled Tanager. We hope this brief contribution encourages others to continue publishing available data for Tanagers and poorly studied Neotropical species.

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