

## ON THE NEST, EGGS, NESTLINGS, AND PARENTAL CARE OF THE SCALED ANTPITTA (*GRALLARIA GUATIMALENSIS*)

Robert C. Dobbs<sup>1</sup>, Paul R. Martin<sup>2</sup> & Michael J. Kuehn<sup>3,4</sup>

<sup>1</sup>234 E. Cobblecreek Dr. #4, Cedar City, Utah 84720, U.S.A.

<sup>2</sup>Montana Cooperative Wildlife Research Unit, Univ. of Montana, Missoula, MT 59812, U.S.A.

<sup>3</sup>23600 Woodward Ave., Big Rapids, Michigan 49307, U.S.A.

**Resumen.** – Nido, huevos, pichones y cuidado parental del Hormiguero-cholino Escamoso (*Grallaria guatimalensis*). – La historia natural de los hormigueros (*Grallaria*, *Grallaricula*, *Hylopezus*, *Myrmothera*, *Pittasoma*) es entre las menos conocidas de las aves Neotropicales. Presentamos información detallada sobre la biología reproductiva del Hormiguero-cholino Escamoso (*Grallaria guatimalensis*), información conseguida de cinco nidos del sudoeste de Ecuador. En particular, proveemos las primeras descripciones del cuidado parental y de los hábitos de nidificación de esta especie, y la primera información sobre el desarrollo de los pichones para la subfamilia Grallariinae (Formicariidae) entera. Además, complementamos las tres descripciones previamente publicadas del nido y los huevos, y proveemos detalles sobre la composición del nido.

**Abstract.** – Antpitta natural history is among the least known of Neotropical birds. From five nests in southwestern Ecuador, we present detailed information on the breeding biology of the Scaled Antpitta (*Grallaria guatimalensis*). In particular, we provide the first descriptions of parental care and nesting behavior in this species, and the first nestling development data for the entire Grallariinae (Formicariidae). We also supplement the three previously published nest and egg descriptions and provide details of nest composition. Accepted 28 January 2001.

**Key words:** *Scaled Antpitta*, *Grallaria guatimalensis*, nest, egg, nestling development, parental care, nesting behavior.

### INTRODUCTION

Antpittas (Grallariinae: Formicariidae) are common and ecologically important members of most Neotropical avifaunas, yet their breeding biology remains very poorly known. Since Wiedenfeld's (1982) three page, yet thorough, review of antpitta breeding biology, only six short papers (Erard 1982, Tostain 1986, Quintela 1987, Tostain & Dujardin 1988, Whitney 1992, Protomastro 2000) have added to our knowledge of the natural history

of antpitta nesting. Little more than nest and egg descriptions of a few species and virtually nothing of nestling development or parental care during any stage of the nesting cycle has been published (see Wiedenfeld 1982, Skutch 1996).

The Scaled Antpitta (*Grallaria guatimalensis*) is one of the most widespread species of its genus, occurring primarily in montane forest from Jalisco and Hidalgo, Mexico, south to Cochabamba, Bolivia (Ridgely & Tudor 1994, Howell & Webb 1995). Both sexes sing during the breeding season, usually at dusk, dawn, and during periods of heavy mist, often from a low perch such as a fallen log. Much of an individual's time appears to be spent walk-

<sup>4</sup>Current address: University of California, Department of Ecology, Evolution and Marine Biology, Santa Barbara, California 93117, U.S.A.

ing or hopping on the forest floor in search of litter-dwelling prey (e.g., earthworms, arthropods). Birds typically forage by picking up and tossing aside leaf litter with their bills and then pausing to examine intently, with head cocked to one side, the exposed area for potential food (pers. observ.). As with most antpittas, most aspects of the breeding biology of the Scaled Antpitta are unknown; only three nests and eggs and two nestlings have been described (Edwards & Lea 1955, Miller 1963, Rowley 1966), and nothing has been written on nest composition, incubation behavior, nestling development, or parental care and behavior during nestling provisioning.

While supplementing the sparse literature with nest and egg descriptions, we present previously undescribed natural history information on the nests, nestlings, and parental behavior from a Scaled Antpitta (*G. g. regulus* Sclater; Peters 1951) population on the western slope of the Andes in southern Ecuador.

## METHODS

Data were collected between 13 February and 6 March 2000 from five nests found in humid montane cloud forest between 2000–2100 m elevation, 10 km west of Celica (4°07'S, 79°58'W), Loja Province, Ecuador. The forest, which was fragmented and had some understory disturbance from livestock, was characterized by a 12–20 m tall canopy and trees heavily laden with green moss and other epiphytic vegetation. On this west-facing slope, nighttime heavy rain typically subsided at dawn and was followed by cloud inundation from 09:00–11:00 (EST) onwards, and almost continuous drizzle after noon. This consistent weather pattern probably accounts for the high breeding activity observed in Scaled Antpittas and other passerine species (P.R.M. unpubl. data; see also Best *et al.* 1993, 1996).

Nests typically were found by flushing an adult off of eggs or nestlings, although one nest was found by randomly searching vegetation. Nest and nest site characteristics were described and measured at each nest. Composition of nest materials was quantified by dissecting three nests, which were collected on the day of or day following fledging (one nest) or depredation (two nests); nest material was dried, separated into categories, and weighed.

Linear measurements (mm) of eggs and nestlings were taken with digital calipers (Mitutoyo CD-6" CS) and mass (g) was measured with a digital scale (ACCULAB PP2060D). Tarsus length, mass, and appearance of nestlings were recorded every day or every other day at all nests while nestlings were present, except late in development when there was a risk of premature fledging with disturbance.

Nest watches were conducted during incubation and nestling feeding periods in order to observe adult and nestling behavior at the nest. Single observers monitored nests from the ground (without a blind) at a distance of 15–25 m, depending on the density of vegetation. During all nest watches, which ranged in duration from 2.5 to 6.0 h, birds did not appear to be affected by the observer's presence.

## RESULTS

*Nests.* Nests were located (mean  $\pm$  SD) 0.92 m  $\pm$  0.28 above the ground (N = 5), near the main trunk of standing trees as follows: (1) at the intersection of the trunk (unidentified sp.) and 3 bamboo (*Chusquea* sp.) branches; (2) on a horizontal branch adjacent to the trunk (snag, unidentified sp.); (3) in a fork of the trunk (Rubiaceae sp.); (4) in a crotch formed by the division of the trunk into 7 smaller trunks/branches (Melastomataceae sp.); (5) among 2 intertwined trunks and 5 small vertical branches of the same unidentified species.

TABLE 1. Nest site and nest dimension data for five Scaled Antpitta nests (units = cm, except where noted).

Nest	Nest height (m) <sup>1</sup>	Substrate diameter <sup>2</sup>	Substrate height (m) <sup>3</sup>	Nest outer diameter <sup>4</sup>	Nest inner diameter <sup>4</sup>	Nest cup depth	Nest outside depth <sup>5</sup>
1	1.27	4.5	6.0	20.25	10.9	4.1	13.5
2	0.67	8.0	10.0–12.0	22.5	8.5	5.0	13.0
3	0.65	11.5	10.0	16.0	11.0	6.5	21.5
4	1.15	11.5	9.0–10.0	18.65	9.75	5.0	19.5
5	0.84	4.0	3.0	20.0	9.5	6.7	14.0

<sup>1</sup>Height of nest above ground (measured from bottom of cup).

<sup>2</sup>At breast height.

<sup>3</sup>Estimates.

<sup>4</sup>Values presented are means calculated from 2 perpendicular measurements.

<sup>5</sup>Distance from bottom of nest exterior to rim of cup, excluding dangling material.

Mean substrate (i.e., trunk) diameter at breast height was 7.9 cm  $\pm$  3.63 SD (N = 5).

Scaled Antpitta nests are large, bulky, open cups. Those considered here (N = 5) had the following dimensions (mean  $\pm$  SD): outer diameter of nest (i.e., outer edge to opposite outer edge) = 19.48 cm  $\pm$  2.38; inner diameter of nest cup = 9.93 cm  $\pm$  1.04; cup depth = 5.46 cm  $\pm$  1.10; outside depth (i.e., bottom of nest exterior to rim of cup) = 16.30 cm  $\pm$  3.91. Because of the paucity of published information on the nests of this and other *Grallaria* species, specific measurements of each nest and nest site are presented in Table 1.

The exterior cup of all nests consisted primarily of moss, sticks, and dead leaves and all nests were lined with coarse, thin rootlets. Among three nests (mean mass = 242.5 g  $\pm$  45.3 SD) dissected, proportional use of nesting materials was relatively consistent. Considering mean percentage by mass ( $\pm$  SD), these nests were composed of woody material (e.g., sticks, vine twigs, bark) (33.4%  $\pm$  7.5), green moss (31.2%  $\pm$  4.7), dirt and miniscule, inseparable pieces of vegetation (20.7%  $\pm$  2.1), dead leaves (10.5%  $\pm$  6.0), and roots and rootlets (3.4%  $\pm$  0.9). The remain-

ing 0.8%  $\pm$  0.73 of nesting materials consisted of fibrous materials (e.g., fine grasses), green plant material (e.g., herbaceous stems, small live plants), and foliose lichen.

*Eggs and incubation.* Clutch size was two eggs at both nests that were observed during incubation. At one of four nests observed following hatching, one egg failed to hatch and was removed, presumably by a parent, 11–13 days after the second (viable) egg hatched.

Eggs were solid turquoise-blue in color and lacked other markings completely. Egg shape was short-subelliptical (following Palmer 1962). Two eggs from a single clutch measured 29.84 x 24.15 mm (9.2 g) and 29.05 x 24.05 mm (8.9 g).

Incubation behavior at a single nest was recorded over 5.5 h of continuous observation, during which the eggs were covered 86.7% of the time. On the morning of 6 March, adults were absent upon our arrival at 06:30 (approximately sunrise), allowing the eggs to become cool to the touch by 06:35. One adult returned to the nest at 06:54 and, after perching on the rim of the nest for 11 min, began incubating. Thereafter, both adults took turns incubating, with one reliev-

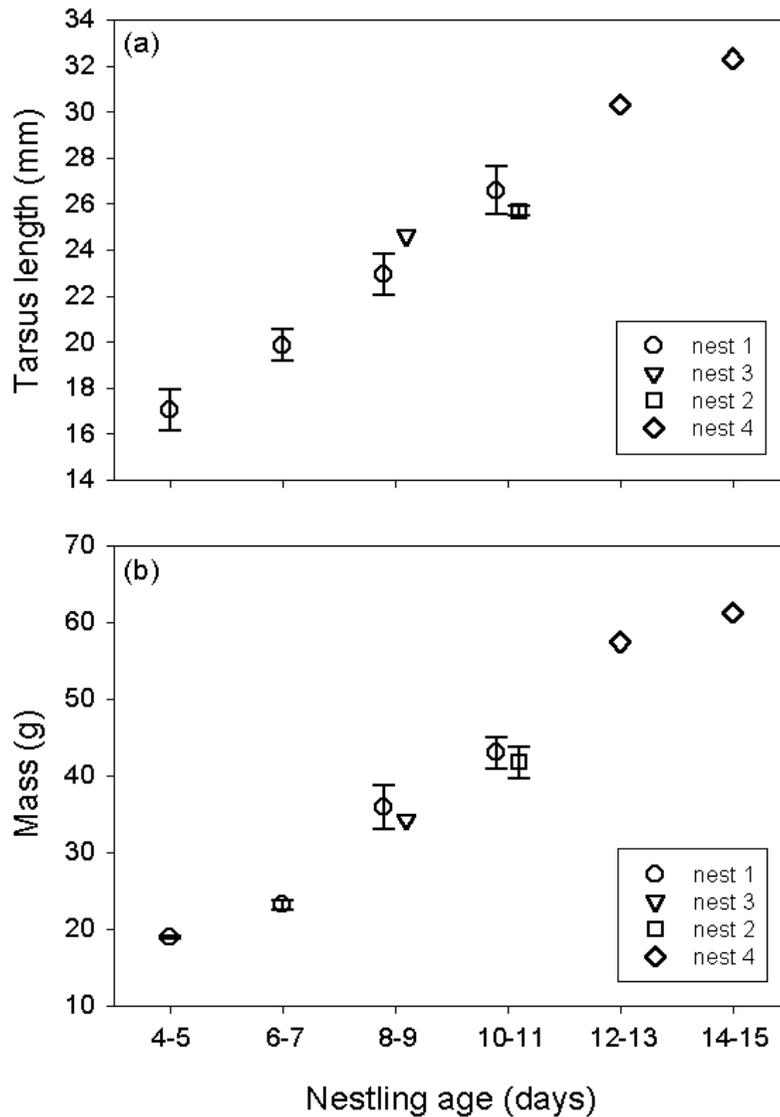


FIG. 1. Nestling growth with respect to (a) tarsus length, and (b) body mass. Mean values ( $\pm$  SE) are presented if two nestlings were measured at a single nest. At 10–11 days of age, the gape measured (mean  $\pm$  SD) 18.72 mm  $\pm$  0.12 and the culmen was 13.22 mm  $\pm$  0.007 ( $n = 2$  siblings).

ing the other at the nest. During exchanges, the approaching adult always flew to and perched on the rim of the nest cup, waited for the incubating bird to leave, and then remained perched 10–11 min before moving

into the cup to begin incubating. The departing adult often anticipated the other's arrival by looking out from the nest, but always remained in the cup 15–30 sec after the arrival of its mate. The two full on-bouts

TABLE 2. Descriptive statistics of three components of Scaled Anpitta parental care with respect to nestling age. Time/obs. refers to mean duration of individual nest watches.

Nestling age (days)	Mean $\pm$ SD				Total time (h)
	% time brooding	Feeding trips/h	Fecal sacs removed/h	Time/obs. (min)	
3-7	79.26 $\pm$ 8.49	1.29 $\pm$ 0.57	0.83 $\pm$ 0.14	193.3 $\pm$ 70.9	9.66
8-12	33.7 $\pm$ 22.1	2.11 $\pm$ 0.5	1.51 $\pm$ 1.0	170.0 $\pm$ 31.0	17.0
13-18	11.98 $\pm$ 11.9	2.16 $\pm$ 0.56	0.95 $\pm$ 0.33	203.8 $\pm$ 27.5	13.58

observed lasted 91 and 140 min. Eggs were turned once by an adult (with its bill) at the beginning of an incubation bout.

*Nestling appearance, growth, and behavior.*

Although we were unable to measure nestlings at any one nest from hatching to fledging, duration of the nestling period was estimated at 17–19 days based on measurements from a nest with known hatching date (24–25 February) that overlapped those from a nest with known fledging date (5–6 March). Three of the four nests observed during the nestling period initially contained two nestlings; the remaining nest contained one nestling and one unhatched egg (see above). At one nest, one of two nestlings apparently died between 6–8 days of age and was removed from the nest.

Nestlings were mostly naked with some sparse down at hatching. By days 4–5, dark-colored down was present on all feather tracts except the main element of the ventral tract. By days 6–7, pin feathers had emerged on all body feather tracts (i.e., excluding wing and caudal tracts), but had not yet begun to break their sheaths on the ventral tract (main element). As they broke their sheaths, all feathers were completely black, except for those on the ventral tract (main element), which were a light yellowish color. By days 10–11, the black color of head and contour feathers, wing coverts, and secondaries was confined to the edges and tips of feathers, which were largely chestnut in color. Later

still, the black tips of these feathers faded, leaving chestnut feathers with black edging. Feathers of the ventral tract (main element) were light-buffy with black edging at this time.

Nestlings' eyes opened at 6–8 days of age. Primary feathers broke their sheaths on days 9–10. Nestling growth is depicted in Figure 1. Mid-way through development (i.e., 9–11 days), leg color was purplish-gray, foot color was bluish-gray, and body skin color was dark mauve. Color of the cloaca was identical to that of the body skin. Gape and mouth lining were bright orange with a slight pinkish tint throughout development. The bill, which was initially also bright orange, began to turn black on the culmen by days 4–5, and became almost completely black by days 10–12.

Nestlings begged only during adult presence and were otherwise still and inconspicuous in the nest except when adults were present. Younger nestlings often continued to beg after being fed if the adult remained perched at the nest, whereas older nestlings tended to beg less and become quiet immediately upon being fed. Begging was audible at 20 m by days 9–10. Two to three days prior to fledging, nestlings became very active during adult nest visits and brooding attempts. At these times, nestlings constantly preened themselves, stretched, and practiced flapping their wings, often beneath a brooding adult. One to two days before fledging, nestlings began to stand up to accept food and became restless even during adult absence, often

standing up to flap their wings.

Nestlings may have been capable of communicating vocally with their parents prior to fledging. At one nest, on the morning of the day of fledging or the preceding day, a nestling was observed giving a short, harsh “eak” call seemingly in response to nearby and incessant singing by its parents. The parents may have been attempting to coax it from the nest. After fledging, fecal material was present in the nest cup and dripping down the outside of the nest, suggesting that the young bird had perched on the rim of the nest before leaving it.

*Parental care and behavior.* Adult, and nestling (see above), behavior during the nestling provisioning stage was recorded at the nest during 43 h of observation. Sexual roles in parental care were not determined because of sexual monomorphism. Both adults fed and brooded nestlings. Parents were occasionally present at the nest at the same time (11% of total nest visits), but rarely arrived at the nest together (3% of total nest visits). Adults fed their young more frequently and spent less time brooding as the nestlings aged (Table 2). Brooding always commenced after the young were fed and, with younger nestlings, an adult usually stopped brooding only when its mate arrived to feed and immediately resumed brooding afterwards. Brooding bouts ranged from 5–76 min.

Parallel to the increase in feeding rate, adults also appeared to remove nestlings’ fecal sacs at a higher rate as nestlings aged (Table 2). Adults ate nestlings’ fecal sacs while at the nest 93.8% of the time (48 fecal sac observations) and flew away with them only on three occasions, where disposal method was not observed. Typically, adults ate fecal sacs after feeding and before brooding or leaving the nest, but did so occasionally during the middle of a brooding bout. Adults consumed large nestling fecal sacs throughout the nest-

ling period, including just prior to fledging, and often removed fecal sacs directly from nestlings’ cloacas.

Adults appeared deliberate and cautious while approaching and while present at nests. Long pauses (e.g., up to 8 min), in which birds were completely still, were common after arriving at a nest, during feeding, before brooding, and before leaving a nest. Adults approached nests by flying up from the ground, usually from a distance of 2–4 m, to perch within 1 m of the nest or directly on the rim of the nest. Nestlings were always fed while adults perched on the rim. If present, each of two nestlings was fed; food not swallowed immediately by a nestling was often removed and given to its sibling. Identifiable prey items in adults’ bills included adult insects, insect larvae (e.g., Coleoptera, Lepidoptera), myriapods (Diplopoda), and earthworms (Oligochaeta). Of 79 feeding visits observed, 42% included at least one earthworm and adults often delivered multiple worms (up to five at a time), which ranged from 2–6 cm in length. One small pellet, which was a dense collection of exoskeletal parts of beetles (Carabidae), was found in a nest and, as it contained no fecal material, was likely regurgitated by the nestling.

Adults invested little effort in nest defense. In response to manipulation of nest contents, adults did not perform distraction displays and did not attack approaching humans or natural predators. Adults on nests appeared to rely on their cryptic plumage and simply remained still, flushing only once perceived danger was within 1–2 m of the nest. If a potential predator was near, but unaware of a nest, the adult present often raised its bill slowly to an approximately 70° angle revealing the vertical striations of the neck plumage that made it visually cryptic to human observers. This behavior is similar to that of the Variegated Antpitta (*Grallaria varia*) (Protomastro 2000; PRM, pers. observ.) and was observed

in Scaled Antpittas on several occasions as a mountain coati (*Nasua olivacea*; Procyonidae) walked beneath nests. Adults on nests also froze in response to vocalizations of potential avian nest predators [e.g., Squirrel Cuckoo (*Piaya cayana*), Crimson-rumped Toucanet (*Aulacorhynchus haematopygus*)]. One nest depredation event was observed, in which a tayra (*Eira barbara*; Mustelidae) happened to spot an adult brooding two nestlings on a nest located below the lip of a steep ravine, just below eye-level. Just before the tayra's head reached it, the adult flushed from the nest, giving an alarm call, and apparently left the area. The tayra removed both nestlings from the nest, ate each as they squealed loudly, and briefly inspected the nest before walking away. The adults did not return to the nest within 45 min of the attack.

## DISCUSSION

Due to their secretive and skulking nature (frequently within a montane forest understory), antpittas are poorly known in life and their nesting habits remain largely undocumented. Except for the importance of green moss as a nesting material, Scaled Antpitta nests (i.e., size, structure, and composition) described here are similar to those reported from Mexico (Edwards & Lea 1955, Rowley 1966) and Colombia (Miller 1963). However, unlike previously described Scaled Antpitta nests, which were built upon fallen logs and on the branches of a fallen shrub, nest sites in Ecuador were all on or against the main trunk of an upright live or dead tree, consistent with the few described nest sites of other *Grallaria* species (see Erard 1982, Wiedenfeld 1982, Whitney 1992). Two of the five Scaled Antpitta nest sites described here are identical to two nest sites recently described for the closely related Variegated Antpitta, in being placed at the division of a main tree trunk and numerous small vertical branches (Proto-

mastro 2000). Nest structure and composition of Scaled Antpittas are generally similar to known nests of other *Grallaria* species, but differ markedly, as do nest sites, with those of other antpitta genera for which several nests have been described (i.e., *Hylopezus*, *Myrmothera*) (see Wiedenfeld 1982, Tostain & Dujardin 1988).

Eggs, although similar in color and shape, may be smaller than those of Scaled Antpittas in Mexico, which measured 33.1 x 26.0 mm (11.2 g), 31.6 x 25.9 mm (10.9 g) (nominate subspecies; Rowley 1966), and 35 x 26 mm (*ochraceiventris* subspecies; Edwards & Lea 1955). Color and shape of Scaled Antpitta eggs are similar to the known eggs of other *Grallaria* species, except for a secondary, and hence questionable, report of Chestnut-crowned Antpitta (*G. ruficapilla*) having buffy eggs with rufous blotches (see Wiedenfeld 1982). Egg coloration (i.e., lacking dark markings or blotches) of *Grallaria* species appears to be unique among other antpitta genera (*Grallaricula*, *Hylopezus*, *Myrmothera*, *Pittasoma*) (Wiedenfeld 1982, Tostain & Dujardin 1988).

The dearth of information on antpitta nestling appearance limits present discussion to soft part colors within the genus *Grallaria*. Mouth lining color has been described as bright orange in nestlings of the Pale-billed Antpitta (*G. carrikeri*) (Wiedenfeld 1982) and red-orange in nestlings of the Variegated Antpitta (Erard 1982, Quintela 1987, Protomastro 2000). Variation in gape color of nestling Variegated Antpitta, from yellowish (Quintela 1987) to red-orange (Protomastro 2000), may be age related. Whereas Protomastro (2000) described tarsus and toe color as black and body skin color varying from black to pinkish in nestling Variegated Antpittas, Scaled Antpitta nestlings described here had bluish to purplish legs and feet and dark mauve skin that was uniform over the body.

Very little information is available on the behavior of antpittas at their nests. As Skutch

(1969, 1981) reported for the Streak-chested Antpitta (*Hyllopezus perspicillatus*), both adult Scaled Antpittas incubate the eggs and, it appears, both forage just after daybreak, but seldom leave the eggs uncovered thereafter. At one Streak-chested Antpitta nest, adults brooded young nestlings in bouts of 1–71 min, for 69% of a 5.5 h observation, and fed nestlings 2.5 times per hour (Skutch 1981). Two Pale-billed Antpitta adults spent 60% of 11 h brooding their young, in bouts up to 41 min in duration, and were often present at the nest at the same time as one replaced the other (Wiedenfled 1982). Brooding bouts of Pale-billed Antpittas were preceded by feeding visits, which, although variable, averaged one every 30 min (Wiedenfled 1982). Both Pale-billed Antpitta nestlings were fed during all observed feeding visits, with earthworms comprising an important part of their diet (Wiedenfled 1982). Erard (1982) briefly described parental behavior at a Variegated Antpitta nest, at which adults fed spiders, cockroaches, orthopterans and myriapods to nestlings at intervals of 30–45 min. These behaviors are consistent with those that we observed at Scaled Antpitta nests.

Given their primarily Andean distribution and the current risk to montane forest in Central and South America, we risk losing antpitta species without knowing anything about their breeding biology and behavior (see Collar *et al.* 1992). Collecting basic natural history information is a first step to understanding and protecting antpittas and other little known species. Regardless of research goals, we urge Neotropical biologists and naturalists to collect and publish natural history information, despite its being out of fashion in the current academic climate.

#### ACKNOWLEDGMENTS

We thank Esteban Ambuluoli and his family for their hospitality during our stay in Celica.

Galo Dias assisted with nest dissections. We thank Helen Chuang-Dobbs and David Wiedenfled for helpful comments on the manuscript. Sara Smith translated the abstract. This work was made possible by a Natural Sciences and Engineering Research Council (Canada) grant to P. R. M. We also thank U. N. H. S. for support.

#### REFERENCES

- Best, B. J., C. T. Clarke, M. Checker, A. L. Broom, R. M. Thewlis, W. Duckworth, & A. McNab. 1993. Distributional records, natural history notes, and conservation of some poorly known birds from southwestern Ecuador and northwestern Peru. *Bull. Br. Ornithol. Club* 113: 108–119 & 234–255.
- Best, B. J., M. Checker, R. M. Thewlis, A. L. Best, & W. Duckworth. 1996. New bird breeding data from southwestern Ecuador. *Ornitol. Neotrop.* 7: 69–73.
- Collar, N. J., L. P. Gonzaga, N. Krabbe, A. Madroño Nieto, L. G. Naranjito, T. A. Parker, III, & D. C. Wege. 1992. Threatened birds of the Americas. International Council for Bird Preservation, Cambridge, U.K.
- Edwards, E. P., & R. B. Lea. 1955. Birds of the Monserrate area, Chiapas, Mexico. *Condor* 57: 31–54.
- Erard, C. 1982. Le nid et la ponte de *Lipangus vociferans*, Cotingidé, et de *Grallaria varia*, Formicariidé. *Alauda* 50: 311–313.
- Howell, S. N. G., & S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford Univ. Press, Oxford, U.K.
- Miller, A. H. 1963. Seasonal activity and ecology of the avifauna of an American equatorial cloud forest. *Univ. Calif. Publ. Zool.* 66: 1–78.
- Palmer, R. S. 1962. Handbook of North American birds. Volume 1. Yale Univ. Press, New Haven, Connecticut.
- Peters, J. L. 1951. Check-list of birds of the world. Volume VII. Museum of Comparative Zoology, Cambridge, Massachusetts.
- Protomastro, J. J. 2000. Notes on the nesting of Variegated Antpitta *Grallaria varia*. *Cotinga* 14: 39–41.

- Quintela, C. E. 1987. First report of the nest and young of the Variegated Antpitta (*Grallaria varia*). *Wilson Bull.* 99: 499–500.
- Ridgely, R. S., & G. Tudor. 1994. *The birds of South America. Volume 2: The suboscine passerines.* Univ. Texas Press, Austin, Texas.
- Rowley, J. S. 1966. Breeding records of birds of the Sierra Madre del Sur, Oaxaca, Mexico. *Proc. West. Found. Vert. Zool.* 1: 107–204.
- Skutch, A. F. 1969. *Life histories of Central American birds. Volume 3. Pacific Coast Avifauna 35.* Cooper Ornithol. Soc., Berkeley, California.
- Skutch, A. F. 1981. *New studies of tropical American birds.* Publ. Nuttall Ornithol. Club No. 19, Cambridge, Massachusetts.
- Skutch, A. F. 1996. *Antbirds and ovenbirds: their lives and homes.* Univ. Texas Press, Austin.
- Tostain, O. 1986. Description du nid et la ponte de deux formicariidés guyanais: *Hylopezus macularius* et *Thamnophilus nigrocinereus*. *Alauda* 54: 170–176.
- Tostain, O., & J.-L. Dujardin. 1988. Nesting of the Wing-banded Antbird and the Thrush-like Antpitta in French Guiana. *Condor* 90: 236–239.
- Whitney, B. M. 1992. A nest and egg of the Rufous Antpitta in Ecuador. *Wilson Bull.* 104: 759–760.
- Wiedenfeld, D. A. 1982. A nest of the Pale-billed Antpitta (*Grallaria carrikeri*) with comparative remarks on antpitta nests. *Wilson Bull.* 94: 580–582.

