

## NESTING OF BARRED HAWK (*LEUCOPTERNIS PRINCEPS*) IN NORTHEAST ECUADOR

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Anidación del Gavilán Barreteado (*Leucopternis princeps*) al nororiente del Ecuador.

**Key words:** Barred Hawk nest, *Leucopternis*, Andes, prey, Caecilian.

### INTRODUCTION

Although Neotropical forests host some of the most speciose assemblages of raptors in the world (Thiollay 1985), most are poorly studied (Bierregaard 1995). Nests of Andean forest raptors are virtually unknown. *Leucopternis* is a strictly Neotropical genus of raptor containing 10 species, yet the breeding biology of only the White Hawk (*L. albicollis*) has been published (Draheim 1995). The Barred Hawk (*Leucopternis princeps*) is a large, heavily-built resident of foothill and subtropical forests from southern Costa Rica to northeastern Peru, and is considered local and uncommon in Ecuador (Ridgely & Greenfield 2001). Other than a single nest found and photographed in the Darien of Panama (Muela & Valdez 2003), nothing to date has been published concerning its breeding biology, and virtually nothing is published about its diet (del Hoyo *et al.* 1994). We present data from two consecutive breeding seasons of

a single nest we found in a private reserve in the humid mountains of eastern Ecuador.

### METHODS

We discovered a nest of a pair of Barred Hawks on 10 February 2004 when an incubating adult was flushed from a nest containing one egg. The nest site (1950 m a. s. l.) was in the private reserve of Cabañas San Isidro, next to the Yanayacu Biological Station and Center for Creative Studies (00°35'S, 77°53'W). The 1700-ha reserve comprises a mosaic of primary and secondary growth in humid, montane, evergreen forest, about 3 km west of Cosanga in the Napo Province of northeastern Ecuador (for a more complete site description, see Greeney *et al.* 2006). We installed a blind 3.5 m above and 10 m from the nest, on the opposite side of a stream on 13 February 2004, and filmed incubation behavior on 15, 16, and 17 February. The single egg hatched on 18 February and was filmed periodically from that day until 8 May. We visited the nest on 15 May and found it empty. Less than a year later, on 23 December 2004, HFG accessed the same nest to

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FIG. 1. Nest of the Barred Hawk (*Leucopternis princeps*) on rocky ledge, 23 December 2004, Napo Province, Ecuador. Photo by H. F. Greeney.

photograph and measure the nest and single egg. We filmed the second season from 7 to 28 January 2005; hatch-day for the 2005 nest was 19 January. We filmed the incubation stage 99 h (18 h in 2004, 81 h in 2005) and nestling stage 500 h (375 h in 2004, 125 h in 2005). All videos were transcribed at a later date.

## RESULTS

*Description of nest.* The nest (Fig. 1) was placed on a rocky ledge 5 m from a rushing waterfall. It was on a small section of level ground and loosely positioned between two small *Geonoma* palm trunks (DBH 3 cm and c. 2 m tall) and a flat, jutting rock. The nest laid in a corner formed by the union of two vertical rock

walls and faced a 6 m drop of vertical rock to the stream. Rock surfaces surrounding the nest were patchily covered by mosses and herbaceous plants. The cup-shaped nest had an outside diameter of 50–70 cm. The outer part was composed of slightly mossy sticks, 20–60 cm long and 12 cm in diameter. Outer nest height was 15 cm. The tidier, inner cup had a diameter of 17 cm and a depth of 8 cm. The inner cup, composed of sticks 10–30 cm long and 0.5 to 1 cm in diameter, was lined mostly (90%) with fresh *Vismia tomentosa* (Clusiaceae) leaves. The leaves were arranged with the pale tan underside facing upward. The remaining 10% of lining was composed of other leafy plants including *Myrica* sp. (Myricaceae), *Chusquea scandens* (Gramineae), and *Psammisia* sp. (Ericaceae).



FIG. 2. Egg of the Barred Hawk (*Leucopternis princeps*), 23 December 2004, Napo Province, Ecuador. Photo by H. F. Greeney.

*Description of egg and chick.* The all white, albeit dirty egg from 2005, measured 58.9 x 48.9 mm (Fig. 2) and weighed more than 45 g (beyond scale measuring capacity). The nestling gradually transformed a white and helpless hatchling to a strong, nearly adult-plumaged chick after 65 days (Table 1).

*Adult behavior, incubation stage.* The adults were not sexually dimorphic enough for us to distinguish between them (Fig. 3). The incubating adult left 1–3 times a day for short periods, possibly to hunt, and often returned to the nest with fresh, leafy twigs. The mate brought 0–2 prey per day to the incubating adult. On such occasions, the incubating adult would rise from the egg, beg vocally, and partially extend and flap its wings. The arriving adult brought prey in its talons, dropped prey

onto the nest, and quickly flew away. Prey items delivered during incubation ( $n = 8$ ) were three snakes, three unknowns, one large young bird, and one giant earthworm (*Martiodrilus* sp., Csaba Csuzdi, pers. com.).

*Adult behavior, nestling stage.* Adult behavior at the nest during the first half of nestling development was similar to incubation. The brooding adult remained at the nest while the other adult delivered prey. After departure of the second adult, the brooding bird tore small pieces from the prey to feed the chick. The brooding adult continued to leave the nest and bring fresh, leafy twigs, 1–3 times a day during the first month. After about 45 days, when the chick was capable of feeding itself, an adult spent very little time at the nest. The nestling was brought 0–3 prey per day. Prey

TABLE 1. Development of Barred Hawk (*Leucopternis princeps*) chick.

Age of chick (days)	Change in appearance and behavior of chick
0 (hatch-day)	White with black beak; helpless; fed tiny pieces of prey by attending adult.
32	White with indistinct peppering of black on shoulder; c. half the size of adult.
36	Mostly white; strong black streaking on chest, back (especially where wing meets back), leading edge of wing, and trailing edge of wing.
44	Black barring on flanks; wings and back mottled black and white (60% black/40% white); capable of feeding itself.
50	Tail still not protruding/developing; back and wings 75% black/25% white; head white with flecks of black; primaries and secondaries well-developed; chest mottled black and white; barring below conspicuous; nape black; deftly snatches prey with talons from arriving adult.
57	Barring below complete; chest black; head and upper parts 95% black with white patch at base of primaries; rectrices well-formed and black above; rump and lower back white.
65	Small patches of white remain above (base of primaries and lower back where trailing edge of wing meets body); small amount of white remaining on forehead and around eye; practices bounding and flapping.

items delivered to the nestling (n = 104) were: 50 caecilians (*Caecilia orientalis*), 36 snakes (including *Leptophis* sp.), three giant earthworms, three young birds, three mammals, and seven unknowns.

## DISCUSSION

Although some raptors in Ecuador use cliffs as nesting sites [e.g., Black-chested Buzzard-Eagle (*Geranoaetus melanoleucus*), Variable Hawk (*Buteo polyosoma*), Carunculated Caracara (*Phalacrocorax carunculatus*), pers. observ.], those species are associated with open habitats. Forest-based, diurnal raptors of the Neotropics have been reported to nest in tree cavities (Thorstrom 1990) or build large, cup nests of sticks high in trees (Lyon & Kuhnigk 1985, Thorstrom 1997, Seavy *et al.* 1998, Panasci & Whitacre 2000, Thorstrom & Quixchán 2000). According to reports of nests for two congeners (Draheim 1991, Vargas 1995) and the closely related Crane Hawk (*Geranospiza caerulescens*) (Sutter *et al.* 2001), Barred Hawk

allies also place nests high in trees. Barred Hawks may depart from these usual nest sites and prefer to place their cup nests on wet, rocky cliffs surrounded by forest (this study; Muela & Valdez 2003). One Barred Hawk nest, in contrast, was found in a tree in La Planada Reserve, Colombia (J.-M. Thiollay unpubl.). More investigation is needed to further our understanding of nest-site selection.

The egg photographed by HFG appears to be the first published data of its kind for *Leucopternis*. One-egg clutches appear to be a standard in *Leucopternis*: three nests, *L. princeps* (this study, Muela & Valdez 2003); six nests, *L. albicollis* (Draheim 1991); and 10 nests, *L. occidentalis* (Vargas 1995). Draheim (1991) found the mean dimensions of two eggs of *L. albicollis* to be 53.4 x 44.3 mm and Vargas' (1995) egg of *L. occidentalis* was 54.7 x 46.3 mm. Not surprisingly, the Barred Hawk (this study) laid a larger egg (58.9 x 48.9 mm) than its smaller congeners. However, the mean outer width (54 x 91 cm) and depth (30 cm) of three nests of *L. albicollis* (Draheim 1991)



FIG. 3. Two adult Barred Hawks (*Leucopternis princeps*), caecilian prey, and partially hidden, white chick, 10 March 2004, Napo Province, Ecuador. Photo by M. Cooper.

was greater than our nest of *L. princeps* (50–70 cm outer width and 15 cm deep).

Our observations of hatching on 18 February 2004 and remaining until at least 8 May 2004 suggest a nestling period of c. 80 days. Barred Hawks are probably opportunistic hunters that prey on different animals according to the weather. Snakes accounted for 35% of prey, yet none were brought during heavy rains (unpubl.). A snake sunning itself is surely a welcome target in the cloud forest. Furthermore, at least 53.5% of prey brought to the nest during late incubation/nestling periods may be associated with the arrival of the first rainy season of the year. Caecilians ( $n = 50$ ), giant earthworms ( $n = 6$ ), and young birds ( $n = 4$ ) may reach a peak of availability for these hawks. Published information for *Caecilia orientalis* (Funk *et al.* 2004) suggests that caecil-

ians may breed at the onset of the rainy season. While their reproductive biology remains poorly understood, these normally subterranean amphibians may surface to find mates or nesting areas, and thus seasonally provide an abundance of prey. To our knowledge, this study represents the first report of a bird eating a caecilian, and 45% of all prey brought to the nest were these enigmatic creatures. We also encounter giant earthworms at this time of year, usually after heavy rains (pers. observ.). Many birds breed in the area during January–February and produce fledglings soon thereafter (HFG unpubl.).

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## REFERENCES

- Bierregaard, R. O., Jr. 1995. The biology and conservation status of Central and South American Falconiformes: a survey of current knowledge. *Bird Conserv. Int.* 5: 329–345.
- del Hoyo, L., A. Elliott, & J. Sargatal. 1994. Handbook of the birds of the world. Volume 2. New World vultures to Guineafowl. Lynx Ediciones, Barcelona, Spain.
- Draheim, G. 1991. Life history of the White Hawk in Guatemala. *J. Raptor Res.* 25: 153.
- Funk, F. C., G. Fletcher-Lazo, F. Nogales-Sornosa, & D. Almeida-Reinoso. 2004. First description of a clutch and nest site of the genus *Caecilia* (Gymnophiona: Caeciliidae). *Herpetol. Rev.* 35: 128–130.
- Gerhardt, R. P., D. M. Gerhardt, & M. A. Vásquez. 2004. Food delivered to nests of Swallow-tailed Kites in Tikal National Park, Guatemala. *Condor* 106: 177–181.
- Greeney, H. F., R. C. Dobbs, G. I. C. Diaz, S. Kerr, & J. G. Hayhurst. 2006. Breeding biology of the Green-fronted Lancebill (*Doryfera ludovicae*) in eastern Ecuador. *Ornitol. Neotrop.* 17: 321–331.
- Lyon, B., & A. Kuhnigk. 1985. Observations of nesting Ornate Hawk-Eagles in Guatemala. *Wilson Bull.* 97: 141–147.
- Muela, A., & U. Valdez. 2003. First report of the nest of the Barred Hawk (*Leucopternis princeps*) in Panama. *Ornitol. Neotrop.* 14: 267–268.
- Panasci, T., & D. Whitacre. 2000. Diet and foraging behavior of nesting Roadside Hawks in Petén, Guatemala. *Wilson Bull.* 112: 555–558.
- Ridgely, R.S., & P. J. Greenfield. 2001. The birds of Ecuador, status and distribution, Volume 1. Cornell Univ. Press, Ithaca, New York.
- Seavy, N. E., M. D. Schulze, D. F. Whitacre, & M. A. Vasquez. 1998. Breeding biology and behavior of the Plumbeous Kite. *Wilson Bull.* 110: 77–85.
- Sutter, J., W. E. Martínez, F. T. Oliva, & O. J. Nery. 2001. Diet and hunting behavior of the Crane Hawk in Tikal National Park, Guatemala. *Condor* 103: 70–77.
- Thiollay, J.-M. 1985. Falconiformes of tropical rainforest: a review. *I.C.B.P. Tech. Publ.* 5: 155–166.
- Thorstrom, R. 1997. A description of nests and behavior of the Gray-headed Kite. *Wilson Bull.* 109: 173–177.
- Thorstrom, R. K., C. W. Turley, F. G. Ramírez, & B. A. Gilroy. 1990. Descriptions of nests, eggs, and young of the Barred Forest-Falcon (*Micrus-tur ruficollis*) and of the Collared Forest-Falcon (*M. semitorquatus*). *Condor* 92: 237–239.
- Thorstrom, R., & A. Quixchán. 2000. Breeding biology and nest-site characteristics of the Bicolored Hawk in Guatemala. *Wilson Bull.* 112: 195–202.
- Vargas, H. 1995. Food habits, breeding biology and status of Gray-backed Hawk (*Leucopternis occidentalis*). M. Sc. thesis, Boise State Univ., Boise, Idaho.

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