

sites located 100–210 m apart. Some birds alternated between sites during the same display period, or from one day to the next. Some males appeared at auxiliary positions only when other males attempted to use these sites. A description of a typical example, which occurred on 19 March, follows: We arrived at the singing site before the display period began. A bird began “peenting” (Sheldon 1967) on site A at 05:40. Shortly thereafter a bird “peented” on site B (188 m northwest and separated from singing ground A by a row of trees and shrubs). The bird on site A flew over to site B, “cackled,” began a display flight over site A but landed on site B. He was identified on both sites as “double-green”—the bird which had displayed on site A for 13 consecutive days. The bird made another display flight and landed on site A. During the next 28 min five more flights were made, site A being used three times and B used twice. This bird alternated between these sites for several days. He frequently “cackled” on his approach to site B. Several weeks later site B became occupied and remained so for 10 days, with the double-green bird remaining on site A for an additional 24 days.

Pugnacious behavior on singing sites during the display period is not uncommon in woodcocks (Sheldon 1967; Godfrey, Ph.D. diss., Univ. Minnesota, Minneapolis, Minnesota, 1974). During this study such behavior was usually preceded by audible “peents” or “cackles” by intruding birds. On three occasions, non-displaying birds were estimated to be 0.3 m to 1 m from a displaying male. These non-displaying birds appeared to be ignored by the displaying male. All birds involved were color-banded and of known sex. One non-displaying male previously displayed on another singing site. No vocalizations were heard from the non-displaying males. If pre-copulatory calls, as described by Sheldon (1967), are necessary for female receptiveness to mating, these silent males may represent a minimal competitive challenge to dominant males trying to attract hens.—BRYON P. SHISSLER AND DAVID E. SAMUEL, *Div. Forestry, West Virginia Univ., Morgantown, West Virginia 26506. Accepted 4 Mar. 1983.*

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Notes on the ecology of the Black-breasted Puffleg on Volcán Pichincha, Ecuador.—The 10 endemic Andean “puffleg” hummingbirds of the genus *Eriocnemis* include a number of little known species presently known from only one or a few adjacent mountains or from a single river valley. We here report the first detailed observations on the ecology of the endemic Ecuadorian species, the Black-breasted Puffleg (*Eriocnemis nigrivestis*), which is known only from Volcán Pichincha and Volcán Atacazo, two adjacent volcanic peaks less than 20 km west of Quito in north-central Ecuador.

During a 3-week search in September 1980, we located three *E. nigrivestis* on Cerro Pugsí, on the west slope of Pichincha. Here we conducted a brief study from 19–27 September on the habitat and feeding ecology of this little known hummingbird.

The study site was a saddle of flat ground on a ridge crest located at 3020 m elev. (for a picture of this site see Chapman, *Bull. Am. Mus. Nat. Hist.* 55:94, plate XIX, 1926). We observed one male daily in specific feeding areas and also sometimes heard another male individual calling: a monotonous repeated metallic *tzeet tzeet tzeet tzeet*. We also found one site regularly visited by a female.

The natural vegetation on the saddle was shorter in height than the vegetation on surrounding slopes or in the valleys of the Río Mindo and Río Verdecocha, which run south and north, respectively, of Cerro Pugsí. Most canopy trees did not exceed 8–10 m in height. Dense growths of ericads and abundant epiphytes characterized the non-arborescent vegetation, but several areas on the saddle were grazed by cattle, resulting in local grassy open-

TABLE I
CHARACTERISTICS OF FLOWERS OF FOOD PLANTS OF *ERIOCNEMIS NIGRIVESTIS*^a

Family species ^b	Length of tube (mm) ^c	Corolla color	Orientation ^d
Ericaceae			
<i>Macleania macrantha</i>	44	orange	pendant
<i>Thibaudia floribunda</i>	17	red and white	various
<i>Disterigma</i> cf. <i>acuminatum</i>	9	white	pendant
<i>Disterigma acuminatum</i>	5	pink	pendant
Rubiaceae			
<i>Palicourea huigrensis</i>	20	blue	various ^e
<i>Psychotria uliginosa</i>	8	white	various
Gesneriaceae			
<i>Heppiella ampla</i>	16	red	horizontal
<i>Manettia recurva</i>	5	white	various
Melastomataceae			
<i>Miconia corymbiformis</i>	cup	pale yellow (calyx red)	upright
<i>Miconia hymenantha</i>	cup	yellow (calyx red)	various
Lobeliaceae			
<i>Burmeistera</i> sp.	20	green	horizontal
Onagraceae			
<i>Fuschia</i> cf. <i>silvatica</i>	23	red	pendant
Tropaeolaceae			
<i>Tropaeolum pubescens</i>	24	pink	horizontal
Rosaceae			
<i>Rubus</i> sp.	cup	pink	various

^a *E. nigrivestis* bill (exposed culmen): male, $\bar{x} = 15.27 \pm 0.46$, N = 5; female, $\bar{x} = 15.82 \pm 0.47$, N = 5.

^b Voucher specimens of all plant material referred to in this paper are deposited at the Gray Herbarium, Harvard University, and the New York Botanical Gardens.

^c Mode of minimum distance from opening to base of corolla tube (N = 6).

^d As actually presented to hummingbird; influenced by growth form.

^e Horizontal to upright in panicle.

ings in the forest and lush second growth comprised primarily of blackberry brambles (*Rubus* sp.) where grazing was not as intensive. The most conspicuous plant in bloom in the understory was the small tree *Palicourea huigrensis* (Rubiaceae), with bright blue flowers borne on large panicles. Among the ericads were several species of *Disterigma* that formed large tangles up to canopy height as well as less conspicuous species of scrambling growth form including *Thibaudia floribunda* and *Macleania macrantha*. The undergrowth was rich with flowering herbaceous plants, creepers, and vines. During our September visit several of the more common plants appeared to be nearing the end of their flowering period; *P. huigrensis* and the ericads were heavily laden with fruit and the number of flowers decreased noticeably during our visit.

TABLE 2
HUMMINGBIRD FEEDING RECORDS

Plant species	<i>E. nigrivestis</i>		Other
	Male	Female	
Shrubs and scramblers			
<i>Macleania macrantha</i>	4 ^a		female <i>Coeligena lutetiae</i> (1); female <i>Coeligena torquata</i> (1)
<i>Thibaudia floribunda</i>	22		<i>Diglossa lafresnayii</i> (2)
<i>Disterigma</i> cf. <i>acuminatum</i>	12		
<i>Disterigma acuminatum</i>	4		<i>Diglossa lafresnayii</i> (2)
<i>Miconia hymenanthera</i>	2		
<i>Fuschia</i> cf. <i>silvatica</i>	1		
<i>Rubus</i> sp.	12	1	
Vines/climbers			
<i>Heppiella ampla</i>	6		
<i>Manettia recurva</i>	1		
<i>Burmeistera</i> sp.	5		
<i>Tropaeolum pubescens</i>	7		
Small trees			
<i>Palicourea huigrensis</i>	92	24	male <i>Coeligena lutetiae</i> (1); <i>Eriocnemis luciani</i> (4); <i>Metallura tyrianthina</i> (5); male <i>Heliangelus strophianus</i> (1)
<i>Miconia corymbiformis</i>	1		
Herbaceous			
<i>Psychotria uliginosa</i>	7		

^a Most often through holes in the base of the corolla.

The few individuals of *E. nigrivestis* were the most frequently seen of the 10 hummingbird species we recorded from our study site. Other regular species on the saddle were Mountain Velvetbreast (*Lafresnaya lafresnayi*), Buff-winged Starfrontlet (*Coeligena lutetiae*) and Tyrian Metaltail (*Metallura tyrianthina*), while species seen rarely included the Sword-billed Hummingbird (*Ensifera ensifera*), Collared Inca (*Coeligena torquata*), Sapphire-vented Puffleg (*Eriocnemis luciani*), Gorgeted Sunangel (*Heliangelus strophianus*), Purple-backed Thornbill (*Ramphomicron microrhynchum*), and Speckled Hummingbird (*Adelomyia melanogenys*).

We recorded food plants for *E. nigrivestis* during walks over the study area and by extended watches at preferred feeding sites. Feeding records were tabulated according to the methods in Snow and Snow (Bull. Br. Mus. Nat. Hist. [Zool.] 38:105-139, 1980). Floral characteristics of food plants are given in Table 1 and feeding records are given in Table 2. Males fed in a wide variety of microhabitats but mostly in low dense vegetation (less than 2 m). Low foraging may cause some underrepresentation of certain understory nectar sources but *P. huigrensis* was by far the most frequently visited nectar source for both sexes. We

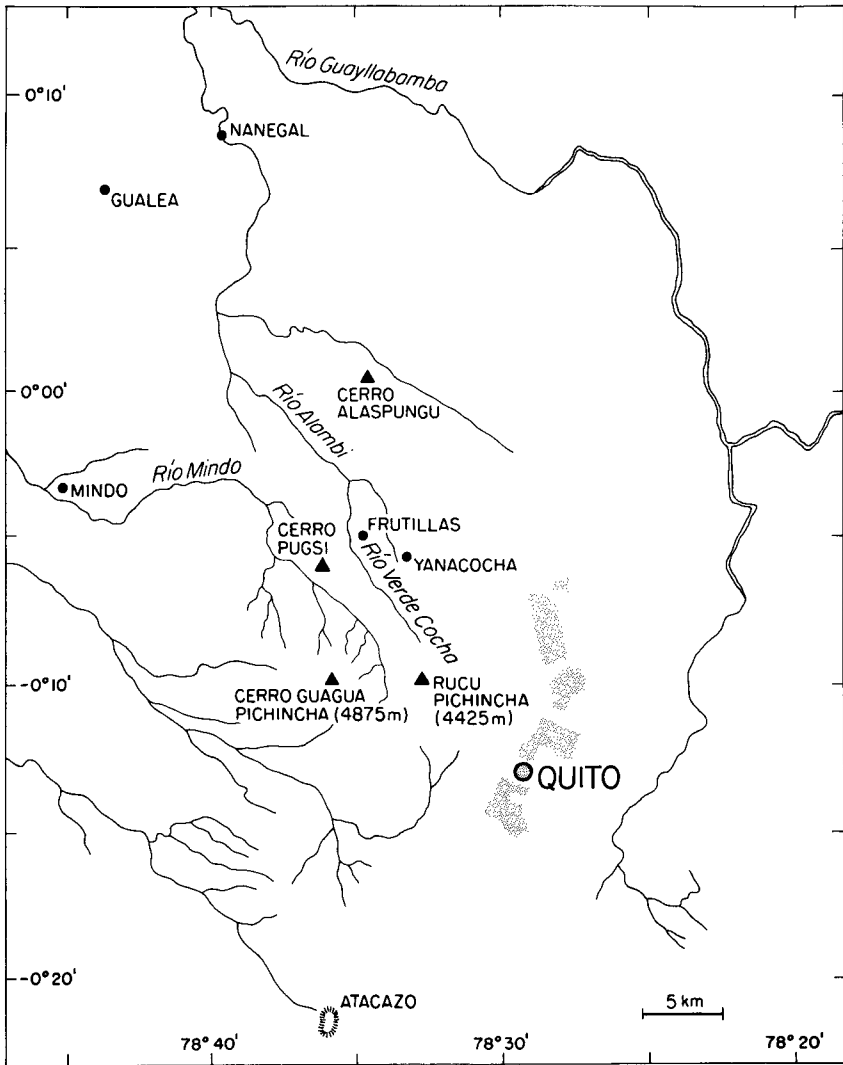


FIG. 1. Quito area showing localities mentioned in the text. Pichincha is comprised of a series of peaks of which the two major ones, Guagua Pichincha and Rucu Pichincha, are shown.

recorded the female feeding only in a grove of *P. huigrensis* which had few alternative nectar sources so male-female differences in diet breadth may be an artifact. Most of the major food plants (more than 10 records) had straight tubular corollas of the general size and shape of the *E. nigrivestis* bill (see Table 1). Feeding was usually through the corolla opening, including *P. huigrensis*. However, males fed through holes made by them or presumably the

Glossy Flower-piercer (*Diglossalafresnayii*) at the corolla base of *M. macrantha*, which had tubular flowers much longer (44 mm) than their bills (\bar{x} = 15.3 mm, N = 5). Both sexes frequently perched on adjacent branches or leaves (often at *P. huigrensis*) while flower feeding or sat in the leaf litter when feeding at prostrate vines of *Heppiella ampla*.

We conducted extended watches of a male *E. nigrivestis* in a plot of natural vegetation roughly 20 × 20 m, in which the male fed at 11 plant species. The male was regularly but intermittently present within this plot throughout watch periods, which lasted from 07:00–16:30 on two separate days. During this time the male would regularly station himself at the top of a small (4 m) tree located in the northern portion of the plot near a large stand of *P. huigrensis*. Visits to this or nearby secondary perches were usually accompanied by extended feeding bouts, invariably at the *P. huigrensis* stand. Continuous time on the principal perch ranged from a few seconds to over 9 min, but was usually between 2 and 4 min duration. The male never vocalized from any of these perches but did catch insects and chased other hummingbird species, including females of *C. lutetiae*, *E. ensifera*, *M. tyrianthina*, and the Glossy Flower-piercer. An extended watch of the female feeding in the grove of *P. huigrensis* between 07:00 and 15:00 showed regular visitation throughout the day but less total time in her feeding area than the male for the same period (male: 131 min perching, 60 feeding bouts; female: 17 min perching, 18 feeding bouts). The female adopted inconspicuous perches and never chased other hummingbirds in the area.

During our 3-week survey of Pichincha, we spent time at a variety of different elevations from 2650–4200 m, a good cross-section of the upper vegetated habitats on Pichincha. We recorded *E. nigrivestis* only on the crest of Cerro Pugsi; the few individuals were strictly limited to this ridge crest, despite flowering *P. huigrensis* elsewhere between 2850–3200 m. The northern and western slopes of Pichincha below the various peaks show a characteristic topography of high narrow ridges or “nudos” running roughly east-west, between which are deeply incised river valleys (a brief trip to Atacazo, the only other locality where *E. nigrivestis* has been recorded, substantiated the presence of similar topography there as well). Within this ridge-valley system, the distribution of *E. nigrivestis* appears to parallel the ridge crests. In addition to our findings for the few individuals on Pugsi, M. Olalla has found *E. nigrivestis* in the past only on the tops of the nudo ridges; specifically on Cerro Pugsi and Frutillas on the northwest slope of Pichincha, and the Cordillera Alaspungo to the north, across the Río Alambi (see Fig. 1). The ridge crest vegetation at these elevations, as described here, is characteristically denser and shorter and with greater representation of ericads than the vegetation on the surrounding slopes and seems to comprise a structurally and floristically distinct habitat required by *E. nigrivestis*.

The total elevational distribution of *E. nigrivestis* on Pichincha appears to be broad, but the limited information available suggests that it may be complicated by sexual differences and seasonal movements. Males have been reported between 3650 and 4725 m by Goodfellow (Oberholser, Proc. U.S. Natl. Mus. 24:309–324, 1902) during November to January (USNM specimens examined by R.B.) and at other months at lower elevations: around Verdecocha (approx. 2850 m; Paynter and Traylor, Ornithological Gazetteer of Ecuador, Harvard College, Cambridge, Massachusetts, 1977) in July (ANSP specimens examined by R. B.), “above Gualea” at 2750 m and Cerro Pugsi in June (AMNH specimens examined by R. B.) and Cerro Pugsi at 3020 m in September (this study). In contrast, females have been collected from as low as 2400 m in June, “above Gualea” (AMNH specimens examined by R. B.) and up to 3300 m at Yanacocha (P. Greenfield, pers. comm.) (see Fig. 1) but have not yet been recorded higher. Further fieldwork will be needed to verify both the presence of males alone at the highest elevations, which are based solely on the old Goodfellow records, and the elevational migration suggested by the complementary collecting dates for low and high elevations, at least for males if not in both sexes. It is possible that elevational migration by

E. nigrivestis is timed to coincide with flowering of *P. huigrensis* (and other plants) which bloom seasonally at lower elevations.

The general ecology of *E. nigrivestis* is similar to that recorded for the closely related species, the Glowing Puffleg (*E. vestitus*) (Snow and Snow 1980). Snow and Snow (1980) observed *E. vestitus* feeding principally at plants of similar general morphology (straight tubular corollas 10–20 mm in length) in similar taxonomic groups (*Cavendishia*; Ericaceae more often than *Palicourea*; Rubiaceae for *E. vestitus*). Territoriality in *E. vestitus* was pronounced while this was only suggested in the male *E. nigrivestis* we observed, perhaps a seasonal effect. Finally *E. vestitus*, like *E. nigrivestis*, did not occur in tall forested habitats at similar elevations (Snow and Snow [1980] study at 2400–2500 m).

The evidence presented here suggests that the greatly restricted range of *E. nigrivestis* is not due to dietary specializations. Male nectar sources are from a broad spectrum of plants, and the principal food plant of both sexes, *P. huigrensis*, is a widespread Andean species. Nesting requirements of *E. nigrivestis* may still be threatened with extinction through habitat destruction, especially if the species requires specific habitats of natural vegetation at certain times of year, such as that found on nudo ridge crests. The vegetation on nudos in particular is rapidly disappearing because nudos provide flat ground for cultivation in otherwise precipitous terrain. In light of its restricted range and the threat of habitat destruction resulting from such close proximity to a major urban center, Quito, we consider *E. nigrivestis* an endangered species.

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A giant hummingbird from Paramo de Chingaza, Colombia.—On 10 October 1981, during an ornithological survey at 3250 m elev. near Laguna de Chingaza, Dept. Cundinamarca, Colombia, the senior author watched a large, perched hummingbird for 30 sec at 3 m distance; while observing it, the bird was drawn and described. The bird finally took off, ascended steeply 10–15 m and descended with spread tail in an apparent territorial display flight, to disappear in dense forest. Familiar with the Giant Hummingbird (*Patagona gigas*) from field studies in Peru, the observer immediately recognized the bird as a probable *Patagona* sp. by its size and its erratic and slow wingstrokes. However, the colors were different from those of *P. gigas gigas* and *P. g. peruviana* of which large series have been examined by Fjeldsa. The top of the head was fuscous except for white spots near the eyes; the mantle and scapulars were blackish (fuscous black?) with a green lustre rather than the normal olive or bronzy of a Giant Hummingbird; the wings were fuscous black without noticeable light feather edges and without the blue gloss of a Great Sapphirewing (*Pterophanes cyanopterus*). These parts were in contrast with the uniform cinnamon or cinnamon-