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Juvenal Plumage in the Green-breasted Mountain-gem (*Lampornis sybillae*) with Observations on Timing of Breeding and Molt

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ABSTRACT.—We documented the juvenal plumage of the Green-breasted Mountain-gem (*Lampornis sybillae*) during mist-netting operations in the cloud forest at La Tigra National Park, Honduras from February to April 2006. A recently-fledged juvenile of this species was caught on 17 March and, contrary to previous suggestions, we found the throat and breast were mottled green. Ninety-eight immature mountain-gems intermediate between this juvenal plumage and that of adults were also caught during our study. Both males and females of the Green-breasted Mountain-gem apparently begin replacing juvenal throat feathers soon after fledging and prior to molting flight feathers. A high capture rate of young hummingbirds at the end of the dry season, including recent fledglings and individuals showing only traces of juvenal plumage, suggests a protracted breeding season that we estimate to last at least from November through March. We also caught adults in a variety of stages of flight-feather molt, perhaps part of a transition from breeding; molting in our population is estimated to span at least an 8-month period. Received 25 October 2006. Accepted 19 January 2007.

We conducted a preliminary survey of the avifauna of La Tigra National Park, Honduras in 2006 (Glowinski Matamoros 2006). No studies had been conducted in cloud forests of Honduras and little is known about avian species in this habitat, including hummingbirds. During mist-netting operations we identified juvenal plumage of the Green-breasted Mountain-gem (*Lampornis sybillae*) that differed from previous descriptions. Ridgway (1911) only described the adult plumage. Monroe (1968) questioned

whether immature females have white throats while Howell and Webb (1995) report that immature males resemble the female “but throat whitish only faintly washed buff.” Our observations did not match these descriptions and suggest they may be in error, perhaps from misidentification of museum specimens; alternatively, different subspecies could exist that are not currently identified.

The Green-breasted Mountain-gem is a fairly common resident of high elevation forests, especially cloud forest, and occupies both humid evergreen and pine-evergreen forest, and forest edge (Howell and Webb 1995). This species is largely restricted to Honduras and a small area of north-central Nicaragua, and is replaced by the closely related Green-throated Mountain-gem (*Lampornis viridipalens*) west of the Sula Valley (Monroe 1968). The status of these mountain-gems as two distinct species is based upon morphology and apparent differences in display patterns (Monroe 1963). Recent nuclear and mitochondrial DNA analysis failed to clarify the relationship (García-Moreno et al. 2006). Little is known about either species and the objective of this paper is to contribute to understanding the life history of tropical hummingbird species: we describe juvenal plumage in the Green-breasted Mountain-gem and present our observations on timing of breeding and molt.

METHODS

Mist-netting operations at La Tigra National Park, Honduras were conducted from 24 February to 19 April 2006 in primarily mid-successional cloud forest at an elevation of 1,700–1,800 m (14° 22' N, 87° 08' W). We caught birds toward the end of the dry season that typically lasts from December through April. Birds were not banded, but a small clipping of the outermost tail feather ensured that we were collecting data from different individuals. The unflattened wing chord was measured to the nearest half millimeter; the birds

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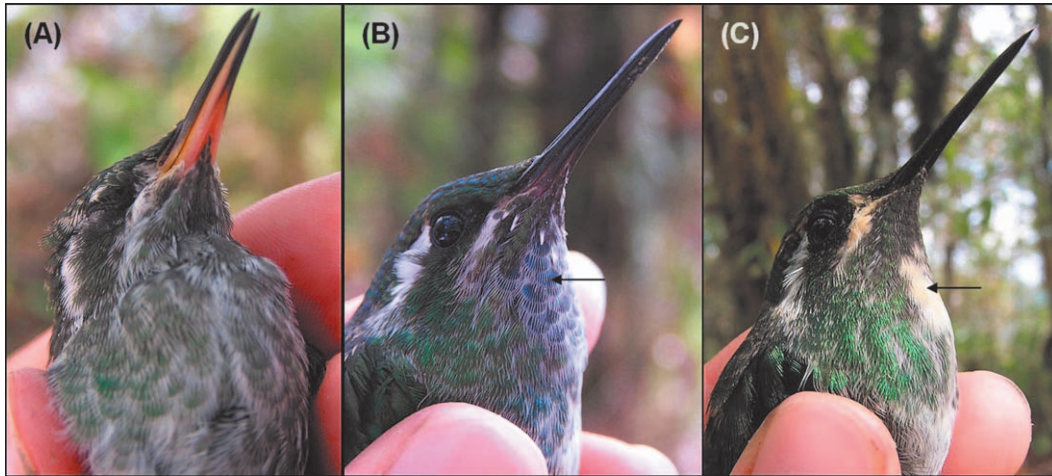


FIG. 1. Juvenile Green-breasted Mountain-gems captured in March 2006 at La Tigra National Park, Honduras. (A): a fledgling of unknown gender barely days out of the nest with the throat completely mottled green. (B): a young male has the start of iridescent green throat feathers. (C): a young female with a buffy patch on the throat. Photographs by Felicity L. Newell.

were then weighed with an electronic scale and checked for subcutaneous fat deposits. Flight feather molt was scored following Ginn and Melville (1983). We classified hummingbirds based on the extent of bill striations (Ortiz-Crespo 1972, Pyle 1997, Yanega et al. 1997). Breeding can occur year round in the tropics and it was not possible to ascertain the actual calendar year in which a bird was hatched, especially in February. We classified hummingbirds as immatures if distinct striations covered >50% of the bill. This would be equivalent to a bird in its first several months of life and prior to its first breeding season. We classified birds without obvious bill striations as adults. Birds captured were extensively documented with photographs.

OBSERVATIONS

We caught a fledgling Green-breasted Mountain-gem of unknown gender on 17 March 2006. Loud begging and an extensive yellow gape indicated this bird was recently out of the nest; all wing feathers (measured at 58.5 mm) and tail feathers were incompletely grown with the shaft still in sheath. The fledgling showed the white post-ocular stripe, green back, and dark inner rectrices with whitish outer rectrices distinctive of this species. The throat and breast were mottled green (Fig. 1A) similar to the green mottling on the sides

and variably across the breast of adults. The bill was not fully grown in length and its underside was tinged dusky-pink near the base; adults have completely black bills.

Concurrently during mist-netting we caught 98 immatures (Fig. 1B, C) intermediate between the juvenal plumage described above and the adult plumage. Individuals ranged from juveniles with extensive green throat mottling and traces of pink under the bill to older birds with almost completely adult throat plumage and only a few retained juvenal feathers, typically just below the base of the bill. The mottling on juveniles appeared variable with almost solid dark green on some individuals. Young birds also had pale buffy to cinnamon edging on feathers of the crown and lower back. All immatures except the one fledgling showed distinct plumage dimorphism and gender could easily be identified based on incoming throat feathers alone, although there was also extensive sexual size dimorphism (Table 1). Both male and female Green-breasted Mountain-gems appear to begin acquiring adult throat plumage soon after fledging (a few young males had a more speckled but not full gorget). Rate of throat feather molt may vary as one male with an almost complete gorget still had pink under the bill but other males and females with mostly juvenal plumage had completely black

TABLE 1. Measurements of Green-breasted Mountain-gems captured at La Tigra National Park, Honduras, February–April 2006. Immatures had variable amounts of retained green mottling characteristic of juvenal plumage in this species. A few individuals ($n = 15$) had moderate fat deposits.

	<i>n</i>	Unflattened wing chord (mm)			Body mass (g)		
		Mean	SD	Range	Mean	SD	Range
Males							
Adults	51	67.1	1.5	64.5–69.5	6.0	0.4	5.3–7.3
Immatures	33	67.8	1.1	66.0–69.5	5.9	0.5	5.1–7.0
Females							
Adults	58	60.4	1.2	58.0–62.5	4.9	0.3	4.3–6.0
Immatures	65	60.9	0.9	59.5–62.5	4.7	0.4	3.9–5.7

bills. Some immature mountain-gems were also molting body feathers although none showed flight feather molt. Apparently both juvenal throat and body feathers in this species are replaced prior to flight feather molt; the extent and timing of this replacement remains unknown.

Indicative of active and/or recent breeding, half of the 207 Green-breasted Mountain-gems that we captured between 24 February and 19 April were immatures. We saw a similar trend for the other dominant species, the White-eared Hummingbird (*Hylocharis leucotis pygmaea*). A few immatures of other highland species included the Amethyst-throated Hummingbird (*Lampornis amethystinus*), Green Violet-ear (*Colibri thalassinus*), Magnificent Hummingbird (*Eugenes fulgens*), and Garnet-throated Hummingbird (*Lamprolaima rhami*). As well as immature hummingbirds, we also caught adults molting flight feathers, perhaps part of a post-breeding initiation of molt. During our mist-netting period, 29% ($n = 109$) of adult Green-breasted Mountain-gems were undergoing flight feather molt and individuals were captured with a range of molt scores (4–79). For other hummingbird species netted during this period, 49% of White-eared Hummingbirds ($n = 100$), 19% of Amethyst-throated Hummingbirds ($n = 32$), and 43% of Green Violet-ears ($n = 14$) were also undergoing flight feather molt.

DISCUSSION

The juvenal plumage that we observed in the Green-breasted Mountain-gem was consistent with the young of other hummingbird species in the genus *Lampornis*. Both the Blue-throated Hummingbird (*L. clemenciae*)

and Amethyst-throated Hummingbird have a pinkish base to the lower mandible in juveniles. Based on the extent of bill striations, young of both of these species can also acquire nearly adult throat plumage (Pyle and Howell 2000; FLN, pers. obs.). Loose buffy edging on juvenal contour feathers is typical of immatures of many hummingbird species (Bent 1940, Williamson 2001). Our wing measurements consistently averaged ~ 2 mm larger than Ridgway (1911) reported from birds in Nicaragua. This could be due to measurement error, or geographic variation may exist within the species and northern individuals average slightly larger.

Breeding in tropical hummingbirds generally appears to be synchronized to local peaks in flower abundance either during the wet or dry season (Skutch 1950, Stiles 1980, Schondube et al. 2003). We confirmed breeding in March for the Green-breasted Mountain-gem with capture of a juvenile, and we estimated that some young fledged at least as early as December. This estimate is based upon several immatures captured in early April that still showed traces of juvenal plumage but which had lost most bill striations due to hardening and wear (Stiles and Wolfe 1974, Yanega et al. 1997). This suggests a protracted breeding season of 5 months or more in which females might attempt two broods.

The annual molt cycle in tropical hummingbirds may be complicated by regional variation and/or an extended breeding season (Wagner 1957). However, recent work suggests that in predictable seasonal environments such as cloud forests, adults should optimally molt following breeding (Barta et al. 2006). Our observations support post-breed-

ing initiation of molt for adults at the end of the dry season. However, from a limited mist-netting period, it was not possible to ascertain that birds were not molting from August to November. We estimated the earliest molting Green-breasted Mountain-gems would have initiated molt around the beginning of December and the latest individuals completed molt by the end of July. Replacement of flight feathers in many hummingbird species typically takes 4 months or more (Williamson 1956, Stiles and Wolf 1974, Stiles 1980, Baltosser 1995). This would result in at least an 8-month period of molt within the population and is similar to the duration in several migrant species that depend on a seasonal environment (Williamson 1956, Baltosser 1995). Only in unpredictable environments have hummingbirds been found to molt year-round with timing following an individual 12-month schedule (Stiles and Wolf 1974).

The juvenal plumage of the Green-breasted Mountain-gem in our population was characterized by green mottling on the throat. Further work should examine whether the closely related parapatric Green-throated Mountain-gem may have similar juvenal plumage. More complete year-round study of the basic life history of this and other cloud forest species in Honduras and elsewhere is needed.

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LITERATURE CITED

- BALTOSSE, W. H. 1995. Annual molt in Ruby-throated and Black-chinned hummingbirds. *Condor* 97: 484–491.
- BARTA, Z., A. I. HOUSTON, J. M. MCNAMARA, R. K. WELHAM, A. HEDENSTRÖM, T. P. WEBER, AND O. FERÓ. 2006. Annual routines of non-migratory birds: optimal moult strategies. *Oikos* 112:580–593.
- BENT, A. C. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds and their allies. Smithsonian Institution, Washington D.C., USA.
- GARCÍA-MORENO, J., N. CORTÉS, G. M. GARCÍA-DERAS, AND B. E. HERNÁNDEZ-BAÑOS. 2006. Local origin and diversification among *Lampornis* hummingbirds: a mesoamerican taxon. *Molecular Phylogenetics and Evolution* 38:488–498.
- GINN, H. B. AND D. S. MELVILLE. 1983. Molt in birds. BTO Guide 19. British Trust for Ornithology, Tring, United Kingdom.
- GLOWINSKI MATAMOROS, S. L. 2006. A preliminary survey of the avifauna of La Tigra National Park, Honduras with an emphasis on mist-netting results. Unpublished Final Technical Report to USAID-MIRA and Fundación AMITIGRA. Tegucigalpa, Honduras.
- HOWELL, N. G. AND S. WEBB. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, USA.
- MONROE JR., B. L. 1963. A revision of the *Lampornis viridipallens* complex (Aves: Trochilidae). *Occasional Papers of the Museum of Zoology, Louisiana State University* 27:1–10.
- MONROE JR., B. L. 1968. A distributional survey of the birds of Honduras. *Ornithological Monographs* 7. American Ornithologists' Union, Washington, D.C., USA.
- ORTIZ-CRESPO, F. I. 1972. A new method to separate immature and adult hummingbirds. *Auk* 89:851–857.
- PYLE, P. 1997. Identification guide to North American birds. Part I. Trochilidae. Slate Creek Press, Bolinas, California, USA.
- PYLE, P. AND N. G. HOWELL. 2000. Revised ageing and sexing criteria for the Blue-throated Hummingbird. *North American Bird Bander* 25:134–137.
- RIDGWAY, R. 1911. The birds of Middle and North America. Part V. U.S. National Museum Bulletin 50:508–509.
- SCHONDUBE, J. E., E. C. SANTANA, AND I. RUÁN-TEJEDA. 2003. Biannual cycles of the Cinnamon-bellied Flowerpiercer. *Biotropica* 35:250–261.
- SKUTCH, A. F. 1950. The nesting season of Central American birds in relation to climate and food supply. *Ibis* 92:185–223.
- STILES, F. G. 1980. The annual cycles in a tropical wet forest hummingbird community. *Ibis* 122:322–343.
- STILES, F. G. AND L. L. WOLF. 1974. A possible circannual molt rhythm in a tropical hummingbird. *American Naturalist* 108:341–354.
- WAGNER, H. O. 1957. The molting periods of Mexican hummingbirds. *Auk* 74:251–257.
- WILLIAMSON, F. 1956. The molt and testis cycles of the Anna Hummingbird. *Condor* 58:342–356.
- WILLIAMSON, S. L. 2001. A field guide to hummingbirds of North America. Houghton Mifflin Company, New York, USA.
- YANEGA, G. M., P. PYLE, AND G. R. GEUPEL. 1997. The timing and reliability of bill corrugations for ageing hummingbirds. *Western Birds* 28:13–18.