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Identifying Colibri Hummingbirds Occurring in Arkansas Using Indirect Measurements

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General Notes

IDENTIFYING *COLIBRI* HUMMINGBIRDS OCCURRING IN ARKANSAS USING INDIRECT MEASUREMENTS

The Green Violet-ear *(Colibri thalassinus)*, a Latin American hummingbird, is extremely rare north of Mexico (Amer. Ornithologists' Union. 1983. Check-list of North American Birds, Wash., D.C.). The surprising first Arkansas record of the species occurred at Fort Smith, Sebastian County, where it was photographed (2 x 2 inches color transparency) at a hummingbird feeder by William B. Brazelton on 16 September 1984 (erroneously dated 7 October in James and Neal. 1986. Arkansas Birds: Their Distribution and Abundance. Univ. Arkansas Press). The photograph showed definitely that the large hummingbird pictured was in the genus *Colibri*, but the image was not decisive in determining whether the bird was a Green Violet-ear or the larger Sparkling Violet-ear *(C. coruscans)*. Although the chances of it being a Sparkling Violet-ear were negligible, because that species has never been found north of Colombia, South America (Peters. 1945. Check-list of Birds of the World, Vol. 5. Harvard Univ. Press), there was still this possibility based on the fact that the critical plumage characteristics were not obvious in the photograph. Stephen W. Cardiff of Louisiana State University recommended that I attempt to determine the beak length, which is diagnostic, by measuring the bill on the photographic transparency for comparison to the measured dimensions of the hummingbird feeder in the same photograph.

The measurements were made by viewing the diffusely backlighted transparency on the stage of a 15x binocular dissecting microscope. A fine-scale comparator (scale in 0.1 mm divisions) was superimposed on the photograph visible through the microscope. Thus the bird's beak length and feeder dimensions were read directly in the units of the comparator scale. Knowing the actual feeder measurements (using a dial caliper), the bill length in millimeters was calculated from a formula based on simple proportions: $l=mx/y$, where l is the actual bill length in millimeters, m and y are bill length and feeder dimensions respectively expressed in comparator scale units, and x is the actual feeder dimension in millimeters. The known variables m, x, and y are used to solve for bill length. In doing this it is essential to use a photograph that shows the bird exactly in profile, which with hovering hummingbirds at feeders is not at all difficult to obtain.

Using the photograph of the Fort Smith bird as an example; on the transparency the bill (m) was 12.23 units, the feeder dimension used (y) was 29 units, compared to the actual feeder measurement (x) of 39 mm. Thus solving for $l=12.33 \times 39/29=16.58$ mm, the beak length equaled 16.58 mm. This length beak is definitely at the low end of bill lengths for the smaller species, the Green Violet-ear. Cardiff supplied bill measurements of both species from the Louisiana State University collection as follows: Green Violet-ear (13 specimens) range from 17.8 to 20.2 mm, mean 19.1 mm; Sparkling Violet-ear (10 specimens) range 21.7 to 24.2 mm, mean 23.2 mm. Notice that there is no overlap in the range of bill lengths for the larger Sparkling Violet-ear compared to the smaller Green Violet-ear. This non-overlapping separation is confirmed by Ridgeway (1911. The Birds of North and Middle America. U.S. National Museum, Bull. No. 50, Smithsonian Inst.).

Care has to be exercised to measure only the exposed culmen length (cord) in the bird profiles, which is the length of the beak from where the feathers end a short way down the bill, measured from there to the tip. This feather terminus is marked by a point where the plumage of the forehead tapers down and ends at the maxilla. Having a hummingbird specimen of any species on hand helps as a reference in finding this spot on the photograph.

Subsequently to the Fort Smith bird, which was there only from 4 to 5 days to about 17 September 1984, there have been three additional occurrences of Green Violet-ears in Arkansas. One was in Arkadelphia in Clark County, 2-4 June 1989, another occurred in Newton County between Lurton and Cowell, 6-23 July 1990, and the final one was at Rogers in Benton County from 4 August to 5 September 1990. All three were photographed, bill lengths determined, and all thereby proved to be Green Violet-ears.

The Arkadelphia bird photographed by Don Harrington had the longest bill of the four records, measuring 19.18 mm. Two transparencies of the Newton County bird were used, both photographs taken by Sue Burlingame. This provided an opportunity to test repeatability of measurements between slides. In addition, three different feeder dimensions were used separately to verify the technique. Two of the feeder dimensions produced a bill length of 18.3 mm in both photographs. The other dimension showed bill length of 19.25 mm, also in both photographs. This shows the variation in accuracy that can be expressed using the technique. The one millimeter difference would not have been decisive in obscuring the identity of any of the four birds.

The beak length of the bird at Rogers, Arkansas, was measured from one photograph taken by me, and from two photographs taken by Max Parker, using the same feeder dimension measured separately in each of three transparencies. In all three cases the bill proved to be 16.7 mm long. This is excellent documentation of how precise the measurement technique can be.

The Rogers bird was 60 miles northwest of the Newton County site, and arrived shortly after the Newton County bird disappeared. This led to speculation that the two records could have been of the same individual, which was discounted when the bill length of the Rogers bird proved to be over 1.5 mm shorter than in the Newton County bird. Besides bill length, several kinds of evidence suggested conclusively that the two birds were different individuals. These were as follows, 1) there was a narrow blue band on the nape of both birds, which appeared to be much wider (1.5 mm) and brighter blue in the Rogers bird than in the Newton County bird (1.0 mm), 2) the blue mask was more conspicuous and wider posteriorly in the Rogers bird, 3) the Rogers bird had a dingy brown color on the forehead and anterior crown that was not iridescent whereas the Newton County bird was iridescent green in sunlight over the whole crown and forehead, appearing black not brownish in dimmer light, 4) the Newton County bird had a tiny white spot over the left eye that was not present in the Rogers bird (although this could have been a temporary blemish), 5) in behavior the Rogers bird was bold and would appear at the feeder even when people were in the yard nearby, whereas the Newton County bird was very shy and usually did not appear when people were in the yard, and finally 6) while the Rogers bird seldom vocalized the Newton County bird was very noisy, frequently making "chip" notes, and often perched and emitted the principal song of the species.

A big debt of gratitude is owed to those who persisted in finding whom to contact about the "strange large all dark hummingbird" at their feeder. The presence of the Green Violet-ear in Arkansas would not have been known without these efforts from Blanche Tinder, Jane Bowden, Sue Burlingame, and Patty Simmons. (The hummingbird photographs and associated documenting materials have been deposited in the file of Arkansas bird records maintained by the Arkansas Audubon Society.)

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RANGE EXTENSION OF THE ENDANGERED GRAY BAT, *MYOTIS GRISESCENS*, INTO THE ARKANSAS RIVER VALLEY

The Arkansas distribution of the endangered gray bat, *Myotis grisescens*, has typically been associated with the cave region of the northern Ozark Mountains comprising the Salem and Springfield Plateaus (Harvey *et al.*, 1981; Sealander and Heidt, 1990). On 25 October 1990, one of us (TAN) visited Land's End Cave, a sandstone fracture cave located in Pope County (T7N-R21W-S13), to investigate reports the cave contained large numbers of bats (Fig. 1).

Figure 1. Arkansas distribution of the endangered gray bat, *Myotis grisescens*. Back-slashed area represents geographic range according to Sealander and Heidt (1990). The closed circle indicates the new record extending the range southward into the Arkansas River Valley.

Land's End Cave is relatively small with the largest chamber rectangular in shape, approximately 30 m long, 20 m wide and 10-15 m high. Additional passages occur as narrow cracks and crevices that provide bat roosts nearly inaccessible to humans. There are no streams or permanent pools, but water does drip and seep along some walls, providing high humidity. The majority of the cave lies well below the entrance, creating a cold sink during winter months. Access to the interior of this cave is extremely difficult without the use of a rope, and this feature has probably allowed the bats to use more remote areas relatively undisturbed. However, the accumulation of trash at the base of the drop-off and knowledge of the cave's location among local residents suggests a significant level of disturbance at the cave entrance. The cave and associated sandstone bluff are on private property.

Three bats were removed from the cave wall for identification. Two specimens roosting solitarily were collected and identified as eastern pipistrelles *(Pipistrellus subflavus)*. The third specimen was removed from one of several clusters and identified as a male gray bat. Clusters were located on the face of an overhanging wall 2 to 4 m above the floor, and were estimated to contain 20 to 40 individuals each. The total number of bats present in clusters was estimated to be 150. All 3 bats examined were released. A single guano pile beneath a domed area of the ceiling indicated that gray bats or some other colonial species had utilized this cave during warmer periods of the year when bats were actively foraging. There was no evidence of guano accumulation beneath areas used by hibernating gray bats.

On 13 November 1990, the cave was visited again, and clusters of bats were observed at approximately the same locations on the cave wall. One bat was removed from a cluster and identified as a male gray bat. Several eastern pipistrelles were examined and released.

The cave was not visited between 13 November 1990 and 26 January 1991. On 27 January, we entered the cave and collected 3 eastern pipistrelles and a Rafinesque's big-eared bat *(Plecotus rafinesquii)*. These were released after identification, and no other species were seen.

On 15 February 1991, one of us (LEC) visited the cave entrance at dusk. Sounds emanating from the cave's interior suggested that large numbers of bats were present and active. Alight was shone into the cave and a large number of bats were observed flying about the chamber. Due to the cave's configuration, only a portion of the main room was visible. Clusters were not observed, nor was positive identification possible.

The cave was entered and searched again on 16 February 1991. Several eastern pipistrelles and 6 gray bats were observed. Five male and 1 female gray bats were in deep torpor. Two males roosted singly, 2 males roosted together, and a male and female roosted together. All individuals and pairs were spaced more than 1 m apart.

Two adult males with epididymides extended into their uropatagia weighed 10 g each and had left forearm (LFA) lengths of 43.6 and 43.9 mm. Three males did not exhibit epididymides in their uropatagia, and were presumed to be young-of-year. Young-of-year male gray bats undergo little or no spermatogenic activity and are infertile their first fall (Saugey, 1978). These bats weighed 8.75, 9.0, and 9.0 g and had LFA lengths of 42.1, 42.8, and 44.0 mm. The female weighed 9.5 g and had a LFA length of 43.5 mm.

The temperature and relative humidity recorded within 1 m of these bats was 7.5 C and 95%. Throughout their range, gray bats choose hibernation sites where temperatures average 6-11°C (Barbour and Davis, 1969). In northern Arkansas, Harvey *et al.* (1981) found ambient temperatures near hibernating clusters ranged from 10-12°C.

Temperatures recorded at the U.S. Army Corps of Engineers' weather station at the Dardanelle Lock and Dam were examined for the 14 day period prior to the influx of bats on 15 and 16 February. Daytime highs exceeded 15.5°C on 9 of these days, with a high of 21.1°C on 14 February (the day before the large number of bats was heard in the cave). Temperatures cooled to 11°C on 15 February, becoming dramatically colder with a high of 4.4°C on 16 February. We speculate that the high ambient temperatures on 14-15 February may have caused arousal of the bats, and that these bats returned to their preferred hibernation site (location currently unknown) when temperatures dropped on 16 February. Tuttle (1961) observed similar behavior by gray bats at a small cave in Tennessee.

Most gray bats migrate seasonally between hibernating and maternity caves. The distance travelled by individual colonies varies depending on geographic location (USFWS, 1982). Gray bats that hibernate in Arkansas are known to migrate to summer caves in Kansas, Missouri, and Oklahoma, and some gray

bats that hibernate in Missouri are known to summer in Arkansas caves (Harvey, 1989-90). Based on distances traveled between maternity sites and hibernacula in the Meramec River area of Missouri (LaVal and LaVal, 1980), distances from major maternity caves in northern Arkansas to this site are not excessive. Tuttle (1976) documented one-way migrations of gray bats between summer and winter sites of up to 525 km.

The occurrence of gray bats during the fall migratory period, and the accumulated pile of guano suggest this cave is used as a transitory or staging cave. However, the influx of gray bats in February, during the middle of the hibernating period indicates additional hibernacula likely exist in the area. It is highly unlikely that gray bats would move great distances in mid-winter due to the high energetic costs involved (Tuttle, 1976). Further, prior research has shown a strong site fidelity in gray bats to both winter and summer sites (Myers, 1964; Harvey, 1975; Tuttle, 1976; LaVal and LaVal, 1980). Tuttle's (1976) banding studies demonstrated that gray bats show lifetime fidelity to the hibernacula used during their first winter. This information, in conjunction with our discovery of gray bats at Land's End Cave, suggests that gray bats may have been wintering undetected in the Arkansas River Valley for some time.

This discovery constitutes a significant southward range extension for gray bats of at least 70 km from the other Arkansas caves known to house this species (Harvey *et al.*, 1981; *pers. comm.*, 1991). In addition, this report further emphasizes the need for additional field work in areas previously considered unlikely habitat, but which may contain pockets of suitable or marginal habitat (Gates *et al.*, 1984).

The gray bat may be more restricted to cave habitats than any other mammal in the United States (Hall and Wilson, 1966). Their requirements for roost sites and habitat are so specific, that fewer than 5% of available caves are suitable for occupation (Tuttle, 1979). Harvey (1989-90) estimated that gray bat populations in the cave region of northern Arkansas have declined as much as 61% in recent years. It seems especially timely then to re-evaluate the importance of fracture caves and mines, located in areas adjacent to known occupied habitat, in the natural history, distribution, and recovery of this endangered bat.

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AGGRESSIVE INTERACTIONS BETWEEN MALE COTTON MICE *(PEROMYSCUS GOSSYPINUS)* AND MALE TEXAS MICE *(P. ATTWATERI)*

Four species of *Peromyscus* (deer mouse, *P. maniculatus*; white-footed mouse, *P. leucopus;* cotton mouse, *P. gossypinus;* and Texas mouse, *P. attwateri*) are found sympatrically in the Ouachita Mountains and the southern Ozark Mountain region of Arkansas. Of these, *P. attwateri* is the most restricted in habitat, being found only in rock outcroppings of the Ouachitas and rock outcrops and cedar glades of the Ozarks (Sealander and Heidt, 1990). This restricted habitat has apparently resulted in some morphological and genetic differentiation, leading to lowered heterozygosity, between populations of *P. attwateri* (Kilpatrick, 1984; Sugg *et al.*, 1990). The reasons, however, for the observed habitat isolation of this species are not clear.

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