Journal of the Arkansas Academy of Science

Volume 42 Article 37

1988

Extralimital Hummingbirds in Arkansas

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Table 1. Velocities of falling spheres at various fall times.

Time of fall (msec)	Ideal Velocity (cm/s)	Calculated Velocity (cm/s)	Measured Velocity (cm/s)
146	142.97	142.89	142.95
236	231.46	231.13	230.73
278	272.21	271.67	271.98
324	317.17	316.33	316.50
370	362.41	361.15	360.80
406	398.14	396.47	396.23
455	445.58	443.24	443.58
484	473.72	470.91	470.57
515	504.80	501.40	501.06
551	539.80	535.65	535.77

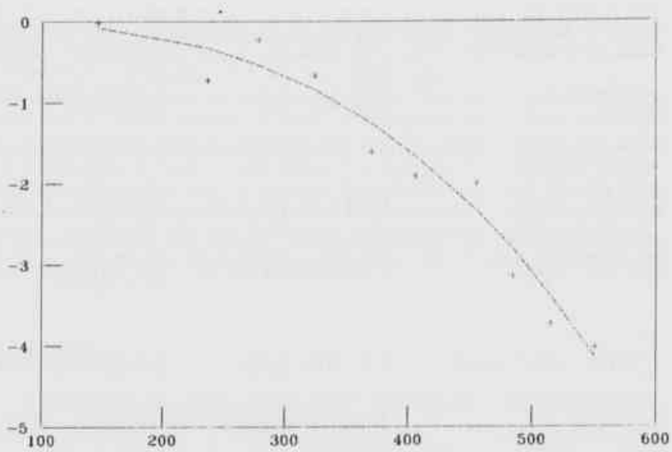

Figure 1. Differences from the ideal falling body case (dashed line - calculated values; plusses - measured values).

the switch is thrown, the power to the magnet is cut off, allowing the bar to fall and release the ball. At the same time, the timer cycle begins. Located in the path of the ball is a photogate consisting of a laser beam directed onto a phototransistor connected to the timing system. When the ball breaks the beam, the phototransistor is turned off and the timer stops. In addition, the computer can be set to measure the time the phototransistor is obstructed by the sphere. In this mode, a microsecond timer begins when the leading edge of the sphere breaks the beam and ends when the phototransistor is no longer darkened.

The experiment was conducted using a plastic sphere of diameter d = 4.379 cm and mass M = 57.80 g. Since a photogate may not be obstructed by all of an object which passes through it, a preliminary test was made and the effective diameter of the sphere was found to be 4.27 cm. The main timing procedure involved first setting the timer to the microsecond time-through-gate mode and determining the time taken for the ball to travel through the photogate. Great care was taken through numerous horizontal adjustments of the photogate system to insure that the sphere passed through the beam along its diameter, since this path will give the longest possible time measurement for the pass through the gate. When this time was achieved consistently, it was recorded as the gate time and the timer was reset to the (millisecond) time-of-flight mode. The ball was then dropped to determine the time taken to fall from rest to the photogate. This entire procedure was followed for 10 different heights at approximately 15 cm increments.

The average velocity of an object travelling a distance d in a time t can be written as $V_{av} = d/t$. If the velocity increases linearly with time, then the average velocity is equal to the velocity at t/2. For the time interval during which the sphere passes through the gate, the acceleration is very nearly constant, so these approximations are valid for calculating the velocity at a particular time. Thus, the experimental velocity, which is just the average velocity of the sphere through the photogate, may be calculated from 4.27 cm/(gate time) and corresponds to a total travel time equal to the time of flight plus one half the gate time. Using this travel time, the theoretical velocity was calculated from the drag equation (Eq. 8). A value for g for the local latitude and elevation equal to 979.7 cm/s^2 and an air density of $\varrho_a = 1.2 \times 10^{-3}$ g/cm^3 were used. A computer program was written to determine the lag time between the start of the timer and the actual dropping of the sphere to obtain the best agreement between the theoretical and calculated velocities; the lag was found to be 3 msec. The velocity if there were no air resistance is referred to as the ideal velocity and can be calculated from V = gt. Figure 1 shows the differences from the ideal case for the measured velocities and the velocities calculated from Eq. 8 for various times of flight. It is seen from the figure that the experimental velocities correspond very well with the calculated velocities.

We have shown that this timing technique can be used to provide measurements of the effects of drag forces on falling bodies to relatively high precision. This can be useful in the undergraduate laboratory to supplement the usual free-fall measurement of the gravitational acceleration and to introduce the concept of drag forces in viscous media.

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EXTRALIMITAL HUMMINGBIRDS IN ARKANSAS

The Ruby-throated Hummingbird *(Archilochus colubris)* is the only species of hummingbird known to nest in Arkansas or anywhere else in eastern North America (James and Neal, 1986; A.O.U., 1983). Until 1985 it was the only hummingbird species ever identified in Arkansas, where it is a common summer resident and migrant in all parts of the state (James and Neal, 1986).

Before 1985 there were several well documented Arkansas reports (notably at Little Rock in December of 1978 and January of 1979 and at North Little Rock in October of 1984) of unidentified hummingbirds that clearly belonged to other species (Arkansas Audubon Society files). All these were identified as members of the genus *Selasphorus,* most likely Rufous Hummingbirds *(S. rufus),* a western species that normally winters in Mexico, though small numbers of Rufous Hummingbirds regularly overwinter along the Gulf Coast of the U.S. (A.O.U., 1983). Positive identification of the Arkansas birds could not be made on the basis of field observations or photographs. Only in the plumage of the adult male (with an all-rufous back) is *S. rufus* distinguishable in the field from the very similar Allen's Hummingbird *(S. sasin).* In female and immature plumages,

Table 1. Additional vagrant and out-of-season hummingbirds 1987-88 (from Arkansas Audubon Society files).

DATE	LOCATION	RECORD	OBSERVERS
25-26 Aug.	Columbia Co.	Rufous (adult male)	Charline Aubrey
26-30 Aug.	Fayetteville	Selasphorus sp.	Tess Grasswitz, James, Neal, & others
7 Nov.-27 Jan.	El Dorado	Black-chinned	L. & H. Shugart & others
26 Nov.	Fort Smith	Rufous (adult male)	William Brazelton
Dec.-Jan.	Little Rock	Archilochus sp.	Marge & Ben Dunn, Shepherd, & others
21 Jan.-11 Feb.	El Dorado	Rufous (specimen)	L. & H. Shugart & others

the two species can be distinguished only by capturing the birds and measuring retrices (Stiles, 1972; N.L. Newfield, pers. com.). None of these early Arkansas vagrants were in adult male plumage (AAS files).

On 23 January 1985, a dead hummingbird was found frozen on its perch at Pine Bluff. Foti sent the specimen to Louisiana State University at Baton Rouge (James and Neal, 1986), where J. Van Remsen identified it as a Rufous Hummingbird and retained it in the collection (Louisiana State University Museum of Zoology, Cat. No. 121495). Other female and immature hummingbirds of the brown-and-green *Selasphorus* type continue to appear in Arkansas (Table 1) but have not been captured and thus, unless found dead, cannot be identified to species with certainty.

The second species of stray hummingbird identified in Arkansas was the most surprising to date: the Green Violet-ear *(Colibri thalassinus)*. Unlike the Rufous Hummingbird and other hummingbird species (see below) that have strayed into Arkansas, the Green Violet-ear does not occur north of Mexico except as an extremely rare vagrant. All previous verified U.S. records of the Green Violet-ear came from south-central and southern Texas (A.O.U., 1983). (Two reports from California [including the one cited in A.O.U., 1983] were rejected by the California Bird Records Committee [Roberson, 1986].) The Arkansas record for Green Violet-ear is based on a photograph taken at Fort Smith by William Brazelton on 7 October 1984. The bird itself was positively identified from photographs by the method described in James and Neal (1986).

The late summer, fall, and winter of 1987-88 yielded several hummingbirds from the West, including two species previously unrecorded from Arkansas. A hummingbird observed and photographed (Helen and Max Parker, *et al.*) at North Little Rock in December and January proved to be an immature male Black-chinned Hummingbird *(Archilochus alexandri)*, a species new to the state (report accepted by the Arkansas Bird Records Committee on the basis of written documentation and photographs submitted). More surprisingly, a bird observed and photographed (also by the Parkers and others) at Gillett in January and February of 1988 was an Anna's Hummingbird *(Calypte anna)* (identification verified from photographic slides in a letter from J. Van Remsen and Peter E. Scott to Max Parker, dated 11 February 1988). Anna's Hummingbird is a species of the West Coast and Arizona reported only a few times from southern Louisiana in winter, whereas the Black-chinned, breeding as close to Arkansas as central Texas (A.O.U., 1983), having summered and possibly nested near Oklahoma City, Oklahoma (Vacin, 1969), and wintering with some regularity in southern Louisiana (N.L. Newfield, pers. com.), was almost to be expected.

Other vagrant and out-of-season hummingbirds reported in the 1987-88 season are listed in Table 1. Worth comparing with these records are Newfield's report of "numbers of Black-chinned Hummingbirds ... higher than normal in s[outhern] Louisiana" during the fall of 1987 and Mississippi's first record of this species 26 November 1987 (Purrington, 1988).

All vagrant hummingbirds observed in Arkansas to date have been observed in the months of August through February. This seasonal pattern is consistent with the dates of vagrant Rufous Hummingbirds elsewhere in eastern North America (Conway and Drennan, 1979).

Although few hummingbirds have been banded in Arkansas, if any, the experience of Marguerite Baumgartner south of Jay, in northeastern Oklahoma (onCity,ly 17 km. west of the Arkansas State line), provides a basis for speculating on the abundance in Arkansas of extralimital hummingbirds relative to the abundance of Ruby-throated Hummingbirds. In 11 years Baumgartner banded 2,290 Ruby-throated Hummingbirds, two Rufous, and one Black-chinned (Baumgartner, pers. com.). Thus she banded between 700 and 800 Ruby-throated Hummingbirds for every individual of a vagrant species. Since all the vagrants originate farther west, they may be relatively even scarcer in Arkansas. Conversely, more hummingbirds may attempt to winter in central and southern Arkansas than in the vicinity of Jay, Oklahoma, because vagrant hummingbirds in Texas and Louisiana concentrate near the Gulf Coast and Baumgartner's site in Oklahoma lies only 13 km. south of the latitude of the northern border of Arkansas.

Why have so many vagrant hummingbirds been observed in Arkansas in recent years when none had been recorded in Arkansas only 10 years ago? Part of the answer may be that more people are watching birds now than in the past. It may be also that the reporting network has enlarged or otherwise improved, though both this and the preceding tentative explanation would be difficult, if not impossible, to prove. Perhaps both a growing corps of informed observers and better reporting are contributing to larger numbers of records for extralimital birds in all taxonomic groups.

We suggest that an additional factor in the case of hummingbirds is the greatly increased popularity of hummingbird feeders. We do not claim to demonstrate that this is a factor, but want to set out the hypothesis for others to test if they wish. Neither can the increase in artificial feeding of hummingbirds be demonstrated statistically; but Shepherd's personal experience illustrates how much more common such feeding has become. Forty years ago Shepherd had been feeding hummingbirds from tiny glass medicine vials painted red with fingernail polish. Then he talked his father into mail-ordering from Massachusetts some hand-blown glass feeders that held about 12 cc. of sugar water each. Everybody who knew him then remembers this, because at the time, they knew no one else in Pine Bluff, Arkansas, who fed hummingbirds.

In January of this year Shepherd bought a plastic hummingbird feeder from a Little Rock florist. In mid-winter that one shop had in stock at least four models of hummingbird feeders of various designs and capacities. It is no longer unusual to see a hummingbird feeder in an Arkansas garden. There must be thousands of them! Significantly, every one of the hummingbirds seen in Arkansas during the winter months and every one identified as something other than a Ruby-throated Hummingbird was frequenting a feeder (AAS files). Not only are hummingbirds easier to see well (and thus to identify to species) when they drink repeatedly from a feeder placed near a window, but, more important for the bird, a well stocked feeder represents the only chance for a belated hummingbird to survive more than a day or two. A hard freeze kills the last nectar-producing flowers and, along with them, any flying insects and flower-dwelling arthropods that may have been supplementing the diet of nectar.

This paper has benefited greatly from thoughtful comments offered by A. Marguerite Baumgartner, Nancy L. Newfield, and Charles R. Preston, who reviewed earlier versions of it. We thank them sincerely.

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MAMMALIAN SPECIES RECOVERED FROM A STUDY OF BARN OWL, *TYTO ALBA*, PELLETS FROM SOUTHWESTERN ARKANSAS

The barn owl, *Tyto alba*, has been historically a common raptor in Arkansas and one might expect a wealth of data available on the food habits of this owl. While studies have been conducted in other areas of the country (Banks, R. C., Auk 82:506, 1965; Jemison, E. S. and R. S. Chabreck, Wilson Bull. 74(1):95-96, 1962; and Parmalee, P. W., Auk 71:469-470, 1954), in Arkansas only one other study has been reported (Paige, K. N., C. T. McAllister, and C. R. Tumlison, Proc. Ark. Acad. Sci. 33:88-89, 1979).

A. C. Bent (1937), in his book *Life Histories of North American Birds Of Prey*, relates that the barn owl is a very beneficial predator in that it consumes large numbers of harmful rodents. He also indicates that its choice of prey is dependent upon those items available in its forage range.

Our study began in April 1987, when an owl roost was discovered in an abandoned cotton gin in Ozan, Hempstead County. The roost is located on the edge of a small community in an area composed mostly of farm land with scattered stands of hardwood trees.

Table 1. Frequency of occurrence (Percentage of occurrence) of prey items recovered from barn owl pellets.

Species	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
Microtus pinetorum	6(33.3)	37(54.4)	36(53.0)	6(19.4)	2(20.0)	1(11.1)	2(10.0)	2(9.1)	5(18.5)	16(32.0)	49(60.5)	162(40.1)
Sigmodon hispidus	8(44.4)	19(27.9)	16(23.5)	16(51.6)	5(50.0)	8(88.9)	15(75.0)	16(72.7)	17(63.0)	14(28.0)	11(13.6)	145(35.9)
Rattus rattus	–	5(7.4)	10(14.7)	5(16.1)	1(10.0)	–	1(5.0)	1(4.5)	1(3.7)	–	2(2.5)	26(6.4)
Oryzomys palustris	3(16.7)	1(1.5)	1(1.4)	4(12.9)	1(10.0)	–	–	2(9.1)	4(14.8)	4(8.0)	4(4.9)	24(5.9)
Reithrodontomys fulvescens	–	–	2(2.9)	–	–	–	–	1(4.5)	–	6(12.0)	8(9.9)	17(4.2)
Reithrodontomys humulis	1(5.6)	–	–	–	–	–	–	–	–	2(4.0)	1(1.2)	4(1.0)
Reithrodontomys sp.	–	–	–	–	–	–	–	–	–	2(4.0)	–	2(0.5)
Blarina carolinensis	–	4(5.9)	1(1.4)	–	–	–	–	–	–	1(2.0)	4(4.9)	10(2.8)
Cryptotis parva	–	1(1.5)	–	–	–	–	–	–	–	1(2.0)	2(2.5)	4(1.0)
Notiosorex crawfordi	–	–	1(1.4)	–	1(10.0)	–	–	–	–	–	–	2(0.5)
Ochrotomys nuttalli	–	–	–	–	–	–	–	–	–	2(4.0)	–	2(0.5)
Mus musculus	–	–	–	–	–	–	1(5.0)	–	–	–	–	1(0.2)
Unknowns	–	1(1.5)	1(1.4)	–	–	–	1(5.0)	–	–	2(4.0)	–	5(1.2)
Total	18	68	68	31	10	9	20	22	27	50	81	404