FLIGHT SPEEDS OF THE CAVE BAT

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Two estimates of flight speed of the cave bat (*Myotis velifer*) were obtained in a cave in Harmon County, Oklahoma, one of 10.77 mph for individuals clocked from 30 to 40 ft from a release point and the other of 11.04 mph as timed from 30 to 50 ft.

Accurate information on speeds of bats is essential to the interpretation of homing experiments and estimation of home range. With the increase of information on homing studies, banding records, and seasonal movements, the speeds at which bats fly are of growing interest (1).

In addition to summarizing earlier literature, Hayward and Davis (2) recorded the flight speeds of 17 species of bats from Arizona, including speeds ranging from 9.0 to 12.0 miles per hours (mph) for the cave bat, *Myotis velifer*, recorded in a vacated hall of a building. Cockrum (3) reported a speed of at least 7 mph, i.e. 28 miles/4 hr, for the cave bat during a homing study, and Twente (4) determined the cruising speed of this species, by automobile speedometer, to be 13 to 15 mph when there was no wind. However, until this time, there seems to be no report of the flight speed of *M. velifer* within a cave.

MATERIALS AND METHODS

On 16 July 1972, specimens of *M. velifer* were taken with a long-handled net in a cave 2 miles west and 1 mile south of Reed in Harmon County, Oklahoma. They were placed in containers and taken to a straight passage of the cave, a short distance away, to be released. Two gas lanterns, placed in the passage close to the opening of the cave, made the bats clearly visible during flight. The animals were released in a straight, arched passage (10 ft high, 25 ft wide at base, and 16 ft wide at midheight), and the elapsed flight times for distances of 30 ft and 40 ft or of 30 ft and 50 ft were measured with two stopwatches, read to the nearest 0.1 sec. Only speeds of individuals flying on a relatively straight flight pattern, between the release point and the end of the specified distance, were recorded.

RESULTS AND DISCUSSION

Flight speeds of 49 individuals were taken; the data for males, females, and combined sexes at specified distances are presented in Table 1. Some of the animals were considered in more than one of the samples listed, e.g., the same bat may have been timed from 0 to 30 ft and also from 0 to 40 ft during the same flight. Statistically, a significant difference was found between males and females at distances of 30-40 ft and 30-50 ft (t-test, $P<0.05$). The biological significance of the statistical differences between sexes at these distances is unclear, particularly because no significant difference in the length of the forearm was found. Further studies should be done to investigate this problem.

TABLE 1. *Flight speeds of* Myotis velifer (*male, female, and both sexes combined*) *over various distances in a cave.*

Sex	Sample size	Distance (ft)	Mean speed (mph)	Standard deviation
♂	32	0-30	10.58	1.563
♂	19	0-40	10.19	1.070
♂	13	0-50	10.34	0.992
♂	19	30-40	9.77	2.227
♂	13	30-50	10.38	1.781
♀	17	0-30	9.79	1.362
♀	11	0-40	10.00	1.320
♀	6	0-50	11.08	1.083
♀	11	30-40	12.63	3.185
♀	5	30-50	12.73	1.245
♂♀	49	0-30	10.30	1.530
♂♀	30	0-40	10.12	1.149
♂♀	19	0-50	10.57	1.051
♂♀	30	30-40	10.77	3.009
♂♀	18	30-50	11.04	1.941

The average combined speeds of males and females for flights between 30 and 40 ft and between 30 and 50 ft are probably the more accurate estimate of the average speed at which these bats fly within a cave. Bats flying between those points were probably flying at a more constant speed, because the time lost accelerating to flight

speed would be partially eliminated. The speeds (10.77 mph and 11.04 mph, respectively) closely approximate those recorded for *M. grisescens* (11.14 mph) by Kennedy and Best (5) and for *M. sodalis* (10.8 mph) by Patterson and Hardin (1) taken under similar conditions. Because the bats in our study were captured and released within a very short time, in a familiar territory, and during their normal activity period, we believe our results to be relatively accurate.

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REFERENCES

1. A. P. PATTERSON and J. W. HARDIN, J. Mammal. 50: 152-153 (1969)
2. B. HAYWARD and R. DAVIS, J. Mammal. 45: 236-242 (1964).
3. E. L. COCKRUM, J. Mammal. 37: 48-57 (1956).
4. J. W. TWENTE, Ecology 36: 706-732 (1955).
5. M. L. KENNEDY and T. L. BEST, Amer. Midl. Natur. 88: 254-255 (1972).