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Myotis keenii.

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Myotis keenii (Merriam, 1895)

Keen's Myotis

Vespertilio subulatus keenii Merriam, 1895:850. Type locality Massett, Graham Island, Queen Charlotte Islands, British Columbia.

Myotis keenii Miller and Allen, 1928:104. First use of current name combination.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Subfamily Vespertilioninae, Genus *Myotis*, and Subgenus *Myotis*. *M. keenii* belongs to the *evotis* species group, which includes *M. evotis* and *M. auriculus* (Findley, 1972). The genus *Myotis* includes some 60 extant species (Findley, 1972). At present, two subspecies of *M. keenii* are recognized (Genoways and Jones, 1969):

M. k. keenii (Merriam, 1895:860), see above.

M. k. septentrionalis (Trouessart, 1897:131). Type locality Halifax, Nova Scotia.

DIAGNOSIS. Head and body length is less than 50 mm; foot length is 48 to 60% of that of tibia; ear extends noticeably beyond muzzle when laid forward; free border of uropatagium has inconspicuous, scattered, stiff hairs; metacarpals are subequal; skull is relatively lightly built, slender, sagittal crest is sometimes present; length of upper toothrow slightly exceeds greatest palatal breadth including molars (Miller and Allen, 1928; Hall and Kelson, 1959).

Characters which distinguish closely related species such as *M. auriculus* and *M. evotis* from *M. keenii* are listed by Findley (1960) and Genoways and Jones (1969). Illustrations useful for recognition are available in several publications (Miller and Allen, 1928; Hall and Kelson, 1959; Barbour and Davis, 1969).

GENERAL CHARACTERS. *Myotis keenii* generally resembles other small New World species of the same genus, but with slight modifications. This bat is medium sized; color is brown with dorsal surface darker than ventral surface; tail is long; forearm and hind foot are short; ear is long for *Myotis*, reaching 4 mm beyond the tip of the nose when laid forward; tragus is long and pointed; foot is about one-half (48 to 60%) the length of tibia; dental formula, i 2/3, c 1/1, p 3/3, m 3/3, total 38. While significant differences were found (Williams and Findley, 1979) in the length of forearm between females and males (females being about 3% larger on the average), other body measurements did not differ. Dorsal, ventral, and lateral views of cranium, mandible, and dentition are shown in figure 1.

Averages and ranges for the measurements of five *M. k. keenii* (Genoways and Jones, 1969) are listed (in mm) as follows: length of forearm, 36.4 (35.9 to 37.0); length of ear, 18.6 (18.0 to 19.0); greatest length of skull, 14.8 (14.7 to 15.0); zygomatic breadth, 8.8 (8.7 to 8.9); interorbital constriction, 3.7 (3.6 to 3.8); mastoid breadth, 7.5 (7.5 to 7.6); breadth of braincase, 7.0 (6.9 to 7.1); breadth across upper molars, 5.6 (5.5 to 5.7); length of maxillary toothrow, 5.7 (5.6 to 5.8). Similar measurements of twenty *M. k. septentrionalis* are: 35.0 (33.3 to 36.8); 17.0 (15.0 to 19.0); 15.2 (14.7 to 15.8); 9.3 (8.7 to 9.7); 3.5 (3.3 to 3.7); 8.1 (7.8 to 8.5); 7.3 (6.9 to 7.6); 5.8 (5.6 to 6.1); 6.0 (5.7 to 6.2).

DISTRIBUTION. The species is distributed in two disjunct ranges in North America (figure 2). In the Northwest, *M. keenii* occurs in coastal regions from Alaska south to Puget Sound in Washington. In eastern North America, *M. keenii* ranges widely from Saskatchewan to Newfoundland and south to northern Florida (Miller and Allen, 1928; Poole, 1932; Rice, 1955; Hall and Kelson, 1959; Jones, 1964; Cowan and Guiguet, 1965; Fleharty and Farney, 1965; Genoways and Jones, 1969; Banfield, 1974). *M. keenii* is a colonial hibernator and roosts in a variety of shelter types throughout its range.

FUNCTION. Fitch (1966) reported that males and females of this species experienced an average winter weight loss of 43% and 41%, respectively. During the same period, average ambient and body temperatures were 12.8°C and 12.1°C, respectively, for males and 12.7°C and 11.8°C, respectively, for females.

Stones and Branick (1968) evaluated the relative importance of sensory modalities in short distance homing (58 km) experiments involving *M. keenii*. Some bats with impaired vision did return to the home night roost but in lower frequencies than bats with no visual impairments. None of the bats with impaired hearing returned to the roost. Thus, short range homing ability is reduced by loss of vision and does not occur unless auditory capabilities are intact.

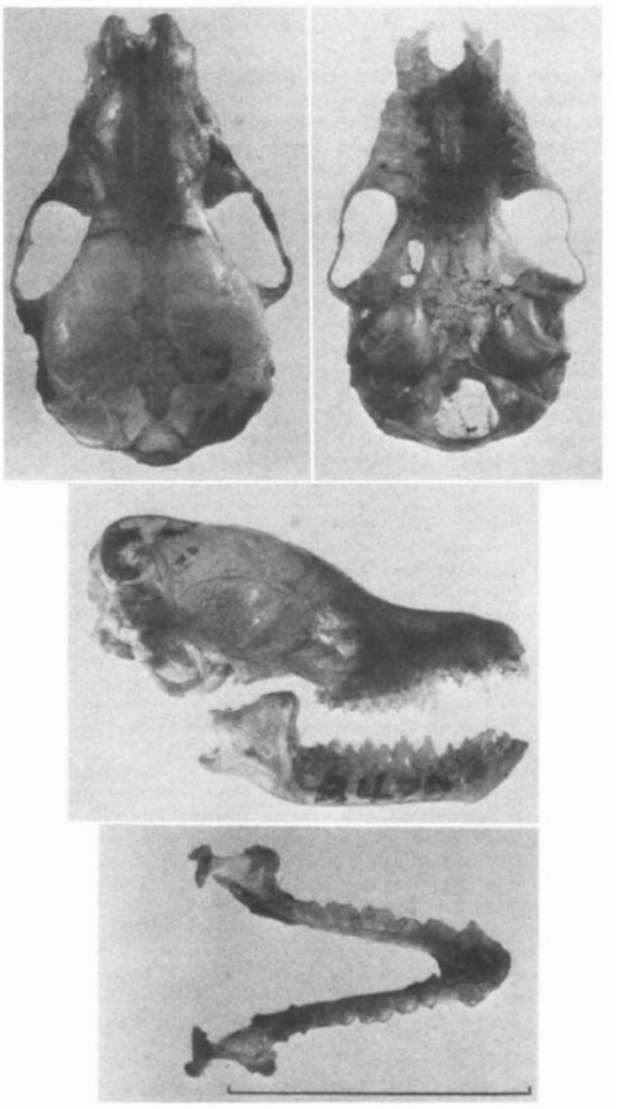

FIGURE 1. Dorsal, ventral, and lateral views of cranium and mandible of *M. k. septentrionalis* (MSU 8428, male, Bear Cave, 6 km, N. Buchanan, Berrien Co., Michigan). Scale at bottom represents 10 mm.

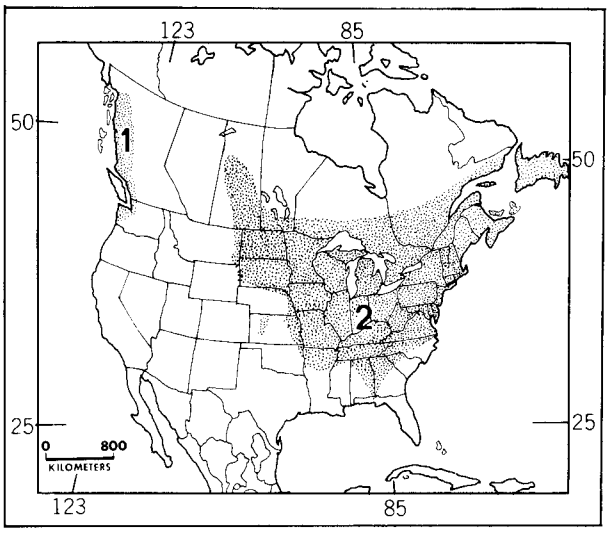

FIGURE 2. Distribution of Keen's myotis: 1, *M. k. keenii*; 2, *M. k. septentrionalis*.

ONTOGENY AND REPRODUCTION. Reproductive and developmental patterns of *M. keenii* are probably similar to those of *M. lucifugus* although specific information is sparse. Presumably most breeding occurs in the fall prior to the onset of hibernation. Uterine storage of sperm occurs during the winter and fertilization in the spring (Barbour and Davis, 1969).

A parturition date of 5 June was reported by Easterla (1968) in Missouri. Lactation dates range from 12 June in Ohio (Brandon, 1961) to late July and mid-August in the Black Hills of South Dakota (Turner, 1974). Pregnant females were found fr m 20 May to 23 June in central Iowa, and lactating females were captured from 23 June to 28 July. The first young were flying by 23 July (Kunz, 1971).

Females segregate into small maternity colonies which are usually apart from the summer roosting sites of males. Maternity colonies range in size from several to as many as 30 individuals (Mumford and Cope, 1964). Maternity colonies have been reported under loose tree bark in Indiana (Mumford and Cope, 1964), under wooden shingles of a park shelter in Ohio (Brandon, 1961), and in a barn in New Hampshire in association with a colony of *M. lucifugus* (Barbour and Davis, 1969).

ECOLOGY. Keen's myotis is less common and less gregarious throughout its range than other similar species such as *M. lucifugus* (Griffin, 1940; Mills, 1971). Hibernating colonies vary considerably in size and can be as large as 100 to 350 individuals (Hitchcock, 1949; Jackson, 1961). Wintering colonies are usually larger than summer groups which are often dispersed and segregated by sex.

Keen's myotis has frequently been reported in association with other bat species. In winter quarters, this species may cluster with *Myotis lucifugus*, *Eptesicus fuscus*, *Myotis leibii*, and *Pipistrellus subflavus* (Swanson and Evans, 1936; Griffin, 1940; Hitchcock, 1949; Stones and Fritz, 1969). While these species use the same hibernaculum, spatial arrangements differ in relation to species-specific temperature and humidity preferences. Keen's myotis seems to prefer cool, moist hibernating sites where the air is still. Goehring (1954) found three *M. keenii* hanging alone in a sewer where the temperature was 1.5°C and relative humidity was 69%. Hibernation may begin as early as August and may last for eight and nine months in northern latitudes (Stones and Fritz, 1969).

During the summer, *M. keenii* generally abandons winter hibernation sites and resides in less insulative shelters such as under tree bark (Mumford and Cope, 1964), behind shutters of cabins (Mumford, 1969), and in old buildings (Doutt *et al.*, 1966; Turner, 1974). Barbour and Davis (1969) have suggested that day and night roosts differ during the summer. Foraging activities begin just after dusk and bats may seek a separate night roosting shelter. More foraging occurs prior to dawn at which time *M. keenii* returns to the daytime roost (Barbour and Davis, 1969; Kunz, 1973). This species is known to forage over trees and ponds (Cowan and Guiguet, 1965). LaVal *et al.* (1977) attached chemical lights to 11 *M. keenii* and observed foraging patterns. These individuals foraged mainly in hillside and ridge forests rather than in riparian and flood plain forests. They frequented areas under the forest canopy and just above shrub level.

Several captured specimens of *M. keenii* have been examined for parasites. Jones and Genoways (1967) reported a chigger, *Leptotrombidium myotis* (Ewing), and Whitaker and Mumford (1971) found 43 unidentified intestinal trematodes in one individual.

Banding studies have indicated that *M. keenii* may live as long as 18.5 years (Hall *et al.*, 1957).

REMARKS. Several authors have alluded to the possibility that *M. keenii* subspecies might be specifically distinct (Barbour and Davis, 1969; Genoways and Jones, 1969); however, no definitive studies have been published.

The generic name *Myotis* means "mouse ear" and the specific epithet *keenii* refers to J. H. Keen who collected the type specimen in 1894.

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