

*Nycticeius humeralis* By Larry C. Watkins

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***Nycticeius Rafinesque, 1819***

*Nycticeius* Rafinesque, 1819:417. Type species *Vespertilio humeralis* Rafinesque, 1818, by subsequent designation (Miller, 1897:15). *Nycticeus*, *Nycticejus*, *Nycticeyx*, and *Nycticea* are variant spellings.

*Scoteinus* Dobson, 1875:371. Type species *Nycticejus emarginatus* Dobson. Valid as a subgenus.

*Scotoecus* Thomas, 1901:263. Type species *Scotophilus albofuscus* Thomas. Valid as a subgenus.

*Scoteanax* Troughton, 1943:353. Type species *Nycticejus rueppelli* Peters. Valid as a subgenus.

*Scotorepens* Troughton, 1943:354. Type species *Scoteinus orion* Troughton. Valid as a subgenus.

This synonymy and the diagnosis below were prepared by Karl F. Koopman.

**CONTEXT AND CONTENT.** Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Subfamily Vespertilioninae, Tribe Nycticeiini. There are 14 species in the genus *Nycticeius*. Only two are native to the New World. One of them, *N. cubanus*, is known only from the island of Cuba. The other 12 species inhabit parts of Africa, India, Australia, and Papua.

***Nycticeius humeralis* (Rafinesque, 1818)**

Evening Bat, Twilight Bat, Black-shouldered Bat

*Vespertilio humeralis* Rafinesque, 1818:445. Type locality "Kentucky."

*Nycticea crepuscularis* Le Conte, in McMurtrie, 1831:432. Type locality not stated.

**CONTEXT AND CONTENT.** Context noted in generic summary above. Three subspecies currently are recognized (Hall and Kelson, 1959:194):

*N. h. humeralis* (Rafinesque, 1818:445), see above (*crepuscularis* Le Conte a synonym).

*N. h. mexicanus* Davis, 1944:380. Type locality Río Ramos, 1000 ft., 20 km. NW Montemorelos, Nuevo Leon, Mexico.

*N. h. subtropicalis* Schwartz, 1951:233. Type locality 2½ mi. W Monroe Station, Collier Co., Florida.

**DIAGNOSIS.** Lacrimal tubercle absent or poorly developed (excludes subgenera *Scotoecus* and *Scoteinus*); anterior palatal emargination extends behind canine (excludes subgenera *Scotoecus*, *Scoteanax*, and *Scotorepens*); interdental palate (between toothrows and behind anterior palatal emargination) clearly longer than broad (excludes *Scotoecus*, *Scoteinus*, *Scoteanax*, and *Scotorepens*); condylobasal length more than 13.2 mm (excludes *schlieffeni* and *cubanus*).

**GENERAL CHARACTERS.** In general the evening bat has: nose plain; facial glands pronounced; tragus short, broad and blunt, bent slightly forward, posterior base with distinct lobule; ears 11 mm from notch to tip, naked, and for their size remarkably thick and leathery; forearm 34 to 38 mm in length (including wrist and elbow); total length 88 to 105 mm; tail 36 to 41 mm long and extending less than 1 mm (middle of terminal caudal vertebrae) beyond edge of a uropatagium, which is furred at extreme base only; membranes of wings and tail also thick and leathery; fur dull umber brown above, paler below, pelage dark at extreme base; skull massive, short, broad, and low; upper incisor separated from canine by a space less than half as great as diameter of the incisor (see figure 1); dentition i 1/3, c 1/1, p 1/2, m 3/3, total 30 (modified from Miller, 1897:118-121). Additional description may be found in Allen (1893:131-136) and Miller (1907:216). Line drawings illustrating the various features used to recognize *Nycticeius humeralis* as well as tables of measurements were given by Allen. Photographs of a live specimen and a skull (three views) appear in Barbour and Davis (1969:158).

**DISTRIBUTION.** The range is mapped in Figure 2. Marginal records of this species were given by Hall and Kelson (1959), and Watkins (1969) reported extensions in the northern and western parts of the range. This bat occurs from sea level to 300 m or more in the temperate deciduous forest. There are no reported fossil specimens of *Nycticeius humeralis*.

**FORM.** The tip of each dorsal hair is light ash-gray, the basal one-third to two-thirds is dark brown. Ventral hair is similar, but the brown hues of the shafts are more conspicuous in the pelage. The sides of the neck are less ashy than elsewhere, nearly brown throughout. The color of the dorsum varies in specimens from one locality. Color aberrations are fairly common. Easterla and Watkins (1969) noted a partly albino juvenile and Watkins (1969) reported others with varying amounts of white pelage. The venter is quite constant in color in all individuals examined. Young are sooty black until about six

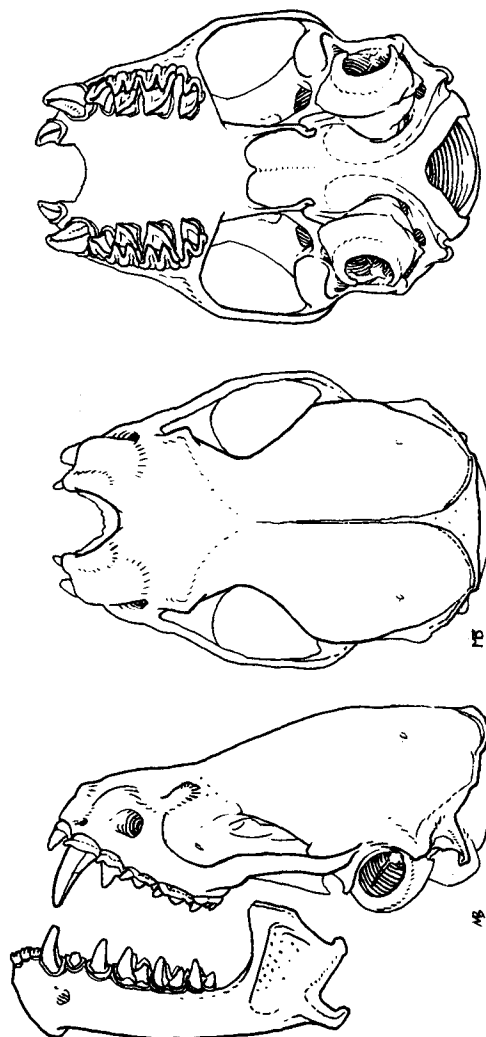


FIGURE 1. Views of skull of *Nycticeius humeralis*, St. Andrews Parish, Charleston Co., South Carolina, MVZ 97176 (from Hall and Kelson, 1959:195, by permission of Ronald Press, Inc., New York). From top to bottom, ventral, dorsal, and lateral views of cranium and lateral view of mandible, all  $\times 4$ .

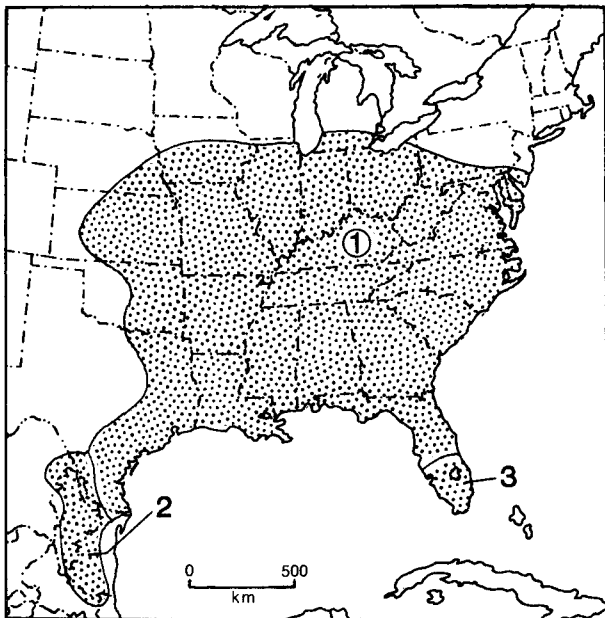


FIGURE 2. Distribution of *Nycticeius humeralis* and its subspecies in North America. 1. *N. h. humeralis*; 2. *N. h. mexicanus*; 3. *N. h. subtropicalis*.

weeks of age at which time they approach the color of adults. Deciduous dentition is complete at birth (Jones, 1967), the heterodont formula being di 2/3, dc 1/1, dp 2/2. The deciduous teeth have two accessory cusps, one on either side of the main central cusp. In general, each cusp is in the shape of a hook and is curved backward and inward toward the mouth. The greatest development of curved, hook-shaped cusps is on the incisors. The cusps of the canines are hooked noticeably, but some premolars have poorly developed accessory cusps that appear as small bumps rather than hooks. Notes on the skeleton were presented by Allen (1893:135) as follows: atlas with minute spine from the transverse lamina; axis without lateral oblique spine; scapula with thin axillary border; triceps impression without rugosity or spine; the superior angle scarcely inflected; tip of the coracoid process broader than the base and deflected toward the vertebral border; humerus with internal tuberosity not higher than head and of about the same size as the external tuberosity; ulna in some specimens ankylosed to radius at proximal end, the distal end with square perforated lamina; innominate bone with narrow subrounded ilium not expanded above; proximal end of tibia with large spine; first metacarpal bone equals the phalangeal series in length. The baculum is disproportionately large (Hamilton, 1949), "bladelike, the distal portion being deep, with convex walls which terminate in an ascending point." The thickened proximal part of the baculum has a base that "forms a prominent angle inclined toward the ventral aspect." The penis is long (8 mm), pendulous, cylindrical, and without expanded prepuce. The testes are near base of tail. The spermatozoa of *Nycticeius humeralis* appear to be distinct within the family Vespertilionidae in that the head is elliptical and lacks a flattened or concave base (Hirth, 1960:79). The cerebellum of the brain is not projected although the anterior portion of the cerebrum is abruptly constricted from the pyriform figure of the hemisphere. No literature on the other organ systems or on function has been found.

**ONTOLOGY AND REPRODUCTION.** It is not known where copulation of *Nycticeius humeralis* occurs. The sexes generally segregate during the period when young are born. Watkins (1969:332) noted an absence of male *Nycticeius* in the northern part of the range. His report supported the contention by Jones *et al.* (1967:22) that "adult males may not accompany females in spring to at least some parts of the warm-weather range of the species." Records of adult males in the northern portion of the range of the evening bat are rare; none was reported by Kunz and Schlitter (1968:173) from Iowa or by Jones *et al.* (*loc. cit.*) from Kansas. Watkins (*loc. cit.*) reviewed the two records for Missouri and noted a record for Indiana by Cope and Humphrey (1967:136). There are records for both males and females during the winter

months in the southern states (Golley, 1966:65). The reproductive cycle of the evening bat is as yet not well documented. Young are born in nursery colonies of various sizes; those in northern Missouri and adjacent Iowa range in size from 25 to 950 individuals (Watkins, 1969) and small groups of a half dozen or fewer have been taken from Spanish moss in Florida (Jennings, 1958:92). Parturition times are highly variable; in Alabama, Florida, and Louisiana births occur from the middle of May to mid-June. Most births in the northern part of the range occur near mid-June, but some individual females give birth as late as 8 July. The usual number of embryos is two although one to four have been found (Cockrum, 1955; Asdell, 1964). Of hundreds examined in Iowa and Missouri, only four have contained a single embryo and six carried three (research conducted during the summer of 1971 revealed a high percentage of females carrying three embryos). Jones (1967) provided a detailed description and discussion of the growth and development of captive *Nycticeius*. In roosts, the adult normally moves away from the cluster a short time before parturition occurs. The presentation at birth is breech and delivery requires 3 to 114 minutes. Most births occurred between the hours of 1300 and 1600. The same phenomena have been found in wild populations (Watkins, unpublished data). Humphrey and Cope (1970) reviewed published population samples of *Nycticeius* and found no significant difference in the sex ratios of immatures as was reported by Hooper (1939), Gates (1941), and Jones (1967). There is a great deal of grooming and cleansing of the newborn by the female following birth. The umbilical cord is severed by the adult, or sometimes it breaks under strain after drying. A few instances were noted in wild populations where the female became entangled in the umbilical cord; rarely this prevented the neonates from reaching the nipples and death resulted for the young. The adult generally encloses the newborn with her plagiopatagium and uropatagium. The babies, shortly after birth, move to the nipples, often with the aid of their mother, and become firmly attached. Newborn bats are pink and naked, and only a few scattered hairs are present. By day 5 following birth, short gray fur can be found on the dorsum. The texture and color of fur remain constant for about 30 days. The eyes are closed tightly at birth, but open some 12 to 30 hours later, and pinnae are folded double. Newborn evening bats are extremely vocal when separated from their mothers. Growth rates of young bats vary with the type of roost in which they occur as well as with the geographic locality. Small, crowded roosts tend to foster a high rate of growth. Geographic areas of high agricultural usage seem to promote faster growth, apparently in response to greater insect abundance that accompanies row cropping (Watkins, unpublished data). By approximately day 20, juvenile *Nycticeius* are airborne. First time of flight from the roost seems to be a highly selective period for the species. Roosts that are large and open often allow juveniles to "practice" flight in a protected environment, and fledgling mortality due to accidents is low. Few young are found dead on the ground near the entrances to these roosts. This is in contrast to small, enclosed roosts where large numbers of young may be found on the ground under the roost entrance.

**ECOLOGY.** The predators of *Nycticeius humeralis* are not well known. Domestic and feral cats take the heaviest toll (aside from man) when the nursery colonies are situated in rural dwellings. Many observations have been made of cats waiting for bats leaving roosts to fall to the ground. Raccoons (*Procyon lotor*) and black rat snakes (*Elaphe obsoleta*) have been found inhabiting the same areas of attics and no doubt some predation occurs. Chandler (1938, and recently Ubelaker and Kunz in an unpublished manuscript) reported a mite (*Steatonyssus ceratognathus*) and a bat bug (*Cimex adjunctus*) as external parasites of *Nycticeius* and nematodes (*Capallaria palmata*, *Allintoshius nycticeius*, and *A. travassosi*) and a cestode (*Vampirolepus roudabushi*) as internal parasites. Weekly samples of parasites removed from *Nycticeius* revealed a well defined cycle of abundance. This cycle is correlated with the reproductive cycle of the host. The parasites tend to reach a peak in abundance at the time when newborn young are plentiful, and thus find a ready supply of tender hairless prey (Watkins, unpublished data).

**BEHAVIOR.** The evening bat prefers buildings or trees for roost sites and is one of few bats that does not commonly frequent caves. Barbour and Davis (1969:157) netted several outside the entrance of Dixon Cave, Mammoth Cave National Park, Kentucky, and Richard Myers found the only individual thus far reported from within a cave (Easterla, 1965). Most

literature on *Nycticeius* involves reports of colonies of this bat in buildings (for example, Hooper, 1939; Anderson, 1951; Cope *et al.*, 1961; Baker and Ward, 1967; Watkins, 1969; Humphrey and Cope, 1970), but some have recorded small numbers of pregnant and lactating females shot as they foraged near wooded areas at dusk far removed from buildings (Birney and Rising, 1967, and Easterla and Watkins, 1967, 1969, 1970, for example), indicating that nursery roosts may have been located in trees. Harper (1927) and Jennings (1958) found colonies of *Nycticeius* in trees, usually cypress (*Taxodium distichum*). Evening bats are known to forage in the same area with several other species of bats, but they have been reported to occupy buildings only with *Tadarida brasiliensis* (Jennings, 1958). In northern Missouri, *Eptesicus fuscus* (single adult males) have been found occasionally in nursery roosts of evening bats. At one location, *Myotis lucifugus* and *M. sodalis* use an old barn as a nursery roost less than 0.8 km from a known *Nycticeius humeralis* colony. Intermixing of the three species has never been found. When representatives of each species were placed in a holding cage, complete segregation of clusters was noted. Environmental parameters of nursery roosts are currently being studied. Attics used as nursery roosts are known to vary from 8° to 45° C while bats are present. *Nycticeius* responds to the higher end of this range by spacing evenly over the ceiling or moving down into the wall spaces, but at low temperatures tight clusters are formed (personal observations). Preliminary investigations on the nocturnal activity of *Nycticeius* revealed patterns that were altered by temperature, humidity, and the stage of development of newborn young (Watkins, 1972). Heavy rain and ambient temperatures approaching 10° C retarded activity, and females nursing young returned to the roost periodically to care for their offspring.

The absence of this species in the northern part of its range during winter months strongly suggested migration. Humphrey and Cope (1968:329) first documented the fact that *Nycticeius* migrates, with recovery of bats 176, 192, and 299 km south of the place they were tagged. Watkins (1969) later reported a recovery 547 km south of the place of banding. Departure dates for southward migration are variable. Usually all individuals have vacated the roosts by mid-October. It is not known where summer inhabitants of northern nursery colonies spend the winter months. Baker and Ward (1967:132) listed *Nycticeius* as a probable winter resident as far north as southeastern Arkansas on the basis of specimens obtained there late in December. Sealander (1960:525) reported flying *Nycticeius* in northwest Arkansas seen in February. Autumn fat deposition as reported by Baker *et al.* (1968) indicates that *Nycticeius* prepares for long distance migration. The high caloric value of their body fat is analogous to that of long distance bird migrants. Heavy fat deposition occurs in individuals throughout their known range. Cope and Humphrey (1967:136) reported homing distances of 61 and 153 km and later Watkins (1969:333) noted a homing record of 74 km. Nonflying juveniles seem to have a strong homing tendency. When individuals were experimentally placed on the ground as far as 3.2 km from the roost they tended to crawl in a homeward direction. Evening bats from the northern Missouri populations currently being studied are known to live an average of two years. A few individuals have been found that are more than five years of age.

**GENETICS.** *Nycticeius humeralis* has two large pairs of metacentrics and a series of 20 pairs of medium to small acrocentrics (including three pairs of minute chromosomes). The X chromosome is a medium submetacentric and the Y is a small acrocentric ( $2N = 24$ ,  $FN 48$ ). The karyotype is similar to that of *Antrozous pallidus* (Baker and Patton, 1967:272).

**REMARKS.** The first part of the scientific name, *Nycticeius*, is of Greek and Latin origin and means "belonging to the night." The second part, *humeralis*, is of Latin origin and means "pertaining to the humerus." Three vernacular names have been found in the literature (evening bat, twilight bat, and black-shouldered bat); the one used most often seems to be "evening bat." Not all of the works cited were seen by the author.

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The principal editor of this account was S. ANDERSON.

LARRY C. WATKINS, MUSEUM OF NATURAL HISTORY, THE UNIVERSITY OF KANSAS, LAWRENCE, 66044.