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# Lasiurus borealis.

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## *Lasiurus* Gray, 1831

*Nycteris* Borkhausen, 1797:66. Type species *Vespertilio borealis* Muller. *Nycteris* Borkhausen is a homonym of *Nycteris* Cuvier and Geoffroy St.-Hilaire.

*Lasiurus* Gray, 1831:38. Type species *Vespertilio borealis* Muller.

*Atalapha* Peters, 1871:907, and other authors, not *Atalapha* Rafinesque, 1814.

*Dasypterus* Peters, 1871:912. Type species *Lasiurus intermedius* Allen.

**CONTEXT AND CONTENT.** Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Subfamily Vespertilioninae, Tribe Lasiurini. The genus *Lasiurus* includes 11 extant species (Hall and Jones, 1961), and the following key should aid in their identification (Barbour and Davis, 1969; Hall and Jones, 1961).

1 Color reddish or grayish; two premolars on each side of upper jaw ---- 2
Color yellowish; only one premolar on each side of upper jaw ---- 10

2 (1) Occurring on mainland and coastal islands of North and South America; also on Galapagos, Bermuda, and Hawaiian islands; color reddish or grayish ---- 3
Occurring on Antillean islands; color reddish ---- 8

3 (2) Large size; total length more than 120 mm; forearm more than 49 mm; color grayish ---- *Lasiurus cinereus*
Moderate size; total length less than 120 mm; forearm less than 49 mm; color reddish ---- 4

4 (3) Upperparts brick red to rusty red, washed with white underparts; lacrimal ridge present ---- 5
Upperparts not brick red to rusty red; lacrimal ridge not developed ---- 6

5 (4) Not occurring on Galapagos ---- *Lasiurus borealis*
Known only from Galapagos (ear of 7.6 mm and thumb of 6.4 mm, shorter than in *L. borealis*) ---- *Lasiurus brachyotis*

6 (4) Forearm more than 46.5 mm; dorsum bright rufous ---- *Lasiurus egregius*
Forearm less than 46.5 mm; dorsum not bright rufous ---- 7

7 (6) Upperparts mahogany brown washed with white; forearm less than 43 mm ---- *Lasiurus seminolus*
Upperparts deep chestnut; forearm more than 43 mm ---- *Lasiurus castaneus*

8 (2) Greatest length of skull greater than 13.9 mm; occurring on Jamaica ---- *Lasiurus degelidus*
Greatest length of skull less than 13.9 mm; not occurring on Jamaica ---- 9

9 (8) Length of upper toothrow less than 4.5 mm; forearm less than 42 mm; occurring on Hispaniola and Bahamas ---- *Lasiurus minor*
Length of upper toothrow more than 4.5 mm; forearm greater than 42 mm; occurring on Cuba ---- *Lasiurus pfeifferi*

10 (1) Total length more than 119 mm; length of upper toothrow more than 6.0 mm; condylocanine length more than 16.5 mm ---- *Lasiurus intermedius*
Total length less than 119 mm; length of upper toothrow less than 6.0 mm; condylocanine length less than 16.5 mm ---- *Lasiurus ega*

## *Lasiurus borealis* (Müller, 1776)

### Red Bat

*Vespertilio borealis* Müller, 1776:20. Type locality New York.

[*Vespertilio*] *noveboracensis* Erxleben, 1777:155. Based on "the New York bat of Pennant (Synop. Quad., p. 367), 'Die nordamerikanische Fledermaus' of Schreber (Säugthiere, I, p. 176), and 'Der Neujorker' of Müller," from Miller, 1897:32.

*Vespertilio lasiurus* Schreber, 1781:62. Type locality North America.

*Vespertilio rubellus* Palisot de Beauvois, 1796:204. Type locality unknown.

*Vespertilio rubra* Ord, 1815:291. Based on the red bat of Wilson, 1812:60.

*Vespertilio tesselatus* Rafinesque, 1818:445. Type locality unknown.

*Vespertilio monachus* Rafinesque, 1818:445. Type locality unknown.

*Vespertilio rufus* Warden, 1820:606. Based on the red bat of Wilson, 1812:60.

*Vespertilio blossevillii* Lesson and Garnot, 1826:95. Type locality Montevideo, Uruguay.

*Vespertilio bonariensis* Lesson, 1826:156. Type locality Rio La Plata at Buenos Aires, Argentina.

*Nycticejus varius* Poeppig, 1835:451. Type locality Antuco, provincia de Bío-Bío, Chile.

*Lasiurus funebris* Fitzinger, 1870:46. Based on *Nycticeius noveboracensis* Temminck, 1840. Type locality Tennessee.

*Myotis quebecensis* Yourans, 1930:65. Type from Anse-a-Wolfe, Quebec.

*Atalapha frantzii* Peters, 1871:908. Type locality Costa Rica.

*Atalapha teliotis* Allen, 1891:5. Type locality unknown, probably California.

*Lasiurus enslenii* Lima, 1926:73. Type locality São Lourenco, Rio Grande do Sul, Brazil.

**CONTEXT AND CONTENT.** See generic account above. Five subspecies of *Lasiurus borealis* are recognized (Hall and Jones, 1961) as follows:

*L. b. borealis* Müller, 1776:20, see above (*noveboracensis* Erxleben, *funebris* Fitzinger, *quebecensis* Yourans, and presumably, *lasiurus* Schreber, *rubellus* Palisot de Beauvois, *rubra* Ord, *tesselatus* Rafinesque, *monachus* Rafinesque, and *rufus* Warden are synonyms).

*L. b. frantzii* Peters, 1871:908, see above (*ornatus* Hall a synonym).

*L. b. teliotis* Allen, 1891:10, see above.

*L. b. blossevillii* (Lesson and Garnot), 1826:95, see above (*bonariensis* Lesson and *enslenii* Lima are synonyms).

*L. b. varius* (Poeppig), 1835:451, see above (*salinae* Thomas a synonym).

**DIAGNOSIS.** *Lasiurus borealis* has a distinctive color; upperparts are brick red to rusty red washed with white (males are usually more brightly colored than females); underparts are slightly paler; anterior part of shoulder has buffy white patch. In hand, the long tail, furred interfemoral membrane, and reddish color set this species apart from close relatives (also see key above); whereas in flight, the tail extended straight behind the body is distinctive (Barbour and Davis, 1969; Hall, 1981; Miller, 1897).

The skull resembles that of *L. cinereus* but is smaller. It is short, broad, and has a high, rounded braincase. The surface of the rostrum is nearly in line with that of the braincase; width of the palatal emargination is greater than the depth; floor of braincase and palate are not parallel; diameter of each auditory bulla is approximately equal to the space between the bullae (Barbour and Davis, 1969; Hall and Jones, 1961; see Fig. 1).

**GENERAL CHARACTERS.** The red bat is a moderately sized lasiurine (7 to 13 g) with long pointed wings and heavily furred interfemoral membrane (Fig. 2). The ear is low, broad, and rounded, and the tragus is triangular. The ears when laid forward reach a little more than half way from angle of mouth to nostril.

FIGURE 1. Dorsal, ventral, and lateral views of cranium and lateral and occlusal views of mandible of *Lasiurus borealis* (Michigan State Univ. no. 24396, female from Lansing, Ingham Co., Michigan). Greatest length of skull is 13.5 mm.

FIGURE 2. *Lasiurus borealis* (courtesy of M. D. Tuttle).

The foot is small, less than one-half as long as tibia. The calcar is about twice as long as the foot.

Measurements (in mm) reported by Miller (1897) compare well with those noted by Hamilton and Whitaker (1979) and Jackson (1961), and are as follows (n = 10 males): total length, 108.9; length of tail, 52.7; length of tibia, 18.6; length of foot, 7.9; length of forearm, 40.6; length of thumb, 6.4; length of longest finger, 8.2; length of ear from notch, 10.5; width of ear, 9.8; length of tragus, 6.1. Williams and Findley (1979) found females of *L. b. teliotis* to be 7.9% larger than males. Size-related measurements ($\bar{X} \pm SE$) for males (n = 30) and females (n = 30) in mm are, respectively, as follows: length of head and body, 55.2± 0.83 and 59.6 ± 0.75; length of forearm, 39.2 ± 0.254 and 41.14 ± 0.252; condylocanine length, 11.75 ± 0.042 and 12.23 ± 0.044; length of maxillary toothrow, 4.11 ± 0.015 and 4.31 ± 0.02.

The teeth are large and upper molars broad on the inner side; the lower molars are wide in their transverse diameter. The anterior upper premolar is minute, peglike, and displaced inward from the normal toothrow; occasionally this tooth is lacking. The dental formula is i 1/3, c 1/1, p 2/2, m 3/3, total 32 (Hall and Jones, 1961; Miller, 1897).

**DISTRIBUTION.** Red bats are found from southern Canada southward throughout the United States, Mexico, Central America, and into South America as far south as Argentina and Chile. In winter in the United States, they are found from the Ohio River Valley southward in the east and, in the west, along the coast from San Francisco south. They are common in the midwestern and east-central states, and can probably be found easily wherever there are trees in the prairie and Great Plains states. They have also been found on five Caribbean islands (Cuba, Jamaica, Hispaniola, Puerto Rico, and Bahamas), and wayward migrants have been found considerable distances from land (Baker and Genoways, 1978; Banfield, 1974; Barbour and Davis, 1969; Bogan and Williams, 1970; Cabrera, 1958; Dabbene, 1902; Hall, 1981; Hall and Jones, 1961; Handley, 1960; Koopman, pers. comm.; Varona, 1974; Villa-R. and Villa-Cornejo, 1969). A map of the geographic range is presented in Figure 3.

**FOSSIL RECORD.** Late Pleistocene specimens of this species have been found at: Vero, Indian River Co., Florida; Reddick, Marion Co., Florida; Bat Cave, Pulaski Co., Missouri; Organ-Hedricks, Greenbriar Co., West Virginia; Natural Chimneys, Augusta Co., Virginia (Kurtén and Anderson, 1980; Martin, 1972).

**FORM.** The fur is dense and soft all over the body. The back has an average fur depth of 5.8 mm, while that of the uropatagium is 2.6 mm (Shump and Shump, 1980). The ears are naked inside and on the tips, with only the basal two-thirds of the outer portion being furred. The ears are positioned relatively low on the head and do not extend much above the dorsal fur line (Barbour and Davis, 1969; Miller, 1897).

The aspect ratio ($\bar{X}$ = 7.55) and wing loading ($\bar{X}$ = 0.086) indicate that red bats fly relatively fast and are moderately maneuverable. In fact, *L. borealis* has the third highest aspect ratio and wing loading of 23 species of North American bats measured by Farney and Fleharty (1969).

Facial glands of *L. borealis* are comparatively more diverse and numerous than for nonfoliage-roosting species. Four distinct groups of glands are recognized: sudoriferous, sebaceous, paired submaxillary, and paired sublingual (Werner and Dalquest, 1952).

The baculum, as described by Hamilton (1949) is shaped somewhat like a slipper. The high base is slanted forward, appearing in dorsal view as a rounded spur directed over the shaft. The dorsal sides of the base are concave, joining with the shaft to form broad flanges. On the ventrum these flanges form the lateral borders of a deep concavity. The distal tip has a slight rise and is somewhat thickened and broader than the central shaft.

The spermatozoa of *L. borealis* were described by Hirth (1960). The head has a concave base, and the apex is blunt and broadly rounded. Measurements (in $\mu$) of the head are: length, 5.3 (5.0 to 5.7); width, 2.0 (1.9 to 2.3). The midpiece is not spiraled, and there is an evident swelling near the posterior end; its length is 11.2 (10.5 to 12.2) and the width is 0.8 (0.7 to 1.0). The tail is nearly uniform in width, with a length of 67.0 (64.0 to 70.0). Compared with spermatozoa of other vespertilionids (Forman, 1968), those of *L. borealis* have a unique bulge in the posterior region of the midpiece.

**FUNCTION.** Jones (1965) found that red bats became active outdoors when temperatures reached about 20°C. Davis and Lidicker (1956) and Lewis (1940) found them flying at ambient temperatures of 19°C and 13°C, respectively. This suggests that the ambient temperature initiating arousal is much higher than the temperature of hibernating cave bats, which would protect them from waking too frequently and wasting energy during winter.

This species seems capable of surviving even drastic temperature fluctuations. Individuals remain torpid in the laboratory below 20°C and decrease their heart rates to less than 16 beats/min at 5°C (Davis and Reite, 1967). They respond to subfreezing temperatures by increasing metabolism just enough to maintain body temperatures above the critical low limit of −5°C (Reite and Davis, 1966). Several other adaptations for surviving low temperatures include the short, rounded ears which minimize heat loss, the thick insulative pelt (insulation, °C $kcal^{-1}$ $h^{-1}$ $m^{-2}$ averages 0.279, SE = 0.001), and a heavily furred uropatagium, adding about 15% insulation when wrapped over the pelt. This foliage-roosting bat is much better insulated than species of *Myotis* and *Eptesicus* which roost in caves and buildings (Shump and Shump, 1980).

Quay and Miller (1955) counted $17.63 \times 10^6$ erythrocytes/$mm^3$ of blood in a male taken in summer, and Dunaway and Lewis (1965) reported an average $19.61 \times 10^6$ in five individuals. These are relatively high values for mammals (four times that of humans) and may be an adaptation to the environmental stresses to which red bats are exposed.

**ONTOGENY AND REPRODUCTION.** *Lasiurus borealis* breeds in August and September (Glass, 1966; Hamilton, 1943; Layne, 1958; Stuewer, 1948); fertilization occurs in the spring. Copulation apparently is initiated in flight.

Jackson (1961) estimated that the gestation period is from 80 to 90 days. Mumford (1973) suggested that most young are born in mid-June in Indiana. Kurta (1980) reported that red bats apparently gave birth in June; lactating females were found into early August in southern Lower Michigan. Pregnant females were found through 10 June in central Iowa, although lactating individuals were not captured until 20 June. The estimated median parturition date was 15 June and lactation lasted approximately 38 days (Kunz, 1971). Counts of embryos per female (n = 45) of

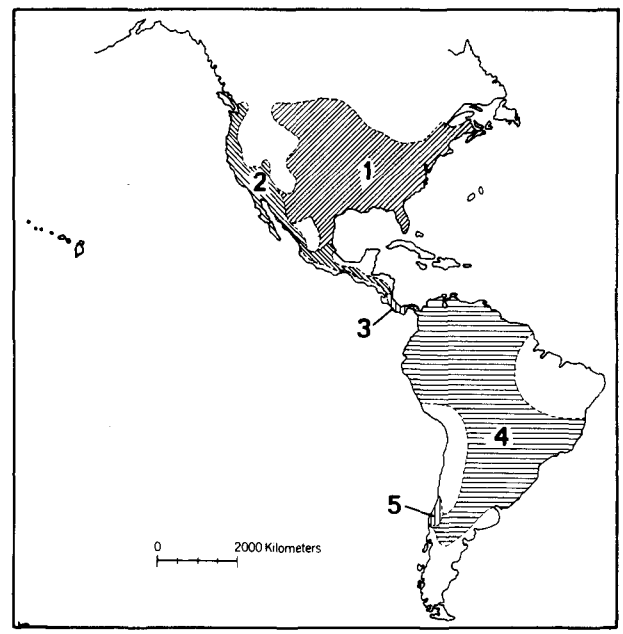


FIGURE 3. Distribution of the red bat, *Lasiurus borealis*: 1, *L. b. borealis*; 2, *L. b. teliotis*; 3, *L. b. frantzii*; 4, *L. b. blossevillii*; 5, *L. b. varius*.

*L. b. borealis* average 3.2 (Cockrum, 1955; Jennings, 1958; Layne, 1958), but the number of young born per litter ranges from one to five (Hamilton and Stalling, 1972; Mumford, 1973), with an average of 2.3 (Birney and Rising, 1968; Constantine, 1966; Jones et al., 1967; McClure, 1942). This discrepancy is probably due to intrauterine mortality and resorption or high mortality among the young. Measurements (mm) of three embryos that were probably near term were: total length, 44, 44, 41; tail length, 15, 12, 12; length of foot, 6, 6, 6 (Whitaker and Mumford, 1972). The sex ratio at birth is about equal, with a slight tendency toward more males (Jackson, 1961).

Very young bats cling to the fur of their mother with their teeth and thumb-claws as well as their hindfeet (Jackson, 1961). As they get older and larger each young clasps the mother with its wings but hangs from a leaf or twig with one or both feet during the day (Johnson, 1932). The mother generally leaves the young at the roost when she forages for food in the evening. Times when females have been seen flying with young probably are instances where the mothers are moving their young to another roost (Barbour and Davis, 1969).

Little data on growth and development are available, but young are born completely hairless and with eyes closed, and weigh about .5 g each. By 3 to 4 weeks of age their eyes have opened, their fur is short but dense, and the weight of each is 4 to 5 g, or nearly half the weight of the mother (Jackson, 1961). Kurta (1980) reported that the forearm size of four neonates varied from only 12.7 to 16.6 mm. The greatest forearm length of juveniles captured from 10 June to 14 July was 38.6 mm, which is less than that of most adults. Estimates are that the young are weaned in weeks 4 to 6 and that they can fly sometime between week 3 and 6 (Barbour and Davis, 1969; Hamilton, 1943; Jackson, 1961). In Iowa, young were flying by 21 July (Kunz, 1971). Mumford (1973) and Whitaker and Mumford (1972) suggested that young probably become independent when 80 to 85 mm in total length.

**ECOLOGY.** Red bats are solitary, roosting mostly in trees or shrubs, sometimes near or even on the ground (Hall and Kelson, 1959). Roost sites in summer are often used by different individuals on different days (Constantine, 1966; Downes, 1964). Downes (1964) found that in captivity one bat will respond to sounds made by others and may be attracted by vocalizations to resting sites. He found five different bats in a 7-day period on the underside of a sunflower leaf in Illinois during August, although other suitable leaves in the row existed. He thought there was some kind of communication among the bats for the favored site. During the day, red bats commonly roost in edge habitats adjacent to streams, open fields, and in urban areas (Constantine,

1958, 1959, 1966; Kunz, 1973; Mumford, 1973). McClure (1942) studied use of tree species by bats in Lewis, Iowa. Constantine (1966), however, discovered few bats in the town of Lewis, probably because there was sparse leaf density at the time of study. The red bats he found were in places distant from human population centers. Of 100 roost stations found, tree species were: American elm, 41; box elder, 33; wild plum, 10; silver maple, 4; wild black cherry, 3; Chinese elm, 2; mulberry, 1; willow, 1; hackberry, 1; catalpa, 1; hawthorn, 1; sumac, 1; black walnut, 1. Roosts generally provided dense shade and cover above and at the sides, but were open from below. In Iowa, there was definite preference for the south side of trees and for sites bordered by dense leafy crops such as corn or beans (also noted by Watkins and Shump in Missouri, unpubl.). Roosts usually were 1.1 to 3.1 m above ground, except for family clusters, which often were 3.1 to 6.2 m high. There appeared to be no difference in preference among adults, but young occupied higher roosts after family groups broke up (Constantine, 1966). Mumford (1973) noted the average height of daytime roosts in Indiana was 2.6 m (range 0.6 to 13 m). Watkins and Shump (unpubl.) found preferred roost sites correlated well with reduced evaporative water loss.

Barbour and Davis (1969) described the flight pattern of red bats during foraging. Upon emergence, they were seen higher in air, where they exhibited a slow, fluttering, erratic flight. After 15 to 30 min, they descended and fed from treetrop level to within a few feet of the ground. At this time they flew straight or in wide circles. The pattern was only broken to chase and capture insects. They also appeared to forage regularly over the same area (Davis, 1960). LaVal et al. (1977) found that both *L. borealis* and *L. cinereus* usually forage high above trees and pastures.

Kunz (1973) reported that red bats generally begin to forage 1 to 2 h after sunset, with some bats feeding throughout the night (see also Mumford, 1973). Jones (1965) found that red bats emerged just prior to *L. cinereus*, which appeared 1 h 40 min after sunset. In Missouri, Shump and Watkins (unpubl.) noted that red bats were first active just prior to hoary bats, but always later than other sympatric vespertilionids. The initial foraging period generally corresponds to the early period of nocturnal activity of insects reported for a number of groups, and the minor secondary activity period corresponds to the increased activity of insects often noted several hours before sunrise (Kunz, 1973). Kunz (1973) indicated that red bats were similar to hoary bats in foraging on fewer taxa of insects than sympatric *Myotis* and *Eptesicus*. Ross (1967), however, suggested that *L. borealis* probably selects food according to the size of the insects and does not limit its choices to 1 or 2 groups. Whitaker (1972) found that of 128 stomachs analyzed in Indiana, 26.2% of the contents by volume was moths. Representatives of Homoptera, Coleoptera, Hymenoptera, Diptera, and Lepidoptera have been found in the stomachs of red bats (Mumford, 1973; Ross, 1967). They also feed on ground-dwelling crickets, flies, bugs, beetles, cicadas, grain moths, and other insects (Connor, 1971; Hamilton, 1943; Jackson, 1961; Lewis, 1940). We, Hamilton and Whitaker (1979), and Wilson (1965) have observed red bats around street lights in the city and flood lights on the sides of barns, presumably catching insects drawn to the lights.

Records of movement patterns for individual red bats are sparse. Wintering sites are not well documented, but are probably in southern states; their numbers increase there from December to March. Although red bats have been seen at the mouths of caves in July, August, and September, they probably hibernate in trees in winter (Barbour and Davis, 1969; Davis and Lidicker, 1956; Mumford, 1975; Poole, 1932). Nevertheless, red bats sometimes enter and presumably become lost in caves (Barbour and Davis, 1969). Myers (1960) found 100 or more in Missouri caves; they ranged from skeletons to well preserved specimens. They are most common in caves during August, but are rarely found there at other times of the year; the reason for their presence in August is not known (Barbour and Davis, 1969). Red bats arouse from hibernation on warm days to feed, often before dusk (Barbour and Davis, 1969; Davis and Lidicker, 1956; Whitaker and Mumford, 1972). LaVal and LaVal (1979) reported having seen one foraging at 7°C during winter.

Red bats are generally considered to be highly migratory. Although generally solitary, red bats seem to migrate in groups and forage in close association with one another in summer (LaVal and LaVal, 1979). Males and females seem to migrate at different times and to have different summer ranges (Grinnell, 1918; Williams and Findley, 1979). During summer, a preponderance of females has been reported in Missouri (LaVal and LaVal, 1979) and southern Lower Michigan (Kurta, 1980), but females are even more common in Louisiana (LaVal and LaVal, 1979), central Iowa (Kunz, 1971), Indiana (Whitaker and Mumford, 1971), and southern Illinois (Layne, 1958). Baker and Ward (1967) noted that females were absent in winter from southeastern Arkansas. Mumford (1973) reported that most bats leave Indiana by October or November and return between March and April, although some certainly remain all winter. LaVal and LaVal (1979) reported netting fewer bats in Louisiana during the winter months. Data for California indicate that males and females winter together but may use different summer ranges (Williams and Findley, 1979).

Red bats have been found associating with other species only when foraging or drinking. They have been observed foraging with *Eptesicus fuscus*, *Lasiurus cinereus*, *Lasionycteris noctivagans*, *Nycticeius humeralis*, *Pipistrellus subflavus*, *Myotis lucifugus*, and *M. keenii* (Barbour and Davis, 1969; Kunz, 1973).

Opossums (*Didelphis virginianus*), domestic cats (*Felis catus*), sharp-shinned hawks (*Accipiter striatus*), American kestrels (*Falco sparverius*), merlins (*Falco columbarius*), great horned owls (*Bubo virginianus*), and roadrunners (*Geococcyx californianus*) are known to prey on red bats. In eastern North America blue jays (*Cyanocitta cristata*) are probably the most important predator, particularly of the young (Allan, 1947; Downing and Baldwin, 1961; Drake, 1957; Elwell, 1962; Hoffmeister and Downes, 1964; Johnson and Coble, 1967; Lowery, 1974; Mumford, 1973; Sperry, 1933; Strecker, 1924; Wilks and Laughlin, 1961).

Parasites reported from red bats include: mites—*Steatomyssus furmani*, *S. occidentalis*, *Acanthapthirius* sp. (Ewing, 1933; Tipton and Boese, 1958; Whitaker, 1973; Whitaker and Wilson, 1974); fleas—*Eptescopsalla* sp. (Jackson, 1961); bat bug—*Cimex pilosellus* (Jackson, 1961; Lowery, 1974); helminths—*Lecithodendrium* sp., *Taenia* sp., *Longibucca lasiura*, *Oochoustica taborensis* (Jackson, 1961; Lowery, 1974; Tromba, 1954); and protozoa—*Distoma* sp. (Jackson, 1961).

A relatively high incidence of rabies has been noted for red bats. In Indiana, 7.2% of red bats examined between 1965 and 1968 (Whitaker et al., 1969) and 7.0% analyzed between 1968 and 1972 (Whitaker and Miller, 1974) were rabid. The same investigators found higher incidences only in *Lasiurus cinereus* and *Pipistrellus subflavus*. Other incidences of rabid red bats have been reported from various parts of the United States by Burns et al. (1956), Constantine (1967), Enright (1962), Irons et al. (1957), Richardson et al. (1966), Schneider et al. (1957), Schnurrenberger et al. (1964), Tierket et al. (1960), Trimarchi (1978), and Wiseman et al. (1962).

**GENETICS.** *Lasiurus borealis* has a karyotype of 2n = 28, FN = 48. It consists of seven pairs of large metacentric and submetacentric chromosomes, three pairs of medium metacentrics, and three pairs of small acrocentrics. The X chromosome is a medium submetacentric and the Y chromosome is a small acrocentric (Baker and Patton, 1967). Bickham (1979) presented G- and C-band data for *L. borealis*.

**REMARKS.** The generic name *Lasiurus* is derived from two Greek words meaning "hairy tail." The specific name *borealis* is from a Latin word meaning "northern."

Orr (1958) fed *L. borealis* mealworms supplemented with vitamins (Stuart Liquid Formula) at a level of one drop per bat on every other day. Bats did not learn to feed by themselves in less than 1 month. Red bats have been successfully maintained in captivity for several months (Gates, 1936, 1938; Orr, 1958).

In acclimating *L. borealis* to captivity, Nellis (1969) placed them directly on top of mealworms and covered them with wire mesh. Movement of mealworms induced the bats to bite and then subsequently consume prey. They later learned to fly down from the cage top and feed off the cage floor. Subsequently, they were maintained on mealworms and water with a multivitamin supplement. Other general information helpful in maintaining bats is found in Rasweiler (1977).

K. Koopman graciously provided records necessary to approximate the range of *L. borealis* in South America.

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