

Eptesicus furinalis. By Rob Mies, Allen Kurta, and David G. King

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Eptesicus furinalis (d'Orbigny and Gervais, 1847)

Argentine Brown Bat

Vespertilio furinalis d'Orbigny and Gervais, 1847:13. Type locality "la province de Corrientes (république Argentine)."

Vesperugo (Vesperus) dorianus Dobson 1885:17. Type locality, "The Argentine Republic (Misiones Province)."

Adelonycteris gaumeri J. A. Allen, 1897:231. Type locality "Izamal, Yucatan," Mexico.

Eptesicus chapmani J. A. Allen, 1915:632. Type locality "Lower Rio Solimoens," restricted by Davis (1966) to near Manaus, Amazonas, Brazil.

Eptesicus montosus Thomas, 1920:363. Type locality "Choro, north of Cochabamba, Highlands of Bolivia, on the upper waters of the R. Mamoré. Alt. 3600 m."

Eptesicus furinalis Thomas, 1920:365. First use of current name combination.

Eptesicus chiralensis Anthony, 1926:6. Type locality "El Chiral, Western Andes, 5350 feet, Provincia del Oro, Ecuador."

Eptesicus gaumeri carteri Davis, 1965:233. Type locality "Turrialba, 2600 ft, Prov. de Cartago, Costa Rica."

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Family Vespertilionidae, Tribe Vespertilionini, Genus *Eptesicus*. The genus *Eptesicus* contains 32 species (Koopman, 1993). There are seven subspecies of *E. furinalis* (Davis, 1966; Koopman 1978; Williams, 1978):

E. f. carteri Davis, 1965:233, see above.

E. f. chapmani Allen, 1915:632, see above.

E. f. chiralensis Anthony, 1926:6, see above.

E. f. findleyi Williams, 1978:377. Type locality "Aguas Chiquitas, about 800 m, Sierra de Medina, Provincia Tucumán, Argentina."

E. f. furinalis (d'Orbigny and Gervais, 1847:13), see above (*dorianus* is a synonym).

E. f. gaumeri (J. A. Allen, 1897:231), see above.

E. f. montosus Thomas, 1920:363, see above.

DIAGNOSIS. *Eptesicus furinalis* (Fig. 1) is distinguished from most vespertilionids within its range by having a combination of large, broad head; husky body; short, rounded ears; short, broad wings; two incisors and one premolar in each upper jaw; and brownish to black pelage. It differs from sympatric members of the genus mainly in size, tending to be larger than *E. diminutus*, but smaller than *E. brasiliensis* and much smaller than *E. fuscus*. It is separated from its congeners by a combination of length of maxillary toothrow ranging from 5.4 to 6.0 mm; greatest length of skull, 15.0-17.1 mm; length of metacarpal 3, 34.3-39.0 mm; and forearm length, 37.0-41.0 mm (Davis, 1966).

Lowland forms of *E. furinalis* from Brazil, Paraguay, Bolivia, and Argentina are easily separated from other *Eptesicus* by a combination of mandibular length ranging from 10.9-12.4 mm and length of mandibular tooth row varying from 5.5-6.7 mm. Correct identification requires knowing the sex of the animal, because size overlap occurs with *E. diminutus* and *E. brasiliensis* and is related to sexual dimorphism. Large female *E. furinalis*, for example, may be the same size as small male *E. brasiliensis* (Williams, 1978).

GENERAL CHARACTERS. *Eptesicus furinalis* is a small-to-medium sized bat with a broad nose, sparse vibrissae, and fleshy lips. Ears are thin, evenly convex on the front border, and slightly hollowed on the posterior border below the rounded, posteriorly directed tip. Tragus is long and narrowly pointed, and its height is equal to 50% of ear height. Ears and membranes are naked and

appear black to dark brown, although the underside of the uropatagium may be sparsely haired and grayish. Wing membranes begin at the base of the toes. The calcar has a well-developed keel, and the tail is totally contained within the uropatagium (Allen, 1897; Davis, 1966; Mares et al., 1989; Williams, 1978).

Dorsal fur is darker than the venter and varies in color depending on subspecies, season, and habitat. *E. f. carteri* has upperparts reddish brown to blackish brown. *E. f. chapmani* is noticeably paler and less blackish than the other subspecies. *E. f. gaumeri* is blackish or blackish brown and resembles *E. fuscus* in its darker, immature pelage. *E. f. findleyi* has a chestnut or auburn brown color, and *E. f. furinalis* is cinnamon brown (Allen, 1897; Davis, 1966; Williams, 1978). Individuals from the highland subspecies *E. f. montosus* and *E. f. chiralensis* are black to dark brown and have dorsal hairs exceeding 8 mm in length, whereas the other subspecies, which are lowland forms, have shorter hairs (Davis, 1966; Koopman, 1978). Specimens of *E. furinalis* collected from mid-September through March are several shades paler than those taken at other times of the year (Davis, 1966). *E. furinalis* from humid, wooded regions of Argentina appear darker than those from more arid areas (Barquez and Lougheed, 1990).

The skull (Fig. 2) is typical of the genus. The flat rostrum slopes moderately upward to the braincase, which usually has a distinct, but low, sagittal crest. The basisphenoid region generally lacks marked sculpturing or obvious pits. Dental formula is $i\ 2/3, c\ 1/1, pm\ 1/2, m\ 3/3$, total 32. The first upper incisor is well developed and bears a secondary cusp, whereas I2 is unicuspidate and half the height of I1. The lower incisors are trifid, crowded, distinctly imbricated, and subequal in size; the crown of i3 is slightly wider than that of i1 or i2. The upper premolar is located close to the canine and is more than half its height. The second lower premolar is distinctly larger than p1. A hypocone is present on M1 and M2, and M3 is thinner from front to back than M1 or M2 but is as wide or wider than M2 (Davis, 1966; Dobson, 1885; Hall, 1981).

Mean body masses (in g, with standard deviation in parentheses) of six males and four females, respectively, from Venezuela are 7.53 (0.55) and 8.08 (0.50—Eisenberg, 1989). Mean external measurements (in mm, with standard deviation in parentheses) for eight males and six females, respectively, from Venezuela are: total



FIG. 1. *Eptesicus furinalis*. Photo by J. Scott Altenbach.

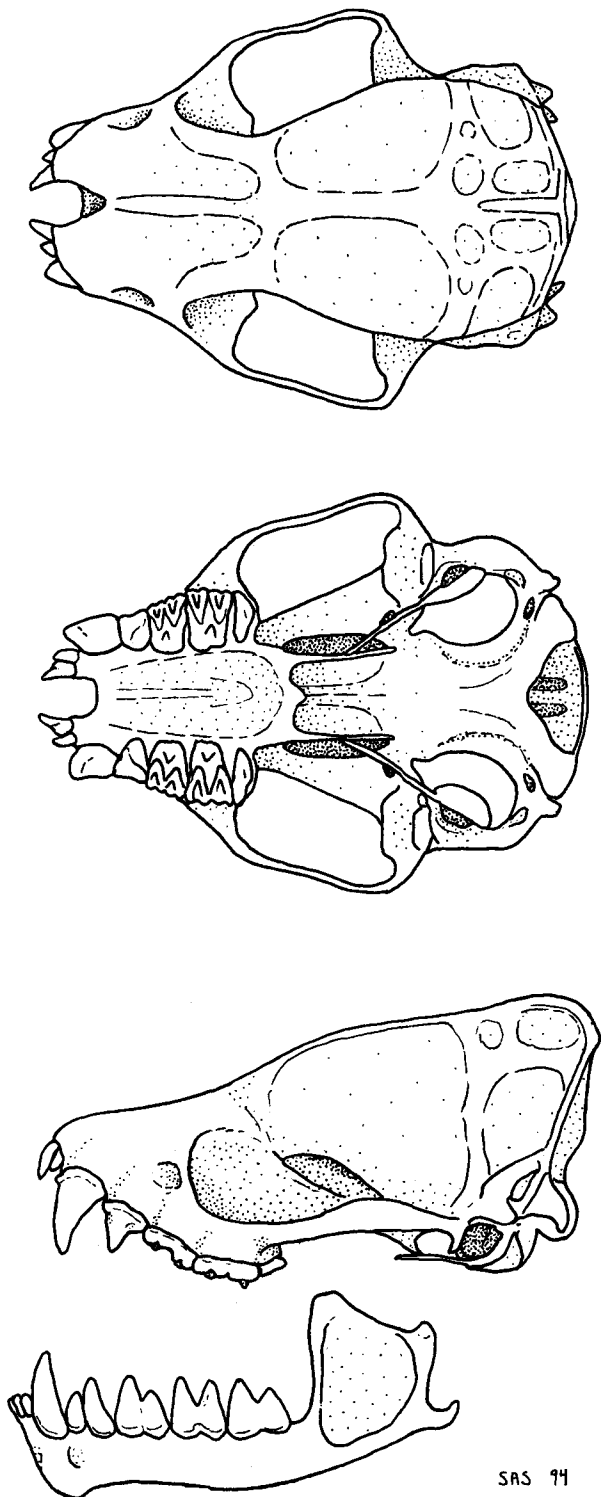


FIG. 2. Dorsal, ventral, and lateral views of cranium, and lateral view of mandible of a female *Eptesicus furinalis* from Paraguay, Departamento Central, 17 km E Luque (University of Michigan Museum of Zoology #125744). Greatest length of skull is 14.5 mm. Drawings by Scott A. Schwemmin.

length, 92.50 (2.62), 92.33 (3.20); tail length, 40.50 (1.51), 38.33 (2.34); hindfoot length, 9.00 (0.00), 9.33 (0.82); ear height, 13.25 (1.28), 13.83 (1.33); and forearm length, 38.35 (1.24), 39.03 (1.43—Eisenberg, 1989). Mean external dimensions (in mm, with range in parentheses) for 20 males and 29 females, respectively, from the Chaco Boreal of Argentina, Bolivia, and Paraguay are: total length, 92.8 (88–96), 97.0 (86–106); tail length, 36.8 (32–41),

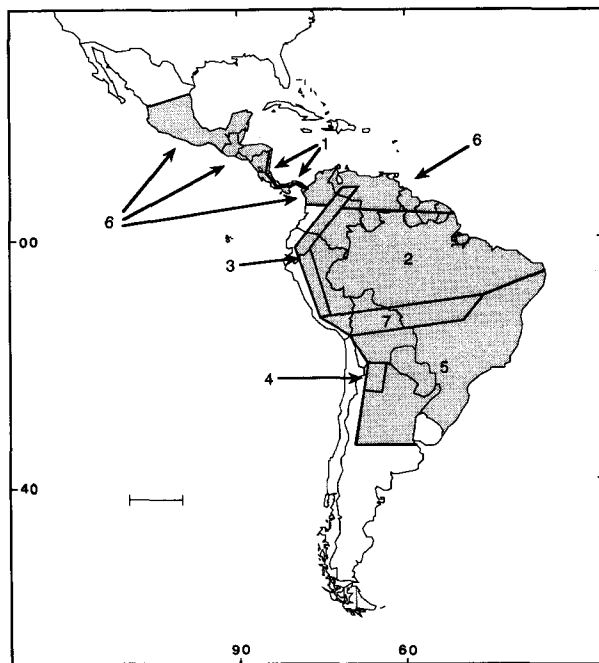


FIG. 3. Geographic distribution of *Eptesicus furinalis* (Barquez et al., 1993; Hall, 1981; Hollander and Jones, 1988; Koopman, 1982; Redford and Eisenberg, 1992): 1, *E. f. carteri*; 2, *E. f. chapmani*; 3, *E. f. chiralensis*; 4, *E. f. findleyi*; 5, *E. f. furinalis*; 6, *E. f. gaumeri*; and 7, *E. f. montosus*. Subspecific distributions are not well defined and those indicated are approximations that encompass localities given in Davis (1965, 1966), Hall (1981), Hollander and Jones (1988), and Williams (1978). Distance bar represents 1,000 km.

38.6 (29–45); hindfoot length, 9.4 (8–10), 9.7 (8–11); ear height, 16.4 (13–18), 16.2 (14–18); and forearm length, 38.0 (35.2–39.9), 38.4 (36.7–40.5—Myers and Wetzel, 1983).

Average skull measurements (in mm, with range in parentheses) for seven females from the Yucatan Peninsula are: greatest length of skull, 15.1 (14.7–15.8); zygomatic breadth, 10.6 (10.4–10.9); and length of maxillary toothrow, 5.6 (5.5–5.6—Birney et al., 1974). Mean skull dimensions (in mm, with range in parentheses) for 20 males and 29 females, respectively, from the Chaco Boreal of Argentina, Bolivia, and Paraguay are: greatest length of skull, 14.7 (14.1–15.1), 15.0 (14.3–15.7); condylobasal length 14.0 (13.7–14.3), 14.3 (13.5–15.5); zygomatic breadth, 10.2 (9.8–10.6), 10.3 (9.9–10.7); width across mastoid processes, 8.1 (7.7–8.6), 8.3 (8.0–8.7); width of maxillary toothrow, 6.3 (6.1–6.5), 6.4 (6.1–6.8); width across canines, 4.6 (4.4–4.8), 4.6 (4.4–5.0); least interorbital constriction, 3.7 (3.4–4.0), 3.9 (3.6–4.2); maxillary toothrow length, 5.4 (5.1–5.7), 5.4 (5.2–5.8); mandibular length, 11.4 (10.8–11.7), 11.6 (11.0–12.2); and length of mandibular toothrow, 6.9 (6.5–7.1), 6.9 (6.7–7.4—Myers and Wetzel, 1983).

Average measurements of females often are greater than those of males, but few characters differ statistically (Davis, 1965, 1966; Myers and Wetzel, 1983; Williams, 1978). Females from Brazil are significantly larger than males in mandibular length and length of phalanx 1 of digit 3 (Williams, 1978). In Venezuela, females average 1.5 g heavier than males (Eisenberg, 1989). In Paraguay, average forearm length of females significantly exceeds that of males by 0.86 mm, or about 2.3% (Myers, 1978). Although means of individual characters of males and females seldom are statistically different, discriminant function analysis, involving 18 measurements of the body and skull, distinguishes the sexes with no misclassification (Williams, 1978).

DISTRIBUTION. *Eptesicus furinalis* is widely distributed in Latin America (Fig. 3). This species occupies much of central and southern Mexico, although it may be absent from the arid midlands (Hall, 1981; Villa-R., 1966). In Central America, this bat is known from Belize, Costa Rica, Guatemala, Honduras, Nicaragua, and Panama (Dickerman et al., 1981; Hall, 1981; McCarthy, 1987).

South American records exist for Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, and Venezuela (Anderson et al., 1982; Anthony, 1926; Barquez et al., 1993; Brosset and Charles-Dominique, 1990; Eisenberg, 1989; Koopman, 1978; Redford and Eisenberg, 1992). Although Davis (1966) includes Uruguay within the range of *E. fernalis*, and even though *E. fernalis* is known from surrounding areas of Argentina (Barquez et al., 1993), there are no known specimens from Uruguay (Ximénez et al., 1972). The northernmost record for this species is over the Rio Sabinas, 1.2 km west of Calabazas, Tamaulipas, Mexico (Hollander and Jones, 1988), and the southernmost record is in the Argentine province of La Pampa, at about 37°S latitude (Barquez et al., 1993).

Eptesicus f. montosus and *E. f. chiralensis* are highland forms that generally occur at altitudes greater than 1,000 m, and the highest recorded capture is 3,600 m in Bolivia (Davis, 1966; Koopman, 1982; Thomas, 1920). The other subspecies are lowland dwellers, generally found below 1,000 m, but occasionally up to 1,800 m (Arnold and Schonewald, 1972; Davis, 1966; Graham, 1983; Jones, 1964; Jones and Dunnigan, 1965).

FOSSIL RECORD. All fossils are from late Pleistocene cave deposits. Fossils consist of three skulls and a mandible found in Cueva de Spukil (Actun Spukil—Hatt, 1953) and post-cranial material from Gruta de Loltún (Arroyo-Cabrales, 1992; Arroyo-Cabrales and Alvarez, 1990); both caves are in Yucatan, Mexico. In addition, another fossilized specimen is known from an unspecified cave in the Cayman Islands, an area not within the current geographic range of *E. fernalis* (Morgan, 1977).

FORM AND FUNCTION. Activities of citrate synthase ($299 \mu\text{mol}\cdot\text{g}^{-1}\cdot\text{min}^{-1}$) and 3-hydroxyacyl-CoA dehydrogenase (values not stated) in the pectoralis muscle of *E. fernalis* ($n = 2$) are among the highest reported for mammalian skeletal muscle and are comparable to values for insect flight muscle. In contrast, hexokinase activity is low (value not stated), as is the ratio of hexokinase to citrate synthase activity (0.013). Together these activities indicate that aerobic metabolism in the pectoralis is supported largely by fat metabolism, rather than glycogen breakdown. Enzyme activities for *E. fernalis* are similar to those of seven other species of insectivorous bats from South America, except that one *E. fernalis* had an unusually high level of citrate synthase activity (Yacoe et al., 1982).

Uterine horns of nonpregnant females are equal in size, approximately 0.7 mm in diameter and 2 mm long. Mature follicles or corpora lutea are not grossly visible on the surface of the ovary. Intact ovaries are ellipsoidal in shape; in cross-section, they are round to oval in shape, about 1.3 mm in diameter, and lacking obvious lobes or fissures. Compared to gonads of sympatric *Lasiurus ega*, ovaries of *E. fernalis* are larger and contain more interstitial tissue, but epophoron tubules and ovarian rete of *E. fernalis* are smaller than those of the lasiurine (Myers, 1977).

In Paraguay, during April and May (autumn), ovarian follicles are 100–250 microns in diameter. More than 15 follicles per female enlarge to 230–260 microns in June, and 3–5 follicles expand to 300 microns by early July, just prior to ovulation. All large follicles disappear during the ensuing pregnancy, but others again increase to as much as 230 microns during very late pregnancy. Biovular follicles occasionally occur (Myers, 1977).

Just after cleavage begins (2–4 cell stage) and the developing embryo is still within the oviduct, corpora lutea are nonvascular and possess large lumina with a few free cells. The remains of the theca externa still surround the young corpora lutea, and paraluteal cells are likely present. Swollen nuclei and distinct nucleoli characterize luteal cells at this early stage. As the embryo moves down the oviduct and uterine implantation nears, vascularity increases, lumina disappear, and the theca externa partly or totally disappears (Myers, 1977).

After implantation, vascularity changes little during pregnancy. However, as the embryo approaches 18 mm in length (crown-rump), luteal nuclei begin to shrivel, nucleoli become difficult to discern, and the border of the corpus luteum appears to merge with the surrounding stroma. By late pregnancy, when the embryo is about 23 mm long, the corpus luteum is barely identifiable. During lactation, the remains of the corpus luteum is sometimes discernable by its lighter color and lower density of nuclei compared to the stroma (Myers, 1977).

In Paraguay, *E. fernalis* is polyestrous, with females apparently giving birth up to two times each year. During the first pregnancy (July–November), the number of corpora lutea per female (3–5) generally exceeds the number of embryos (1–4), and the difference increases as pregnancy proceeds. This indicates consistent reduction in litter size after fertilization, presumably through resorption, and is similar to what occurs in the Nearctic species *E. fuscus*. There is never more than one embryo and a single corpus luteum during the second pregnancy (Myers, 1977).

Paraguayan males have two periods of reproductive activity. During summer, the testes are small but contain many cells undergoing meiosis. Spermatozoa first enter the epididymis in late April, at about the time that the testes reach maximum size. The testes remain enlarged until at least mid-June, when meiotic activity begins to decline. Spermatids and tubular spermatozoa become abundant again by early September, and by late September, epididymal sperm are also abundant again. Testicular activity decreases during December and reaches its lowest level in January and February (Myers, 1977).

Seasonal changes in accessory organs and interstitial cells also occur, but such changes are not as pronounced as in other vesperilionids that breed only once per year. Interstitial cells and nuclei of *E. fernalis* are at maximum size during the time that the testes are at their greatest size, which corresponds to the two copulation periods (late March–June and September–October). Interstitial cell and accessory gland activity are temporally correlated in *E. fernalis*, unlike Nearctic species in which the accessory glands remain active after the interstitial tissue has involuted (Myers, 1977).

Male accessory glands include a prostate, ampullary glands, and bulbourethral glands. In *Myotis albescens*, *M. nigricans*, and *L. ega*, the prostate gland projects farther forward than does the ampullary gland, but the reverse occurs in *E. fernalis* (Myers, 1977).

In dorsal view, the distal surface of the baculum is narrow, blunt, and knoblike, and it is connected to the basal end by a triangular neck that widens toward the base. The base is broad and rounded, with prominent flanges that extend laterally and ventrally. The dorsal surface rises sharply at the proximal end, whereas the ventral surface is distinctly convex beneath the flanges. The dorsal surface of the base, in effect, forms a saddle over the ventral convexity, which acts as a passage for the urethra. The baculum ($n = 1$) is 0.92 mm in length and 0.65 mm in greatest width. Compared to the baculum of *E. fuscus*, the os penis of *E. fernalis* lacks a basal emargination and is larger and more noticeably sculptured (Brown et al., 1971).

Eptesicus fernalis probably does not hibernate; it may use daily torpor (Myers, 1977), although there are no published observations. Timing of molt is not known, but specimens in fresh pelage were taken on 20 July in Yucatan, Mexico (Jones et al., 1973).

ONTOGENY AND REPRODUCTION. Based on limited data, Davis (1966) believed that *E. fernalis* bred year-round. However, the extensive work of Myers (1977) in Paraguay strongly suggested a bimodal breeding pattern, with parturition occurring only during the warmer parts of the year. The lack of breeding activity during winter presumably was related to food (insect) shortages brought on by cool ambient temperatures (Myers, 1977).

Copulation in Paraguay first occurred between May and early June (autumn), but pregnant females were not found until late July and August. This suggested that females store sperm for 2–3 months before fertilization occurs. Following fertilization, gestation length for this first pregnancy was just over three months, and young were born in late October and November. Mean litter size, based on five females with large embryos (≥ 18 mm in length), was 1.8 and ranges from 1 to 2, with a mode of 2 (Myers, 1977).

The presence of sperm inside the reproductive tract of females that have just given birth was indicative of a post-partum estrus in the austral spring. Females were simultaneously pregnant and lactating in December, suggesting that there was little delay between post-partum copulation and ovulation. The second litter was born in January, indicating that gestation was shorter for the second pregnancy. Warmer ambient temperatures during the summer (second) pregnancy was a hypothesized, but untested, cause of the shorter gestation period. Litter size was invariably one for the second birth (Myers, 1977).

Litter size and dates of pregnancy or lactation from other countries are summarized here. Records from Yucatan, Mexico, show

five of seven females were pregnant on 9 May; each carried two embryos that averaged 16 mm in length and ranged from 13 to 18 mm (Birney et al., 1974). One female with two embryos was taken in Michoacan, Mexico, on an unspecified date in May (Sanchez Hernandez et al., 1985), whereas a female captured on 6 August in Tamaulipas, Mexico, gave birth two days later in captivity (Hollander and Jones, 1988). Three females were in early stages of pregnancy on 27 May in Guatemala (Rick, 1968), and one pregnant female captured in Nicaragua on April 22 carried two embryos (15 mm in length—Jones et al., 1971). In Venezuela, pregnant females are known from January (Willig, 1985b).

Lactating females were reported from Guatemala on 27 May (Rick, 1968), and from Nicaragua on 5 and 29 July (Dolan and Carter, 1979; Jones et al., 1971). On the latter date, 9 of 15 females that were captured were lactating, but the other 6 were not reproductively active; volant juveniles were also taken at this time (Dolan and Carter, 1979). Four lactating females were taken in Venezuela in February (Willig, 1985b).

In Paraguay, breeding activity of males was also bimodal, as indicated by testis size. From December through February, testicular mass was low, averaging less than 20 mg. It peaked (80–85 mg) in late April during the first breeding period, remained high through June, and dropped to <30 mg during July and August. Testicular mass again exceeded 70 mg during September, October, and probably November, which corresponded to the second mating period (Myers, 1977).

Reports of male breeding activity in other countries only refer to testis length and not testis mass. Testes length in Yucatan, Mexico, was 8 mm and 5 mm, for individual males captured on 2 and 9 May, respectively. Two adult males captured in Nicaragua in March had testes 5–7 mm in length, whereas two males taken in April had testicular lengths of 9–10 mm (Jones et al., 1971). A male from Costa Rica had small (4.7 mm) scrotal testes that contained no sperm and showed little spermatogenic activity on 23 July (Starrett and de la Torre, 1964).

In a juvenile, 1–2 months old, the testes were small (5.8 mg), seminiferous tubules had no obvious lumina, and the epididymal tubules were small and empty. Only Sertoli cells and spermatogonia were seen in the seminiferous tubules at that age. In a juvenile, 3–4 months old, meiotic activity had begun but no spermatids were visible. The seminiferous tubules were larger but still lacked a lumen, and the epididymal tubules remained small and empty. Both males and females apparently bred within their first year (Myers, 1977).

ECOLOGY AND BEHAVIOR. No study of habitat use exists for this species, and one must infer habitat preferences based on sites at which *E. furinalis* has been captured. This species has been mist netted or shot while flying along a stream in a pine-oak forest (Watkins et al., 1972), along a swift-flowing stream through thick vegetation with a cypress-fig canopy (Hollander and Jones, 1988), over a small pool in the streambed of a canyon surrounded by dense forest (Jones, 1964), in riparian vegetation along a lagoon (McCarthy, 1987), and over a partly filled cistern in an open area that was part of a coffee-drying facility (Jones et al., 1971). *E. furinalis* is commonly captured in nets set over or next to rivers, cenotes, arroyos, swimming pools, and cattle ponds (Barquez and Loughheed, 1990; Birney et al., 1974; Hall, 1963; Jones et al., 1973; McCarthy, 1987; Myers, 1977; Starrett and Casebeer, 1968; Villa-R., 1966). Some have been captured in gardens (Brosset and Charles-Dominique, 1990; Sawada and Harada, 1986) or shot while flying over roads (Starrett and Casebeer, 1968), under the overhanging branches of a mango tree (Hall, 1963), or in a forest clearing (Jones, 1964). Areas surrounding capture sites in Venezuela include yards, evergreen forest, cloud forest, savannah, swamps, and orchards (Handley, 1976).

Although mostly found in moist habitats, *E. furinalis* has been collected in a variety of vegetative life zones. In Venezuela, these include many of the life zones of Holdridge, including tropical dry forest, tropical moist forest, tropical wet forest, subtropical moist forest, subtropical wet forest, lower montane moist forest, and lower montane wet forest (Handley, 1976). In Brazil, it is a rare to common resident of edaphic portions of the Cerrado biome, a shrub-tree savannah with a pervasive grass component (Willig, 1985a). In Argentina, it has been taken in a thorn-scrub association (Barquez and Loughheed, 1990).

This species has a large geographic range and lives in a va-

riety of habitats; consequently, a large number of bat species have been captured while flying at the same location and time as *E. furinalis*. Other vespertilionids occasionally caught with *E. furinalis* are *E. fuscus*, *Myotis californicus*, *M. nigricans*, and *Rhogeessa tumida* (Dolan and Carter, 1979; Ibáñez and Ochoa G., 1989; Hollander and Jones, 1988; Jones and Dunnigan, 1965; Phillips and Jones, 1971; Watkins et al., 1972). Phyllostomid associates include *Anoura geoffroyi*, *Artibeus jamaicensis*, *A. lituratus*, *A. phaoetis*, *A. toltecus*, *Carollia perspicillata*, *Chiroderma salvini*, *Glossophaga soricina*, *Hylonycteris underwoodi*, *Leptonycteris sanborni*, *Sturnira lilium*, and *S. ludovici* (Hollander and Jones, 1988; Ibáñez and Ochoa G., 1989; Jones and Dunnigan, 1965; Jones et al., 1971, 1973; Phillips and Jones, 1971). *E. furinalis* also occurs with the molossids *Eumops bonariensis*, *Molossus aztecus*, *M. bondae*, *M. molossus*, *M. pretiosus*, *M. sinaloe*, and *Promops centralis* (Dolan and Carter, 1979; Ibáñez and Ochoa G., 1989; Jones and Dunnigan, 1965; Jones et al., 1971). Associates from other families are *Desmodus rotundus*, *Noctilio albiventris*, *N. leporinus*, *Pteronotus davyi*, *P. parnellii*, *Rhynchonycteris* sp., and *Saccopteryx bilineata* (Dolan and Carter, 1979; Hall, 1963; Hollander and Jones, 1988; Ibáñez and Ochoa G., 1989; Phillips and Jones, 1971; Starrett and Casebeer, 1968).

Eptesicus furinalis often roosts in buildings—within walls or floors, behind window shutters (McCarthy, 1987; Rick, 1968), under roofing material (Barquez, 1988; Gaumer, 1917), in attics (Goldman, 1920), and between beams of a porch (Myers, 1977). This species also may roost under the bark of trees (Barquez et al., 1993) and in hollow trees or logs (Dalquest, 1953; Handley, 1976). *E. furinalis* contributed to an aggregation of approximately 100,000 bats inhabiting a cave in Morelos, Mexico, on 18 June 1956, but such an aggregation was not seen during other visits to the cave (Villa-R., 1966). Other reports concerning colonial roosting describe four adult females and one subadult female exiting a building in Guatemala (Rick, 1968), fewer than 10 bats in a building in Paraguay (Myers, 1977), and a “small colony” in Panama (Goldman, 1920:215). Roosting associates include *Macrotus waterhousii* at the Mexican cave (Villa-R., 1966), *Rhogeessa tumida* in a building in Panama (Goldman, 1920), and *Tadarida brasiliensis* and *Myotis albescens* in a rural dwelling in Argentina (Barquez, 1988).

Stomach contents consist of finely chopped insect remains (Dalquest, 1953; Starrett and de la Torre, 1964), and *E. furinalis* apparently is an aerial insectivore (Barquez et al., 1993), as are other species of *Eptesicus*. Timing of activity is not well defined, but Villa-R. (1966) mentions that this species was, on some occasions, the first bat to be captured in nets, and Gaumer (1917) describes this species flying around a house searching for insects at twilight. In San Luis Potosi, Mexico, it appears very early in the evening, often flying at a height of 6–9 m, over and through the tops of trees; these bats fly erratically in irregular circles about 15–30 m in diameter (Dalquest, 1953). Hall (1963:251) describes this bat emerging at dusk, foraging about a mango tree near buildings, and later flying “low and excessively fast” in an open area near a stable. In Costa Rica, the flight of this bat is similar to *Myotis nigricans* (Starrett and Casebeer, 1968). One *E. furinalis* swam “well and swiftly,” after striking a wire strung over a pool (Hall, 1963:251).

Eptesicus furinalis is type host for *Vampirolepis pandoensis*, a medium-sized hymenolepidid cestode infecting the small intestine. Of 13 *E. furinalis* specimens examined from Bolivia, only one was infected with this cestode (Sawada and Harada, 1986). Two *E. furinalis* from Belize were examined for cutaneous lesions associated with leishmaniasis with negative results (Disney, 1968). Two individuals examined in Costa Rica were free of ectoparasites (Starrett and de la Torre, 1964), but five *E. furinalis* from Panama carried the nycteribiid batfly *Basilisa wenzeli* (Guimarães, 1966). There are no reports of this species harboring the rabies virus, but few specimens have been examined (Constantine, 1988; Malaga Alba and Villa R., 1957).

In Nicaragua, Jones et al. (1971) reported a number of dead *E. furinalis* floating in a concrete cistern. The cistern was 12 m wide, but the water level was 3 m below the rim. The authors speculated that the bats collided with the wall of the cistern and became entrapped after falling into the water.

GENETICS. The diploid number is 50, and the fundamental number is 48. *E. furinalis* has acrocentric autosomes (grading from large to small), a submetacentric X chromosome, and a small ac-

rocentric Y chromosome. One pair of intermediate autosomes has a subcentromeric secondary constriction. *E. andinus*, *E. diminutus*, *E. fuscus*, *E. guadeloupensis*, *E. hottentotus*, *E. serotinus*, and *E. furinalis* have identical karyotypes that differ from those of *E. capensis* and *E. zuluensis* (Baker and Patton, 1967; Williams, 1978).

An electrophoretic analysis of 13 presumptive genetic loci indicates a Roger's genetic similarity value of 0.84 among Central American populations of *E. furinalis* and *E. fuscus* and African populations of *E. hottentotus*. These three species possess synapomorphies at two of 13 loci. Despite representing different continents, these species form a homogenous group clearly distinct from other eptesicoid species with different karyotypes (*E. capensis* and *E. zuluensis*—Morales et al., 1991).

REMARKS. *Eptesicus furinalis* has many common names; some of these are tropical brown bat (Jones et al., 1973; Watkins et al., 1972), *murciélago pardo comun* (Barquez et al., 1993), *murciélago pardusco* (Redford and Eisenberg, 1992), *murciélago de Gaumer* (Gaumer, 1917), *murciélago moreno de Gaumer* (Villarr., 1966), and the Bolivian native name *chĩĩ* (Thomas, 1920). The name *Eptesicus* means "house flyer" (Rafinesque, 1820), but the derivation of *furinalis* is unknown.

Although the name *E. dorianus* was synonymized with *E. furinalis* by Thomas (1920), there is still debate concerning the status of *E. dorianus*. The original published measurements of the holotype of *E. dorianus* (Dobson, 1885) are consistent with those of *E. furinalis*; however, those measurements do not correspond to the museum specimen currently labeled as the holotype. Recent measurements of this specimen are larger than those of *E. furinalis*, and multivariate analysis places the supposed holotype of *E. dorianus* among *E. brasiliensis* (Williams, 1978). Williams, therefore, considers the name *dorianus* a *nomen dubium*, applicable without certainty to any known taxon, rather than as a synonym of *furinalis*.

Peters (1872) originally described a small brown bat from Guatemala and gave it the name *Vesperus propinquus*. Osgood (1914) later concluded that *Adelonycteris gaumeri* J. A. Allen was indistinguishable from *V. propinquus* and placed *gaumeri* as a synonym of *propinquus*. Miller (1897) believed that *propinquus* was only a subspecies of *Eptesicus fuscus*, whereas Hershkovitz (1949) considered *propinquus* a subspecies of *E. brasiliensis*. Davis (1965), however, indicated that the specimens described by Peters (1872) most likely came from Europe, and not Central America, and that the type of *V. propinquus* actually was a specimen of *Eptesicus nilssoni*. Consequently, Davis (1965) placed *propinquus* as a synonym of *nilssoni*, resurrected the name *gaumeri*, and reestablished *gaumeri* as a distinct species; a year later, Davis (1966) placed *gaumeri* as a subspecies of *E. furinalis*—a classification generally accepted today. In the present account, we considered specimens previously referred to in the literature as *propinquus* to be representatives of *E. furinalis*.

Similarly, Peters (1872) also described another brown bat from Mexico and called it *Vesperus albigularis*. However, Davis (1965) indicated that the type of *V. albigularis* was actually a specimen of the Old World species *Vespertilio murinus*. Davis (1965) considered a specimen from Honduras that Goodwin (1942) referred to as *Eptesicus albigularis* to be nothing more than a color variant of *E. gaumeri*, which he later placed as a subspecies of *E. furinalis* (Davis, 1966).

Eptesicus montosus Thomas and *E. chiralensis* Anthony were originally described from specimens taken in the highlands of Bolivia and Ecuador, respectively. Later, Davis (1966) noted that the two were quite similar in most measurements and that they shared a long, lax, dark pelage; consequently, Davis (1966) suggested that these two groups were really one species consisting of two subspecies, *E. m. montosus* and *E. m. chiralensis*. Koopman (1978), however, pointed out that both subspecies of *E. montosus* showed considerable overlap with *E. furinalis* in cranial measurements and size of forearm and that *E. montosus* and *E. furinalis* differed primarily in the former having longer hairs—a characteristic not unexpected given the highland distribution of *E. montosus*. Therefore, Koopman (1978) referred the two subspecies of *E. montosus* to *E. furinalis*, and we have followed that arrangement in this account.

The validity of the subspecies *E. f. findleyi* is disputed. Barquez and Loughheed (1990) suggest that the diagnostic characters used by Williams (1978) can be explained by geographic, environ-

mental, and individual variation within *E. f. furinalis*. In addition, Myers and Wetzel (1983) remark that specimens of *E. f. findleyi* from the province of Jujuy, Argentina, are weakly differentiated, at best, from *E. f. furinalis* in eastern Paraguay. If the bats from Jujuy do not represent *E. f. findleyi*, then *E. f. findleyi* is only known from four specimens (the type series) from Tucumán and one other bat from Salta Province, Argentina.

Willig (1983:97) states that male values are statistically greater than those of female *E. furinalis* for "forearm length, weight, and greatest length of the maxillary" and refers to his table 24 for the appropriate statistics. Unfortunately, those data (Willig, 1983: 104) actually indicate that females are statistically larger than males in forearm length and weight, which is similar to the trend seen in other regions. In addition, the table has no entry for "greatest length of the maxillary," but does show that females are significantly larger than males in length of mandible.

Philip Myers, University of Michigan Museum of Zoology, provided copies of pertinent literature, aided with Spanish translations, and allowed us to borrow the skull for the drawing.

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