MAMMALIAN SPECIES No. 754, pp. 1–6, 3 figs.

Nyctomys sumichrasti.

By John L. Hunt, James E. Morris, and Troy L. Best

Published 15 December 2004 by the American Society of Mammalogists

Nyctomys de Saussure, 1860

Nyctomys de Saussure, 1860:106. Type species *Hesperomys sumichrasti* de Saussure, 1860.
Hesperomys: de Saussure, 1860:107. Part, not *Hesperomys* Waterhouse, 1839:75.
Myoxomys Tomes, 1861:284. Type species *Hesperomys* (*Myoxomys*) *salvini* Tomes, 1861, by designation; described as a subgenus of *Hesperomys* Waterhouse, 1839.
Sitomys: True, 1894:689. Part, not *Sitomys* Fitzinger, 1867:97.

CONTEXT AND CONTENT. Order Rodentia, suborder Sciurognathi, family Muridae, subfamily Sigmodontinae. The genus *Nyctomys* is monotypic (Musser and Carleton 1993).

Nyctomys sumichrasti (de Saussure, 1860)

Sumichrast's Vesper Rat

H[*esperomys*]. *sumichrasti* de Saussure, 1860:107. Type locality "Cordilière de la province de Véra-Cruz" restricted to "Uvéro, 20 kilometros al noroeste de Santiago Tuxtla, Veracruz" (Alvarez 1963:583).
Hesperomys (*Myoxomys*) *salvini* Tomes, 1861:284. Type locality "Dueñas, Guatemala."
Sitomys (*Phipidomys*) *decolorus* True, 1894:689. Type locality "Rio de las Piedras," Honduras.
Nyctomys nitellinus Bangs, 1902:30. Type locality "Boquete, . . . 4,000 feet," Chiriqui, Panama.
N[*yctomys*]. *sumichrasti* Bangs, 1902:30. First use of the current name combination.

CONTEXT AND CONTENT. Context as above. Nine subspecies of *N. sumichrasti* are recognized (Hall 1981).

N. s. colimensis Laurie, 1953:390. Type locality "Juarez, Colima, Mexico."
N. s. costaricensis Goldman, 1937:422. Type locality "San Geronimo de Pirris, hamlet on the main road to Pirris before reaching Jabillo, near the west coast of Costa Rica, about two miles before the abrupt descent to the lowlands of Pozo Azul and about 12 miles inland from Pirris (altitude about 100 feet)," = Puntarenas, Costa Rica (Hall 1981:630).
N. s. decolorus (True, 1894:689), see above.
N. s. florencei Goldman, 1937:421. Type locality "Barra de Santiago, Department of Ahuachapan, Salvador (sea level)," = El Salvador (Hall 1981:630).
N. s. nitellinus (Bangs, 1902:30), see above.
N. s. pallidulus Goldman, 1937:420. Type locality "Santo Domingo, 8 miles west of Lagunas, on the Mexican National Railroad, Isthmus of Tehuantepec, Oaxaca, Mexico (altitude 900 feet)."
N. s. salvini (Tomes, 1861:284), see above.
N. s. sumichrasti (de Saussure, 1860:107), see above.
N. s. venustulus Goldman, 1916:155. Type locality "Greytown, Nicaragua" = San Juan del Norte (Hall 1981:631).

DIAGNOSIS. *Nyctomys sumichrasti* (Fig. 1) is similar to the slightly smaller Yucatán vesper mouse (*Otonyctomys hatti*), with which it is sympatric in Belize. *N. sumichrasti* has a longer maxillary toothrow than *O. hatti* (Genoways et al., in press) and is heavier (40–67 g) than *O. hatti* (<36 g). *N. sumichrasti* (length of hind foot, 22–27 mm) is similar to the larger Mount Pirri climbing mouse (*Rhipidomys scandens*, length of hind foot, 29–32 mm), with which is allopatric in eastern Panama (Reid 1997). *N. sumichrasti* may be distinguished from other murids by its color and dark ocular blotches (Ceballos and Miranda 2000).

GENERAL CHARACTERS. *Nyctomys sumichrasti* is a medium-sized stocky rat with tawny-brown to orange upperparts and well-demarcated creamy-colored underparts (Reid 1997). *Nyctomys sumichrasti* has a large head. Whiskers are long, and ears are small but longer than they are wide. Tail is robust, cylindrical (de Saussure 1860), well haired, and tufted terminally (Ellerman et al. 1941). Hind feet are short and wide; toes are long, except for 1st toe; 4th toe is the longest (de Saussure 1860). Hallux is clawed. Pad of pollex may be prominent (Ellerman et al. 1941). Six plantar pads are present, with 1st through 4th interdigitals close together; 1st and 4th digits oppose each other; thenar and hypothenar pads are close behind interdigitals; plantar surface is naked or only lightly furred on heel (Carleton 1980). Claws are compressed and recurved as an adaptation for an arboreal lifestyle (Goldman 1916).

Eyes are large and rimmed with narrow black rings that may be faint and extend forward as a dusky smudge at base of nose and whiskers (Emmons 1997). Eyes reflect a moderately bright, reddish eyeshine (Reid 1997). Hair is soft and thick. Overall, body appears reddish-brown or orange and is somewhat brighter on sides and muzzle. Hairs on upperparts are reddish at tips and slate-colored at roots. Underparts are white. Fronts of forelegs are reddish-brown, and toes are whitish gray. Tops of hind feet are pale reddish-brown. Ears are reddish-brown and whiskers are blackish. Tail is solid brown to reddish-brown. At base of tail, hair is thinner and lies flat, but away from base hair becomes more plentiful and longer. Hairs are bristly on distal 3rd of tail and resemble a long paintbrush terminally (de Saussure 1860).

Several subspecies are darkened along middle of back, head, and rump by a slight mixture of brown-tipped hairs (Bangs 1902; Goldman 1916; Laurie 1953). Pelage of individuals in Nicaragua does not differ between wet and dry seasons (Genoways and Jones 1972). Individuals in dry lowlands tend to be smaller and more brightly colored, whereas those in higher wetlands are larger and darker (Reid 1997). Sumichrast's vesper rats from Panama and Costa Rica sometimes are red-brown, whereas their young are gray-brown, with woolly fur, until they reach almost adult size. Those from Mexico are bright rust, with young the same color as adults (Emmons 1997).

Measurements of individuals of *N. sumichrasti* from across the range suggest a general increase in size from north to south (Bangs 1902; Goldman 1916, 1937; Goodwin 1969; Laurie 1953; True 1894). Average of external measurements (in mm; range and sample size in parentheses) of adult males and females, respectively, from Nicaragua are total length, 236 (225–246, 8), 230 (219–

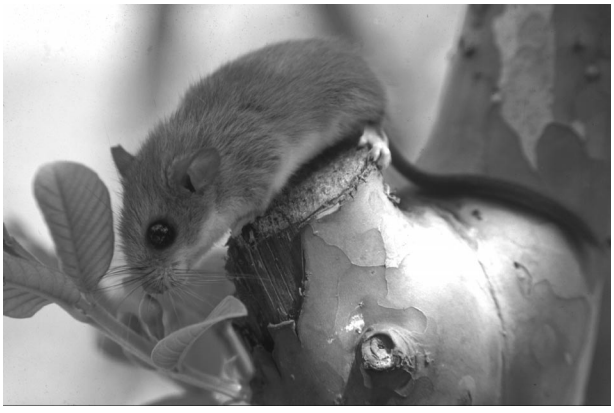

FIG. 1. *Nyctomys sumichrasti* from Chamela, Cuixmala Biosphere Reserve, Jalisco, Mexico. Photograph by G. Ceballos.

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Nyctomys sumichrasti* from Monteverde, Puntarenas, Costa Rica (female, University of Kansas 157601). Greatest length of cranium is 30.2 mm. Photograph by T. L. Best.

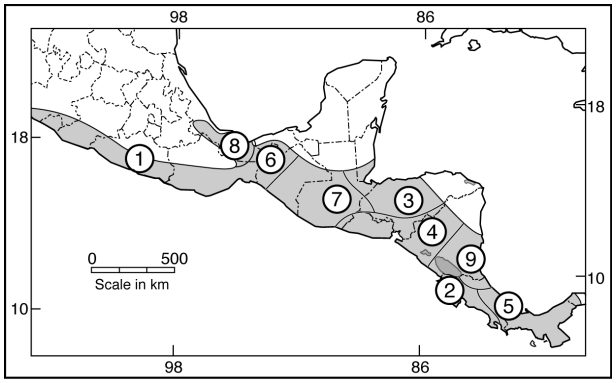

FIG. 3. Distribution of *Nyctomys sumichrasti* in North America (Hall 1981): 1, *N. s. colimensis*; 2, *N. s. costaricensis*; 3, *N. s. decolorus*; 4, *N. s. florencei*; 5, *N. s. nitellinus*; 6, *N. s. pallidulus*; 7, *N. s. salvini*; 8, *N. s. sumichrasti*; 9, *N. s. venustulus*.

242, 16); length of head and body, 118 (99–129, 15), 118 (106–128, 24); length of tail, 115 (108–126, 8), 113 (102–124, 16); length of hind foot, 22 (21–23, 15), 22 (20–23, 24); length of ear, 17 (15–18, 15), 17 (15–18, 24). *N. sumichrasti* exhibits little sexual dimorphism; but mass (mean, range) of 15 males from Nicaragua (48.5, 39.3–61.3) was significantly greater than 24 females (44.9, 38.2–53.9—Genoways and Jones 1972).

Nyctomys sumichrasti has a broad braincase and frontals with well-developed supraorbital ridges that extend across parietals to occiput (Fig. 2). Interparietals are broad and large; they completely separate parietals from supraoccipital. Rostrum is short. Zygomatic plate is narrow, but straight anteriorly. Infraorbital foramen is prominent. Tympanic bullae are small. Broad palate, which ends in front of posterior part of toothrow, has no lateral pits (Ellerman et al. 1941). Average cranial measurements (in millimeters, range and sample sizes in parentheses) of adult males and females, respectively, from Nicaragua are occipitonasal length, 29.8 (28.5–31.2, 14), 29.7 (28.5–31.1, 18); zygomatic width, 17.1 (16.4–18.0, 12), 16.8 (15.8–17.8, 18); interorbital constriction, 5.6 (5.4–6.2, 14), 5.5 (5.3–6.0, 23); width of braincase, 13.2 (12.8–13.6, 14), 13.2 (12.4–13.6, 22); rostral width, 5.7 (5.3–6.0, 15), 5.7 (5.2–6.4, 22); length of rostrum, 10.2 (9.7–11.0, 14), 10.2 (9.4–10.7, 20); depth of cranium, 11.1 (10.5–11.6, 12), 11.0 (10.2–11.5, 21); length of maxillary toothrow, 4.4 (4.3–4.6, 12), 4.5 (4.2–4.7, 19); length of incisive foramen, 5.1 (4.8–5.6, 14), 5.1 (4.3–6.3, 24); length of palatal bridge, 4.4 (4.0–4.7, 15), 4.4 (3.9–4.7, 24—Genoways and Jones 1972).

DISTRIBUTION. *Nyctomys sumichrasti* occurs (Fig. 3) from southern Jalisco and southern Veracruz, Mexico, south to central Panama, excluding the Yucatán Peninsula (Musser and Carleton 1993). Elevational range is from sea level to 1,600 m (Mendez 1993; Timm et al. 1989). No fossils are known.

FORM AND FUNCTION. Cheekteeth are complex. Molars are relatively low crowned (Carleton 1980). Anterointernal cusp of M1 is strongly reduced, with well-defined islands between each pair of cusps; M3 is large (Ellerman et al. 1941). Dental formula is i 1/1, c 0/0, p 0/0, m 3/3, total 16 (Goodwin 1946).

A foramen ovale is present; postglenoid and subsquamosal foramina are absent. Hyoid apparatus consists of a long thyrohyal bone and an arched basihyal with a small, knobby entoglossal process. A large accessory tympanum is present. Mastoid bullae are small and unmodified. An entepicondylar foramen is present above medial epicondyle of humerus. *N. sumichrasti* has 13 thoracic and 6 lumbar vertebrae. First rib articulates only with 1st thoracic vertebra. Fusion of tibia and fibula is <30% (Carleton 1980).

Stomach of *N. sumichrasti* has a bordering fold that bisects the organ on a line from incisura angularis to a point opposite it on greater curvature (Carleton 1973). Gall bladder is absent. Large intestine has 3 or 4 coils, and cecum is long with elaborate infoldings (Carleton 1980).

Penis has large sparsely distributed spines, a trilobed urethral flap, which is the ventral part of a ridge that, with the bacular mass, elevates the meatus urinarius above floor of surrounding crater. Glans is plain on exterior with some shallow middorsal and lateral depressions, but is strongly spinous, with large sharp spines that scarcely overlap. Spines are absent in the open, shallow, terminal crater and on a narrow erect band of tissue bordering it. Bacular mound is a globular structure supported by baculum. The 2 lateral papillae are slightly larger than dorsal papilla and are recessed on the sides of bacular mound. Dorsal papilla is a slim cone, sometimes bearing a conule near its base, and also is recessed on flank of the medial mound (Hooper and Musser 1964).

Base of baculum is dumbbell shaped in cross-section and tapers abruptly into the slender shaft, which curves gently upward and terminates in a rounded knob. A baculum from Oaxaca, Mexico, was 5.7 mm long and 1.5 mm wide at base (Burt 1960). Baculum is composed of a slim, narrow-based, large-headed bone capped by a mass of cartilage, but no lateral digits. Bacular shape varies among specimens; osseous head varies from a simple, slight, ball-like expansion to a large, 3-lobed structure. The cartilaginous mass also is variable, ranging from a simple globular mass to shamrock shaped (Hooper and Musser 1964).

Information regarding accessory reproductive structures is conflicting (Arata 1964; Voss and Linzey 1981). One study of accessory reproductive glands of 1 individual found no preputials or

vesiculars. The specimen had paired ovate bulbouretrhal glands that lay cranial and lateral to urethral bulb. These glands were drained by a single duct, which entered urethra anterior to origin of phallus. Ampullary glands were 5 by 5 mm and were filiform. Each gland discharged into vas deferens through numerous ducts. The specimen had only a single set of prostate glands. Each prostate was made up of 4 units. Each unit was drained by a single duct that entered prostatic urethra laterally and dorsally to the ampulla; each unit was 15 by 3 mm and was composed of 2–8 branching tubules (Arata 1964). A subsequent study of 5 specimens revealed 2 pairs of preputials and a single bulbourethral gland. Lateral preputials were large and extended well beyond ventral flexure of penis, whereas medial, ventral glands were smaller. Conventional dorsal and anterior prostates and vesiculars were lacking (Voss and Linzey 1981). A branched gland identified as a modified anterior prostate in initial study (Arata 1964) was identified subsequently (Voss and Linzey 1981) as a dorsal prostate based on form and lack of vesiculars. One of 5 specimens examined had a single small pair of ventral prostates (Voss and Linzey 1981).

ONTOGENY AND REPRODUCTION. Individuals of *N. sumichrasti* may be separated into 3 age classes (juvenile, subadult, adult) based on tooth wear, cranial measurements, and body measurements. In Nicaragua, sex ratio for all age groups combined did not differ significantly from 1:1. All age classes were equally represented in the population (Genoways and Jones 1972).

Nyctomys sumichrasti has 2 pairs of mammae (Ellerman 1941). In captivity, average size of litter was 2 ($n = 11$, range 1–3), 1 female produced 5 litters in 7 months, and gestation period was 30–38 days (Birkenholz and Wirtz 1965).

Breeding occurs in both wet and dry seasons. In Panama, pregnant females were present in February and June; lactating females were present in March; some subadult females showed evidence of breeding. From December to June, all males had scrotal testes (Fleming 1970). In Costa Rica, an adult male had scrotal testes measuring 7 by 14 mm on 7 August (Timm et al. 1989). In Colima, Mexico, a lactating female was present in January (J. L. Hunt and T. L. Best, pers. comm.). In Panama, only adults were present from December to June; juveniles were present from March to May (Fleming 1970).

In captivity, mating began with the male chirping at the female at 5–10-s intervals for ≤3.5 min. The male mounted the female for 30–40 s. Both animals squeaked during copulation, which consisted of short, slow thrusts. Copulation was followed by self-grooming that lasted for 2 min in the male and 2–3 s in the female (Birkenholz and Wirtz 1965).

In captivity, adults of both sexes built globular nests in which parturition occurred. The male sometimes stayed in the nest with the adult female and young but usually stayed outside for up to 7 days after birth. The adult female protected young by rushing toward and attempting to bite objects introduced into the nest. After such a disturbance, the female rearranged young beneath her and covered herself with bedding material. Young Sumichrast's vesper rats remained attached to nipples of the mother for most of the first 2 weeks of life. They were detached if the mother voluntarily left the nest but remained attached if she was disturbed (Birkenholz and Wirtz 1965).

Total length, length of tail, and length of hind foot of 2 neonates from different captive litters were 77.0, 22.5, 10.0 and 72.0, 22.0, 9.5 mm, respectively; both weighed 4.7 g. Young were born with haired upperparts and naked venters, erupted lower incisors, toes fused except for distal 25%, and soft, distinct claws. Newborn Sumichrast's vesper rats made feeble squeaks and executed crawling movements with forelimbs. Pinnae unfolded on 1st day. By end of 1st week, pelage took on a glossy appearance; hair was fawn-colored on sides, brownish-gray middorsally, white on venter, and black on tail, ears, nose, and eyelids. Toes, which carried sharply-hooked claws 1.5 mm in length, were completely separated by end of 1st week. Coordination increased rapidly during 1st week. At 2 days, young were able to crawl slowly, at 3 days could cling to a finger held upright, and by 5 days could climb with front legs. By end of 2nd week, movements were well coordinated; young could climb on branches using all 4 legs and right themselves if turned over. When disturbed, they made rapid chirps. Young ≤14 days old chilled quickly when removed from nest. By 14 days, pelage pattern resembled that of adult. Nursing stopped during week 3. Eyes opened at 15–18 days of age; thereafter, young showed little fear. They left the nest at 17 days. They crawled slowly along branches and ran with rapid spurts. Vibrissae and ears twitched rapidly. Young occasionally shuddered between active periods (Birkenholz and Wirtz 1965). In Nicaragua, juveniles were molting in March and July; molt from juvenile to adult pelage begins ventrally, proceeds over sides to meet middorsally, then proceeds anteriorly and posteriorly, with head and rump molting last (Genoways and Jones 1972). Molt into adult pelage normally was completed during 4th week (Birkenholz and Wirtz 1965). Adult *N. sumichrasti* were molting in July; no molting pattern was discernable in adults or subadults (Genoways and Jones 1972). Vibrissae grew to 50 mm in length by end of 4th week and to 65 mm by end of 9th week.

At 2 months of age, 2 males born in mid-June reached the subadult stage of development and had testes measuring 5 by 3 mm and 4 by 3 mm (Sánchez-Hernández et al. 1999). Body mass of adults was attained when >2 months old (Ceballos 1990). Sexual maturity was noted in some individuals at ca. 75 days (Birkenholz and Wirtz 1965).

ECOLOGY. In Jalisco, Mexico, *N. sumichrasti* feeds on hard fruits of false evergreen needle bush (*Jacquinia pungens*). Captive animals thrived and reproduced on a diet of oats, seeds, and fruits including calabash tree (*Cresentia alata*), purple mombin (*Spondias purpurea*), and wild almond (*Terminalia catappa*—Ceballos 1990). In Nicaragua, food consisted primarily of fruits, seeds, and other vegetative matter. During the wet season, individuals ate fruits of borage (*Cordia diversifolia*). In the dry season, they ate figs (*Ficus*—Genoways and Jones 1972). *N. sumichrasti* also feeds on fruits of madders (*Hoffmania* and *Psychotria gracilis*—Eisenberg 1989) and on moths (Lepidoptera—Reid 1997). In Costa Rica, a Sumichrast's vesper mouse fed on leaves of *Daphnopsis americana*, which contains several poisonous secondary plant compounds. It ate only the sides and tip, avoiding the midrib. Only young leaves were consumed (Timm and Vriesendorp 2003).

Throughout its range, *N. sumichrasti* occurs in evergreen lowland and lower montane forests, old secondary and riparian forests, and semideciduous forests (Emmons 1997). In Jalisco, Sumichrast's vesper rat occurred in arroyo forest habitat (Ceballos 1990). In Colima, 1 was on the edge of a coconut grove, in thick, thorny undergrowth in a tree ca. 0.5 m aboveground. This location was <1 km from the ocean and <3 m above sea level (J. L. Hunt and T. L. Best, pers. comm.). In Oaxaca, *N. s. pallidulus* inhabits arid wooded mountain slopes on the southern side of the Isthmus of Tehuantepec, whereas *N. s. sumichrasti* inhabits more humid areas in northern Oaxaca (Goodwin 1969). In Veracruz, 1 was in a cane thicket (Sumichrast 1882). In Panama, *N. sumichrasti* occurs in 2nd-growth, dry tropical forest (Fleming 1970). *N. sumichrasti* is rare in evergreen forest of central and western Panama (Handley 1966).

In Nicaragua, *N. sumichrasti* occurs in cloud forest where understory has been cleared for agriculture and was in dense, 2nd-growth scrub forest along a small stream (Jones and Genoways 1970). Also in Nicaragua, it was in semievergreen forest with a tropical wet-and-dry climate in a riparian remnant running through sugar cane fields. Vegetation was composed of borage (*Cordia diversifolia*) and 2 species of madders (Rubiaceae), with woody vines intertwined (Genoways and Jones 1972). *N. sumichrasti* is ecologically similar to *Ototylomys phyllotis*, but in Nicaragua, where the species are sympatric, competition between the 2 appears to be minimal because *O. phyllotis* usually remains at a lower level than *N. sumichrasti* (Lawlor 1969).

In Nicaragua, the trombiculid *Microtrombicula mesoamericana* has been reported from Sumichrast's vesper rat (Webb and Loomis 1971). Also in Nicaragua, 36 of 85 specimens harbored the laelapid mite, *Androlaelaps fahrenholzi*; 10 carried another undescribed species of *Androlaelaps*, and 1 had another laelapid (*Eubrachylaelaps circularis*). Three specimens had a trombiculid (*Fonsecia longicalcar*). Other species collected from specimens of *Nyctomys* included a trombiculid, *Speleocola secunda* (from 1 specimen); a tick, *Ornithoderas talaje* (from 3 specimens); and unidentified *Ornithoderas* (from 1 specimen). Mites (*Eutrombicula alfreddugesi* and *Listrophorus*) also were found (Genoways and Jones 1972). One of 4 specimens from Panama harbored a ceratophyllid flea (*Pleochaetis dolens*—Tipton and Méndez 1966). Laelaptine mites (*Haemolaelaps glasgowi*) were on 4 females from Panama (Tipton et al. 1966). Mites (*Paralabidophorus guatema-*

lensis and *Echimyopus nyctomys*) were on specimens from Guatemala (Mendez 1993).

A specimen injected with *Trypanosoma cruzi* showed a high resistance to infection (Petana 1969). One of 8 specimens examined in Belize was infected with leishmaniasis (*Leishmania mexicana*). The infection resulted in a 5-mm bump at the base of the tail and abundant Leishman-Donovan bodies (Lainson and Strangways-Dixon 1964). *Leishmania mexicana* has been collected from *Nyctomys sumichrasti* in Belize for use in research (Bray 1983).

BEHAVIOR. *Nyctomys sumichrasti* inhabits middle and upper levels of forest, usually above 3 m and at least as high as 22 m; it rarely descends to the ground (Emmons 1997; Timm and LaVal 2000). In Jalisco, an adult male was flushed in a semideciduous, subhumid forest by hammering on a downed tree trunk (López-Forment et al. 1971). In Jalisco, 5 individuals were captured in trees at heights of 0.7–7.0 m (Ceballos 1990). In another study in Jalisco, 8 individuals were captured in traps placed in trees; none was captured on the ground in 8,400 trap nights (Collett et al. 1975). In Nicaragua, *N. sumichrasti* was observed low in forest, at heights of 3–6 m. During the wet season, it remained much higher in fig trees (*Ficus*), where it appeared to be feeding. It rarely came to the ground; few individuals near ground were adults (Genoways and Jones 1972). In Costa Rica, *Nyctomys sumichrasti* may be common in the forest, but seldom is observed because of its nocturnal, arboreal habits (Timm et al. 1989).

Nests may be on branches or in tree cavities. In Jalisco, 4 nests were made of plant fibers and leaves in the upper forks of trees (Ceballos 1990). In Veracruz, Mexico, tree cavities used for nesting were 15–33 cm in diameter with an opening in the trunk of 3–7 cm in diameter. Nests, which were irregular masses of shredded bark at the bottom of the hollow, were often built on top of older nests; 1 hollow contained 5 layers of nesting material. Nests had a central cavity in the form of a flattened sphere ca. 10 cm across and 8 cm high. Insects, spiders, and scorpions were in nests, but no ectoparasites (Hall and Dalquest 1963). In Panama, a nest was in a hog plum tree (*Spondias mombin*—Fleming 1970). In Costa Rica, Sumichrast's vesper rat may inhabit buildings, where it may make nests in papers or clothing (Timm and Vriesendorp 2003).

In Panama, individuals of both sexes and all ages used the same arboreal pathways. Home ranges included both horizontal and vertical dimensions. Average distance between successive captures for 3 females was 28–54 m, with greatest distance between successive captures 30–100 m. Average distance between successive captures for an adult male was 69 m; greatest distance was 131 m (Fleming 1970).

Sumichrast's vesper rat is agile in trees, but less so on the ground. When released after capture, individuals immediately ran up trees or bounded for a short distance along the ground before climbing a tree (Fleming 1970). It runs relatively slowly (Hall and Dalquest 1963). When disturbed in her nest by day, a mother will flee along horizontal branches, with her young clinging tightly by their mouths to her teats (Emmons 1997).

In captivity, *N. sumichrasti* moves deliberately when feeding, manipulating food, or grooming but travels in a quick, jerky, manner, even when not excited. The animals twitch their vibrissae and move ears backward and forward independently when exhibiting inquisitive behavior. Tail is carried over back during climbing. Claws are short, recurved to facilitate climbing, and allow animals to hold on to cloth cage walls with only the hind feet. Sumichrast's vesper rats are able to hold their body with hind feet at right angles to the cage wall while eating or grooming. They often perched bipedally on branches when resting, with front legs and head resting on chest (Birkenholz and Wirtz 1965). In the wild, a Sumichrast's vesper rat was observed hanging by its hind feet in a strong wind to obtain food. After reaching fruit, it sat on its haunches on a branch, balancing with its tail, and manipulated the fruit with its forefeet. It ate only pulp and discarded seeds and skin (Timm and LaVal 2000).

Nyctomys sumichrasti is primarily nocturnal, with some diurnal activity reported (Eisenberg 1989). In captivity, *N. sumichrasti* was nocturnal, although individuals might leave the nest during day to drink or urinate. Ca. 2 h after dark, animals left the nest to feed, followed by a period of activity. A period of inactivity lasted ca. 3 h, followed by another bout of feeding and activity. In a captive experiment, *N. sumichrasti* was more loyal to location of a nest box than to the nest box itself, although the box retained a strong odor (Birkenholz and Wirtz 1965).

In captivity, commonest vocalization was a faint, rapid, high-pitched, almost-musical chirp or trill given when the animal was excited or when young were at play. Adult males sometimes directed a low-pitched "groomp" ca. every 5 s for ≤1 min toward their mate in a nest box. While grunting in this fashion, their ears and vibrissae twitched (Birkenholz and Wirtz 1965). In the wild, *N. sumichrasti* make calls consisting of single chirps of a peak frequency of 3.5 kHz repeated at irregular intervals. These vocalizations are used to locate and navigate toward prospective mates (Timm and LaVal 2000).

In captivity in a large cage, Sumichrast's vesper rat remained in family groups but would not tolerate, and was aggressive toward, introduced strangers. Animals reared separately often did not associate when paired, and placing strangers in enclosures with established pairs resulted in injuries from fighting (Birkenholz and Wirtz 1965). Aggressive behavior toward strangers may include hisses and squeaks (Reid 1997). One lived in captivity for 5 years 2 months. Individuals occasionally stow away on banana boats, reaching the United States (Nowak and Paradiso 1983), but no populations have become established.

GENETICS. The diploid number of chromosomes is 50–52 (Bradley and Ensink 1987; Haiduk et al. 1988; Lee and Elder 1977). Karyotype of a female *N. s. florencei* from Honduras consisted of 1 large and 1 small pair of biarmed chromosomes, 22 pairs of acrocentric somatic chromosomes, and a pair of a large subtelocentric X chromosomes (Bradley and Ensink 1987; Lee and Elder 1977). Karyograms of 1 male and 1 female *N. s. sumichrasti* from Jalisco are similar in simplicity to those of *Baiomys taylori*, *Tylomys panamensis*, and several species of *Neotoma* and *Peromyscus*. Karyotype is different in appearance from that of members of the thomasomyine group, neotomyine-peromyscine group, and South American cricetines (Lee and Elder 1977).

REMARKS. *Nyctomys sumichrasti* is endemic to Middle America, and the taxon is of enigmatic phyletic position. Hershkovitz (1962) placed it with thomasomyine group of South American sigmodontines. Others suggest distant kinship to neotomine-peromyscines or a cladistic origin prior to both North and South American sigmodontines (Carleton 1980; Voss and Linzey 1981). Based on bacular structure and G-banded chromosomes, *Nyctomys* may be more closely related to *Neotoma* than to *Oryzomys* (Burt 1960; Haiduk et al. 1988). *Nyctomys* may be most closely related to *Otonyctomys*; these genera from a sister group to 2 other Middle American endemics *Tylomys* and *Ototylomys*. The 4 genera may be remnants of a clade that diverged relatively early in evolutionary history of sigmodontine rodents (Carleton 1980; Engel et al. 1998; Steppan 1995). Following Carleton (1980), Reig (1984) arranged *Nyctomys* and its 3 close generic relatives in the separate subfamily Tylomyinae.

Nyctomys is from the Greek *nyx* meaning night and *mys* meaning mouse (Jaeger 1955). The specific epithet *sumichrasti* is a patronym for F. Sumichrast, who collected the 1st specimen (Alvarez 1963). Local names for *N. sumichrasti* include ratón trepador (Eisenberg 1989), rata cosechadora de Sumichrasti, and rata vespertina (Mendez 1993).

We thank L. L. Thornton, A. M. Krista, and other personnel in the Interlibrary Loan Department at Auburn University R. B. Draughon Library for assistance in obtaining articles from other institutions; R. M. Timm and T. Holmes, University of Kansas Museum of Natural History, for loaning us the specimen illustrated in Fig. 2; T. E. Rodriguez for preparing Fig. 3; and M. W. Carleton, R. M. Timm, and an anonymous reviewer for critically evaluating an early draft of the manuscript. This is a contribution of the Alabama Agricultural Experiment Station.

LITERATURE CITED

ALVAREZ, T. 1963. The type locality for *Nyctomys sumichrasti* Saussure. Journal of Mammalogy 44:582–583.

ARATA, A. A. 1964. The anatomy and taxonomic significance of the male accessory reproductive glands of muroid rodents. Bulletin of the Florida State Museum, Biological Sciences 9: 1–42.

BANGS, O. 1902. Chiriqui mammalia. Bulletin of the Museum of Comparative Zoology 39:17–51.

BIRKENHOLZ, D. E., AND W. O. WIRTZ, II. 1965. Laboratory observations on the vesper rat. Journal of Mammalogy 46:181–189.

BRADLEY, R. D., AND J. ENSINK. 1987. Karyotypes of five cricetid rodents from Honduras. Texas Journal of Science 39:171–175.

BRAY, R. S. 1983. *Leishmania*: chemotaxic responses of promastigotes and macrophages in vitro. Journal of Protozoology 30:322–329.

BURT, W. H. 1960. Bacula of North American mammals. Miscellaneous Publications of the Museum of Zoology, University of Michigan 113:1–75.

CARLETON, M. D. 1973. A study of gross stomach morphology in New World Cricetinae (Rodentia, Muroidea), with comments on functional interpretations. Miscellaneous Publications of the Museum of Zoology, University of Michigan 146:1–43.

CARLETON, M. D. 1980. Phylogenetic relationships in neotomine-peromyscine rodents (Muroidea) and a reappraisal of the dichotomy within New World Cricetinae. Miscellaneous Publications of the Museum of Zoology, University of Michigan 157: 1–146.

CEBALLOS, G. 1990. Comparative natural history of small mammals from tropical forests in western Mexico. Journal of Mammalogy 71:263–266.

CEBALLOS, G., AND A. MIRANDA. 2000. Guia de campo de los mamiferos de la costa de Jalisco, Mexico. Fundacion Ecologica de Cuixmala, A. C., Universidad Natcional Autonoma de Mexico, La Huerta, Jalisco, Mexico.

COLLETT, S. F., C. SÁNCHEZ-HERNÁNDEZ, K. A. SHUM, JR., W. R. TESKA, AND R. H. BAKER. 1975. Algunas características poblacionales demográficas de pequeños mamíferos en dos habitats mexicanos. Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoolgía 1:101–123.

DE SAUSSURE, M. H. 1860. Note sur complementaire quelques mammifères du Mexique. Revue et Magasin de Zoologie, Pure et Appliquee, serie 2,12:97–110.

EISENBERG, J. F. 1989. Mammals of the Neotropics. The northern Neotropics: Panama, Colombia, Venezuela, Guyana, Suriname, French Guiana. University of Chicago Press, Illinois 1:1–449.

ELLERMAN, J. R., R. W. HAYMAN, AND G. W. C. HOLT. 1941. The families and genera of living rodents, with a list of named forms (1758–1936). British Museum (Natural History), London, United Kingdom 2:1–690.

EMMONS, L. H. 1997. Neotropical rainforest mammals: a field guide. University of Chicago Press, Illinois.

ENGEL, S. R., K. M. HOGAN, J. F. TAYLOR, AND S. K. DAVIS. 1998. Molecular systematics and paleobiogeography of the South American sigmodontine rodents. Molecular Biology and Evolution 15:35–49.

FITZINGER, L. J. 1867. Versuch einer natürlichen Anordnung de Nagethiere (Rodentia). Sitzungberichte der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften, Wein 56(1 Abtheilung, Heft 1):57–168.

FLEMING, T. H. 1970. Notes on the rodent faunas of two Panamanian forests. Journal of Mammalogy 51:473–490.

GENOWAYS, H. H., AND J. K. JONES, JR. 1972. Variation and ecology in a local population of the vesper mouse (*Nyctomys sumichrasti*). Occasional Papers, The Museum, Texas Tech University 3:1–22.

GENOWAYS, H. H., R. M. TIMM, AND M. D. ENGSTROM. In press. Natural history and karyotype of the Yucatán vesper mouse, *Otonyctomys hatti*. In Contribuciones mastozoológicas en homenaje a Bernardo Villa (V. Sánchez-Cordero and R. Medellin, eds.). Publicaciones Especiales, Asociación Mexicana de Mastozoologia, Mexico City, Distrito Federal, Mexico.

GOLDMAN, E. A. 1916. A new vesper rat from Nicaragua. Proceedings of the Biological Society of Washington 29:155–156.

GOLDMAN, E. A. 1937. New rodents from Middle America. Journal of the Washington Academy of Sciences 27:418–423.

GOODWIN, G. G. 1946. Mammals of Costa Rica. Bulletin of the American Museum of Natural History 87:271–473.

GOODWIN, G. G. 1969. Mammals from the state of Oaxaca, Mexico, in the American Museum of Natural History. Bulletin of the American Museum of Natural History 141:1–269.

HAIDUK, M. W., C. SANCHEZ-HERNANDEZ, AND R. J. BAKER. 1988. Phylogenetic relationships of *Nyctomys* and *Xenomys* to other cricetine genera based on data from G-banded chromosomes. Southwestern Naturalist 33:397–403.

HALL, E. R. 1981. The mammals of North America. Second edition. Volume 2. John Wiley & Sons, Inc., New York.

HALL, E. R., AND W. W. DALQUEST. 1963. The mammals of Veracruz. University of Kansas Publications, Museum of Natural History 14:165–362.

HANDLEY, C. O., JR. 1966. Checklist of the mammals of Panama. Pp. 753–795 in Ectoparasites of Panama (R. L. Wenzel and V. J. Tipton, eds.). Field Museum of Natural History, Chicago, Illinois.

HERSHKOVITZ, P. 1962. Evolution of Neotropical cricetine rodents (Muridae) with special reference to the phyllotine group. Fieldiana: Zoology 46:1–524.

HOOPER, E. T., AND G. G. MUSSER. 1964. The glans penis in Neotropical cricetines (family Muridae) with comments on classification of muroid rodents. Miscellaneous Publications of the Museum of Zoology, University of Michigan 123:1–57.

JAEGER, E. C. 1955. A source-book of biological names and terms. Third edition. Charles C. Thomas Publisher, Springfield, Illinois.

JONES, J. K., JR., AND H. H. GENOWAYS. 1970. Harvest mice (genus *Reithrodontomys*) of Nicaragua. Occasional Papers of the Western Foundation of Vertebrate Zoology 2:1–16.

LAINSON, R., AND J. STRANGWAYS-DIXON. 1964. The epidemiology of dermal leishmaniasis in British Honduras: part II. Reservoir-hosts of *Leishmania mexicana* among the forest rodents. Transactions of the Royal Society of Tropical Medicine and Hygiene 58:136–153.

LAURIE, E. M. O. 1953. Rodents from British Honduras, Mexico, Trinidad, Haiti and Jamaica collected by Mr. I. T. Sanderson. Annals and Magazine of Natural History, series 12, 6:382–394.

LAWLOR, T. E. 1969. A systematic study of the rodent genus *Ototylomys*. Journal of Mammalogy 50:28–42.

LEE, M. R., AND F. F. B. ELDER. 1977. Karyotypes of eight species of Mexican rodents (Muridae). Journal of Mammalogy 58:479–487.

LÓPEZ-FORMENT, C. W., C. SÁNCHEZ-HERNÁNDEZ, AND B. VILLA-RAMÍREZ. 1971. Algunos mamíferos de la región de Chamela, Jalisco, México. Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología 42:99–106.

MENDEZ, E. 1993. Los reodores de Panama. Impresora Pacifico, Panama.

MUSSER, G. G., AND M. D. CARLETON. 1993. Family Muridae. Pp. 501–755 in Mammal species of the world: a taxonomic and geographic reference (D. E. Wilson and D. M. Reeder, eds.). Second edition. Smithsonian Institution Press, Washington, D.C.

NOWAK, R. M., AND J. L. PARADISO. 1983. Walker's mammals of the world. Fourth edition. Johns Hopkins University Press, Baltimore, Maryland.

PETANA, W. B. 1969. American trypanosomiasis in British Honduras. VI.—A natural infection with *Trypanosoma* (*Schizotrypanum*) *cruzi* in the opossum *Didelphis marsupialis* (Marsupialia, Didelphoidea), and experimental investigations of different wild-animal species as possible reservoirs for the parasite. Annals of Tropical Medicine and Parasitology 63:47–56.

REID, F. A. 1997. A field guide to the mammals of Central America and southeast Mexico. Oxford University Press, New York.

SÁNCHEZ-HERNÁNDEZ, C., M. L. ROMÉRO-ALMARAZ, R. D. OWEN, A. NÚÑEZ-GARDUÑO, AND R. LÓPEZ-WILCHIS. 1999. Noteworthy records of mammals from Michoacán, México. Southwestern Naturalist 44:231–235.

SUMICHRAST, F. 1882. Enumeracion de las especies de mamíferos, aves, reptiles y batracios observados en la parte central y meridional de la República Mexicana. La Naturaleza 5:322–328.

STEPPAN, S. J. 1995. Revision of the tribe Phyllotini (Rodentia: Sigmodontinae), with a phylogenetic hypothesis for the Sigmodontinae. Fieldiana: Zoology (New Series) 80:1–112.

TIMM, R. M., AND R. K. LAVAL. 2000. Mammals. Pp. 223–244 in Monteverde: ecology and conservation of a tropical cloud forest (N. M. Nadkarni and N. T. Wheelwright, eds.). Oxford University Press, New York.

TIMM, R. M., AND C. VRIESENDORP. 2003. Observations on feed-

ing behavior in the vesper mouse, *Nyctomys sumichrasti*. Zeitschrift für Säugetierkunde 68:126–128.

TIMM, R. M., D. E. WILSON, B. L. CLAUSON, R. K. LAVAL, AND C. S. VAUGHAN. 1989. Mammals of the La Selva—Braulio Carrillo complex, Costa Rica. North American Fauna 75:1–163.

TIPTON, V. J., R. M. ALTMAN, AND C. M. KEENAN. 1966. Mites of the subfamily Laelaptinae in Panama (Acarina: Laelaptidae). Pp. 23–45 in Ectoparasites of Panama (R. L. Wenzel and V. J. Tipton, eds.). Field Museum of Natural History, Chicago, Illinois.

TIPTON, V. J., AND E. MÉNDEZ. 1966. The fleas (Siphonaptera) of Panama. Pp. 289–338 in Ectoparasites of Panama (R. L. Wenzel and V. J. Tipton, eds.). Field Museum of Natural History, Chicago, Illinois.

TOMES, R. F. 1861. Report of a collection of mammals made by Osbert Salvin, Esq., F.Z.S., at Dueñas, Guatemala; with notes on some of the species by Mr. Fraser. Proceedings of the Zoological Society of London 29:278–288.

TRUE, F. W. 1894. Description of a new species of mouse (*Sitomys decolorus*) from Central America. Proceedings of the United States National Museum 16:689–690.

VOSS, R. S., AND A. V. LINZEY. 1981. Comparative gross morphology of male accessory glands among Neotropical Muridae (Mammalia: Rodentia) with comments on systematic implications. Miscellaneous Publications of the Museum of Zoology, University of Michigan 159:1–41.

WATERHOUSE, G. H. 1839. Zoology of the voyage of H.M.S. Beagle. Part II, Mammalia. Smith, Elder, and Co., London, United Kingdom.

WEBB, J. P., JR., AND R. B. LOOMIS. 1971. The subgenus *Scapuscutala* of the genus *Microtrombicula* (Acarina: Trombiculidae) from North America. Journal of Medical Entomology 8:319–329.

Associate editors of this account were GAIL MICHENER, ELAINE ANDERSON, and KRIS HELLGREN. Editor was VIRGINIA HAYSSEN.

J. L. HUNT, J. E. MORRIS, AND T. L. BEST, DEPARTMENT OF BIOLOGICAL SCIENCES AND ALABAMA AGRICULTURAL EXPERIMENT STATION, 331 FUNCHESS HALL, AUBURN UNIVERSITY, ALABAMA 36849-5414, UNITED STATES.