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BATS OF COLIMA, MEXICO: NEW RECORDS, GEOGRAPHIC DISTRIBUTION, AND REPRODUCTIVE CONDITION

CORNELIO SÁNCHEZ-HERNÁNDEZ, MARÍA DE LOURDES ROMERO-ALMARAZ, GARY D. SCHNELL, MICHAEL L. KENNEDY, TROY L. BEST, ROBERT D. OWEN, AND CELIA LÓPEZ-GONZÁLEZ

Departamento de Zoología, Instituto de Biología, Universidad Nacional Autónoma de México, A.P. 70-153, Coyoacán, México, D.F., 04510, México (CSH); Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos, avenida Universidad 1001, colonia Chamilpa, Cuernavaca, Morelos, 62210, México (MLRA); Sam Noble Oklahoma Museum of Natural History and Department of Zoology, University of Oklahoma, 2401 Chautauqua Avenue, Norman, OK 73072, USA (GDS); Department of Biology, University of Memphis, Memphis, TN 38152, USA (MLK); Department of Biological Sciences and Alabama Agricultural Experiment Station, Auburn University, AL 36849, USA (TLB); Department of Biological Sciences, Texas Tech University, Lubbock, TX 79409, USA (RDO); and CIIDIR-COFAA, Unidad Durango, Sigma s/n, Fraccionamiento 20 de Noviembre II, Durango, Durango, 34220, México (CLG).

Corresponding author: Gary D. Schnell
e-mail: gschnell@ou.edu; phone (405) 325-5050; FAX (405) 325-7699

ABSTRACT

Information on geographic distribution, habitat, measurements, and reproductive condition of 28 species and subspecies of bats from Colima, Mexico, is provided. Thirteen species and subspecies are new records for the state. We provide additional data on another 15 little-known species and subspecies in Colima. Twelve of the 13 new records extend distributions of the species or subspecies between 20 and 160 km from the closest known localities in the states of Jalisco and Michoacán. For *Myotis albescens* the closest previous record is 950 km to the east-southeast in the state of Veracruz in eastern Mexico. Eighteen species or subspecies in Colima are known from five or fewer specimens, which points out that knowledge concerning numerous species of bats in the state and in Mexico in general is still relatively limited.

Key words: Colima, Mexico, bats, Chiroptera, distribution, reproductive condition

RESUMEN

Se aporta información para 28 especies o subespecies de murciélagos del estado de Colima, México, sobre distribución, hábitat, medidas y aspectos de reproducción. Trece especies o subespecies son nuevos registros para el estado, y de otras 15 especies o subespecies se amplía el conocimiento sobre la especie. Doce de los 13 nuevos registros amplían su distribución conocida entre 20 y 160 km a partir de los estados de Jalisco y Michoacán, con excepción de *Myotis albescens* que extiende su rango en aproximadamente 950 km a partir del estado de Veracruz, en el extremo este de México. Dieciocho especies se registran con cinco o menos especímenes, lo que muestra que el conocimiento sobre algunos murciélagos en este estado, y de manera general en México, es aún muy limitado.

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Colima, one of the smallest states in Mexico, is located in west-central Mexico at the interface between Nearctic and Neotropical biotas. Colima's topography varies from sea level to 2200 m in elevation. The state has a high diversity of climatic regions and vegetation types that includes pine-oak forest, cloud forest, semideciduous dry forest, deciduous dry forest, and secondary vegetation (Rzedowski 1978).

To date, including this report, 65 (47%) of 137 species of bats recorded for Mexico (Ramírez-Pulido et al. 1996) have been found in Colima. In spite of the relatively high number of species recorded, the state's chiropteran fauna has received relatively little attention from mammalogists, with the primary studies being those of Gardner (1962a), Villa-R. (1967), and Kennedy et al. (1984). López-Wilchis and López Jardinez (1998, 1999, 2000) have detailed tabulations of specimens residing in museums in the United States and Mexico by species, Mexican state, and museum; they listed a number of specimens included in this report. Íñiguez Dávalos (1993) reported on the bats of the "Reserva de la Biósfera Sierra de Manantlán, Jalisco-Colima." However, precise locations were not specified, only a small part of the reserve is in Colima, and the Colima portion has only limited accessibility due to topography and lack of direct road access; thus, it is unlikely that any of the specimens cited by Íñiguez Dávalos (1993) are from Colima.

We conducted limited fieldwork in Colima from 1972 to 1979 and then initiated a detailed mammalian survey of the state in 1997. In this paper, we report on noteworthy new records of bats for Colima based on specimens resulting from our fieldwork, as well as other museum specimens. In addition, basic reproductive and ecological information is provided.

METHODS AND MATERIALS

Our survey has involved fieldwork, as well as examination of mammal collections in Mexico and the United States. Intensive field studies in the years 1997–2001 were conducted in January. Most bats were captured using mist nets erected about 1800 h and checked until 2300 h; sometimes nets were left open overnight and checked again at 0630 h the next morning. We also used sweep nets and other types of nets at roost sites. For most specimens captured, we gathered information on natural history and reproductive condition, preserving skins, skeletons, and tissues; ectoparasites and brain tissues were collected from some specimens.

We follow the nomenclature of Ramírez-Pulido et al. (1996) unless otherwise indicated. One place where we have deviated concerns the specific epithets for three species of *Myotis* (*M. auriculus apache, M. californicus mexicana,* and *M. velifer velifer*). Woodman (1993) had proposed that certain changes in endings were necessary in specific names associated with mammalian generic names ending in *-otis* so as to be in conformance with rules of nomenclature; however, as is the case for most recent authors, we have not followed Woodman's recommendations given Prichard's (1994) reappraisal of the issue.

In accounts of species and subspecies, external, embryo, and testis measurements are in millimeters and mass in grams. Measurements of embryos and testes usually are given as length and width, but sometimes only length is provided. Reproductive data were not available for all specimens.

RESULTS AND DISCUSSION

We document 13 new species and subspecies in Colima and provide additional records for 15 other species and subspecies. Accounts for individual taxa are provided below and localities for each of the specimens cited are summarized in Table 1, which also indicates where specimens are deposited. Collecting localities are depicted in Figure 1, and external and cranial measurements (taken by CSH and MLRA following Hall 1981) are summarized in Appendix 1. In the accounts we identify the collectors (using initials when the collector was one of the authors) for all specimens. For several species we have included comments on taxonomy and the basis of identification of specimens.

1. *Diclidurus albus* Wied-Neuwied, 1820

Specimens examined, 3. The specimens are all males, one captured in February 1977 (collector CSH) and two in January 2000 (H. L. Hopkins and MLK). The two obtained in January were shot while they were hanging among the leaves of coconut palms (*Cocos nucifera*), one at a height of 6 m and the other at 10 m. The former was in an orchard of coconut palms, with tamarind (*Tamarindus indica*) and mango (*Mangifera indica*) trees. The second was close to a swamp with mangroves (*Rhizophora mangle*) and cattails (*Typha*). Predominant natural vegetation in the surrounding area was semideciduous dry forest.

The two bats obtained in January were adults with inguinal testes (3×2); no reproductive information was recorded for the specimen captured

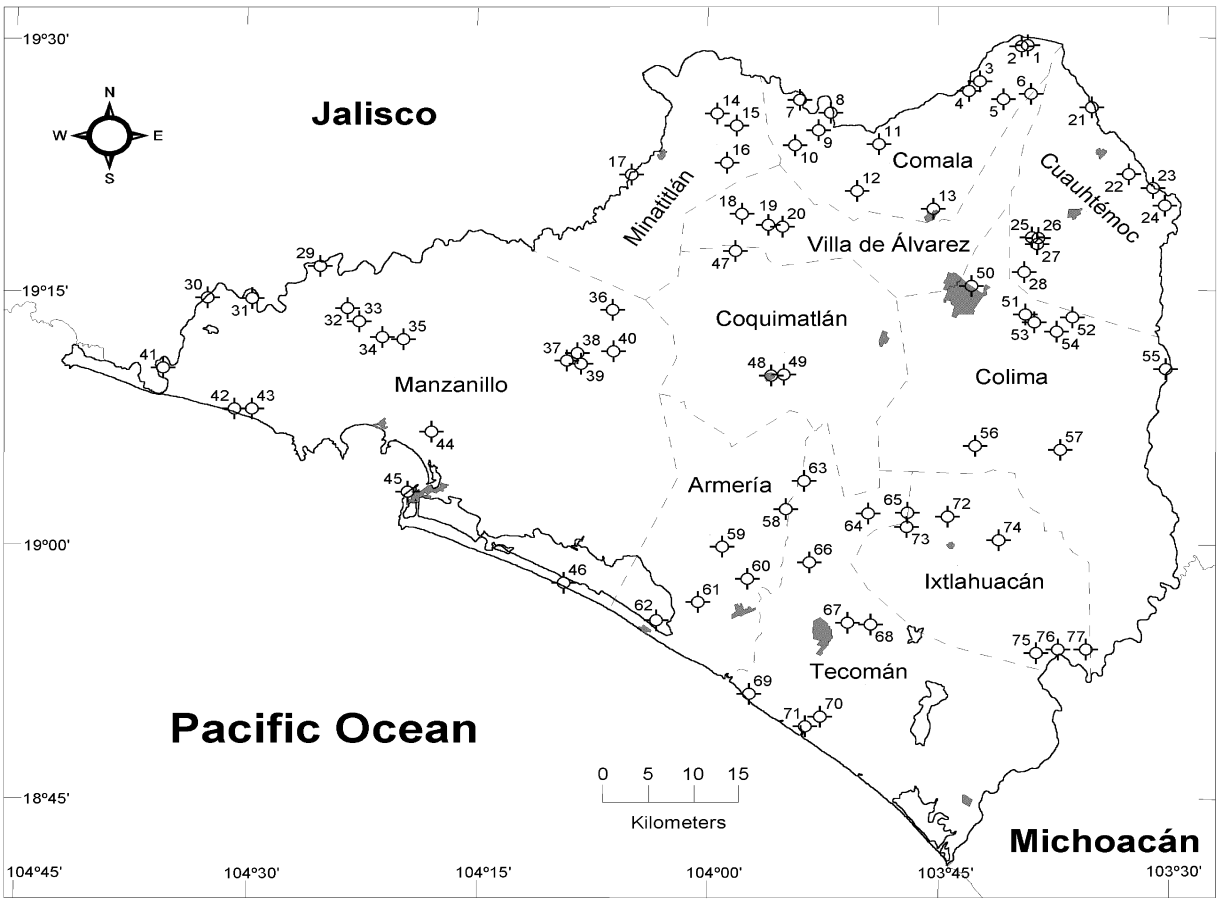

Figure 1. Map showing 84 localities in Colima, Mexico, for 28 species and subspecies of bats included in this report. Numbered symbols correspond to localities listed in Table 1. Some numbered symbols on map represent multiple localities that are geographically close: (symbol 3) 2 localities; (symbol 10) 2; (symbol 19) 4; and (symbol 26) 3. Bodies of water are shown, as are some cities and towns. Dashed lines indicate geographic boundaries of 10 municipalities in the state that are named after the principal city or town in each.

in February. In the dorsal part of the uropatagium, the skins of these specimens have a keratin capsule, a unique feature of the genus found in breeding males (Sánchez-Hernández et al. 1990).

These individuals represent the second, third, and fourth specimens for the state. The species has been reported previously at Boca de Pascuales, 15 km SW Tecomán, 10 m (Sánchez-Hernández et al. 1990).

2. *Noctilio leporinus mastivus* (Vahl, 1797)

Specimens examined, 1. One adult male (no reproductive information recorded; E. W. Nelson) was captured in February 1892 in Manzanillo. The specimen is preserved in alcohol. This represents the second locality record for Colima. Measurements in Appendix 1 are from 11 specimens cited by Kennedy et al. (1984) that were captured 3 mi [4.8 km] E Cuyutlán, Colima, in January 1976.

3. *Glyphonycteris sylvestris* Thomas, 1896

Specimens examined, 2. Specimens were obtained in September 1959 (A. L. Gardner), the first being a postlactating female and the second a male with no reproductive data. These are the second and third specimens for Colima; the species was collected previously at El Mixcoate [Mixcuate], 9 km W Pueblo Juárez (Villa-R. 1967). We have followed Simmons and Voss (1998) in placing the species in the genus *Glyphonycteris* instead of *Micronycteris.*

4. *Micronycteris megalotis mexicana* Miller, 1898

Specimens examined, 69. The species has been recorded in Colima during eight months: January (1997, 1, A. W. Reed; 1998, 26, TLB, B. R. Laseter, and E. L. Warr; 1999, 11, MLK, B. R. Laseter, and H. G. Wang; 2001, 1, CSH); February (1892, 2, E. W. Nelson; 1 listed in López-

Table 1. Numbers of specimens of 28 species or subspecies of bats from 84 localities in Colima, Mexico.

	Locality[a]	Species or subspecies[b]								
		1	2	3	4	5	6	7	8	9
1.	Comala, 2 km NE Yerbabuena, 1500 m									1
2.	Comala, 1 km E Yerbabuena, 1470 m				12					
3.	Comala, laguna La María, La Becerrera									
3a.	Comala, 14.5 mi [23.3 km] N Colima (LACM)									
4.	Comala, San Antonio (LACM)				3					
5.	Comala, 4 km E San Antonio				5					
6.	Comala, 6 km E San Antonio				9					
7.	Comala, Campo Uno, 19º 26' 13.6" N, 103º 53' 50.7" W, 2220 m									
8.	Comala, 3.5 km E Campo Uno, 19º 26' 13.6" N, 103º 53' 50.7" W, 2220 m									
9.	Comala, 10 mi [16.1 km] NW Comala (LACM)									
10.	Comala, Cerro Grande (LACM)									
10a.	Comala, Cerro Grande, near Pueblo Nuevo (LACM)									
11.	Comala, 14 km NE Pueblo Nuevo, 1720 m (OMNH)									1
12.	Comala, 10 mi [16.1 km] NW Colima (LACM)									
13.	Comala, Comala (LACM)						2			
14.	Minatitlán, Rastrojitos, 3 km NW Ranchitos, 1650 m									1
15.	Minatitlán, 1 km NW Ranchitos, 1550 m									
16.	Minatitlán, Los Llanitos (LACM)				2					
17.	Minatitlán, El Salto, 4 km WSW Minatitlán, 19º 22.16' N, 104º 05.06' W, 630 m									
18.	Villa de Álvarez, 3 km W Pueblo Nuevo (LACM)				5					
19.	Villa de Álvarez, Miscuate [Mixcuate], 11 mi [17.7 km] W Comala (LACM)									
19a.	Villa de Álvarez, Mixcuate (LACM)									
19b.	Villa de Álvarez, Mixcuate (Miscuate) (LACM)					1			2	1
19c.	Villa de Álvarez, El Mixcoate [Mixcuate], 9 km W [sic] Pueblo Juárez, 1347 m [ca. 15 km N Pueblo Juárez] (AMNH)					1				
20.	Villa de Álvarez, Pueblo Nuevo (LACM)									
21.	Cuahutémoc, 16 mi [25.7 km] NE Colima (LACM)									
22.	Cuauhtémoc, 1 km NE Palmillas, 19º 21.51' N, 103º 32.96' W, 950 m						1			
23.	Cuauhtémoc, 4.5 km E Palmillas, 805 m						1			
24.	Cuauhtémoc, 4.5 km SE Palmillas, 19º 19.67' N, 103º 31.36' W, 860 m						1	1		
25.	Cuauhtémoc, 0.5 mi [0.8 km] W El Cóbano (UM)									
26.	Cuauhtémoc, El Cóbano, Hacienda El Cóbano, 19º 18.254' N, 103º 38.461' W, 780 m (UM)							1		
26a.	Cuauhtémoc, El Cóbano, 19º 18.254' N, 103º 38.461' W, 780 m (UM; 1 specimen IBUNAM)							1		
26b.	Cuauhtémoc, 0.5 mi [0.8 km] E El Cóbano (UM)									
27.	Cuauhtémoc, 0.5 mi [0.8 km] S El Cóbano (UM)									1
28.	Cuauhtémoc, Trapiche, Had. Vieja, Pacific sid (NMNH)								1	
29.	Manzanillo, 5 km N Los Parajes, 19º 15' 35" N, 104º 25' 30" W							1		
30.	Manzanillo, río Marabasco, 2 km NE puente Cihuatlán, 19º 15.107' N, 104º 32.265' N, 20 m									
31.	Manzanillo, El Charco (LACM)									
32.	Manzanillo, Don Tomás, 19º 13' 43" N, 104º 23' 28" W, 270 m							2		
33.	Manzanillo, La Huiscolotila									
34.	Manzanillo, 3.2 km SE La Huiscolotila, 19º 12.04' N, 104º 21.37' W, 155 m							1		

Table 1 (continued).

Species or subspecies[b]																		
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	1					1												
	2					1						1						
												1	1					
					3	1		1										
	10					1										1		
	1					2		1										
		2				1												
			1			1												
			16			13	2				1			1	13	1		
	2																	
															2			
						6		3		2							1	
	1																	
	4																	
				1	2	1											1	
				2	15	3		1			2							
								1										
															1			
						1												
								1										
	1					1												
3	3																	
	1																	
									1									
						1												
	1																	
	2																	

Table 1 (continued).

	Locality[a]	Species or subspecies[b]								
		1	2	3	4	5	6	7	8	9
35.	Manzanillo, Chandiablo, 19º 11.70' N, 104º 20.57' W, 100 m							1		
36.	Manzanillo, 5.2 km SE Las Canoas, 19º 13.19' N, 104º 06.89' W, 780 m					3				
37.	Manzanillo, 4 km NW (by road), San José de Lumbert, 19º 10.54' N, 104º 9.23[f] W, 466 m				1					
38.	Manzanillo, 3 km WNW San José de Lumbert, 19º 10.808' N, 104º 09.599' W, 480 m							1		
39.	Manzanillo, 2.5 km W San José de Lumbert, 19º 10.747' N, 104º 08.660' W, 500 m									
40.	Manzanillo, 0.5 km NE La Rosa, 19º 11.483' N, 104º 06.146' W, 893 m							1		
41.	Manzanillo, El Centinela (3 mi [4.8 km] S El Chavarín), 3 mi [4.8 km] E Colima/Jalisco border (LACM)							3		
42.	Manzanillo, Playa de Oro, 19º 07.947' N, 104º 30.802' W, 3 m	2							1	
43.	Manzanillo, 2 km E Playa de Oro							1		
44.	Manzanillo, 4 km W Santiago (KU)				5					
45.	Manzanillo, Manzanillo (NMNH)		1		3					
46.	Manzanillo, along Manzanillo-Cuyutlán Hway [highway] (LACM)				2					
47.	Coquimatlán, cerro Chino (LACM)									
48.	Coquimatlán, Pueblo Juárez, 19.0833º N, 103.8333º W, 330 m (LACM; 5 specimens AMNH)				1		3	2		
49.	Coquimatlán, 2.5 km E Pueblo Juárez, 19º 09.872' N, 103º 54.168' W, 230 m									
50.	Colima, Colima (NMNH)				2					
51.	Colima, 2 mi [3.2 km] E La Estancia (OMNH)							1		
52.	Colima, 4.5 mi [7.2 km] E Estancia (UM)									
53.	Colima, 1 km SE Cardona, 1470 m							2		
54.	Colima, 3.5 mi [5.6 km] ESE La Estancia, 427 m (OMNH)							1		
55.	Colima, río El Naranjo, 2 km ENE Trapichillas, 360 m						2	2		
56.	Colima, 2 mi [3.2 km] SE Ortices (OMNH)						1			
57.	Colima, 18 km SE ciudad de Colima (LACM)				1					
58.	Armería, 5 mi [8.0 km] NE La Cofradía [de Juárez] (LACM)				4					
59.	Armería, 12 km NW Tecomán (LACM)			2						
60.	Armería, La Cofradía [de Juárez] (LACM)									
61.	Armería, 4.5 km W Armería, 18º 56.32' N, 104º 02.12' W, 10 m							1		
62.	Armería, 2 km N Cuyutlán, 0 m (IBUNAM)	1								
63.	Tecomán, 7 mi [11.3 km] NE La Cofradía [de Juárez] (LACM)									
64.	Tecomán, 1.5 mi [2.4 km] N Tecolapa (LACM)				2					
65.	Tecomán, 4 km NW Tamala (Aquiles Serdán), 19º 01.14' N, 103º 46.35' W, 400 m				7			2		
66.	Tecomán, río Armería, 8 km N Tecomán (LSUMZ)									
67.	Tecomán, 3 km E Tecomán, 18º 56.13' N, 103º 49.84' W, 10 m							1		
68.	Tecomán, 4 km E Tecomán, 18º 56.13' N, 103º 49.84' W, 10 m							1		
69.	Tecomán, Boca de Pascuales, 5 km S Tecomán (LSUMZ)									
70.	Tecomán, 3 km NE Tecuanillo, 18º 50.10' N, 103º 53.49' W, 10 m						2			
71.	Tecomán, 1 km N El Tecuanillo, 18º 49.62' N, 103º 53.86' W, 10 m							1		

Table 1 (continued).

Species or subspecies[b]																		
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	3																	
						1												
	2																	
									1									
				1														
						2						1						
								6										
									1									
	1																	
					1													
	16			2	5													
	8																	
								1										
																		1

Table 1 (continued).

	Locality[a]	Species or subspecies[b]								
		1	2	3	4	5	6	7	8	9
72.	Ixtlahuacán, 15 mi [24.1 km] S Colima (LACM)							2		
73.	Ixtlahuacán, 4 km E Tecolapa, 19º 01.55' N, 103º 47.17' W, 300 m				4					
74.	Ixtlahuacán, 3 mi [4.8 km] E Ixtlahuacán (LACM)									
75.	Ixtlahuacán, 1.5 km WNW Las Conchas, 18º 53.500' N, 103º 38.721' W, 30 m								1	
76.	Ixtlahuacán, 1.6 km NE Las Conchas, 18º 53.50' N, 103º 38.721' W, 30 m				1	1				
77.	Ixtlahuacán, 4.3 km NE Las Conchas, 18º 54' 37.98" N, 103º 36' 08.32" W, 133 m						3	1		
	Total (340 specimens)	3	1	2	69	6	16	31	5	5

[a]Geographically close localities are designated with the same number combined with a letter designation (e.g., 2, 2a). First item in each locality indicates municipality in which site is located. All localities shown on map in Figure 1. Original distance units on labels are given, with metric equivalents provided in brackets if English units were used. In a few cases, additional locality information has been added in brackets. Acronyms in parentheses indicate where specimens were deposited: (AMNH) American Museum of Natural History; (IBUNAM) Instituto de Biología, Universidad Nacional Autónoma de México; (KU) Natural History Museum, University of Kansas; (LACM) Natural History Museum of Los Angeles County; (LSUMZ) Louisiana State University Museum of Zoology; (NMNH) National Museum of Natural History; (OMNH) Sam Noble Oklahoma Museum of Natural History; and (UM) University of Memphis Museum of Zoology. Localities without an acronym are those from our recent studies, and specimens from these localities have been deposited in: Sam Noble Oklahoma Museum of Natural History; Instituto de Biología, Universidad Nacional Autónoma de México; and Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos.

[b]Species or subspecies names: (1) *Diclidurus albus;* (2) *Noctilio leporinus mastivus;* (3) *Glyphonycteris sylvestris;* (4) *Micronycteris megalotis mexicana;* (5) *Choeronycteris mexicana;* (6) *Glossophaga leachii;* (7) *Glossophaga morenoi morenoi;* (8) *Centurio senex senex;* (9) *Dermanura azteca azteca;* (10) *Sturnira ludovici ludovici;* (11) *Sturnira ludovici occidentalis;* (12) *Corynorhinus mexicanus;* (13) *Corynorhinus townsendii australis;* (14) *Eptesicus furinalis gaumeri;* (15) *Eptesicus fuscus miradorensis;* (16) *Lasiurus blossevillii teliotis;* (17) *Lasiurus cinereus cinereus;* (18) *Lasiurus intermedius intermedius;* (19) *Lasiurus xanthinus;* (20) *Myotis albescens;* (21) *Myotis auriculus apache;* (22) *Myotis californicus mexicana;* (23) *Myotis ciliolabrum melanorhinus;* (24) *Myotis thysanodes thysanodes;* (25) *Myotis velifer velifer; (26) Myotis yumanensis lutosus;* (27) *Molossops greenhalli mexicanus;* and (28) *Nyctinomops femorosaccus.*

Wilchis and López Jardinez 1998, 1999, 2000); March (1892, 3, E. W. Nelson; 1961, 5, M. R. Lee, listed in López-Wilchis and López Jardinez 1998, 1999, 2000); April (1975, 3, D. R. Patten); June (1959, 1, W. J. Schaldach and A. L. Gardner; 1969, 2, P. L. Clifton); July (1959, 4, W. J. Schaldach and A. L. Gardner); August (1960, 1, A. L. Gardner; 1968, 4, P. L. Clifton); and December (1959, 5, A. L. Gardner). López-Wilchis and López Jardinez (1998, 1999, 2000) tabulated an additional four specimens for Colima housed in the collection at Texas A&M that we have not examined.

Most specimens collected in January during our field studies were captured with mist nets in forests, the nets being set on land or over water bodies in the forest. Others were captured in caves, tunnels, or culverts, all of which were located in forests. The forests were deciduous or semideciduous, typically being disturbed with considerable secondary vegetation.

Specimens include 35 females and 34 males. Of 21 females captured in January and two in March, none was pregnant. One captured in April had an embryo 20 mm in length. Four females were lactating (two in June and two in July). Thirteen males taken in January had scrotal testes (5×3 [4 specimens]; 7×5 [2], 6×4 [2], 6×6 [1], 5×4 [1], 6 [2], 5 [1]), and three had inguinal testes (2×2, 2×1, 2).

This species has been noted previously from Colima and Manzanillo (Miller 1898), as well as at Hacienda San Antonio (Kennedy et al. 1984). Specimens we report represent additional records

Table 1 (continued).

Species or subspecies[b]																		
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
								2										
3	59	2	17	5	26	37	2	17	3	2	3	3	1	1	16	2	2	1

and show that this species is found throughout much of the state of Colima.

5. *Choeronycteris mexicana* Tschudi, 1844

Specimens examined, 6. One was captured in January 1997 (T. W. Haner), one in September 1961 (B. Villa R.; listed in López-Wilchis and López Jardinez 1998, 1999, 2000), three in November 1996 (R. López-Wilchis), and one in December 1969 (C. González B.). Three are females and three are males; reproductive information was not recorded. The species has been reported previously in Colima only from El Mixcoate [Mixcuate], 9 km W Pueblo Juárez, 1347 m (Villa-R. 1967).

6. *Glossophaga leachii* (Gray, 1844)

Specimens examined, 16. The species has been recorded during five months: January (1997, 3, T. W. Haner and CLG; 1999, 2, MLRA; 2001, 5, L. E. Alcántara-Quintana, S. B. González-Pérez, RDO, and MLRA); February (1969, 1, J. K. Greer); April (1968, 2, P. L. Clifton); August (1959, 2, P. L. Clifton); and September (1959, 1, A. L. Gardner). Specimens taken in January were captured in a mist net placed over a stream in tropical dry forest.

Thirteen of the specimens are females; two from January had one embryo each (12×8, 10X10), as did two captured in April (20, 25). One bat taken in January was lactating, and two were not pregnant. A male captured in January had inguinal testes (2×2), while another from the same month had scrotal testes (4×2); no reproductive information was noted for the specimen collected in February. The species has been reported previously in Colima only from Comala (Webster 1993).

While originally *G. leachii* was considered to be a subspecies of *G. soricina,* Webster and Jones (1980) concluded that it represented a different species. Given that we do not know if the specimens noted previously for Colima by Miller (1913), Gardner (1962a), Villa-R. (1967), and Kennedy et al. (1984) belong to *G. leachii* or *G. soricina,* we have referenced only the specimens cited by Webster (1993), who distinguished between the two species.

7. *Glossophaga morenoi morenoi* Martínez and Villa-R., 1938

Specimens examined, 31. Specimens were collected during six months: January (1979, 2, D. W. Moore; 1997, 1, GDS; 1998, 3, TLB and J. L. Hunt; 1999, 11, TLB, T. A. Cloud, J. L. Hunt, B. R. Laseter, MLRA, and GDS; 2001, 5, S. B. González-Pérez, RDO, L. Sánchez-Vázquez, and D. G. Siegfried); March (1973, 1, RDO); April (1975, 3, D. R. Patten); May (1974, 1, C. R. Laughlin); June (1959, 2, W. J. Schaldach and A. L. Gardner); and August (1959, 2, A. L. Gardner). Those from January 1997-2001 were captured with mist nets in vegetation or over bodies of water; some were captured in culverts and caves. The species occurred in deciduous and semideciduous forests, as well as in secondary vegetation.

Specimens include 23 females and eight males. Eight of the females had one embryo: six taken in January (15, 11×8, 10, 5, 3×2 [2 specimens]) and two in April (25). Five females collected in January and one in April were not pregnant. Two males in January had scrotal testes (4×2, 2×2), and three had inguinal testes (4×3, 2×2, 1×1).

The species has been recorded previously from two localities in Colima: 3.7 km N Ixtlahuacán; and 4.7 km N Ixtlahuacán, 330 m (Polaco et

al. 1992). For the eight specimens Polaco et al. (1992) collected in December 1990, seven females were pregnant (embryo mean length 11.8, range 7-16), and one male had scrotal testes (4).

8. *Centurio senex senex* Gray, 1842

Specimens examined, 5. All five individuals were females: January (1997, 1, CLG; 2000, 1, L. A. McWilliams); and April (1970, 3, C. González B. and, for one, collector not identified). Specimens taken in January were captured in deciduous dry forest mixed with secondary vegetation; they had one embryo each (10×8, 9×9). Three females captured in April were lactating. The species has been reported previously in Colima from Tabarnillas, 6 km N Agua Zarca (Villa-R. 1967).

9. *Dermanura azteca azteca* (Andersen, 1906)

Specimens examined, 5. Individuals were captured in January (1972, 1, C. C. Powell; 1998, 2, M. D. Gay and R. S. Nye), March (1969, 1, J. K. Greer; listed in López-Wilchis and López Jardinez 1998, 1999, 2000), and December (1969, 1, C. González B.). One from January 1998 was captured in an oak forest and the other in a semideciduous dry forest.

One female obtained in January did not have an embryo. The male captured in January had scrotal testes (6). This species has been recorded in Colima previously by Kennedy et al. (1984) from two sites: 0.5 mi [0.8 km] S El Cóbano; and 14 km NE Pueblo Nuevo, 5650 ft [1722 m].

10. *Sturnira ludovici ludovici* Anthony, 1924

Specimens examined, 3. Three males were collected in January 1976 (M. G. Billingsley, M. S. Breazeal, and R. Vaughn). No reproductive data was recorded. This species originally was described by Anthony (1924) from Gualea, Ecuador, and generally has been regarded as rare (Jones and Phillips 1964). Differentiation between *S. ludovici ludovici* and *S. ludovici occidentalis* is discussed below. The specimens we report represent the second Colima record of *S. ludovici ludovici.* Villa-R. (1967) obtained a male of the subspecies in September 1961 in Colima at Pueblo Juárez.

11. *Sturnira ludovici occidentalis* Jones and Phillips, 1964

Specimens examined, 57. The 21 females were obtained in the following months: January (1975, 1, J. A. Harrick; 1976, 1, D. Melton; 1997, 1, R. López-Wilchis; 1998, 3, M. D. Gay and J. L. Hunt); April (1975, 8, D. R. Patten); and August (1963, 2, P. L. Clifton; 1968, 5, P. L. Clifton). For 10 females, reproductive information was recorded. Seven were lactating (six in April and one in August), and three were not lactating (all January). In August, one female was a juvenile and one a subadult.

The 38 males were obtained during the following months: January (1975, 2, M. R. Sanders and D. H. Snider; 1976, 1, D. Melton; 1979, 1, P. K. Price; 1999, 3, K. E. Francl and B. R. Laseter; 2001, 2, L. Sánchez-Vázquez and GDS); April (1975, 2, D. R. Patten); June (1996, 1, R. López-Wilchis); July (1968, 4, P. L. Clifton); August (1963, 6, P. L. Clifton; 1968, 11, P. L. Clifton); October (1959, 2, W. J. Schaldach); and November (1996, 3, R. López-Wilchis).

Reproductive information is available for seven specimens. Four males collected in January had scrotal testes (7×5, 5×4, 4×3, 3×3), and one had inguinal testes (3×2). Length (5, 4) but not position of the testes was indicated for two individuals captured in April.

This subspecies differs from *S. ludovici ludovici* (listed above) in averaging smaller in most external and cranial dimensions; in some measurements the upper limits for *S. ludovici occidentalis* barely overlap the lower limits for *S. ludovici ludovici* (Jones and Phillips 1964; also see Appendix 1). *Sturnira ludovici occidentalis* has a relatively broader skull with a shorter, more abruptly elevated rostrum than found in *S. ludovici ludovici* (Jones and Phillips 1964). In addition, *S. ludovici occidentalis* is paler both dorsally and ventrally. A zone of overlap of the two subspecies may not be limited to Colima, but could also extend to Zacatecas, Jalisco, and Michoacán, although evidence of a zone of overlap is equivocal for the latter (Villalpando and Álvarez 2000).

These records of *S. ludovici occidentalis* are the first for the subspecies in Colima. Baker and Phillips (1965) listed *S. ludovici*—presumably *S. ludovici occidentalis*—as occurring on El Nevado de Colima, Jalisco, at 9100 ft (2774 m). The records we cite extend the known range 80 km south-southwest of this locality.

12. *Corynorhinus mexicanus* G. M. Allen, 1916

Specimens examined, 2. These specimens—one male and one female—were captured in January 1997 (R. López-Wilchis) soon after sundown in mist nets in a pine-oak forest. No reproductive information was recorded.

This species was previously reported to be in

Colima based on 17 specimens from: Cerro Grande, 7800 ft [2377 m]; and 10 mi [16.1 km] NW Comala, 6800 ft [2073 m] (Tumlison 1991). However, reexamination of these animals indicates that they belong to *C. townsendii australis*. The specimens, which are deposited in the Natural History Museum of Los Angeles County, were identified on specimen labels as *C. townsendii australis*. The I1 is bicuspid in *C. mexicanus* (Handley 1959, Tumlison 1991, 1992), but unicuspid in *C. townsendii australis* (Hall 1981); in these specimens the I1 is unicuspid. The coloration of *C. mexicanus* is blackish, while *C. townsendii australis* is pale cinnamon brown to blackish brown; the specimens in question are like the latter. The greatest skull length in *C. mexicanus* is reported to range from 14.7 to 15.9 mm (Handley 1959, Tumlison 1991, 1992) and that of *C. townsendii australis* from 15.3 to 17.2 mm (Kunz and Martin 1982). The greatest skull lengths for the 11 of the 17 specimens that are females range from 15.75 to 16.21 mm (mean 15.94), while the five males measured have a range from 15.65 to 15.88 mm (mean 15.76). Thus, while some fall in the overlap zone between the two species, many are larger than typical for *C. mexicanus.* It seems likely that Tumlison (1991) simply listed the specimens as *C. mexicanus* by mistake; he did not make any notation on the specimen labels of a misidentification, as he did with other specimens in the collection that were incorrectly identified.

The animals we captured extend the known range of *C. mexicanus* 20 km south from the nearest previous locality: Jalisco, 12 mi [19.3 km] S Tolimán, 7700 ft [2347 m] (Watkins et al. 1972). We captured another specimen at a locality in Jalisco (7 km N Campo Uno, 19º 28' 30.48" N, 103º 56' 41.08" W, 2300 m) within 1 km of the Colima border.

13. *Corynorhinus townsendii australis* Handley, 1955

Specimens examined, 17. Of the 11 females and six males, 16 were captured in May 1975 (D. R. Patten and P. A. Flanagan) and one in July 1968 (P. L. Clifton). Nine females captured in May were lactating, one in May had one embryo, and one in July was postlactating. Data on reproductive condition were recorded for five males, all captured in May (testes measured 6, 6, 5, 5, 5×2).

Tumlison (1991) incorrectly assigned these specimens to *C. mexicanus* (see above). They now represent the first records of *C. townsendii australis* for Colima. These specimens extend the known distribution of *C. townsendii australis* 80 km south from Jalisco, cueva de Las Garrochas, 17 km NNW Soyatlán del Oro (Villa-R. 1967), as well as 190 km southwest from Michoacán, cueva de La Arena, 5 km SW Jacona (Villa-R., 1967).

14. *Eptesicus furinalis gaumeri* (J. A. Allen, 1897)

Specimens examined, 5. Two females were captured in August (1968, 1, P. L. Clifton; 1969, 1, C. González B.), and one male was obtained in each of three months—March 1970 (C. González B. and P. L. Clifton), August 1968 (P. L. Clifton), and December 1969 (C. González B. and P. L. Clifton). No reproductive information was recorded.

These specimens represent the first records for Colima. The capture sites are geographically intermediate with respect to previously reported localities for the species: Jalisco, 15 km NW Cihuatlán (Davis 1965); Jalisco, 10 mi [16.1km] NNE Pihuamo, 3500 ft [1067 m] (Watkins et al. 1972); Michoacán, 6 km NE (by road) Aquila, Los Tenamastes (Sánchez Hernández et al. 1985); Michoacán, 3 km S, 26 km E Caleta de Campos, 40 m (Villalpando and Álvarez 2000); and Michoacán, 7 km S, 22 km W Arteaga, 800 m (Villalpando and Álvarez 2000).

15. *Eptesicus fuscus miradorensis* (H. Allen, 1866)

Specimens examined, 26. Specimens included 21 females and five males captured during the following months: March (1970, 2, C. González B. and P. L. Clifton); April (1975, 3, D. R. Patten); August (1968, 6, P. L. Clifton; 1969, 1, C. González B.); September (1969, 1, C. González B.); October (1969, 12, C. González B. and P. L. Clifton); and November (1969, 1, C. González B. and P. L. Clifton).

Three females in April had two embryos each, one in each uterine horn (3, 3, and small). One female from October was lactating; one in August and one in October were juveniles. One male captured in August was a subadult.

These specimens represent the first records for Colima. They extend the range 80 km northwest from the nearest locality in Jalisco, 10 mi [16.1 km] NNE Pihuamo, 3500 ft [1067 m] (Watkins, et al. 1972).

16. *Lasiurus blossevillii teliotis* (H. Allen, 1891)

Specimens examined, 37. Specimens include five females and 31 males (sex not determined for

one specimen). The species was captured in: January (1979, 1, F. Elder; 1997, 3, R. López-Wilchis; 1998, 8, TLB, T. W. Haner, J. L. Hunt, B. R. Laseter, R. S. Nye, and MLRA; and 2001, 2, RDO and GDS); March (1970, 3, C. González B. and P. L. Clifton); April (1968, 1, P. L. Clifton; 1975, 2, D. R. Patten); May (1975, 13, P. A. Flanagan and D. R. Patten); June (1961, 2, A. L. Gardner); July (1968, 1, P. L. Clifton); and August (1969, 1, C. González B.).

One female collected in January and two in April did not have embryos. Two males taken in January had scrotal testes (5×3, 4×2) and one had abdominal testes (4×1). Lengths of testes were recorded for 14 additional specimens in January (4×3, 4, 3×2, 3 [2 specimens]), April (3), and May (3 [3 specimens], 2 [5]). One male captured in August was a juvenile.

The species has been reported previously for Colima at Hacienda El Cóbano (Kennedy et al. 1984). The newly reported specimens, coupled with previous records, indicate that the species is broadly distributed in Colima.

17. *Lasiurus cinereus cinereus* (Palisot de Beauvois, 1796)

Specimens examined, 2. Two males (each with testis length of 6) were captured in May 1975 (D. R. Patten and P. A. Flanagan). These specimens represent the first records for Colima and extend the known range of *L. cinerus cinerus* 40 km west-southwest from the nearest locality in Jalisco, Hidalgo San Marcos, Tonila (Allen 1890; Watkins et al. 1972).

18. *Lasiurus intermedius intermedius* H. Allen, 1862

Specimens examined, 17. Nine females and eight males were captured in January (1973, 1, MLK; 1997, 1, R. López-Wilchis; 1998, 3, MLRA and GDS), April (1961, 1, A. L. Gardner; 1970, 1, C. González B. and P. L. Clifton; 1975, D. R. Patten), July (1965, 1, C. González B., listed in López-Wilchis and López Jardinez 1998, 1999, 2000; 1968, 2, P. L. Clifton), and September (1959, 1, A. L. Gardner; 1961, 5, B. Villa R., 4 listed in López-Wilchis and López Jardinez 1998, 1999, 2000).

Three females in July were lactating, and two in September were postlactating. Measurements of testes were taken for some specimens in January (8×3, 6×3, 7) and April (5). Specimens from Ranchitos and Campo Uno were captured in mist nets; those at Ranchitos were in semideciduous forest, whereas the one at Campo Uno was in a pine-oak forest.

This species has been noted in Colima from: Pueblo Juárez, 330 m (Gardner 1962a; Villa-R. 1967); and 0.5 mi [0.8 km] W El Cóbano (Kennedy et al. 1984). The newly reported specimens represent records further to the north in Colima.

19. *Lasiurus xanthinus* (Thomas, 1897)

Specimens examined, 3. A lactating female and two males (testis 3×2 for one) were captured in January 2000 (A. Calderón-Zarza, K. E. Francl, and H. L. Hopkins) at Playa de Oro. These specimens represent the first records for Colima. They extend the known range of the species 85 km southwest from the nearest previously known locality in Jalisco, Tolimán, 2200 ft [671 m] (Watkins et al. 1972).

20. *Myotis albescens* (É. Geoffroy St.-Hilaire, 1806)

Specimens examined, 2. Both are adult males captured in January 1998 (testis measurement of 2 for one specimen; TLB and MLK). The specimens were captured in a mist net over a river course in semideciduous forest, conditions similar to those cited for the species in Costa Rica and Peru (Gardner et al. (1970), as well as in Chiapas (Medellín et al. 1986).

Specimens initially were identified using the keys of Hall (1981) and Álvarez et al. (1994). In addition, specimens were compared with those of similar species of *Myotis* in the National Museum of Natural History. While the Colima specimens were smaller than specimens of *M. albescens* from Yaguaron, Paraguay (LaVal 1973), from Costa Rica (Gardner et al. 1970), and from Chiapas (Medellín et al. 1986), there is overlap with *M. albescens* from other localities (LaVal 1973). Measurements of specimens from Colima are most like those of *M. argentatus* from Coatzocoalcos, Veracruz (Dalquest and Hall 1947). Dalquest and Hall (1947) posited that the differences between *M. albescens* and *M. argentatus* "greatly exceed any that can be pointed to between the American subspecies of any other one full species of the genus *Myotis*"; however, based on LaVal's (1973) more comprehensive study that showed there to be considerable overlap in measurements, he subsumed *M. argentatus* under *M. albescens.* Further quantitative morphological and biochemical comparisons of *M. albescens* from Colima and other parts of Mexico would be helpful in clarifying species boundaries for populations now judged to be *M. albescens.*

These records, the first for Colima, extend the

range of *M. albescens* 950 km west-northwest from the nearest previously known locality in Veracruz, 14 km SW Coatzacoalcos, 30 m (Hall 1981). Our measurements (Appendix 1) are somewhat smaller than those cited by Hall (1981). López-Wilchis and López Jardinez (1998, 1999, 2000) listed a specimen of *M. albescens* in the Academy of Natural Sciences of Philadelphia from Guanajuato, which is closer to Colima than Veracruz; however, the specimen was not examined and Ramírez Pulido et al. (2000) judged the identification to be questionable.

21. *Myotis auriculus apache* Hoffmeister and Krutzch, 1955

Specimens examined, 3. One male was collected in each of three months: March 1970 (C. González B. and P. L. Clifton), May 1975 (D. R. Patten), and December 1969 (C. González B. and P. L. Clifton). Testis length (3) was recorded for the May specimen. These records are the first for Colima and extend the range of *M. auriculus apache* 60 km west from the closest known localities: Jalisco, Los Masos (Findley 1960); and Jalisco, 10 mi [16.1 km] NNE Pihuamo, 3500 ft [1067 m] (Watkins et al. 1972).

22. *Myotis californicus mexicana* (Saussure, 1860)

Specimens examined, 3. All are adult males, two being collected in January 1998 (M. D. Gay and CLG) and one in June 1961 (A. L. Gardner). One January specimen, collected in a mist net placed in vegetation within a pine-oak forest, had inguinal testes (3×1) and an epididymis of 4×1. The other specimen obtained in January had inguinal testes (2×2) and was captured in a mist net along the shore of laguna La María, which is located in tropical dry forest with considerable secondary vegetation. The species has been reported previously from Colima at Cerro Grande, 7800 ft [2377 m] (Bogan 1978).

23. *Myotis ciliolabrum melanorhinus* (Merriam, 1890)

Specimen examined, 1. A male (testis 2×2) was captured in January 1998 (CLG) in a mist net along the edge of a lake in dry forest with considerable secondary vegetation. The specimen represents the second record of *M. ciliolabrum melanorhinus* for Colima. This species had been noted previously for Colima at Cerro Grande, 7800 ft [2377 m] by Bogan (1978), who referred to it as *M. leibii.* We follow the nomenclature of van Zyll de Jong (1984) for this group.

24. *Myotis thysanodes thysanodes* Miller, 1897

Specimen examined, 1. A male was captured in May 1975 (D. R. Patten). This specimen represents the first record for Colima. The locality, Cerro Grande, is 70 km southeast and 220 km west-southwest, respectively, from the nearest known localities: Jalisco, Los Masos (Miller and Allen 1928); and Michoacán, Pátzcuaro (Miller 1897).

25. *Myotis velifer velifer* (J. A. Allen, 1890)

Specimens examined, 16. Eight females and eight males were captured in May 1975 (13, D. R. Patten), June 1959 (1, W. J. Schaldach and A. L. Gardner), and July 1968 (2, P. L. Clifton). Four females in May had one embryo each (13, 11, 10, 7), and one did not have an embryo; two females in July were lactating. Lengths of testes were recorded for six males (3, 4 [4 specimens], 5) in May. Previously, the species has been noted in the state from 4 mi [6.4 km] N Colima (Hayward 1970).

26. *Myotis yumanensis lutosus* Miller and G. M. Allen, 1928

Specimens examined, 2. These adult males were captured in April and May 1975 (D. R. Patten). Testis length (2) was recorded for the individual captured in May. These specimens represent the first records for Colima and extend the known range of *M. yumanensis lutosus* 80 km southeast from the nearest locality in Jalisco, 2 mi [3.2 km] S La Cuesta, 1500 ft [457 m] (Watkins et al. 1972).

27. *Molossops greenhalli mexicanus* Jones and Genoways, 1967

Specimens examined, 2. One female—ready to ovulate (i.e., ovum granulated and red in color)—was captured at 2000 h in January 1998 (MLRA) in a mist net over a small stream located in a semideciduous forest. The other female, obtained in September 1969 (C. González B.), was lactating. These specimens are the first and second records for Colima and extend the known range of this subspecies 60 km east-southeast from the closest locality in Jalisco, 7.5 mi [12.1 km] SE Tecomates, 1500 ft [457 m] (Watkins et al. 1972).

28. *Nyctinomops femorosaccus* (Merriam, 1889)

Specimen examined, 1. This female was captured in July 1965 (C. González B.; listed in López-Wilchis and López Jardinez 1998, 1999,

2000). The species had been noted previously as occurring in Colima at Pueblo Juárez (Gardner 1962a), but further examination showed that the specimen was misidentified and actually was *N. aurispinosa* (Gardner 1962b). Thus, the specimen we note is the first record of the species in Colima and extends the known range 160 km south from the closest site in Jalisco, Zacoalco (Hall 1981).

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Appendix 1. Summary of 21 measurements (mean ± *SD*, *n*, with range below)[a] for female and male specimens of 28 species or subspecies of bats from Colima, Mexico.

Species or subspecies sex	Total length	Tail length	Hindfoot length	Ear length
(1) *Diclidurus albus*				
Males	110.50 ± 16.26, 2	21.50 ± 0.71, 2	10.50 ± 3.54, 2	18.50 ± 0.71, 2
	99.0–122.0	21.0–22.0	8.0–13.0	18.0–19.0
(2) *Noctilio leporinus mastivus*				
Females	120.25 ± 6.55, 4	31.50 ± 0.58, 4	35.00 ± 1.41, 4	26.50 ± 1.00, 4
	116.0–130.0	31.0–32.0	34.0–37.0	25.0–27.0
Males	129.86 ± 8.33, 7	32.00 ± 4.80, 7	34.43 ± 2.51, 7	27.57 ± 2.07, 7
	118.0–141.0	26.0–38.0	32.0–39.0	24.0–30.0
(3) *Glyphonycteris sylvestris*				
1 Female	70.0	14.0	11.0	24.0
1 Male	69.0	13.0	10.0	24.0
(4) *Micronycteris megalotis mexicana*				
Females	71.35 ± 7.49, 32	12.17 ± 1.43, 32	10.57 ± 1.09, 32	20.84 ± 1.27, 32
	58.0–81.0	9.5–15.0	9.0–13.0	18.0–23.0
Males	68.19 ± 7.62, 26	12.31 ± 2.01, 26	9.96 ± 1.15, 26	20.65 ± 1.81, 26
	57.0–78.0	9.0–17.0	7.0–12.0	17.0–24.0
(5) *Choeronycteris mexicana*				
1 Female	80.0	9.0	12.0	13.0
Males	77.50 ± 3.54, 2	11.0, 1	10.00 ± 0.00, 2	13.50 ± 2.12, 2
	75.0–80.0	–	–	12.0–15.0
(6) *Glossophaga leachii*				
Females	62.38 ± 5.32, 13	8.72 ± 2.39, 9	10.42 ± 0.70, 13	13.23 ± 1.01, 13
	52.0–69.0	6.0–12.0	9.0–11.5	11.0–15.0
Males	60.50 ± 7.78, 2	7.50 ± 3.54, 2	9.50 ± 0.71, 2	14.00 ± 1.41, 2
	55.0–66.0	5.0–10.0	9.0–10.0	13.0–15.0
(7) *Glossophaga morenoi morenoi*				
Females	68.94 ± 7.07, 17	7.13 ± 1.55, 15	10.53 ± 0.62, 17	13.29 ± 1.10, 17
	57.0–79.0	5.0–10.0	9.0–11.0	11.0–15.0
Males	67.29 ± 5.15, 7	9.71 ± 4.89, 7	10.71 ± 1.11, 7	11.29 ± 2.69, 7
	60.0–73.0	5.0–19.0	9.0–12.0	8.0–16.0
(8) *Centurio senex senex*				
Females	66.25 ± 9.39, 4	0	11.25 ± 1.71, 4	14.50 ± 1.29, 4
	59.0–80.0	–	9.0–13.0	13.0–16.0
(9) *Dermanura azteca azteca*				
Females	70.67 ± 6.66, 3	0	12.00 ± 1.00, 3	13.33 ± 5.51, 3
	63.0–75.0	–	11.0–13.0	7.0–17.0
Males	70.00 ± 2.82, 2	0	12.00 ± 1.41, 2	18.0, 1
	68.0–72.0	–	11.0–13.0	–
(10) *Sturnira ludovici ludovici*				
Males	65.25 ± 6.02, 4	0	11.75 ± 0.96, 4	15.87 ± 2.46, 4
	60.0–73.0	–	11.0–13.0	13.0–19.0
(11) *Sturnira ludovici occidentalis*				
Females	63.68 ± 4.90, 19	0	14.05 ± 1.16, 19	16.76 ± 1.15, 19
	52.0–73.0	–	12.0–16.0	14.0–18.0
Males	65.63 ± 3.67, 30	0	14.38 ± 0.93, 30	17.07 ± 1.09, 30
	61.0–77.0	–	11.0–16.0	15.0–19.0
(12) *Corynorhinus mexicanus*				
1 Female	92.0	44.0	9.0	29.0
1 Male	92.0	40.0	10.0	29.0
(13) *Corynorhinus townsendii australis*				
Females	99.54 ± 3.24, 11	46.82 ± 2.93, 11	10.59 ± 0.66, 11	32.45 ± 0.69, 11
	95.0–104.0	43.0–51.0	9.0–11.0	31.0–33.0
Males	99.60 ± 2.70, 5	47.00 ± 3.16, 5	10.00 ± 0.00, 5	33.00 ± 0.71, 5
	96.0–103.0	44.0–52.0	–	32.0–34.0
(14) *Eptesicus furinalis gaumeri*				
Females	94.00 ± 0.00, 2	39.50 ± 3.54, 2	9.00 ± 1.41, 2	13.25 ± 1.77, 2
	–	37.0–42.0	8.0–10.0	12.0–14.5
Males	92.33 ± 6.66, 3	36.33 ± 2.89, 3	9.67 ± 0.58, 3	12.67 ± 0.58, 3
	88.0–100.0	33.0–38.0	9.0–10.0	12.0–13.0

Appendix 1 (continued).

Mass	Forearm length	Third metacarpal length	First phalanx length	Second phalanx length	Third phalanx length
18.75 ± 1.06, 2	64.86 ± 0.49, 2	65.18 ± 1.02, 2	10.49 ± 0.81, 2	27.48 ± 1.19, 2	–
18.0–19.5	64.52–65.21	64.46–65.90	9.92–11.06	26.64–28.32	–
–	87.01 ± 1.36, 4	81.27 ± 1.12, 4	24.08 ± 0.88, 4	58.91 ± 1.29, 4	14.90 ± 1.84, 4
–	85.99–88.90	79.61–82.10	23.01–25.15	57.70–60.32	13.13–16.67
–	85.41 ± 1.53, 7	79.96 ± 1.08, 7	24.47 ± 1.27, 7	59.13 ± 2.51, 7	14.57 ± 2.32, 7
–	82.86–87.67	78.49–81.28	22.77–26.04	55.48–63.78	11.11–16.62
13.0	44.46	39.50	14.14	20.60	7.86
12.0	–	38.69	13.57	19.29	5.36
7.22 ± 0.64, 25	35.01 ± 0.67, 22	30.23 ± 0.62, 22	13.62 ± 0.50, 22	14.02 ± 0.44, 22	8.43 ± 0.73, 22
6.0–8.5	33.63–36.80	29.00–31.20	12.34–14.27	13.21–14.88	7.20–9.92
6.81 ± 0.79, 21	34.21 ± 1.20, 14	29.11 ± 0.60, 15	13.03 ± 0.40, 15	13.22 ± 0.59, 15	8.24 ± 0.84, 15
6.0–8.5	32.85–37.70	28.06–30.07	12.14–13.68	12.33–14.10	7.03–10.71
14.5	–	–	–	–	–
–	43.47 ± 0.22, 2	42.27 ± 0.34, 2	17.00 ± 0.57, 2	20.55 ± 0.80, 2	11.60 ± 1.19, 2
–	43.32–43.63	42.03–42.51	16.69–17.49	19.98–21.11	10.76–12.44
11.47 ± 4.27, 9	35.06 ± 1.80, 8	34.52 ± 1.99, 8	12.57 ± 0.69, 8	15.62 ± 1.01, 8	7.12 ± 0.82, 8
8.0–19.3	31.51–37.00	31.02–36.67	11.23–13.27	13.67–16.68	5.99–8.20
9.6, 1	33.64 ± 0.77, 3	33.03 ± 1.19, 3	12.19 ± 0.37, 3	15.19 ± 0.96, 3	7.06 ± 0.56, 3
–	32.76–34.21	31.72–34.05	11.83–12.58	14.09–15.78	6.67–7.70
11.00 ± 2.18, 13	35.29 ± 1.08, 9	33.81 +1.21, 11	12.96 ± 0.58, 11	15.31 ± 1.21, 11	7.48 ± 0.94, 10
8.2–15.9	34.10–37.42	31.53–36.20	11.55–13.51	13.50–17.03	6.50–9.15
9.96 ± 3.44, 5	35.41 ± 1.27, 4	34.36 ± 1.23, 4	12.70 ± 0.30, 4	15.60 ± 0.63, 4	7.28 ± 0.52, 4
7.8–16.0	34.04–36.90	32.53–35.16	12.34–12.95	15.16–16.50	6.50–7.59
17.70 ± 0.28, 2	41.56 ± 0.58, 4	38.22 ± 1.46, 4	16.73 ± 0.22, 4	22.69 ± 0.89, 4	10.94 ± 0.87, 4
17.5–17.9	40.77–42.15	36.59–39.97	16.43–16.97	21.45–23.55	9.74–11.68
19.5, 1	42.22 ± 3.11, 3	39.27 ± 4.05, 3	15.41 ± 0.17, 3	22.66 ± 1.07, 3	12.36 ± 0.89, 3
–	39.81–45.73	35.55–43.58	15.30–15.61	21.46–23.53	11.39–13.14
18.55 ± 0.07, 2	43.45 ± 0.49, 2	40.65 ± 0.08, 2	14.29 ± 0.28, 2	22.41 ± 0.83, 2	13.21 ± 2.52, 2
18.5–18.6	43.10–43.80	40.60–40.71	14.10–14.49	21.82–23.0	11.43–15.0
–	41.79 ± 2.31, 4	40.38 ± 1.70, 4	15.29 ± 1.36, 4	18.73 ± 0.51, 4	12.93 ± 0.56, 4
–	38.58–44.07	37.89–41.54	13.51–16.39	18.11–19.25	12.18–13.55
16.53 ± 1.38, 10	41.49 ± 1.42, 16	40.03 ± 1.16, 16	15.70 ± 0.92, 16	19.36 ± 0.74, 16	14.38 ± 1.66, 16
13.8–18.0	39.27–43.70	37.97–41.60	14.30–17.20	18.03–20.45	11.61–17.20
18.52 ± 1.50, 6	42.54 ± 1.27, 28	40.52 ± 1.22, 28	15.68 ± 1.38, 28	19.35 ± 0.86, 28	13.29 ± 0.80, 26
16.0–20.0	40.43–44.93	37.32–42.68	9.84–16.99	15.72–20.61	11.83–15.02
7.6	39.29	38.60	13.68	18.03	7.71
7.3	39.29	36.53	12.24	20.42	2.74
8.00 ± 1.15, 10	42.67 ± 1.02, 11	38.76 ± 0.90, 11	12.99 ± 0.95, 11	18.57 ± 0.76, 11	6.02 ± 1.00, 11
7.0–10.0	41.10–44.30	37.27–40.03	11.35–14.50	17.45–19.63	4.75–8.04
6.80 ± 1.30, 5	40.62 ± 0.84, 5	37.19 ± 0.47, 5	12.46 ± 0.40, 5	17.91 ± 0.60, 5	5.81 ± 1.03, 5
6.0–9.0	39.67–41.58	36.49–37.59	11.91–12.88	17.17–18.61	4.42–6.95
–	39.25 ± 0.24, 2	38.12 ± 0.65, 2	14.65 ± 0.26, 2	12.12 ± 2.42, 2	6.56 ± 0.04, 2
–	39.08–39.42	37.66–38.58	14.47–14.84	10.41–13.84	6.53–6.59
–	38.79 ± 0.84, 3	36.67 ± 0.52, 3	14.29 ± 0.78, 3	11.99 ± 0.82, 3	6.77 ± 0.05, 3
–	37.95–39.64	36.35–37.27	13.44–14.96	11.99–12.83	6.73–6.82

Appendix 1 (continued).

Species or subspecies sex	Tibia length	Greatest skull length	Condylo-canine length	Maxillary toothrow length	Interorbital width
(1) *D. albus*					
Males	21.21 ± 0.86, 2	19.25 ± 0.29, 2	17.33 ± 0.52, 2	8.14 ± 0.01, 2	7.33 ± 0.02, 2
	20.60–21.82	19.05–19.46	16.97–17.70	8.13–8.15	7.32–7.35
(2) *N. leporinus mastivus*					
Females	38.89 ± 1.33, 4	27.64 ± 0.39, 3	23.23 ± 0.56, 3	10.55 ± 0.13, 3	11.93 ± 0.25, 3
	37.25–40.16	27.19–27.87	22.69–23.80	10.43–10.68	11.65–12.12
Males	39.26 ± 1.34, 7	29.18 ± 0.86, 7	24.00 ± 0.26, 7	10.77 ± 0.12, 7	12.49 ± 0.31, 7
	36.97–41.04	28.01–30.36	23.66–24.37	10.56–10.90	12.11–12.80
(3) *G. sylvestris*					
1 Female	17.13	–	–	8.61	5.95
1 Male	15.03	21.92	18.70	8.50	5.78
(4) *M. megalotis mexicana*					
Females	12.97 ± 1.01, 20	19.18 ± 0.34, 20	16.41 ± 0.48, 20	7.26 ± 0.14, 21	5.30 ± 0.15, 21
	10.88–15.07	18.76–19.73	15.64–17.82	6.93–7.54	4.97–5.49
Males	13.19 ± 0.91, 13	19.02 ± 0.45, 13	16.17 ± 0.41, 13	7.19 ± 0.15, 14	5.24 ± 0.14, 14
	11.48–14.70	18.43–19.89	15.54–16.75	6.92–7.43	4.96–5.45
(5) *C. mexicana*					
1 Female	–	30.25	28.36	10.84	4.37
Males	15.32 ± 0.32, 2	29.87 ± 0.41, 2	28.06 ± 0.20, 2	11.01 ± 0.40, 2	4.54 ± 0.08, 2
	15.09–15.55	29.58–30.16	27.92–28.21	10.74–11.29	4.48–4.60
(6) *G. leachii*					
Females	12.91 ± 0.55, 6	21.18 ± 0.60, 4	19.13 ± 0.81, 4	7.22 ± 0.40, 4	4.35 ± 0.16, 4
	12.11–13.52	20.48–21.95	18.34–20.21	6.71–7.69	4.14–4.50
Males	13.01 ± 0.69, 3	20.77 ± 0.76, 2	18.66 ± 0.48, 3	6.84 ± 0.19, 2	4.35 ± 0.18, 3
	12.33–13.72	20.23–21.31	18.20–19.15	6.70–6.98	4.15–4.50
(7) *G. morenoi morenoi*					
Females	12.55 ± 1.06, 8	21.42 ± 0.36, 11	19.01 ± 0.34, 11	7.27 ± 0.25, 12	4.45 ± 0.26, 11
	11.26–14.07	20.89–21.93	18.28–19.58	6.94–7.65	4.00–4.91
Males	13.02 ± 0.40, 4	21.34 ± 0.21, 3	19.10 ± 0.11, 3	7.15 ± 0.25, 3	4.41 ± 0.07, 3
	12.50–13.47	21.12–21.53	19.01–19.23	6.90–7.40	4.34–4.48
(8) *C. senex senex*					
Females	17.05 ± 0.93, 4	19.19 ± 0.26, 4	14.90 ± 0.24, 4	4.90 ± 0.06, 4	6.01 ± 0.42, 4
	16.39–18.36	18.91–19.53	14.63–15.18	4.83–4.98	5.63–6.48
(9) *D. azteca azteca*					
Females	15.44 ± 1.01, 3	21.86 ± 0.56, 3	19.01 ± 0.49, 3	7.04 ± 0.32, 3	7.41 ± 0.29, 3
	14.31–16.25	21.23–22.27	18.61–19.56	6.72–7.37	7.15–7.73
Males	17.08 ± 1.25, 2	21.83 ± 0.32, 2	18.98 ± 0.32, 2	7.15 ± 0.23, 2	7.36 ± 0.47, 2
	16.20–17.97	21.61–22.06	18.76–19.21	6.99–7.32	7.03–7.69
(10) *S. ludovici ludovici*					
Males	17.30 ± 1.91, 4	23.82 ± 0.36, 3	20.30 ± 0.41, 3	6.98 ± 0.34, 3	7.07 ± 0.23, 3
	15.63–19.20	23.43–24.13	20.05–20.77	6.72–7.36	6.87–7.32
(11) *S. ludovici occidentalis*					
Females	16.11 ± 0.92, 15	23.04 ± 0.47, 14	19.61 ± 0.39, 14	6.56 ± 0.22, 14	7.02 ± 0.28, 14
	13.90–17.42	22.31–23.98	19.00–20.30	6.23–6.98	6.49–7.60
Males	15.93 ± 1.17, 28	23.51 ± 0.39, 26	19.96 ± 0.35, 27	6.59 ± 0.20, 27	7.07 ± 0.27, 27
	13.90–18.29	22.66–24.23	19.34–20.79	6.22–7.03	6.64–7.71
(12) *C. mexicanus*					
1 Female	–	15.73	13.49	4.80	5.09
1 Male	17.70	15.38	13.37	4.67	4.83
(13) *C. townsendii australis*					
Females	19.96 ± 0.92, 11	15.94 ± 0.15, 10	13.65 ± 0.30, 10	4.87 ± 0.13, 10	5.19 ± 0.19, 10
	17.90–21.22	15.75–16.21	12.90–13.89	4.69–5.11	4.96–5.42
Males	18.96 ± 0.52, 5	15.76 ± 0.10, 6	13.49 ± 0.23, 6	4.75 ± 0.08, 6	5.33 ± 0.12, 6
	18.19–19.36	15.65–15.88	13.11–13.76	4.64–4.88	5.15–5.51
(14) *E. furinalis gaumeri*					
Females	14.81 ± 0.34, 2	15.51 ± 0.13, 2	14.27 ± 0.16, 2	5.74 ± 0.08, 2	5.99 ± 0.35, 2
	14.57–15.05	15.42–15.61	14.16–14.38	5.69–5.80	5.74–6.23
Males	14.51 ± 0.21, 3	15.71 ± 0.29, 3	14.25 ± 0.24, 3	5.73 ± 0.10, 3	6.03 ± 0.17, 3
	14.38–14.75	15.38–15.92	14.04–14.51	5.66–5.84	5.89–6.22

Appendix 1 (continued).

Postorbital constriction	Zygomatic breadth	Braincase width	Mastoidal breadth	Mandible length	Mandibular toothrow length
5.99 ± 0.11, 2 5.92–6.01	12.16, 1 –	9.37 ± 0.15, 2 9.27–9.48	10.24 ± 0.29, 2 10.04–10.45	15.05 ± 0.60, 2 15.01–15.09	9.90 ± 0.01, 2 9.89–9.91
7.28 ± 0.23, 3 7.04–7.49 7.47 ± 0.13, 7 7.34–7.67	19.22 ± 0.29, 3 19.01–19.56 19.93 ± 0.51, 7 19.19–20.59	14.24 ± 0.19, 3 14.03–14.40 14.38 ± 0.21, 7 14.16–14.64	17.61 ± 0.28, 3 17.36–17.91 19.07 ± 1.10, 7 17.88–20.58	18.93 ± 0.19, 3 18.78–19.14 19.94 ± 0.25, 7 19.53–20.33	11.82 ± 0.05, 3 11.76–11.87 12.25 ± 0.17, 7 12.00–12.50
5.00 5.17	– –	– 9.14	– 9.63	14.06 –	9.41 –
4.07 ± 0.14, 20 3.78–4.33 3.99 ± 0.13, 14 3.81–4.17	9.19 ± 0.18, 20 8.85–9.49 8.99 ± 0.22, 13 8.64–9.41	7.73 ± 0.18, 20 7.45–8.06 7.73 ± 0.17, 13 7.37–7.94	8.83 ± 0.24, 20 8.34–9.22 8.78 ± 0.25, 13 8.30–9.13	12.48 ± 0.33, 21 11.98–13.01 12.30 ± 0.34 , 13 11.73–12.74	8.10 ± 0.24, 21 7.34–8.38 8.03 ± 0.21, 13 7.65–8.36
3.95 4.13 ± 0.09, 2 4.07–4.20	– – –	9.82 9.90 ± 0.12, 2 9.82–9.99	9.96 10.45 ± 0.33, 2 10.22–10.69	22.04 21.51 ± 0.09, 2 21.45–21.58	12.33 12.52 ± 1.48, 2 11.47–13.57
4.57 ± 0.11, 4 4.41–4.67 4.44 ± 0.13, 3 4.35–4.59	9.53 ± 0.07, 2 9.48–9.58 9.12 ± 0.28, 2 8.93–9.32	8.65 ± 0.25, 4 8.31–8.91 8.35 ± 0.11, 3 8.24–8.47	9.06 ± 0.21, 4 8.84–9.34 8.87 ± 0.19, 3 8.71–9.08	14.18 ± 0.01, 5 13.32–15.25 13.76 ± 0.52, 2 13.39–14.13	8.41 ± 0.60, 4 7.71–9.17 8.10 ± 0.79, 2 7.54–8.66
4.67 ± 0.19, 11 4.39–5.01 4.52 ± 0.46, 3 4.02–4.92	9.08 ± 0.43, 9 8.49–9.72 9.47 ± 0.20, 2 9.33–9.61	8.54 ± 0.21, 11 8.25–8.83 8.46 ± 0.10, 3 8.40–8.57	8.97 ± 0.22, 11 8.54–9.25 9.17 ± 0.30, 3 8.83–9.39	13.83 ± 0.35, 12 13.25–14.37 14.06 ± 0.29, 3 13.80–14.37	8.33 ± 0.20, 11 8.00–8.57 8.50 ± 0.50, 3 7.99–8.98
5.60 ± 0.37, 4 5.13–6.04	14.90 ± 0.39, 4 14.59–15.46	10.51 ± 0.59, 4 9.92–11.27	11.81 ± 0.51, 4 11.31–12.48	11.21 ± 0.42, 4 10.62–11.52	6.27 ± 0.31, 4 5.90–6.64
5.63 ± 0.22, 3 5.41–5.86 5.73 ± 0.30, 2 5.52–5.94	12.71 ± 0.38, 3 12.35–13.11 12.52 ± 0.18, 2 12.40–12.65	9.64 ± 0.26, 3 9.37–9.89 9.84 ± 0.19, 2 9.71–9.98	10.94 ± 0.80, 3 10.03–11.51 11.13 ± 0.12, 2 11.05–11.22	14.05 ± 0.30, 3 13.78–14.37 13.98 ± 0.57, 2 13.58–14.39	7.82 ± 0.34, 3 7.44–8.10 7.63 ± 0.28, 2 7.44–7.83
6.07 ± 0.10, 3 5.99–6.18	13.52 ± 0.07, 3 13.48–13.60	10.34 ± 0.28, 2 10.32–10.36	11.98 ± 0.17, 2 11.86–12.10	14.78 ± 0.13, 3 14.67–14.92	7.59 ± 0.38, 3 7.16–7.84
6.00 ± 0.15, 14 5.81–6.36 5.96 ± 0.23, 27 5.55–6.49	13.22 ± 0.36, 14 12.50–13.90 13.39 ± 0.41, 26 12.49–14.30	10.24 ± 0.24, 14 9.76–10.58 10.31 ± 0.21, 27 9.85–10.70	11.68 ± 0.34, 14 11.08–12.33 11.84 ± 0.29, 27 11.26–12.48	14.22 ± 0.39, 14 13.65–14.88 14.59 ± 0.29, 27 14.13–15.33	7.77 ± 0.13, 14 7.47–7.94 7.85 ± 0.19, 27 7.49–8.17
3.35 3.46	8.04 8.04	7.54 7.52	8.65 8.63	9.64 9.45	6.10 6.07
3.37 ± 0.12, 10 3.14–3.59 3.38 ± 0.11, 6 3.25–3.51	8.26 ± 0.32, 10 7.69–8.67 8.07 ± 0.31, 5 7.59–8.39	7.80 ± 0.38, 10 7.44–8.55 7.70 ± 0.48, 6 7.41–8.66	8.69 ± 0.13, 10 8.50–8.92 8.62 ± 0.10, 6 8.53–8.76	9.74 ± 0.15, 10 9.49–9.97 9.62 ± 0.13, 6 9.42–9.77	6.09 ± 0.11, 10 5.95–6.26 6.01 ± 0.16, 6 5.71–6.14
4.07 ± 0.08, 2 4.01–4.13 3.99 ± 0.06, 3 3.95–4.06	10.61 ± 0.01, 2 10.60–10.62 10.82 ± 0.29, 2 10.62–11.03	7.79 ± 0.73, 2 7.27–8.31 7.46 ± 0.11, 3 7.34–7.56	8.35 ± 0.01, 2 8.34–8.36 8.28 ± 0.32, 3 7.93–8.54	11.60 ± 0.21, 2 11.45–11.75 11.29 ± 0.28, 3 10.98–11.51	7.13 ± 0.08, 2 7.07–7.19 7.07 ± 0.15, 3 6.90–7.20

Appendix 1 (continued).

Species or subspecies sex	Total length	Tail length	Hindfoot length	Ear length
(15) *Eptesicus fuscus miradorensis*				
Females	117.58 ± 8.77, 19 87.0–127.0	45.84 ± 4.75, 19 36.0–55.0	10.68 ± 1.26, 19 8.0–12.5	16.37 ± 1.79, 19 12.5–19.0
Males	118.50 ± 5.97, 4 112.0–126.0	45.75 ± 4.19, 4 40.0–50.0	10.50 ± 0.58, 4 10.0–11.0	16.00 ± 0.82, 4 15.0–17.0
(16) *Lasiurus blossevillii teliotis*				
Females	110.60 ± 3.91, 5 107.0–117.0	48.60 ± 3.85, 5 43.0–53.0	9.20 ± 0.45, 5 9.0–10.0	11.00 ± 1.22, 5 9.0–12.0
Males	101.42 ± 4.34, 26 94.0–109.0	47.07 ± 2.92, 26 42.0–53.0	8.23 ± 1.50, 26 5.0–12.0	10.00 ± 1.60, 26 6.0–12.0
(17) *Lasiurus cinereus cinereus*				
Males	134.50 ± 0.70, 2 134.0–135.0	54.00 ± 2.83, 2 52.0–56.0	12.00 ± 0.00, 2 –	19.00 ± 0.00, 2 –
(18) *Lasiurus intermedius intermedius*				
Females	135.00 ± 14.88, 6 107.0–150.0	60.00 ± 2.68, 6 57.0–65.0	11.17 ± 1.47, 6 10.0–13.0	19.00 ± 3.95, 6 12.0–22.0
Males	136.71 ± 6.26, 7 125.0–145.0	63.57 ± 4.31, 7 56.0–70.0	10.43 ± 1.27, 7 9.0–12.0	16.71 ± 0.95, 7 16.0–18.0
(19) *Lasiurus xanthinus*				
1 Female	115.0	51.0	9.0	16.0
Males	113.50 ± 3.54, 2 111.0–116.0	54.00 ± 1.41, 2 53.0–55.0	11.00 ± 0.00, 2 –	17.50 ± 0.71, 2 17.0–18.0
(20) *Myotis albescens*				
Males	78.50 ± 0.71, 2 78.0–79.0	32.50 ± 0.71, 2 32.0–33.0	8.00 ± 2.81, 2 6.0–10.0	13.00 ± 1.41, 2 12.0–14.0
(21) *Myotis auriculus apache*				
Males	86.33 ± 5.86, 3 82.0–93.0	36.66 ± 3.21, 3 33.0–39.0	9.67 ± 0.58, 3 9.0–10.0	20.00 ± 1.00, 3 19.0–21.0
(22) *Myotis californicus mexicana*				
Males	79.00 ± 3.60, 3 75.0–82.0	34.00 ± 3.00, 3 31.0–37.0	6.67 ± 1.15, 3 6.0–8.0	13.33 ± 1.15, 3 12.0–14.0
(23) *Myotis ciliolabrum melanorhinus*				
Males	79.00 ± 4.24, 2 76.0–82.0	37.00 ± 0.00, 2 –	8.00 ± 0.00, 2 –	13.00 ± 1.41, 2 12.0–14.0
(24) *Myotis thysanodes thysanodes*				
1 Male	85.0	33.0	10.0	18.0
(25) *Myotis velifer velifer*				
Females	101.12 ± 3.87, 8 95.0–108.0	42.06 ± 3.84, 8 35.0–47.0	10.81 ± 1.00, 8 10.0–12.5	16.81 ± 0.84, 8 15.0–18.0
Males	98.75 ± 2.31, 8 95.0–103.0	42.37 ± 1.92, 8 40.0–46.0	10.50 ± 0.76, 8 9.0–11.0	15.87 ± 0.64, 8 15.0–17.0
(26) *Myotis yumanensis lutosus*				
Males	75.50 ± 10.61, 2 68.0–83.0	37.00 ± 1.41, 2 36.0–38.0	8.00 ± 1.41, 2 7.0–9.0	12.00 ± 5.66, 2 8.0–16.0
(27) *Molossops greenhalli mexicanus*				
Females	96.50 ± 3.54, 2 94.0–99.0	30.00 ± 0.00, 2 –	8.50 ± 0.71, 2 8.0–9.0	14.00 ± 1.41, 2 13.0–15.0
(28) *Nyctinomops femorosaccus*				
1 Female	112.0	45.0	10.0	22.0

[a]All measurements are in millimeters except for mass, which is in grams. When only one specimen of a sex was available for measurement, this is noted in the column indicating sex. Dashes indicate missing data, that all values are the same, or that the measurement cannot be taken for the taxon.

Appendix 1 (continued).

Mass	Forearm length	Third metacarpal length	First phalanx length	Second phalanx length	Third phalanx length
15.57 ± 1.15, 3	48.36 ± 1.69, 10	45.66 ± 1.74, 10	17.89 ± 0.92, 10	16.17 ± 1.69, 10	8.16 ± 1.12, 10
14.9–16.9	46.29–51.49	43.73–48.38	16.34–19.20	14.25–19.33	6.38–9.49
–	44.76 ± 2.05, 4	43.07 ± 1.83, 4	16.64 ± 0.20, 4	14.61 ± 0.61, 4	8.80 ± 1.40, 4
–	42.58–46.97	41.76–45.77	16.44–16.83	13.93–15.42	6.94–10.23
7.75 ± 0.35, 2	40.19 ± 0.42, 5	44.37 ± 1.73, 5	17.95 ± 0.80, 5	18.94 ± 1.12, 5	3.77 ± 0.91, 5
7.5–8.0	39.64–40.76	41.87–45.90	17.34–19.27	18.10–20.82	2.54–5.05
7.91 ± 2.09, 21	38.53 ± 1.39, 25	42.50 ± 1.76, 25	16.69 ± 0.69, 24	17.60 ± 0.84, 24	3.85 ± 0.53, 24
6.0–14.0	35.86–41.32	39.22–47.30	15.13–17.87	15.74–19.25	2.90–5.28
20.00 ± 1.41, 2	51.98 ± 1.19, 2	58.86 ± 0.14, 2	16.96 ± 0.03, 2	22.74 ± 0.59, 2	4.46 ± 0.76, 2
19.0–21.0	51.14–52.83	58.76–58.96	16.94–16.98	22.33–23.16	3.92–5.00
30.0, 1	53.47 ± 2.38, 7	61.78 ± 2.41, 7	21.71 ± 1.06, 7	20.08 ± 1.77, 7	5.33 ± 0.53, 7
–	48.87–56.06	57.93–64.91	20.11–22.78	16.33–21.44	4.57–5.98
26.12 ± 11.31, 5	51.03 ± 0.85, 7	58.75 ± 1.61, 7	20.39 ± 1.24, 7	19.98 ± 1.42, 7	4.39 ± 1.43, 7
15.6–39.4	49.93–52.48	56.73–60.87	18.31–21.87	18.66–22.46	1.45–6.02
13.5	45.28	52.18	17.56	17.20	4.33
9.25 ± 0.35, 2	44.73 ± 1.60, 2	50.53 ± 1.23, 2	17.03 ± 0.52, 2	17.20 ± 0.43, 2	5.34 ± 0.74, 2
9.0–9.5	43.60–45.86	49.66–51.40	16.66–17.40	16.90–17.51	4.82–5.87
6.00 ± 2.83, 2	32.46 ± 0.62, 2	31.00 ± 0.134, 2	10.09 ± 0.44, 2	9.53 ± 1.36, 2	4.35 ± 1.92, 2
4.0–8.0	32.02–32.90	30.91–31.10	9.78–10.40	8.57–10.50	3.00–5.71
5.0, 1	37.61 ± 0.56, 3	32.69 ± 0.32, 3	11.27 ± 1.09, 3	10.74 ± 0.54, 3	4.62 ± 1.16, 3
–	37.21–38.25	32.49–33.07	10.01–11.93	10.12–11.08	3.78–5.95
3.50 ± 0.71, 2	32.74 ± 1.72, 3	29.29 ± 3.63, 3	11.21 ± 0.18, 3	9.97 ± 0.65, 3	5.29 ± 0.74, 3
3.0–4.0	31.10–34.53	25.32–32.45	11.04–11.40	9.47–10.70	4.46–5.90
3.50 ± 0.71, 2	31.60 ± 1.41, 2	30.00 ± 0.14, 2	11.65 ± 0.64, 2	11.90 ± 1.70, 2	4.25 ± 1.77, 2
3.0–4.0	30.60–32.60	29.90–30.10	11.20–12.10	10.70–13.10	3.00–5.50
6.9	42.06	40.02	13.90	15.00	3.76
8.50 ± 0.55, 6	42.82 ± 1.40, 8	39.28 ± 0.91, 8	13.96 ± 1.12, 8	11.87 ± 1.29, 8	7.69 ± 1.21, 7
8.0–9.0	40.69–44.71	38.27–41.01	12.66–15.70	10.69–14.71	6.36–9.76
8.25 ± 1.28, 8	43.18 ± 1.24, 8	38.69 ± 1.10, 8	13.14 ± 1.29, 8	11.24 ± 0.88, 8	7.84 ± 1.09, 7
7.0–11.0	41.78–45.22	37.07–40.21	10.39–14.48	9.52–12.16	5.92–9.29
3.00 ± 0.00, 2	34.15 ± 0.45, 2	31.48 ± 0.85, 2	11.30 ± 1.88, 2	8.94 ± 0.93, 2	5.28 ± 0.95, 2
–	33.83–34.47	30.88–32.08	9.97–12.63	8.28–9.60	4.61–5.96
20.2, 1	33.93 ± 0.27, 2	36.15 ± 0.76, 2	15.20 ± 0.10, 2	13.18 ± 1.63, 2	4.47 ± 0.66, 2
–	33.74–34.12	35.61–36.68	15.13–15.27	12.03–14.34	4.00–4.94
12.0	45.04	44.79	19.77	17.87	5.67

Appendix 1 (continued).

Species or subspecies sex	Tibia length	Greatest skull length	Condylo-canine length	Maxillary toothrow length	Interorbital width
(15) *E. fuscus miradorensis*					
Females	18.49 ± 1.36, 10	19.95 ± 0.39, 10	17.94 ± 0.31, 10	7.32 ± 0.17, 10	7.57 ± 0.19, 10
	15.34–19.50	19.40–20.55	17.54–18.46	7.09–7.62	7.25–7.78
Males	17.33 ± 0.47, 4	19.37 ± 0.34, 4	17.29 ± 0.16, 4	7.17 ± 0.05, 4	7.10 ± 0.36, 4
	16.81–17.91	18.89–19.68	17.05–17.38	7.12–7.22	6.63–7.48
(16) *L. blossevillii teliotis*					
Females	18.20 ± 1.28, 4	13.01 ± 0.46, 5	12.11 ± 0.45, 5	4.27 ± 0.12, 5	5.77 ± 0.21, 5
	17.02–19.32	12.23–13.43	11.37–12.50	4.11–4.40	5.53–6.01
Males	18.23 ± 1.42, 23	12.60 ± 0.32, 24	11.60 ± 0.46, 24	4.09 ± 0.14, 24	5.47 ± 0.33, 24
	15.43–21.16	11.91–13.12	9.87–12.22	3.85–4.43	4.15–5.81
(17) *L. cinereus cinereus*					
Males	20.39 ± 2.47, 2	17.61 ± 0.12, 2	16.65 ± 0.09, 2	5.86 ± 0.23, 2	7.86 ± 0.29, 2
	18.65–22.14	17.53–17.70	16.59–16.72	5.70–6.03	7.66–8.07
(18) *L. intermedius intermedius*					
Females	21.79 ± 0.62, 7	19.99 ± 0.35, 6	18.71 ± 0.36, 6	6.82 ± 0.11, 6	8.71 ± 0.48, 6
	21.11–22.62	19.59–20.54	18.24–19.29	6.61–6.91	8.10–9.19
Males	20.62 ± 1.98, 7	19.21 ± 0.40, 7	17.65 ± 0.36, 7	6.49 ± 0.09, 7	8.36 ± 0.35, 7
	17.13–22.39	18.82–19.88	17.10–18.19	6.40–6.65	8.03–8.90
(19) *L. xanthinus*					
1 Female	18.19	16.66	15.10	5.60	7.11
Males	17.53 ± 0.47, 2	15.79 ± 0.64, 2	14.46 ± 0.04, 2	5.25 ± 0.08, 2	6.75 ± 0.17, 2
	17.20–17.86	15.34–16.25	14.43–14.49	5.19–5.30	6.63–6.87
(20) *M. albescens*					
Males	13.13 ± 0.61, 2	13.80 ± 13.90, 2	11.95 ± 0.21, 2	5.13 ± 0.05, 2	4.95 ± 0.50, 2
	12.70–13.56	13.70–13.90	11.80–12.10	5.10–5.17	4.60–5.30
(21) *M. auriculus apache*					
Males	15.91 ± 1.03, 3	16.35 ± 0.48, 3	14.42 ± 0.31, 3	6.33 ± 0.19, 3	5.24 ± 0.10, 3
	15.04–17.05	15.9–16.86	14.20–14.78	6.18–6.54	5.14–5.34
(22) *M. californicus mexicana*					
Males	14.43 ± 0.47, 2	13.35 ± 0.59, 3	11.14 ± 1.07, 3	5.06 ± 0.26, 3	4.07 ± 0.90, 3
	14.10–14.76	12.77–13.96	10.31–12.34	4.83–5.34	3.44–5.10
(23) *M. ciliolabrum melanorhinus*					
Males	13.80 ± 0.42, 2	12.68 ± 0.13, 2	10.53 ± 0.32, 2	5.00 ± 0.03, 2	3.60 ± 0.08, 2
	13.50–14.10	12.59–12.77	10.31–10.76	4.98–5.02	3.55–3.66
(24) *M. thysanodes thysanodes*					
1 Male	15.11	16.78	14.74	6.40	5.47
(25) *M. velifer velifer*					
Females	16.54 ± 0.44, 8	16.83 ± 0.32, 8	14.90 ± 0.30, 8	6.47 ± 0.13, 8	6.31 ± 0.09, 8
	15.87–17.08	16.28–17.34	14.50–15.58	6.19–6.64	6.16–6.44
Males	16.90 ± 0.84, 8	16.62 ± 0.25, 7	14.75 ± 0.26, 7	6.36 ± 0.10, 7	6.28 ± 0.26, 7
	15.61–17.77	16.35–17.07	14.51–15.04	6.23–6.52	5.86–6.51
(26) *M. yumanensis lutosus*					
Males	14.38 ± 0.31, 2	13.69 ± 0.13, 2	11.75 ± 0.25, 2	4.98 ± 0.16, 2	4.49 ± 0.12, 2
	14.16–14.60	13.60–13.78	11.57–11.93	4.87–5.09	4.41–4.58
(27) *M. greenhalli mexicanus*					
Females	10.34 ± 0.10, 2	17.94 ± 0.71, 2	16.22 ± 0.11, 2	6.78 ± 0.15, 2	6.92 ± 0.19, 2
	10.27–10.41	17.44–18.44	16.15–16.30	6.67–6.88	6.79–7.06
(28) *N. femorosaccus*					
1 Female	13.24	19.55	17.15	7.29	5.06

Appendix 1 (continued).

Postorbital constriction	Zygomatic breadth	Braincase width	Mastoidal breadth	Mandible length	Mandibular toothrow length
4.29 ± 0.23, 10	13.14 ± 0.29, 10	8.78 ± 0.45, 10	9.96 ± 0.27, 10	14.60 ± 0.30, 10	8.91 ± 0.27, 10
3.99–4.64	12.74–13.61	7.90–9.64	9.45–10.26	14.23–15.17	8.64–9.46
4.12 ± 0.25, 4	12.19 ± 0.61, 4	8.47 ± 0.11, 4	9.72 ± 0.22, 4	13.83 ± 0.29, 4	8.60 ± 0.11, 4
3.80–4.39	11.32–12.71	8.32–8.57	9.49–10.02	13.50–14.11	8.48–8.74
4.30 ± 0.13, 5	9.10 ± 0.28, 5	7.53 ± 0.28, 5	7.60 ± 0.21, 5	9.19 ± 0.16, 5	5.66 ± 0.18, 5
4.15–4.49	8.75–9.33	7.10–7.85	7.28–7.87	8.99–9.42	5.46–5.82
4.30 ± 0.15, 24	8.75 ± 0.18, 24	7.31 ± 0.15, 24	7.40 ± 0.13, 24	8.82 ± 0.22, 23	5.41 ± 0.18, 23
4.09–4.68	8.38–8.97	6.95–7.62	7.18–7.68	8.40–9.29	4.99–5.73
5.33 ± 0.20, 2	12.48 ± 0.38, 2	9.25 ± 0.90, 2	10.12 ± 0.42, 2	12.85 ± 0.06, 2	7.80 ± 0.06, 2
5.19–5.47	12.21–12.75	8.61–9.89	9.82–10.42	12.81–12.89	7.76–7.85
4.86 ± 0.25, 6	13.99 ± 0.40, 5	9.52 ± 0.26, 6	10.70 ± 0.19, 5	14.71 ± 0.27, 6	8.85 ± 0.21, 5
4.55–5.14	13.32–14.38	9.10–9.87	10.43–10.88	14.38–15.00	8.52–9.04
5.06 ± 0.24, 7	13.09 ± 0.55, 7	9.45 ± 0.27, 7	10.29 ± 0.34, 7	14.06 ± 0.31, 7	8.34 ± 0.31, 7
4.58–5.30	12.38–13.80	9.12–9.87	9.76–10.80	13.67–14.55	7.71–8.58
4.54	10.52	8.68	8.67	11.51	7.05
4.60 ± 0.05, 2	10.24, 1	8.41 ± 0.04, 2	8.61 ± 0.21, 2	11.29 ± 0.04, 2	7.16 ± 0.20, 2
4.57–4.64	–	8.38–8.44	8.46–8.76	11.26–11.32	7.02–7.31
3.70 ± 0.00, 2	8.14, 1	6.70 ± 0.00, 2	6.89 ± 0.20, 2	9.84 ± 0.20, 2	6.73 ± 0.05, 2
3.70–3.70	–	–	6.75–7.04	9.70–9.98	6.70–6.77
3.78 ± 0.04, 3	9.41 ± 0.15, 2	7.71 ± 0.13, 3	8.21 ± 0.07, 3	11.69 ± 0.42, 3	7.66 ± 0.59, 3
3.75–3.83	9.31–9.52	7.57–7.82	8.14–8.28	11.27–12.12	7.00–8.13
3.29 ± 0.45, 3	7.23 ± 0.79, 3	6.34 ± 0.36, 3	6.71 ± 0.30, 3	9.55 ± 0.45, 3	6.37 ± 0.55, 3
2.77–3.60	6.66–8.13	5.97–6.70	6.48–7.05	9.23–10.07	5.74–6.77
3.24 ± 0.36, 2	6.89, 1	6.15 ± 0.26, 2	6.41 ± 0.28, 2	9.35 ± 0.00, 2	6.40 ± 0.52, 2
2.99–3.50	–	5.97–6.34	6.21–6.61	–	6.03–6.77
4.08	10.15	8.00	8.19	12.31	8.02
3.89 ± 0.15, 8	10.60 ± 0.36, 8	7.91 ± 0.32, 8	8.29 ± 0.16, 8	12.56 ± 0.23, 8	8.20 ± 0.13, 8
3.70–4.14	10.01–11.29	7.47–8.44	8.10–8.50	12.22–12.99	8.02–8.36
3.90 ± 0.26, 7	10.38 ± 0.22, 7	8.04 ± 0.17, 7	8.27 ± 0.17, 7	12.55 ± 0.24, 7	8.16 ± 0.12, 7
3.47–4.25	10.17–10.77	7.69–8.20	8.09–8.53	12.23–12.94	8.01–8.35
3.65 ± 0.11, 2	7.98 ± 0.07, 2	6.53 ± 0.19, 2	6.87 ± 0.30, 2	9.54 ± 0.41, 2	6.34 ± 0.29, 2
3.58–3.73	7.93–8.03	6.40–6.67	6.66–7.08	9.25–9.83	6.13–6.55
4.35 ± 0.01, 2	11.67 ± 0.06, 2	8.81 ± 0.00, 2	11.16 ± 0.27, 2	12.90 ± 0.13, 2	8.10 ± 0.23
4.34–4.36	11.63–11.71	–	10.97–11.35	12.80–12.99	7.93–8.26
3.65	10.21	8.65	9.98	13.30	8.54

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