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ABSTRACT—Three caves in Guadalupe Mountains National Park, Culberson County, Texas, are closely grouped spatially, and their fossil-bearing sediments are about the same late Pleistocene age. Publications concerning two of the caves, Upper Sloth Cave and Lower Sloth Cave, list and discuss their fossil faunas. Here, we add identifications of mammals from the third site, Dust Cave, and briefly comment on selected taxa. *Tamias canipes* or *T. quadrivittatus* (gray-footed or Colorado chipmunk), *Tamias minimus* (least chipmunk), *Reithrodontomys* (harvest mouse), *Sigmodon ochrognathus* (yellow-nosed cotton rat), *Aztlanolagus agilis* (Aztlán rabbit), and *Sorex nanus* (dwarf shrew) are added to the faunal list of the cave complex. More questionable identifications of taxa not recorded from the other caves include *Ictidomys tridecemlineatus* (thirteen-lined ground squirrel), *Thomomys talpoides* (northern pocket gopher), and *Capromeryx* (miniature pronghorns). Reexamination of several taxa from the Sloth caves did not confirm published records of *Cryptotis parva* (least shrew), but added *Sorex merriami* (Merriam's shrew) and confirmed the presence of *Neotoma mexicana* (Mexican woodrat) and *Sorex cinereus* (masked shrew).

RESUMEN—Tres cuevas en el Parque Nacional Guadalupe Mountains, condado de Culberson, Texas, están cerca de si, y sus sedimentos con fósiles representan aproximadamente el mismo periodo del pleistoceno tardío. Las publicaciones con respecto a dos de las cuevas, Upper Sloth Cave y Lower Sloth Cave, enlistan y discuten su fauna fósil. Aquí, agregamos identificaciones de mamíferos de la tercera cueva, Dust Cave, y brevemente comentamos sobre algunos taxa seleccionados. *Tamias canipes* o *T. quadrivittatus* (ardilla de pata gris o ardilla de Colorado), *Tamias minimus* (ardilla rayada menor), *Reithrodontomys* (ratón de cosecha), *Sigmodon ochrognathus* (rata algodonera de nariz amarilla), *Aztlanolagus agilis* (conejo de Aztlán), y *Sorex nanus* (musaraña enana) son añadidas a la lista de la fauna del complejo de cuevas. Identificación menos confiable de otros taxa que no fueron registrados para las otras cuevas incluyen *Ictidomys tridecemlineatus* (ardilla de tierra de trece líneas), *Thomomys talpoides* (tuza norteña), y *Capromeryx* (antílope miniatura). La revisión de varios taxa de las dos cuevas de Sloth no confirmó los registros publicados de *Cryptotis parva* (musaraña menor), pero agregó *Sorex merriami* (musaraña de Merriam) y confirmó la presencia de *Neotoma mexicana* (rata maderera) y *Sorex cinereus* (musaraña enmascarada).

Three caves on the west face of the Guadalupe Mountains within Guadalupe Mountains National Park are within ca. 400 m of each other horizontally, and all have produced vertebrate faunas of about the same late Pleistocene age. Two of the caves (Upper Sloth and Lower Sloth) are at ca. 2,000-m elevation and were excavated by L. E. Logan in the mid-1970s (Logan and Black, 1979; Logan, 1983). The third cave (Dust Cave), at 1,980 m, also was excavated by Logan at that time, but the faunal material was not studied. We list the identifications of mammalian fossils from Dust Cave herein with a few comments on selected taxa, completing the local Pleistocene fauna represented by fossils from the three caves.

Van Devender et al. (1977:110) described vegetation about the caves as being "a very diverse, succulent Chihuahuan desertscrub community with some intermixed woodland species..." They also noted absence of coniferous forest in the vicinity, although they reported Colorado piñon (*Pinus edulis*) at higher and lower elevations in some mesic microhabitats.

Upper Sloth Cave was partially excavated for archaeological material in 1931 by Mera (1938) and tested in

TABLE 1—Wisconsin-age mammals from Dust Cave and the Sloth caves, Guadalupe Mountains National Park, Culberson County, Texas, with subjective estimates of confidence in identification or in the taxa being members of the local fauna: 1, reasonable confidence; 2, moderate confidence with potential for misidentification; 3, likely a misidentification or not part of the local fauna. An asterisk after a taxon indicates that it likely occurs historically within the hunting range of predators.

Taxon	Dust cave	Sloth caves	Confidence
Shasta ground sloth (*Nothrotheriops shastensis*)	—	X	1
Prairie dog (*Cynomys*)*	X	X	1
Gunnison's prairie dog (*Cynomys gunnisoni*)	—	cf.	1
Thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*)	X	—	2
Yellow-bellied marmot (*Marmota flaviventris*)	X	X	1
Rock squirrel (*Otospermophilus variegatus*)*	X	X	1
Tree squirrel (*Sciurus*)	—	X	1
Chipmunk (*Tamias*)*	X	X	1
Gray-footed or Colorado chipmunk (*Tamias canipes* or *T. quadrivittatus*)*	X	—	1
Least chipmunk (*Tamias minimus*)	X	—	1
Red squirrel (*Tamiasciurus hudsonicus*)	X	X	1
Spotted ground squirrel (*Xerospermophilus spilosoma*)*	X	X	2
Banner-tailed kangaroo rat (*Dipodomys spectabilis*)*	X	X	1
Yellow-faced pocket gopher (*Cratogeomys castanops*)*	—	X	1
Yellow-faced or plains pocket gopher (*Cratogeomys* or *Geomys*)*	X	X	1
Botta's pocket gopher (*Thomomys bottae*)*	X	X	1
Northern pocket gopher (*Thomomys talpoides*)	cf.	—	2
Mogollon vole (*Microtus mogollonensis*)*	cf.	X	1
Bushy-tailed woodrat (*Neotoma cinerea*)	X	X	1
White-toothed woodrat (*Neotoma leucodon*)*	X	X	1
Southern plains woodrat (*Neotoma micropus*)*	—	X	3
Mexican woodrat (*Neotoma mexicana*)*	cf.	X	1
Northern grasshopper mouse (*Onychomys leucogaster*)*	—	X	1
Mearn's grasshopper mouse (*Onychomys arenicola*)*	—	X	3
Deermouse (*Peromyscus*)*	X	X	1
Cactus deermouse (*Peromyscus eremicus*)*	—	X	3
Harvest mouse (*Reithrodontomys*)*	X	—	1
Yellow-nosed cotton rat (*Sigmodon ochrognathus*)*	X	—	1
North American porcupine (*Erethizon dorsata*)*	—	X	1
Aztlán rabbit (*Aztlanolagus agilis*)	X	—	1
Jackrabbit (*Lepus*)*	X	X	1
Black-tailed jackrabbit (*Lepus californicus*)*	—	cf.	2
Cottontail (*Sylvilagus*)*	X	X	1
Mountain cottontail (*Sylvilagus nuttallii*)	X	—	1
Notiosorex shrew (*Notiosorex*)*	X	X	1
Masked shrew (*Sorex cinereus*)	—	X	1
Merriam's shrew (*Sorex merriami*)	X	X	1
Dwarf shrew (*Sorex nanus*)	X	—	1
New Mexican shrew (*Sorex neomexicanus*)	X	X	1
Brazilian free-tailed bat (*Tadarida brasiliensis*)*	—	X	1
Pallid bat (*Antrozous pallidus*)*	X	X	1
Townsend's big-eared bat (*Corynorhinus townsendii*)*	X	X	1
Big brown bat (*Eptesicus fuscus*)*	X	X	1
Silver-haired bat (*Lasionycteris noctivagans*)*	—	X	1
California or western small-footed myotis (*Myotis californicus* or *M. ciliolabrum*) *	X	X	1
Western small-footed myotis (*Myotis ciliolabrum*)*	—	X	1
Fringed myotis (*Myotis thysanodes*)*	—	X	1
Cave myotis (*Myotis velifer*)*	—	X	1
Bobcat (*Lynx rufus*)*	X	X	1
Cougar (*Puma concolor*)*	X	X	1
Wolf (*Canis*)*	—	X	1
Long-tailed weasel (*Mustela frenata*)*	—	X	1
Striped skunk (*Mephitis mephitis*)*	X	—	1
Spotted skunk (*Spilogale*)*	—	X	1
Ringtail (*Bassariscus astutus*)*	—	X	1
Deer (*Odocoileus*)*	X	X	1
Miniature Pronghorn (*Capromeryx*)	cf.	—	3
Bighorn sheep (*Ovis canadensis*)*	X	X	1

1974 for vertebrate fossils by Logan (Logan and Black, 1979). A woodrat (*Neotoma*) midden in a crevice above the entrance was radiocarbon dated at 13,060 ± 280 radiocarbon years before present (Van Devender et al., 1977). A second radiocarbon-dated sample is from Logan's Trench 1; stratigraphy of this trench included an upper archaeological layer, a layer of sloth (*Nothrotheriops shastensis*) dung, wood, and then a layer of leaves and organic material. The layer of plant material "predates stratigraphically the extinction of the ground sloth and represents a flora intermediate between subalpine forest and the present upper Chihuahuan Desert community" (Van Devender et al., 1977:111). Fecal pellets of artiodactyls from the sloth layer were dated at 11,760 ± 610 radiocarbon years before present.

Apparently, most of the fauna was recovered from a second trench (Trench 2), which was not directly dated. Logan and Black (1979) noted that the only correlation between the two trenches is based on presence of *Cryptotis parva* (least shrew) and *Sorex cinereus* (masked shrew) in the 30–40 cm level of Trench 1 and the 10–20 cm level of Trench II.

A single date, on dung of *Nothrotheriops shastensis* (Shasta ground sloth), of 11,590 ± 230 radiocarbon years before present is available for Lower Sloth Cave. Van Devender et al. (1979) recorded samples of pollen from that zone as characterized in part by absent to moderate spruce, moderate to high pine, and moderate grasses. Six trenches were excavated by Logan (1983), who reported 37 non-overlapping taxa.

Dust Cave also was tested by Logan with two trenches. A rich macroflora representing a subalpine forest at the 0–7.5 cm level was dated to 13,000 ± 730 radiocarbon years before present on spruce needles (Van Devender et al., 1977). The fauna reported herein is that excavated by Logan.

The faunal material from Dust Cave, deposited in the Vertebrate Paleontology Collection of Texas Tech University, was received for identification through the auspices of Guadalupe Mountains National Park. It appears that Logan's field notes have been lost, and the only information available was that on labels associated with the faunal material. These data usually consist of a trench number, together with a stratum number and level within the stratum. For Trench 1 (of the two trenches), a grid number usually was given. The material consists mostly of skeletal parts and teeth of small mammals; the limited remains from larger mammals are almost invariably represented only by small fragments. A total of 2,799 items is recorded under 1,357 catalogue numbers. Identifications are largely on the basis of comparisons with modern materials and with some reliance on published data (e.g., Stangl and Dalquest, 1990).

Because of uncertainties regarding identifications in light of studies since the publications on the Sloth caves, specimens identified as *Neotoma mexicana* (Mexican woodrat), *Cryptotis parva* (least shrew), and *Sorex cinereus* (masked shrew) from those caves were borrowed from the Vertebrate Paleontology Collection of Texas Tech University for restudy.

Taxa identified from Dust Cave are listed in Table 1; order of presentation follows Wilson and Reeder (2005). The results of reexamination of specimens from Upper Sloth and Lower Sloth caves are that we cannot confirm identifications of *C. parva*, various fragmentary specimens appearing to be either *Notiosorex* (notiosorex shrews) or *Sorex* (long-tailed shrews); thus, presence of *C. parva* in the Sloth caves is unconfirmed. Borrowed dentition of *Neotoma* (woodrat) from Upper Sloth Cave consisted of only upper teeth, which could pertain to either *N. mexicana* or *Neotoma cinerea* (bushy-tailed woodrat); however, lower first molars from Lower Sloth Cave do pertain to *N. mexicana*. Presence of *S. cinereus* also is confirmed, and *S. merriami* (Merriam's shrew) is newly identified from Lower Sloth Cave.

Dating of fossil deposits often is problematical. This may be a particular problem with Dust Cave, which is assumed to date from near the terminus of the Pleistocene (late Wisconsin age), but has *Aztlanolagus agilis* (Aztlán rabbit), otherwise known in the region only in mid or early Wisconsin deposits. This rabbit is separated easily from extant rabbits by the unique enamel pattern of the lower third premolar and extreme looping of enamel of the talonid of more posterior lower teeth (Russell and Harris, 1986). If a late Wisconsin age is correct, then this extinct rabbit would appear to have been restricted to high elevations in the Guadalupe Mountains region at this time, at odds with other southwestern records (Russell and Harris, 1986).

Ictidomys tridecemlineatus (thirteen-lined ground squirrel) is difficult to separate from *Xerospermophilus spilosoma* (spotted ground squirrel) on most skeletal elements. The spotted ground squirrel is primarily a taxon of lowland, open habitat and considered unlikely to be a member of the local fauna at the time of deposition.

Dipodomys spectabilis (banner-tailed kangaroo rat) is a large kangaroo rat whose current distribution is limited to Upper and Lower Sonoran lifezones from northern New Mexico southward into Mexico. However, it was far-ranging in Pleistocene habitats quite unlike those of today. This pattern is especially notable compared to the smaller *Dipodomys ordii* (Ord's kangaroo rat), which today occurs from Canada into Mexico, but is rare to absent in the Guadalupe regional sites.

Thomomys talpoides (northern pocket gopher) is represented in the Dust Cave fauna by a single element that is only tentatively identified. Its presence, however, is expected as it occurs regularly in regional, late Pleistocene deposits.

Neotoma cinerea and *N. mexicana* usually are separated rather easily by discriminant analysis on the lower first molar (Harris, 1984). *Neotoma cinerea* is widely distributed

geographically and elevationally in the late Wisconsin; east of the Rio Grande, *N. mexicana* appears in the late Wisconsin only in the high-elevation deposits in the Guadalupe Mountains region, although suddenly appearing at low elevations in Holocene deposits (Lear and Harris, 2007). Harris (1990) hypothesized that this species arrived east of the Rio Grande only in post-glacial times; occurrences in the high-elevation sites documented here, if not contaminants, indicate otherwise, but do not clarify why contemporary low-elevation sites, with large numbers of identified woodrats, in seemingly ideal ecological conditions, lack this species.

Presence of *Neotoma micropus* (southern plains woodrat) in the Sloth caves is considered likely based on misidentifications of the common *Neotoma leucodon* (white-toothed woodrat) based both on the ecology (Braun and Mares, 1989) and overlap in measurements between the two species (Lundelius, 1979; Harris, 1984). Alternatively, remains may have been brought to the caves from lower elevations by predators. The situation is similar for *Onychomys arenicola*. This is a lowland species that, if present in the region during the late Pleistocene, would not be expected in habitats indicated for the Sloth caves (Hinesley, 1979).

Peromyscus eremicus (cactus deermouse) was identified from Upper Sloth Cave on the basis of the lack or only rudimentary development of accessory molar cusps (Logan and Black, 1979). However, working with samples of the lower first molars of seven species of *Peromyscus*, Dalquest and Stangl (1983) reported absence of accessory cusps and lophids among all seven species. This, coupled with the current ecological distribution (Veal and Caire, 1979) of the cactus deermouse, strongly suggests that *P. eremicus* was not a member of the local fauna.

The common fossil cottontail in the Guadalupe Mountains region is recognized as *Sylvilagus nuttallii* (mountain cottontail). The taxonomy of cottontails in the Southwest is unsettled (Ruedas, 1998; Frey, 2004), and it is possible that another name should apply.

At the times of publications on the Sloth caves, all fossil and recent southwestern members of *Notiosorex* were considered to represent *N. crawfordi* (desert shrew). Subsequently, Carraway (2010) described two new fossil species (*N. dalquesti* and *N. harrisi*) and found no fossil identifiable as *N. crawfordi*. Thus, presumably all identifications of *Notiosorex* in the literature refer to one of these two taxa rather than to *N. crawfordi* and are listed here only to genus. The specimens of *Notiosorex* from Dust Cave are too fragmentary for identification to species.

The single tentative identification of *Capromeryx* from Dust Cave is a lower third premolar and the identification probably is not trustworthy. The precipitous nature of the western face of the Guadalupe Mountains seems unlikely to have provided habitat for this small pronghorn.

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