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Sinkhole Excavations in Peccary Cave, Newton County, Arkansas

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Peccary Cave in eastern Newton County, Arkansas, is the most intensely analyzed Pleistocene vertebrate site in Arkansas. Dr. James H. Quinn, Geology Department, University of Arkansas at Fayetteville, secured a National Science Foundation grant that funded nearly continuous excavations of more than 20 areas within the cave from September, 1967, through August, 1969. Results of these efforts were published by Davis (Proc. Ark. Acad. Sci., 23:192-196, 1969), Quinn (Proc. 24th Intern. Geol. Cong., 12:89-96, 1972), Semken (*In Contributions in Quaternary Vertebrate Paleontology*, Pp. 405-432, 1984) and Stafford and Semken, (Curr. Res. Pleistocene, 7:129-132, 1990).

Semken's 1984 analysis of remains from Trenches 8, 13, and 15 allowed a six-stage reconstruction of the Newton County biota for the Late Pleistocene continuing through much of the Holocene. He envisioned a community 16,700 years ago "dominated by individuals characteristic of a cool steppe with coniferous forest patches." With the passage of time, species with boreal affinities disappeared from the cave environs and the modern closed deciduous forest biome developed some time after 2290 yrs. B.P. The stratigraphic sequence to support Semken's conclusions was based on correlating three trenches from two areas of the cave. In 1969 it was established that there were 4.26 m of sediments beneath the sinkhole entrance to Peccary Cave, but the time span they represented was not determined. When excavations were resumed in the cave in 1992, the thick, presumably unbroken, sinkhole sequence seemed to offer the opportunity to verify Semken's work. Squares 1 and 2 were excavated on the east side of the sinkhole with the additional goal of opening up any continuation of a series of dome-pit features trending in that direction. Before these squares were excavated to 20 cm depth, the solid limestone wall and floor of the cave blocked further progress. Excavations were then begun on the west side of the sinkhole debris cone to take advantage of 2.13 vertical m of exposed sediment.

The face of the sinkhole fill was excavated to a depth of 2.28 m in 15 cm levels. Sediments were spread on 0.91 x 2.44 m screen-wire covered frames to dry the clays in the matrix as thoroughly as possible. Any visible bone and charcoal was collected while the sediments were still on the frames. Dry sediments were then washed through a

stack of 2.2 cm, 1.1 cm, 0.5 cm and 0.2 cm screens to separate the sediments into uniform size fractions so that large rocks would not break small bones. Teeth, bone, and charcoal were collected during the washing process. Residue that passed through the 0.2 cm mesh was rewashed through window screen baskets to separate the remaining clay from minute specimens. When dry, the different sized sediments were again examined for specimens.

The use of the different sized screens for washing the sediments is a modification of the technique pioneered by C. W. Hibbard (Michigan Univ. Mus. Paleontology Contr. 8(2):7-19, 1949) in southwestern Kansas. Screen-bottomed boxes patterned after his model were used in the 1967-69 excavations. Our procedure seemed to produce less breakage of specimens and took approximately one 10-h day to process each 15 cm level of sediments.

The taxa of mammals recovered in the present study and their abundance in the various levels are recorded in Table 1. Many of the categories include more than one species, and more detailed study is expected to add several more. Excluding carnivores, the total Minimum Number of Individuals (MNI) from the 14 levels is 203. This number is only 17% of the size of the sample available for Semken's 1984 study. It will be desirable to increase our sample size by sampling additional squares as our study proceeds.

Deer mice, wood rats, and shrews are the most abundant taxa (comprising 71.7%) of Semken's study. They represent 68% of the MNI in the present study, but ground squirrels are more abundant (24) than shrews (16). Semken reports the pine vole throughout his sample, but it is concentrated in the top five levels under the sinkhole. The gopher (*Geomys* sp.) was represented by 120 individuals throughout Semken's sample. We have recovered but one and that in the deepest level processed to date. The largest animal recovered under the sinkhole (an unidentified juvenile carnivore) is much smaller than the peccaries, dire wolves, and even musk oxen recovered in the 1967-1969 excavations. These differences may be due to our smaller sample size or may be caused by the different areas of the cave having acquired their specimens by different mechanisms. The larger numbers of micromammals in Semken's 1984 study probably represent some sort

of raptorial bird pellet accumulation. Some of the large mammals Quinn studied clearly inhabited the cave as evidenced by neonatal specimens of *Platygonas compressus*. The sinkhole specimens may be mainly accidental victims of this natural trap, although they may not have been immediately killed by falling. Many of the post-cranial bones recovered show extensive evidence of gnawing. Countless other specimens may have been completely consumed by rodents.

Table 1. Minimum Numbers of Individuals of Mammal Species Collected By Level From Sinkhole Square Four, Peccary Cave.

Lev.	Deer Mouse	Wood Rat	Shrew	Vole	Ground Squirrel	Bat	Tree Squirrel	Ground Hog	Rabbit	Gopher
1	4		2	3						
2	6	4		2	3					
3	6	1		1	1	1				
4	6	2		2		1				
5	13	2	2	2	2	2				
6	10	5	1		6	2	2	1		
7	14	5	1		2	4	1		1	
8	4	3			2	1			1	
9			1			3				
10	6	3	3	1	2	1				
11	2	3	1		3	1				
12	4	3	1	2	2	1				
13	8	2	1		1			1	1	
14	5	2	3			1		1		1
Total	88	34	16	13	24	18	3	3	3	1

Table 2. Minimum Numbers of Individuals of Amphibian and Reptile Species Collected From Sinkhole Square Four, Peccary Cave.

Level	Salamanders*	Anurans	Snakes**	Lizards
1		2	1	
2		9	3	2
3		1	1	5
4		1	1	4
5	1	3	2	5
6	1	4	3	1
7	1	2	2	2
8		2	1	1
9	1	1		1
10	1	2	1	2
11	1	2	1	2
12	1	1	1	1
13		1	1	1
14		1		
Total	7	32	18	27

* All are *Ambystoma*.

** All are cranial elements.

The amphibian and reptile specimens recovered in the present study are presented in Table 2. The two clusters of *Ambystoma* may represent only two individuals. Anurans dominate the herptile collection at the present level of identification. The pattern noticed by Davis (Unpublished Master's thesis, Univ. Arkansas Fayetteville, 1973) that there are more toads (*Bufo*) in the cave rather than true frogs, *Rana*, or smaller forms such as *Hyla*, or *Pseudacris* still seems to hold true. The toad's more terrestrial existence and willingness to wander farther from standing bodies of water may explain this distribution.

Thousands of snake vertebrae have been collected but not studied. Minimum number of individuals have been calculated from cranial elements. One poison fang is clear evidence of pit vipers being in the fauna.

Lizards are more abundant than snakes in terms of MNI counts, which are usually based on numbers of dentaries or parietals. *Crotaphytus*, *Sceloporus*, *Ophisaurus*, *Cnemidophorus*, and *Eumeces* were identified from Peccary Cave by Davis (1973), and all of the present specimens can probably be assigned to those same taxa.

To date, 31,256 pebbles that fell through one inch square mesh hardware cloth but were caught on half inch square mesh hardware cloth have been collected, referred to a stratigraphic formation, counted, and weighed in lots of 50 or fractions thereof. While most of the cave is within Ordovician limestone, such as Plattin, the top of the sinkhole is within the hematite-stained St. Joe limestone member of the Boone Formation. Chert has been washed into the cave since the sinkhole broke through the hillside. Only 6.8% of the pebbles are assigned to the St. Joe, 0.6% to the Plattin limestone, and the remaining 92.6% seem to be insoluble chert derived from the Boone formation. It is anticipated that with increasing depth, indicating even longer times exposed to the dissolving power of water entering the sinkhole, the relative abundance of limestone will decrease even more. At some depth, before the opening of the sinkhole, the fill material is expected to be Ordovician limestone clasts in insoluble clay.

To the present, 2666 St. Joe specimens and 8210 chert fragments which were too large to fall through 2.5 cm square hardware cloth have been analyzed. Table 3 demonstrates that the ratio between these lithologies is not constant, and we believe it is varying in a non-random fashion. There seems to be an overall trend toward diminishing amounts of the St. Joe limestone with two centering on Level 4 (45 - 60 cm) and Level 10 (1.37 - 1.52 m). We await radiocarbon dates from the abundant charcoal samples which have been collected to determine if this pattern represents non-uniform rates of deposition. It is possible that periodic forest fires produce the charcoal, strip major portions of the vegetation from the hillside above the sinkhole, and allow accelerated erosion and transport to the cave of the Boone chert regolith (centering on Levels 3, 8,

and 13).

Table 3. Pebble Types Collected From Sinkhole Square Four, Peccary Cave.

Level	Boone	Plattin	St. Joe	Dripstone
1	252	1	152	4
2	663	7	394	14
3	321		102	1
4	238	8	170	23
5	198	7	131	7
6	682	39	361	
7	740	24	184	
8	623	9	117	2
9	427	2	140	
10	502	7	282	1
11	1055	10	208	4
12	959	7	118	3
13	935	5	90	3
14	615	3	88	
Total	8210	129	2666	62

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