Journal of the Arkansas Academy of Science

Volume 32 Article 36

1978

Geochemistry of a Carbonatite in Montgomery County, Arkansas

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Table 1. Species, number, and temperature zone of bats collected in an Ozark Cave.

Species	No. Collected	Temp. Zone
Pipistrellus subflavus	617	Constant
Myotis grisenscens	369	Cons. & Var.
Myotis lucifugus	100+	Cons. & Var.
Myotis sodalis	2+	Constant
Myotis keenii	1+	Constant
Myotis spp.	197	Cons. & Var.
Eptesicus fuscus	3	Variable
Lasiurus borealis	140	Constant
Lasiurus cinereus	6	Constant
Nycticeius humeralis	9	Constant
Lasionycteris noctivagans	1	Constant

Myers (1960. *Lasiurus* from Missouri caves. J. Mamm. 41:114-117) noted that although cave bats such as *Myotis, Eptesicus,* and *Pipistrellus* commonly used caves in which lasiurine (tree) bats were found, rarely were any of these true cave bats found dead in the caves. Interestingly, the opposite is true in this observations, since 89% of the remains were of cave dwelling species.

Of additional importance was the recovery of two species of tree bats rarely encountered in caves. Nine specimens of the evening bat, *Nycticeius humeralis,* were recovered from the constant temperature zone of the cave. These specimens represent the largest aggregation of evening bats reported from a limestone cave in Arkansas. On only two other occasions have evening bats been reported from caves of Missouri and Arkansas (Easterla, D. A. 1965. A nursery colony of evening bats in southern Missouri. J. Mamm. 46:498; McDaniel, V. R. and J. E. Gardner. 1977. Cave fauna of Arkansas: vertebrate taxa. Proc. Ark. Acad. Sci. 31:68-71).

One specimen of the silver-haired bat, *Lasionycteris noctivagans,* was removed from the constant temperature zone and represents the only specimen of this bat taken from a limestone cave in Arkansas. According to Barbour and Davis (1969. Bats of America. Univ. Kentucky Press, Lexington. p. 107), the silver-haired bat rarely enters caves, and there are published records of only six specimens found in caves (Krutzsch, P. H. 1966. Remarks on the silver-haired and Leib's bats in eastern United States. J. Mamm. 47:121).

Skeletons of two other tree bats, *Lasiurus borealis* and *L. cinereus,* were numerous, but their presence in caves has been reported earlier (Beer, J. R. 1954. A record of the hoary bat from a cave. J. Mamm. 35:116; Quay, W. B. and J. S. Miller. 1955. Occurrence of the red bat, *Lasiurus borealis,* in caves. J. Mamm. 36:454-455).

The presence of such large numbers of bat remains in a cave is intriguing, particularly in light of the abundance of cave bat remains. While tree bats might conceivably enter the cave environment, go into torpor, and in the absence of normal epigean stimuli, fail to ever come out of torpor, cave bats obviously should not suffer such a fate. Additionally, the abundant cave bat remains and the relative proximity of the cave entrance discount the possibility of the tree bats simply becoming lost in an unfamiliar area. Although we cannot readily explain the presence of the tree bats in this cave, our studies on swarming activities at the mouth of this cave reveal an abundance of these species at the cave mouth. The large accumulation of cave bat remains appears to be related to a peculiarity of the entrance of this cave. The entrance is a sinkhole that often floods during spring rains. It appears that many years the entrance remains flooded for extended periods, not allowing bats to exit. Apparently these periods of prolonged flooding have coincided with normal spring emergence and the bats, with energy stores critically depleted, were unable to survive without access to food during this period.

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GEOCHEMISTRY OF A CARBONATITE IN MONTGOMERY COUNTY, ARKANSAS

In a previous paper (Wagner and Steele, 1977) the chemical compositions of carbonatites in Conway and Perry Counties of Arkansas were compared. No large differences were found except those due to varying amounts of weathering. This paper reports on a lone carbonatite in Montgomery County (sec. 11,T4S,R23W) that has not been mentioned in earlier publications on igneous rocks of Arkansas (Croneis and Billings, 1930; Stone and Sterling, 1964). It is located 92 km southwest of the nearest Perry County carbonatite, 53 km west of the Magnet Cove igneous complex and 50 km northeast of the Murfreesboro peridotite. Table 1 compares the composition of the Montgomery County carbonatite to its nearest carbonatite neighbors. Its chemical composition is very near to that of the Perry County carbonatite. Notable exceptions are its lower Na, K and Sr and higher Ni contents. Major elements are similar in percentage to the average for the Perry and Conway County carbonatites. There are fewer xenoliths in the Montgomery County carbonatite.

Only a few square meters of a highly weathered portion of the Montgomery County carbonatite are exposed. Soil and stream sediment samples from a limited area around this weathered exposure were analyzed in an effort to determine geochemical indicators of the carbonatite. Figure 1 shows the location of the sampling sites and the weathered intrusive area. Table 2 lists the analyses.

The carbonatite appears to be confined to a southeast trending ridge about 15 meters high and 110 meters across. Samples PW-10, 12 and 13 are from weathered exposures of the carbonatite on the western slope of the ridge. PW-14 is from altered wall rock on the eastern slope and PW-21 is a B-horizon soil sample from a mid point at the top of the ridge. All other soil samples are labeled PW and are from the top of B-horizon, except PW-15 which is from the A-horizon. Stream sediment samples are labeled Ou in Figure 1. Both soil and sediment samples were sieved on a 95 mesh nylon screen and the minus 95 mesh fraction dissolved in a combination of hydrofluoric acid and aqua regia for the analyses reported in Table 2. Analyses were by atomic absorption using a model 303 Perkin Elmer Spectrophotometer and the recommended procedures (Anonymous, 1973).

Soil samples within the drainage area of the carbonatite generally have the higher metal values, particularly Cu, Zn, Mn and Ba. This is true also of the sediment samples Ou-40 and Ou-35, from the stream which directly drains the carbonatite area. These metals - Cu, Zn, Mn and Ba - are thus the best indicators of the carbonatite.

Table 1. Chemical Analyses of Montgomery County Carbonatite Compared to a Perry County and Magnet Cove Carbonatite (data in wt. %)

Carbonatite	Ca	Mg	Fe	Ti	Mn	Na	K	
Perry Co.[1]	24.4	2.58	6.92	0.64	0.478	1.07	2.23	
Montgomery Co.	20.8	2.47	5.74	0.76	0.286	0.107	0.261	
Magnet Cove[2]	38.1	0.63	0.54	0.06	0.500	0.00	0.13	
	Ba	Sr	Zn	Co	Ni	Cu	V	Li
Perry Co.[1]	0.136	0.3884	0.0190	0.0037	0.0010	0.0012	0.0147	0.0011
Mongtomery Co.	0.100	0.1020	0.0080	0.0060	0.0460	0.0020	0.0220	0.0017
Magnet Cove[2]	0.100	-	-	0.00	0.00	0.0010	0.0200	-

[1] analysis of Brazil Branch carbonatite (Wagner and Steele, 1977)

[2] analysis of sample L-304, Erickson and Blade (1963)

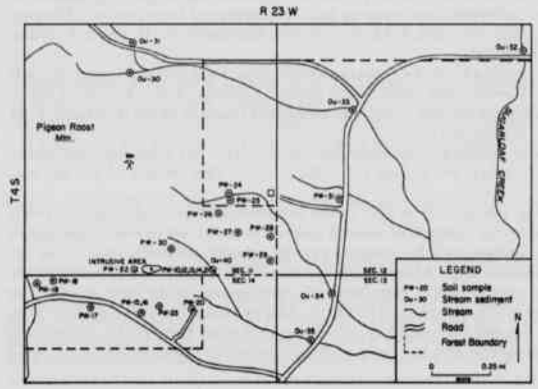

Figure 1. Location map for soil samples (PW) and stream sediment (Ou) samples taken around intrusive area of the Montgomery County carbonatite.

Table 2. Soil (PW) and Stream Sediment (Ou) Analyses Near Montgomery County Carbonatite* (data in ppm)

Sample	V	Co	Ni	Cu	Zn	Mn	Ba	Li	Sr
PW-10	615	263	490	180	313	12,040	1061	35	1208
PW-12	732	51	224	138	339	376	1378	18	949
PW-13	772	307	330	709	407	13,500	893	60	696
PW-14	209	123	606	66	259	36,700	407	59	117
PW-15	96	16	29	53	64	187	105	26	40
PW-16	57	7	13	29	46	419	95	14	29
PW-17	57	17	20	46	43	73	125	27	52
PW-18	57	17	20	32	52	114	125	20	36
PW-19	135	9	14	32	34	92	130	21	38
PW-20	74	20	20	40	70	281	115	25	36
PW-21	135	19	36	43	66	260	161	24	83
PW-22	96	30	40	39	87	1,116	234	29	49
PW-23	135	20	34	56	84	187	146	30	30
PW-24	74	12	30	41	58	73	161	25	15
PW-25	74	20	31	56	87	144	150	29	26
PW-26	113	13	14	39	37	92	269	19	29
PW-27	96	20	27	95	96	135	156	25	26
PW-28	96	16	24	38	54	83	781	39	44
PW-29	74	6	16	26	34	175	166	15	26
PW-30	113	23	74	65	131	3,649	747	36	60
PW-31	74	9	16	36	54	251	1037	22	35
Average PW**	91	16	27	45	64	431	277	25	38
Ou-30	153	44	50	47	90	1,431	1173	48	60
Ou-31	96	72	40	18	54	624	111	34	36
Ou-32	39	37	52	22	70	376	238	36	39
Ou-33	17	22	26	18	43	376	90	13	23
Ou-34	17	15	21	24	40	291	136	14	26
Ou-35	39	29	33	30	64	570	264	21	36
Ou-40	74	46	255	104	315	7578	623	-	45

* Analyses are for minus 95 mesh fractions which were dissolved in hydrofluoric acid followed by aqua regia and analyzed by atomic absorption. Ou-40 had aqua regia only.

** PW-10, 12, 13, 14 not included in average.

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