PHOLEOS

WITTENBERG UNIVERSITY SPELEOLOGICAL SOCIETY

Volume 4(1) 1984

THE WITTENBERG UNIVERSITY SPELEOLOGICAL SOCIETY

The Wittenberg University Speleological Society is a chartered internal organization of the National Speleological Society, Inc. The Grotto received its charter in April 1980 and is dedicated to the advancement of speleology, to cave conservation and preservation, and to the safety of all persons entering the spelean domain.

TABLE OF CONTENTS

PHOLEOS

THE WITTENBERG UNIVERSITY SPELEOLOGICAL SOCIETY NEWSLETTER

Volume 4, Number 1 January 1984

GROTTO ADDRESS

c/o H.H. Hobbs III
Department of Biology
P.O. Box 720
Wittenberg University
Springfield, Ohio 45501
513/327-7029

SUBSCRIPTION RATE

1 volume $3.00 (2 issues)
Single issue $1.50
Send to Grotto address

EXCHANGES
Exchanges with other grottos and caving groups are invited
Please mail to Grotto address.

MEETINGS

Second Wednesday of each month, 7:00 p.m., Room 206, Science Building, Wittenberg University Springfield, Ohio

FRONT COVER - Rat Alley in the Saltpetre-Moon Cave System.

GROTTO OFFICERS 1983-1984

CHAIRMAN
Donna J. D'Angelo
322 W. Cecil St
Springfield, OH 45504

VICE CHAIRMAN
Terence J. Madigan
207 W. Cecil St
Springfield, OH 45504

SECRETARIES
Trish Simon
113 South Hall
Wittenberg University
Springfield, OH 45501

Anne Dolphin
315 Woodlawn Hall
Wittenberg University
Springfield, OH 45501

TREASURER
William O.H. Freund III
1110 Tower Hall
Wittenberg University
Springfield, OH 45501

PUBLIC RELATIONS
John Carter
304 Glendale Ave
Springfield, OH 45504

EDITOR
Victor Fazio
17417 S Woodland
Shaker Heights, OH 44120

Editors note

Vic Fazio

Welcome to the issue that many of us have long awaited, that containing the map of the Saltpetre-Moon Cave System of Carter Caves State Park, Ky. Although it has taken more time to produce than originally anticipated, we feel that what is presented here is a most thorough description. Supplementary articles in this issue include our usual column reporting our caving ventures, two literary reviews, an update on the progress of the Ohio cave survey, and a primer on the mining of saltpetre accompanying our main feature.

I would like to take time out here to speak of our caving club and our continual battle for funds. This pertains to you, the reader, as recently it has affected you through delayed mailing of Vol. 3(2). of Pholeos. This occurred despite funnelling all monies received from dues and the student government organization of Wittenberg to this project. This reflects our devotion to keeping up a quality newsletter, and the rising costs that are inhibiting its production.

Pholeos, and our grotto, was maintained this year through the concerted efforts of our executive staff, taking time from their classes to attack the problems of a student grotto, matriculation and student apathy. Annually we must put ourselves to the task of bolstering, with freshmen, our membership which dwindles each spring at graduation (despite pleas to alumni). This first step, combined with an increase in dues, helps to maintain a modest income. However this will never be enough for this publication. For a large portion of the bill we look to our student government organization to aid us in payment. Through no small effort of persuasion, this years funding has been such that we can look to the future knowing there will be one. But still this represents for us existence without growth, and I know the enthusiasm for spelunking around here has not yet peaked.

Summer/Fall Caving

V. Fazio

Fall activities began with a weekend of caving at Carter Caves State Park, Carter Co., Ky. The purpose of this trip was varied. First we finished our survey of X-Cave, to appear in Vol.4(2). Also we completed the photographic portion of our survey of the Saltpetre-Moon Cave system (see this issue). It was then time to re-enter Bat Cave, one of the few occasions we have had to do so. This is due to the early fall being the only time we can avoid disturbing the bats and count on low water levels.

Water levels were in fact the lowest we had seen in the past two years, reflecting the exceptionally low amount of precipitation the Ohio Valley region had received during the summer. The two main corridors of this cavern had been surveyed in the fall of 1981, while the fall of 1982 was spent connecting those passages by several shunts that were discovered. This fall was to be the time that we completed the "minor" side extensions of a major portion of the cave. This goal was partly achieved as a complicated, though small, catacombed area was surveyed, and two sumps were investigated. One of 60m in length had an average water depth at this time of about .8m leaving us with a comfortable half meter of air space along most of the penetration. The other, much closer to the surface, proved to be of similar length and was observed to hold several very pale fish, with dark pupils.

As well as all this sounds you would think that we managed to finish this project, but then you don't know this group very well. Close examination of several "side leads" in two sections of main passage had us realize that one area was nothing more than a large breakdown room, and in the other a complicated water loop was found below another breakdown room. But the shocker of the season was definitely the discovery of an upper level, when we poked our heads through one of those small, minor leads. It immediately opened up into a large room, in one direction connecting to the upstream entrance vestibule, and in the other continuing on as a grand passage a football fields length or more. At one point a side extension reconnects with main passage at ceiling height. This dry upper level continues to parallel main passage, eventually leading back into it at one of the breakdown rooms.

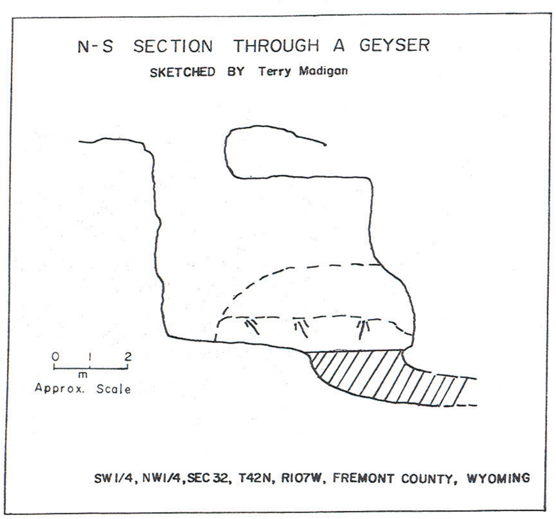
So, it would seem that one more trip is necessary, but as that may not be until the fall of 1984, its writeup and map probably won't appear before Vol. 5 of Pholeos. Additional caving during the fall, for the most part, took place at familiar sites. Our masochistic tendencies drew us back to Freeland's Cave, attempting to dig through a mud-filled stricture. In addition a passage of significant length was discovered in December, and we are currently working towards a spring wrap-up date of Ohio's longest cave. A visit to Seven-Caves to expose new members to a variety of Ohio caves, was successful in generating enthusiasm for our grotto. Also a cave with one of the larger entrances in Ohio, Cedar Fork Cave, was fully explored and a few sinkholes in the vicinity, including one recently collapsed, were pushed.

Summer Experiences: Chip Freund

In August John Fray and I went on a weekend excursion to the Blue Ridge Mountains of the Commonwealth of Virginia. The main purpose of this trip was to scout a large sandstone rock outcropping and a cave within it. This rock exposure, known as Pete's Rocks, southwest of Lexington, near Big House Little House Mountains, is in the Jefferson National Forest. The trail leading in is roughly five miles long beginning at a fire access road off of Interstate 64. The cave is located in the right wall of a natural amphitheatre itself quite impressive as a five meters square and seven meters high open air chamber. The cave is a tri-level fracture cave of appx. 15 meters per level. Each level varies between 2 and 3 meters in height and 0.5 - 1m in width. The cave appears to function as a giant water condenser which in turn feeds a small spring a short way down the mountain. The observed inhabitants of the cave included several brown bats, species unknown. From the large amount of fracture and upheaval in the entire rock unit I would speculate that there are several other caves to be explored in the area.

Summer Experiences: Terry Madigan

In July while attending a geology field camp in the Dubois, Wyoming area, I had the opportunity to examine several very small caves that occur in the Madison formation, a Mississippian aged massive limestone. Three of these, Yetti Cave, Warm Springs Cave and Monkey Cave, are small solution cavities extending no more than ten meters into the rock. Two natural bridges are to be found in the area of Warm Springs Canyon, in the Wind River Range, and appear to be the remnants of a cave, which collapsed long ago. I also had the chance to explore and sketch an extinct geyser (see Fig. 1), located in the same area as the caves, which contained a warm spring pool inside.



Literature Review

V. Fazio

On the Trail of Bird's Nest Soup. Roy Andries d Groot. Smithsonian 14(6): 66-75.

A recent article I believe worthy of your attention was written by Roy Andries d Groot and is splendidly supplemented by Michael Freeman's photography. The article concerns a food, a delicacy to many, and certainly one of few such items to make its way out of a cave and into a mans' stomach. De Grant relates the story of touring HongKong and his first experience with Birds Nest soup. He examines the origins of this highly coveted food item, looked upon as an aphrodisiac.

Trekking through the magnificent caverns of Thailand, he shows us the creator of the nest, the White-nest Swiflet, Collocallia fuciphaga. Pictorally we are presented with views of the tower karst of Phanynga Bay, Thailand and witness the vertical techniques of the collectors; the less than secure use of Ratton ladder and lighted candle at the end of a bamboo pole.

Much of the rest of the article is given to the description of the history of marketing this gourmet food and the development of the "ultimate recipe." "The Official Royal Recipe of Thailand for Birds' Nest Soup" is listed in detail. So valuable are the top grade (pure white) nests that owners of the remote islands where the appropriate caves are found, use barbed wire to defend against poachers. The trade in swifts nests is shrouded in secrecy like "shipments of gold bars" and at nearly $300 dollars/ounce, one can see why.

Although this article was written by an epicurist for people interested in exotic tastes, it still provides some insight into the exotic nature of the karst of this part of the world. Enough, at least, that I believe it worth the time for any caver to peruse through, if only for the photography.

Literature Review

D. D'Angelo

Jennings, J.N. 1983. Karst Landforms. American Scientist, 71(6): 578-586.

The article "Karst Landforms" by J. N. Jennings, discusses some of the factors that govern the solution of limestone and the formation of diverse types of karst terrain. Included in this discussion are many of the conflicting theories concerning ho this variety arises and a study conducted by Jennings on solution rates in the Cooleman Plain (New South Wales).

One of the main theoretical debates mentioned in the article is whether limestone dissolves more readily in hot (tropical) or cold climates. J. Corbel suggests that colder climates are more favorable for limestone solution because the colder waters in these regions can hold more carbon dioxide, thereby increasing the acidity and the ability to attack limestone. H. Lehmann, on the other hand, believes that the tropical areas which have high rainfall and fast decomposition rates form an acidic soil which provides carbon dioxide for the water. This controversy has yet to be resolved.

The author's description of his research on the Cooleman Plain provides the reader with a summary of how solution can be measured, and the difficulties encountered in this type of study. Jennings describes how discharge rates affect solution, what the major contributors of calcium carbonate are (i.e., surface or subjacent karst), and what equipment is used to determine this.

To wind things up, Jennings touches on some of the theories that have been proposed to explain the age differences between various limestone ranges. The effects of glaciation and climate changes appear to be of importance.

The article provides a good overview of the theories concerning why karst landforms of vastly different nature arise in different areas of the world. Jennings covers the subject evenly by touching on theories, research methods, equipment, and climatic-geological changes. Although the article does not provide the reader with any conclusive results, the author illustrates quite effectively why these results are not readily obtainable. I would recommend this article to anyone interested in the formation of diverse karst terrains.

PARALLELES IN PIKE COUNTY CAVES

by

H. H. Hobbs III

Three caves from westcentral Pike County, Ohio are described below. All are small solution features in the Silurian Age dolomite (Peebles Formation) and their surveys add to the knowledge of karst characteristics in the southcentral part of the state. Of particular interest is that the entrances to the caves are located at approximately the same elevation and the passages exhibit joint-control, the orientations of which are nearly equal for all. That is, the passages of these three caves have resulted from solutional processes along fractures in the bedrock that are oriented in a NE-SW direction. Dry Bone and Hackleshin caves are developed along major joint sets oriented at approximately 65/245 degrees; Hogwaller Cave varies somewhat, with passages trending primarily on joint sets oriented along a 57/237 degree axis. The main passage of nearby Hannah Cave (see Hobbs 1983:5-6) is formed on a joint aligned at approximately 60/240 degrees. Surveys of other subterranean, as well as surface features, will provide additional data that will tell us more about trends in the orientation of fractures in the bedrock on a regional basis.

DRY BONE CAVE

The entrance to Dry Bone Cave is located in an inconspicuous, but impressive, sinkhole (see Fig. 1). It is in a wooded area adjacent to a corn field and is at an elevation of approximately 218m. The cave has two distinct levels, a small stream, and its passages are notably joint-controlled

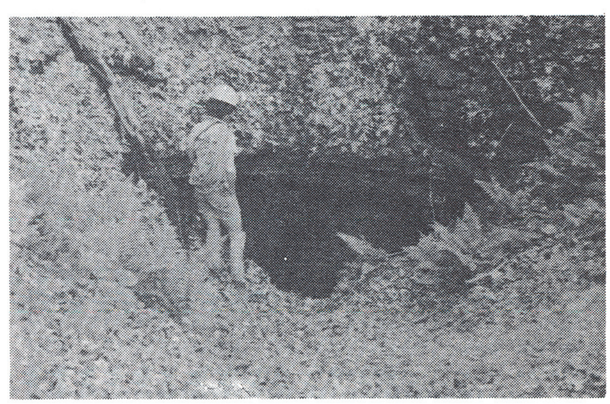
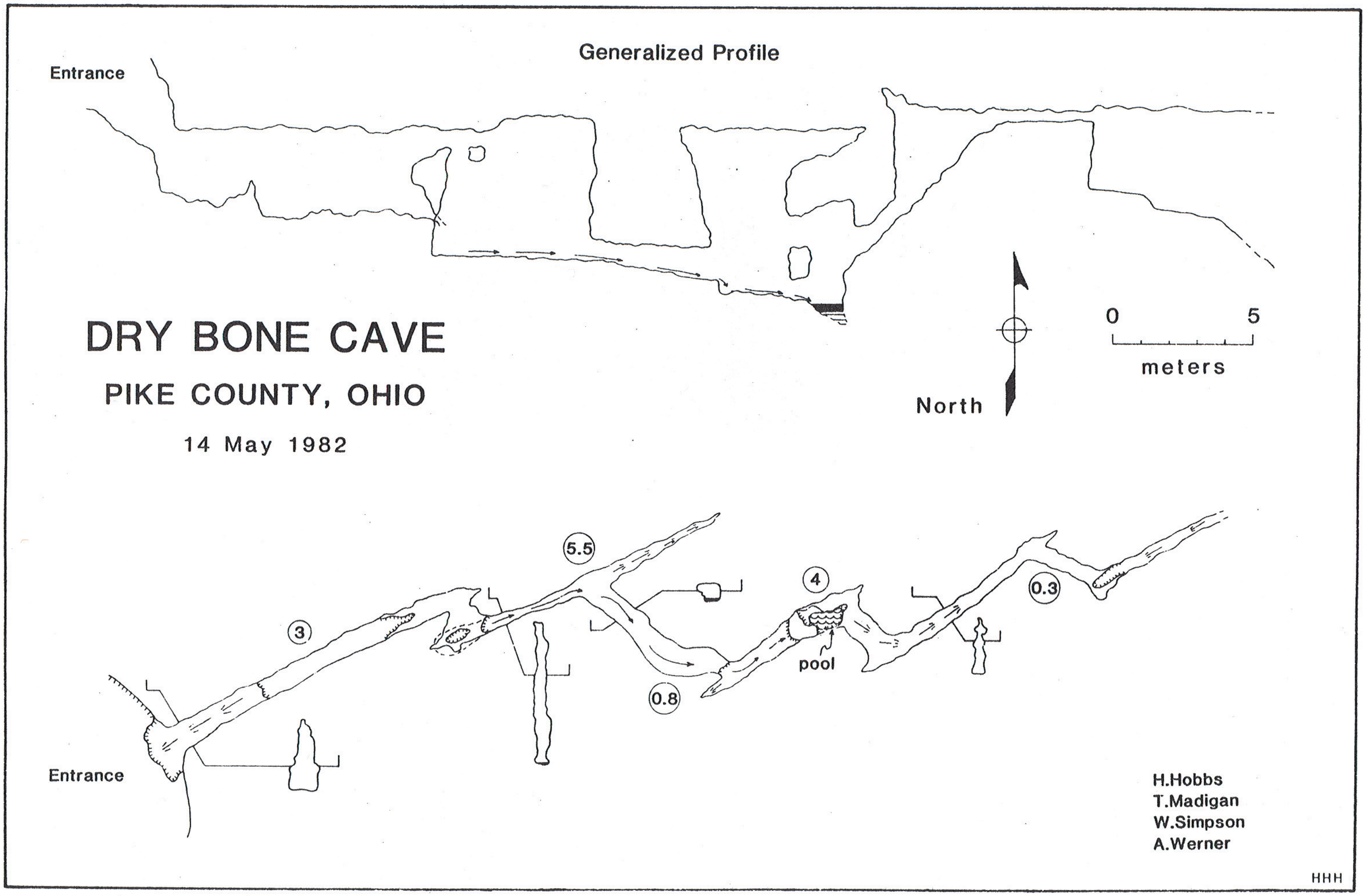


Fig. 1

Fig. 2


Generalized Profile
Entrance
DRY BONE CAVE
PIKE COUNTY, OHIO
14 May 1982
North
0
5
meters
5.5
3
4
0.3
0.8
pool
Entrance
H.Hobbs
T.Madigan
W.Simpson
A.Werner
HHH

for a total horizontal distance of 42m and a maximum depth of 7.3m (Fig. 2). A thin-bedded layer of shale 0.8m thick can be traced through the cave at a level approximately 0.5m below the ceiling.

The front section is a narrow canyon 3m high and floored with surface debris (logs, sticks, leaves). Approximately 9.5m into the cave a small drain which carries surface runoff is observed but one must climb about 2m up to a narrow crawl passage in order to continue. At this point the cave makes a short 90 degree turn to the south and a 3.7m drop into the lower level of the cave must be negotiated. A hand line is useful but the drop is easily chimneyed. A small stream enters from beneath the west wall and flows slowly over the gravel floor. The passage is a narrow canyon developed along a joint and is approximately 5.5m high. The stream then bends sharply to the southeast, follows a low tubular corridor, and turns abruptly to the northwest, where another passage is intersected. This short section in places is 4m high and the stream trickles into a pool at the lowest point within the cave. Several troglobitic amphipods have been observed here but none have been collected. A water sample was taken 14 May 1982: temperature = 9.7 degrees C; pH = 7.6; specific conductance = 252 umhos/cm; oxygen = 12.0 mg/l.

The remainder of the cave is reached by working ones way up a steep, mud-coated slope, the thin-bedded shale layer being observed in the canyon walls near the ceiling. A tight "belly-crawl" leads to the edge of a 2.5m deep drop (an interesting feature to negotiate!). The passage continues but becomes too narrow for further progress; this is particularly frustrating since the passage is heading into Turner Ridge and air movements are pronounced.

Observation of the horizontal plane of the cave clearly shows that the passages are joint-controlled. Of note, the high, relatively long canyons are oriented in a NE-SW direction and the low, relatively short crawlways are developed on joints trending NW-SE.

HACKLESHIN CAVE

The entrance to Hackleshin Cave is located in a prominent sinkhole in a corn field at an elevation of 218m. The sinkhole is walled on three sides by thin-bedded outcrops, easy access to the entrance being made down a talus slope (Fig. 3). A crawl over breakdown leads to a point where the stream enters the main passage from a low right-hand (south) tube (Fig. 4). The flow velocity, although never measured, has been great each time the cave has been visited and the following data were obtained on 16 May 1982: temperature = 16.2 degress C; pH = 7.2; specific conductance = 121 umhos/cm; oxygen = 9.0 mg/l.

The stream remains the dominant feature of this oppressively dark cave; no speleothems are known. Debris clinging to the walls and ceiling are vivid indicators that this cave <u>floods</u> completely and should not be entered when rain is predicted.

The cave is simply a narrow canyon floored by gravel and some surface debris. The total horizontal length is 77m and the maximum height of the canyon is 4.2m. At the end of the cave the water becomes greater than 1.5m in depth and the passage compresses to a narrow crevice. The salamander *Eurycea longicauda*, a pigmented crayfish (*Cambarus bartonii*), and a small fish have been observed in this small but interesting cave.

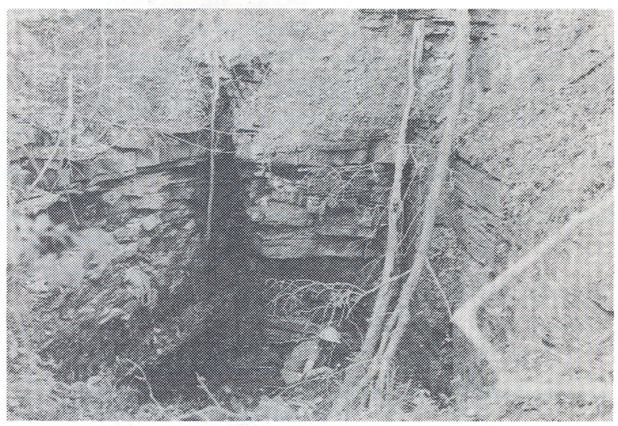


Fig. 3

HOGWALLER CAVE

The somewhat inconspicuous entrance to Hogwaller Cave (83m total horizontal cave) is located south of Little Sunfish Creek at an elevation of approximately 218m (Fig. 5). A trench or shallow canyon, probably one time part of the cave, leads to the entrance and one enters by going down a mud incline (Fig. 6). The passage is straight, narrow, and tall (4m high). Several meters from the entrance a hole opens in the floor and slopes steeply downward where it becomes nearly clogged at a depth of 0.5m. Following rains or during snow and ice melt, water can be heard flowing below this point. Attempts to dig into a lower level have been unsuccessful.

con't on page 14

The Saltpetre-Moon Cave System

by

V. Fazio and D. D'Angelo

In 1981 and 1982 several teams of W.U.S.S. members worked on the surveying and photography of the Saltpetre-Moon Cave System. Our work has culminated in this written description and the accompanying map. This is the most detailed account to date, adding significantly to the little information available on this cavern.

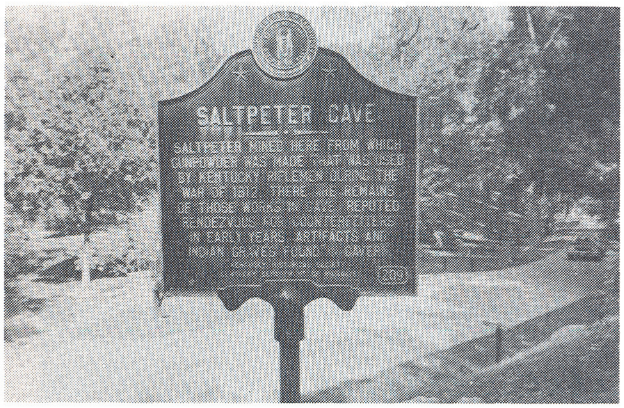


Fig. 1

Carter Caves State Park (Fig. 1) in Carter Co., Ky. is located in the Eastern Coal Fields Region, and is covered by the Lee Sandstone overlying a thick layer of Mississippian limestones. This layer includes the Lower Chester, Ste. Genevieve, and St. Louis formations. The Saltpetre-Moon Cave System, like most of the other major caves in the area, occurs in the Lower Chester and Ste. Genevieve, as these are more easily dissolved than the shale-like St. Louis formation (McGrain, 1954). These layers were downcut by a tributary of Tygarts Creek. Vadose activity replaced the phreatic corrosion occurring along two major joint fractures enlarging the cave to its present length of 3.005 km. A difference of only 25m exists in elevation extremes within the cave making it a moderately level one.

At one entrance of this commercial cave (wild cave tours are offered) is a locked gate barred in a such a fashion as to prohibit entry by human trespassers while not restricting faunal movements. Three other entrances are not so artificially protected, having their own natural features that deter would-be explorers. An early description of the main entrance of Saltpetre Cave, then referred to as "Swingie's Cave" and later "Swindell's Cave" is provided by Peebles ca. 1869. It reads as follows.

> The entrance to this cave is up a gentle rise from the bottom of the valley, on the south or opposite side from the other; and near the point where the hill begins to ascend more abruptly. The opening is ten feet in length, by two and a half and three in breadth, and perpendicular except at one end where the descent, though steep, is not difficult . . . we let ourselves down through the narrow pit-like aperture and came by a rugged and steep descent of fifty or sixty feet.

The steep descent has since been leveled by the placement of steps, the entrance walls shored by concrete, and all this housed under a shelter. However this may be an artificial entrance with the one described above actually being a few meters outside the shelter. Here today we see a debris-filled crevice that heads in the direction of the main entrance and matches the desciption given by Peebles.

Owing in part to the accessibility of the cave over the years, graffiti now abounds throughout. Of note are some now a part of history; signatures of early explorers, including R.R. Peebles and the McCunes from 1869 (see Fig. 18). These we are certain are genuine, however many more potentially legitimate notations remain to be verified by other workers.

A short distance after entering the gated entrance a passage is encountered on the right hand side (west) that leads into the northwest extension of the cave (see map) (Fig. 2). Similar to the other main trunk passages, nitrous earth is found throughout, with that portion near the main entrance having been deepened by mining. This canyon-like passage is a very dry avenue, however water flowed here once as evidenced by an abundance of domes formed by its swirling action. Here in this section rat guano deposits, found on the upper shelf of the earthen pile, may be seen that are quite old. At the end of one side lead are some active formations. It is off this northerly lead that a tight belly crawl (Meat Grinder) heads to the surface. The entrance opens onto a cliff ledge through a 0.5 X 1m hole in a concrete wall, a former attempt at blocking off this entrance. The ledge is accessible from the surface though it should be approached with the aid of a hand line as the slope is dangerous when wet. A sheer drop of about 15m from the ledge to the stream below awaits the careless visitor. Beyond the junction with the Cliff Entrance passage (Fig. 3) the northwest extension continues for 90m with the floor gradually rising to meet the ceiling. As best as we could

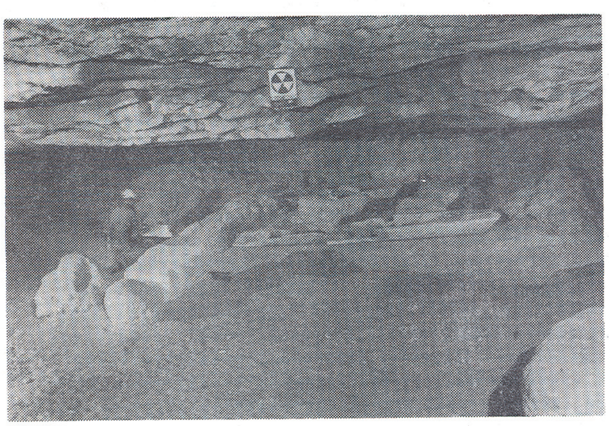
2

3

4

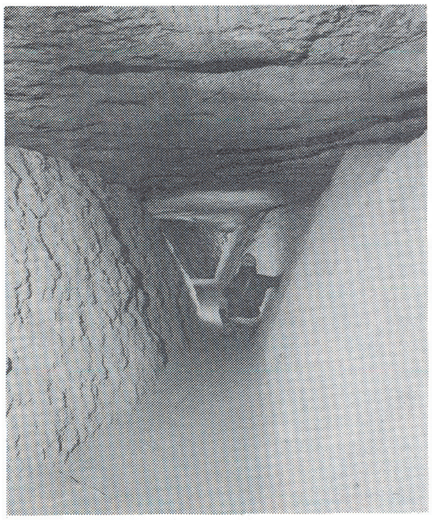
5

6



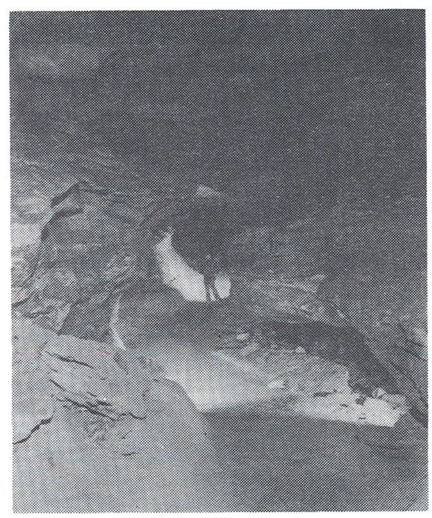
7

8



9

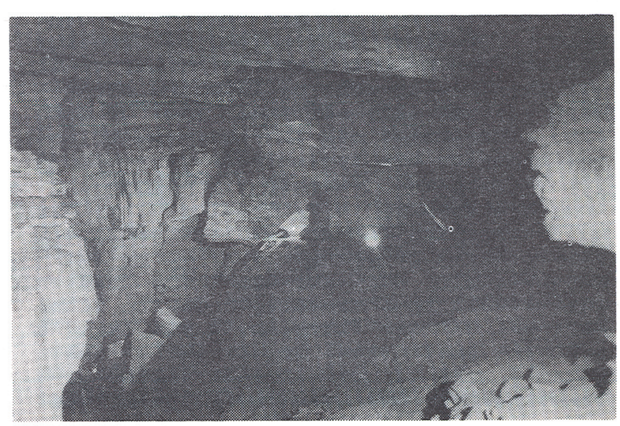
10



11

12

13



ascertain there is no physical connection between this and the parallel passage that penetrates to the west, despite the tantalizing proximity on the map.

The western extension too has been mined for saltpetre, so much so that the fill is made up of very small granules which seem to flow like water through ones fingers upon grabbing a handful. A problem with this, particularly acute in Dead Rat Hall (Fig. 4) and Dust Loop (see map), is that upon stirring it up the dust would remain in the air obscuring vision completely and drying the throats of those unprepared. Dead Rat Hall is so named for the regular appearence of different dead rats (Fig. 5) each time we visited this area, perhaps indicating a turnover in the population. This walking passage continues until a 1.5 X 1.5m tunnel is met, opening into a large room. The wall of this room is solid, and although noise contact may be made by banging on rocks there is no apparent breakdown or other evidence of connection with the afore mentioned passage. Off to the east is a lead that loops back into the tunnel (see map). Further west passage continues up through a tight crawl made more difficult to negotiate by the high slope of the floor and the popcorn on the ceiling. This leads to several rooms, side leads, a couple of loops and a dome-pit that acts as a drain for surface waters. Breakdown and heavy water seepage indicate the nearness to the surface of these rooms.

Back to the central area of the cave, a large expanse greeting those entering directly from the surface, one will find the greatest amount of mine work (Fig. 6). Still as they were when abandoned after use in 1812 and the Civil War (pers. comm. Tierney, 1983), logs and a wheelbarrow can be seen along the wall and central walkways. All that remains of the saltpetre vats are the casts of their contents, some of which may show impressions of the original wood (see D'Angelo this issue). This area is curious in its natural features also. A major dome-pit (see Fig. 7) to the northwest is an uncommon site of vadose seepage which drains into Belushi Crawl. Beyond this crawl a passage slopes down into a lower level where it is possible to come up into the central area by the base of the stairs (see map). Here also may be found one of the few examples of speleothem development in this cave. Further down passage to the northeast is to be located the the only concentration of bats in the entire cave. These groupings are very small consisting of perhaps 1-2 dozen individuals and usually much less. Further on, the floor meets the ceiling and at just that point is a small opening to a pit. The bottom was investigated and several tight leads were found after a rappell of 8.1m, but these could not be pushed, becomming too small after a short distance.

Heading southeast from the central juncture of the two joint-controlled passages is a large wide corridor, though to the observer it is a narrow walkway having been deepened by mining and earth piled up against the walls (Fig. 8). Several leads off the north wall connect back into the beginning portion of the western penetration forming the looping Dust Crawl. Further along, a similar situation again is noted looping into R-survey or Rat Alley (see map and cover photograph). Several rats (<u>Neotoma floridana</u>) have been observed and nests (Fig. 9) are noted in this passage. This narrow, rocky, sinuous avenue follows a southeast fracture line for approximately 200m ending in rocky debris. About 90m before its terminus, a passage runs about 20m to the northeast. Here pools of standing water were found fed by seepage of surface water. This terminates in a vertical fissure oriented perpendicular to the passage with a 4m height. This could not be negotiated due to a tight stricture, thus its relationship with the nearby main entrance of Moon Cave is unknown.

The eastern extension is not so clearly defined as the rest, the unidirectional norm being marred by the Maze, a hands-and-knees and belly-crawl complex connecting the central area with the main passage. Furthermore, the most direct route is blocked by breakdown near the water trough (Fig. 10), therefore usual access is via the broad passage to the south (see map). This enters another large walkable passage with a hard-packed earthen fill which is not a source of dust clouds common to other sections (Figs. 11,12). One twisting corridor leads northeast from the main trunk along which two domes occur, one having a height of 7m and a picturesque waterfall. The end diminishes apparently close to the surface as we were picking up fresh allochthonous matter. Of note also in this eastern part of the cave is the Passage of Whos, a notorious squeeze that represents the deepest portion of the cave descending to the level of the bottom of the rappell pit. The map indicates a possible connection here and indeed smoke was observed to pass from one of the Pit leads to the Passage of Whos. A feature of unknown origin but thought to be associated with the mining period is the water trough. Peebles writes "Near the termination we found a small reservoir of cold water, formed by drippings from the rocky ceiling above."

To the east the passage seemingly ends in breakdown save for a crawl to the north. However upon closer inspection of the S&M breakdown near the ceiling, a small hole continuing vertically may be noticed (see map). This is the connection that a boy scout discovered in the early 1970's between Moon Cave and Saltpetre Cave (Tierney, 1983 pers. comm.). A slippery climb up a shaft brings one into a breakdown room of surprising size but pales in comparison with the room to be entered from a shunt off to the east. This large rotunda which is the main room of Moon Cave has a domed ceiling of some 12-14m in places and is capped by sandstone marking the elevated level of this part of the cavern (Fig. 13). A sharp demarcation is visible where the sandstone and limestone meet, two-thirds the distance up the walls. This is especially clear along the southwest. At this point the cherty limestone has an interesting fluted look due to the flush of surface waters entering from the Pit Entrance. Just above the limestone, less solid sandstone makes its appearence as crumbling blocks in the wall and a sectioned ceiling. This feature is a poignant reminder to the caver of the comparative instability of this rock with limestone. Two vertical shafts may be observed to the south, one with a 10m drop (Fig. 14). From where one enters the room from Saltpetre to the opposite wall where a ledge protrudes, the distance is 22m. The ledge is only prominent enough to accomodate one person on hands and knees to crawl across and enter a tunnel-like Moon Cave entrance passage (Fig. 15). The main entrance of Moon Cave is a large open pit occupied by a number of logs and much leaf litter (Fig. 16). To one side the wall is almost sheer for 10m while to another it is only 3m and climbing out is possible with the available handholds. Difficult to notice from inside, a pit entrance not far from the main entrance (see map) can be used from the outside (Fig. 17). Here a vertical crevice (not unlike that described by Peebles for the original main Saltpetre entrance) slopes rapidly downward to the ledge of a shaft. This brings the rappeller down into the main room along the southwest wall.

In discussing the background of the caves in Carter Co. more often than not historic fact gives way to legend and folklore. While perhaps part or all of these tales are fictional, their telling adds colour to the tours given here. A summary of these stories is provided below (pers. comm. Tierney, 1983).

> Tradition has it that in one of the Carter Caves is located a lost silver mine, and it is known that the caverns were the scene of Swindell's counter-feiting operation many years ago.
>
> Saltpetre Cave itself is involved in the legend of Huraken, a Cherokee brave. The brave had discovered a vein of silver and mined it to produce a tomahawk and peace pipe, of solid silver, for presentation to the chief in return for his daughter Manuita. Huraken did this after going into battle and was away for a very long time. It was assumed that he had been lost in battle, and having grieved in his abscence for some time, Manuita flung herself from a great cliff ending her torment. That very night Huraken returned to claim the maidens hand, but instead came upon the mangled form of his loved one. He carried the body away and buried it in a cave where noone could find it, and where he could live and watch over her. His troubles were not ended however, as one day he was captured by a warrior of the old sachem, who suspected him of killing Manuita. He was sentenced to death, but was granted permission to go to the cave before he was killed. He entered the cavern alone, the other Indians believing it to be the dwelling place of evil spirits. He never returned, and thinking this an evil omen the Indians fled the county.
>
> Years later white men, hearing of the legend, explored the cave and came upon an open grave.
>
> About 28 years ago Ben Henderson, an old resident of Carter Co., passed under a cliff while hunting in Smoky Valley. There he found an elaborate, hand-made tomahawk of solid silver, surmounted by a peace pipe. This is taken to be conclusive proof by the local residents of the lost mine. Only one white man ever new the location, a man named Swift, who died several years ago, taking the secret to his grave.

In our final comments we at W. U. S. S. would like to express our concern about the surprising dearth of knowledge surrounding this and other caverns in the state park. Although it is known that the cave was a source of saltpetre in two seperate periods in the 19th century and evidence of this is extant, we know few additional facts. Although we understand someone named R. R. Peebles lived in Portsmouth, Oh. around 1869 (pers. comm. Tierney, 1983), visited the cave, and wrote a romantic, though accurate, account of his adventure, we know nothing more. The matter of ownership also is cloudy and while one may be quick to put this paucity of information down to the frailty of recorded history, what of the lack of data on the physical and biological aspects? Little of the biology is documented and few organisms were noted by us. What environmental conditions cause this cavern to be at least 5 c colder than most other area caves? Does this have an effect on the biota? We observed very few hibernating bats but we can say little else.

Literature Cited

McGrain, P. 1966. Geology of the Carter Caves Area. Lexington: Univ. of Kentucky., pp 32.

Peebles, R.R. ca. 1869. The Caves of Carter Co., Ky. pp 9.

Tierney, J. 1983. pers. comm.

Fig. 14

Fig. 15

Fig. 16

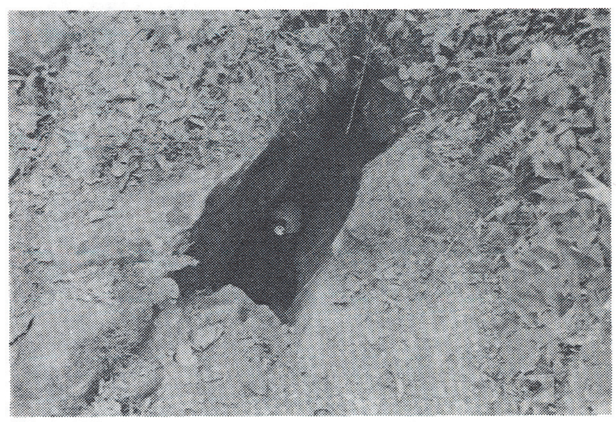


Fig. 17

The Origin and Mining of Saltpetre

by D. D'Angelo

Saltpetre caves were termed as such not because they contained saltpetre, but because the nitrous earth found in them could be converted to saltpetre. Contrary to popular belief, this nitrous earth was not formed primarily by the decomposition of guano (bat or rat), compost, and animal remains. Although these materials may contribute small amounts of nitrate, the main nitrogen source comes from surface soil nitrate that perculates down into the cave. Evaporation within the cave forms a moisture and density gradient between the dry air in the cave and the moist air above it. Nitrogen is transported through the surface soil as NH(4) and oxidized by the bacteria <u>Nitrosomonas</u> and <u>Nitrobacter</u> present in the cave sediments (Hill 1981).

Because saltpetre (primarily KNO3) made an excellent gunpowder, locating and mining it became extremely important during the time of the Civil War. The method for finding niter was fairly simple and easy for the average farmer etc. to perform. The first step was to locate dry loose dirt (either above ground or in a cave) and check it for whitish needlelike crystals. If the crystals were present and tasted cool and bitter then this was a good site to perform further tests. The second step was to dig a furrow in the smooth even dirt. If, after a few days, the surface was smooth and even again then it was probably nitrous earth. The final test was to put a few of the crystals on a hot coal to check and see if they burned quietly, with no sparkling or crackling. If the sparks burned quietly then the soil could be processed for saltpetre (Powers 1981).

The mining procedure began with the removal of the upper 1-2 meters of soil from open areas. Large breakdown blocks were also fragmented to make the nitrous earth beneath them accessible. All tools for digging and converting the soil were made of wood. Metal was not used because it was not readily available and because many of the people of this time believed that it changed the chemistry of the soil (DePaepe 1981). The most common mining procedure was as follows:

1) Locate nitrous earth
2) Mine the dirt and transport it to leeching vats
3) Leech water through the soil
4) Add potash lye
5) Boil
6) Purify

The entire process contained only one chemical reaction. Steps 1-3 merely get the nitrate ion into solution. Step 4 is the only chemical conversion. Lye ions exchange for cations which complement the nitrate ions and also remove calcium and magnesium by precipitation. Steps 5 and 6 are fractional crystalizations to remove the impurities.

Saltpetre has not been used to any great extent since 1913, when Haber discovered a process for fixing atmospheric nitrogen (Eller 1981).

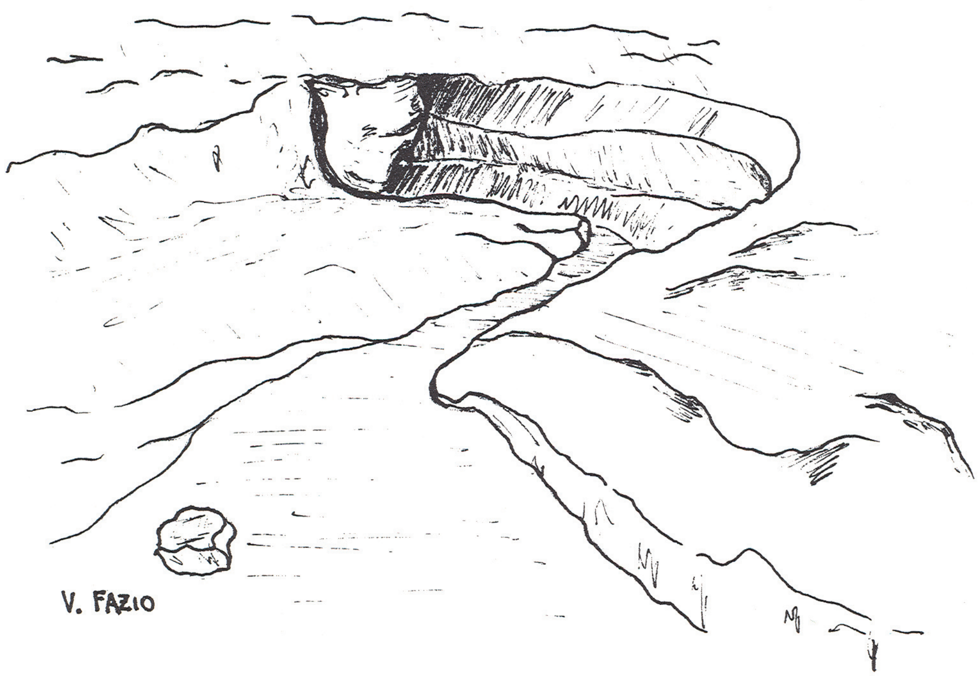
Literature Cited

DePaepe, D. 1981. Saltpetre Mining Features and Techniques. NSS Bulletin 43(4).

Eller, P.G. 1981. Chemical Aspects of the Conversion of Cave Nitrates to Saltpetre. NSS Bulletin 43(4).

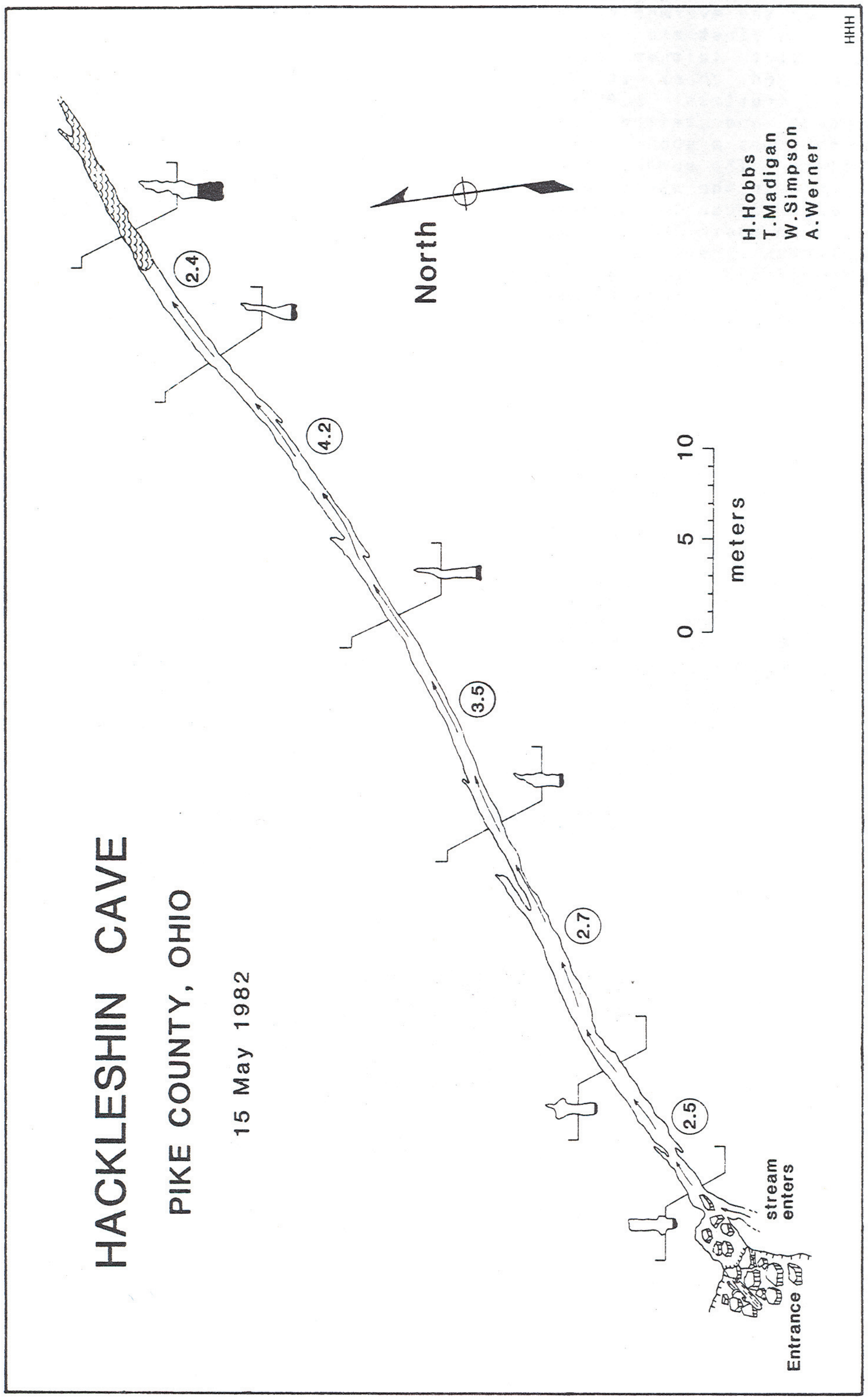
Hill, C.A. 1981. Origin of Cave Saltpetre. NSS Bulletin 43(4).

Powers, J. 1981. Confederate Niter Production. NSS Bulletin 43(4).



con't from page 6

Fig. 4



Some breakdown is encountered but generally the narrow chamber is mud-floored. The passage terminates in a small upper-level gallery; however, a low tunnel on the right (west) side leads to the major portion of the cave. This crawlway intersects a low, narrow passage that widens and gradually attains a height of about two meters. An uneven, undulating mud floor is found in this avenue which soon becomes less than a meter in height. Several "windows" to a parallel passage to the southwest are observed on the left (south) wall, but access can be gained only by the first side tunnel encountered. From this point on the cave is less than a meter high and in most places is little more than a belly crawl trending generally in a southwesterly direction. Some breakdown is found as the passage takes a jog to the west and then bends south and terminates in a small chamber.

Fig. 5

LITERATURE CITED

Hobbs, H. H., III. 1983. A contribution toward the knowledge of southcentral and southwestern Ohio caves. Pholeos, 3(2): 5-11.

Fig. 6