PHOLEOS

WITTENBERG UNIVERSITY

SPELEOLOGICAL SOCIETY

Volume 3(1) 1982

NATIONAL SPELEOLOGICAL SOCIETY

NSS

The Wittenberg University Speleological Society is a chartered internal organization of the National Speleological Society, Inc. The Grotto received its charter in May 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.

WITTENBERG UNIVERSITY SPELEOLOGICAL SOCIETY

SPRINGFIELD, OHIO

COVER

Tropical karst? NO - Cave Run Ravine looking north toward the massive Cedarville dolomite walls of Rocky Fork Gorge in the Seven Caves area, Highland County, Ohio. Note cavers standing near the entrance to McKinle Cave at left - center of page (photo by Hobbs).

PHOLEOS

THE WITTENBERG UNIVERSITY SPELEOLOGICAL SOCIETY NEWSLETTER

Volume 3, Number 1 December 1982

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, 7:30 p.m., Room 206, Science Building, Wittenberg University, Springfield, Ohio

GROTTO OFFICERS 1982-83

CHAIRMAN
Laura Tarulli
933 N. Fountain Ave.
Springfield, Ohio 45501

VICE CHAIRMAN
Victor W. Fazio
207 Tower Hall
Wittenberg University
Springfield, Ohio 45501

SECRETARY
Marilyn L. Matevia
350 South Hall
Wittenberg University
Springfield, Ohio 45501

TREASURER
Terence J. Madigan
211 North Hall
Wittenberg University
Springfield, Ohio 45501

EDITOR
Donna J. Dangelo
628 Woodlawn Ave.
Springfield, Ohio 45501

TABLE OF CONTENTS

LETTER FROM THE EDITOR

Welcome to the first issue of our third volume of Pholeos. In this issue we are pleased to be able to bring you the completed survey of the Seven Caves Area, consisting of a total of 23 caves (actually at least two more). Along with this, we have a description of some caves in the Chesterland area (mapped this past summer), a book review, and an update on the activity of the Society.

The Society has been working on various fund raising activities to supplement money received from SGA for Pholeos and equipment. This term we sold popcorn at campus movies, as has been done in the past, and organized some new fund raisers for next term. The two main ones are giving plasma at a nearby center and sponsoring a Gifted and Talented Workshop for area children. Hopefully adequate funds will be earned from the plasma center to outfit those members who do not already have a helmet and carbide lamp. The Gifted and Talented Workshop (taught by Vic Fazio - VF) will not only be a good fund raiser, but will more importantly be an excellent opportunity to acquaint children with the excitement of caving and the importance of cave conservation.

Fall term has also been a busy session in terms of caving. We ventured out on several day trips to explore various Ohio caves, including: Freeland's, Frost, and the Seven Caves. The more adventurous of the lot went on the Freeland's trip which is notorious for being painfully cold and wet. For a weekend trip the continuing survey of Bat Cave in Kentucky was in order. It turned out to be quite productive even though the mapping could not be completed in the time available.

One weekend when a trip could not be arranged, a rapelling session was held for those members who have never learned vertical techniques, and for those of us who can't get enough of it. This winter we hope to have another rapelling clinic and, weather permitting, finish Salt Peter Cave.

Keep your eyes peeled for the completed survey of Salt Peter and Freeland's caves in issue two of this volume of Pholeos. For those of you anxiously awaiting the end results of Bat Cave, we are sorry to say that (because the cave cannot be entered in the winter due to bat hibernation) it won't be ready until volume four.

As editor, I hope you enjoy this issue of Pholeos and that you will look forward to receiving the next.

FALL CAVING 82'

by Vic Fazio

Progress was made in both projects that W.U.S.S. has concerned itself with over the past years. The survey of Ohio caves was continued by once again visiting Freeland's Cave in Adams County. I like to call it "Forever Cave" as it seems to go on forever and we have forever been working on it. This is perhaps the longest (most grueling) cave in Ohio. With 1300 feet complete and heading into a ridge there is much speculation as to what happens around the next bend. Work is slow, however, as it is definitely a wet suit trip and the sinuous passage back to the fifth bath tub requires at least forty-five minutes to traverse. At the "end" of the cave is a Y-shaped fork termed "Y Survey" (=why the heck are we back here?). To the right (W) is the fifth siphon, impassable at the moment but we might find someone game enough to try it with a snorkel. To the left (E) is a constricted tube filled with mud and rocks. Five hours of digging produced only four surveyable meters but we can see downpassage another four meters until it bends around out of sight. With a strong draft going down passage and some sinkholes present in the vicinity we are hopeful that a little (?) digging will reveal a second entrance. Some twenty W.U.S.S. members have been initiated by this cave; for some this fall it was their first spelunking experience -- not very pleasant particularly when without a wet suit. As to when this work will manifest itself in Pholeos is as uncertain as how much cave is left.

Several other Ohio caves in Pike County (Dry Bone, Hackleshin, and Hanna) were revisited, tying up loose ends (e.g., tracing a shale layer in Dry Bone, photography). These caves are mapped and should be ready for the next issue of Pholeos.

Currently two major caves are under investigation in Carter Caves State Park, Carter County, Kentucky. They are Bat Cave and Salt Peter Cave. In October we spent fourteen hours mapping several side passages in Bat Cave. The two lengthy major passages, for the most part, parallel each other as a number of lateral corridors shunt from one to another. Total horizontal cave survey approaches 2150m, with another 300 + meters anticipated. Further work must be halted for now as the endangered Indiana Bat is in hibernation. We may resume work this spring, however floods have restricted us severely in the past. It may be that we shall be finishing Salt Peter, following up a rumor that Moon Cave connects with this already substantial cave.

Youthful stream level of Pleas Cave, a 5 km long cave developed primarily in the massive Salem limestone in Lawrence County, Indiana (photo by Hobbs).

CHESTERLAND CAVES AREA SURVEY REPORT

Survey by:
Terence J. Madigan and Benjamin L. O'Sickey

The Chesterland Caves Area is located on the west side of a ridge in Munson Township, Geauga County, Ohio (Fig. 1). The caves occur as joint-fracture expansions in Lower Pennsylvanian sandstones and conglomerates, which are occasionally interbedded with thin shale constituting the Sharon formation. Curiously, the conglomerates consist of medium grained quartz sand and elongated golf-ball sized white quartz pebbles. The caves were probably formed during the last glaciation as a result of large amounts of meltwater that flowed through the rock formations, which lie at the head of an outwash zone.

There are three gorges which lie on the west side of this ridge, each of which has cliffs between ten and seventeen meters tall. Herein, the gorges will be referred to as "North", "Middle" and "South." The North Gorge contains not only the most caves, but also the largest cave. Middle Gorge has no caves per se, and South Gorge has only one. All drainages feed into the Chagrin River which, in turn, feeds into Lake Erie.

The South Gorge cliffs are of average size for the area. Many breakdown blocks form short tunnels in the gorge. However, a short walk up the drainage, to an elevation of 1160 feet above sea level, reveals a small cave in the south wall. This cave (South Gorge Cave) follows a joint for about seven meters before making a dogleg to the right. Although a small amount of water continually issues from the cave, it quickly narrows to be impassable after about five meters. Many species of insects live in this cave including midges, mosquitoes, and tipulid Dipterans, and the spider Meta menardi.

As stated above, Middle Gorge contains no caves. However, it does contain the highest cliffs (17m).

North Gorge contains many caves, two natural bridges, and at least one box canyon. To date, only three of these caves have been mapped by us. The largest of these caves is known as "Chesterland Cave" and "North Cave." However, because of its spectacular feature the name "Skylight Cave" might be more appropriate. This cave follows a complex set of intersecting joints. The downstream entrance leads to a short jog in the passage at the first intersecting joint. To the right a short passage extends for a meter, before petering out. To the left the passage continues on for a couple of meters before resuming its original direction, a few meters displaced. It is here that the upper level feeds into the main passage. This upper level continues on in a very straight line for several meters before opening up at the hidden entrance, which is further up the gorge. A few meters past the hidden entrance, and along the same fracture, lies a small cave called "Extension Cave." It is a small expansion cave that fits about one person. It is more or less "I" or "V" shaped. It shares a common wall with Chesterland Cave and has about four meters of total horizontal cave.

The main passage of Chesterland Cave continues in an easterly direction from the upper passage connection for eight or nine meters until it intersects another joint. It is here that a large portion of the cave's roof is missing, forming a skylight. Through the skylight, issues

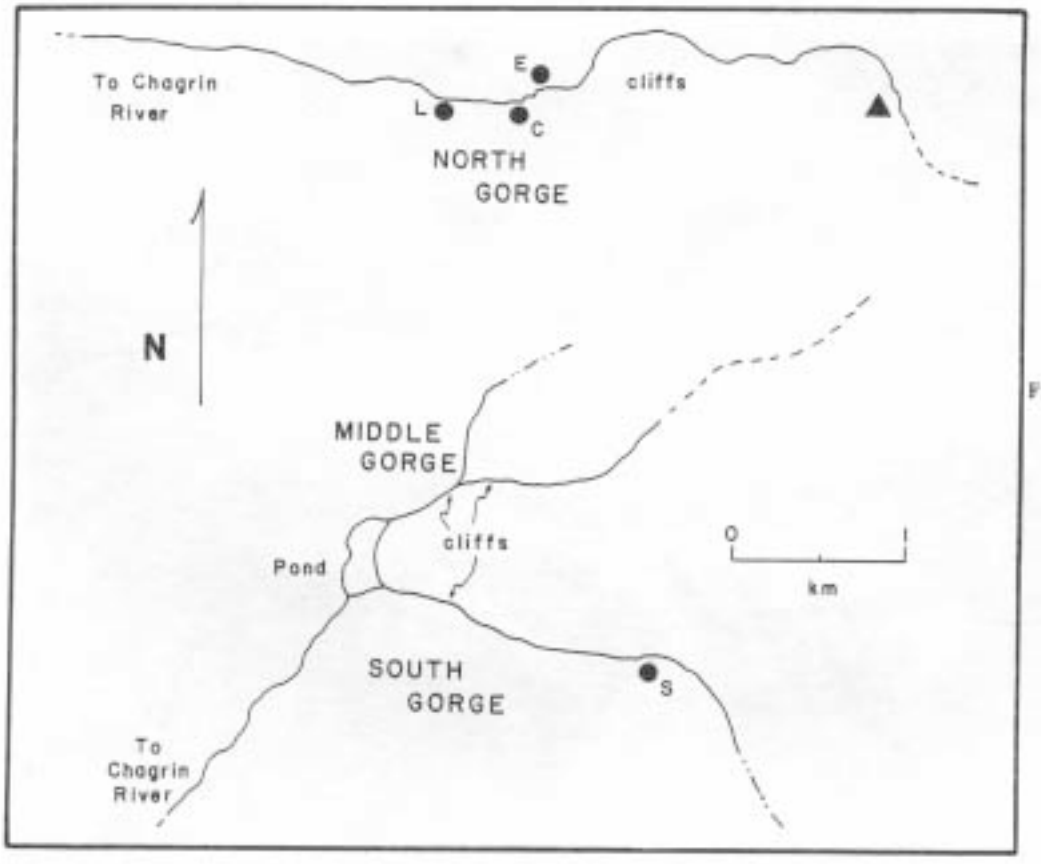


Figure 1. Chesterland Caves area, Geauga County, Ohio.

a small waterfall. This stream originates at the other caves and natural features and follows a low gorge to Chesterland Cave.

From this fracture the cave widens to the right, terminating in a steep slope to the surface. To the left, and through the waterfall, lies the darkest part of the cave. Here yet another joint intersects the passage. Progress can be made either forward or to the right. The walls are very high, very narrow, and incredibly flat. Each passage continues for ten or so meters before terminating. On the left wall of the right passage there is a large thick deposit of limonite or goethite.

"Leaning Cave" is located about one hundred meters downstream from Skylight Cave. It derives its name from its leaning profile. This cave is a simple joint-fracture that continues into the cliff in one direction for about ten meters before terminating.

Various animals are known to frequent this cave. The following were observed: the snail and the slug - Gastropods, the crayfish - Decapoda, crickets - Orthopterans, tipulidae, midges, and mosquitoes - Dipterans, a phalangid, the spider Meta menardi, the salamander - Amphibia, the mouse - Rodentia, and the Raccoon - Carnivora.

In addition, Bole and Moulthrop (1942) cited the following organisms from Chesterland Cave: Sorex f. fumeus Miller, Blarina brevicauda kirtlandi Bole and Moulthrop, Myotis l. lucifugus (LeConte), Peromyscus leucopus noveboracensis (Fischer), Synaptomys c. cooperi Baird, Microtus p. pennsylvanicus (Ord), Pitymys pinetorum scalopsoides (Audubon and Bachman), and Napaeozapus i. insignis (Miller). They also described Tamias striatus rufescens, a new subspecies of chipmonk from Chesterland Cave. Anonymous (1940), Williams (1940) and Lynch (1974) are additional references to this cave.

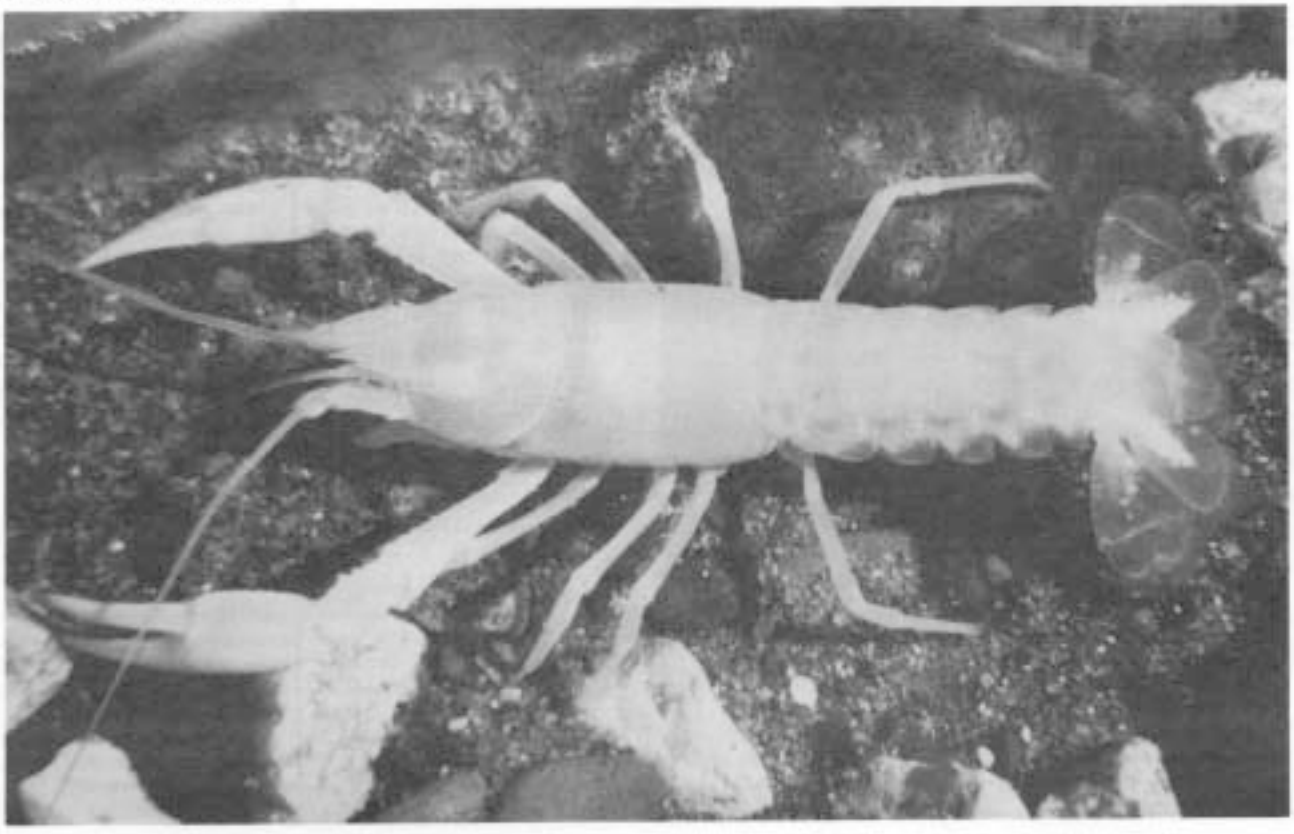
LITERATURE CITED

Anonymous. 1940. Why not explore caves in Ohio. Let's Go Ohio, 2: 3.

Bole, B. Patterson and Phillip N. Moulthrop. 1942. The Ohio recent mammal collection in the Cleveland Museum of Natural History. Sci. Pub. Cleveland Mus. Nat. Hist., 5(6): 83-181.

Lynch, Larry. 1974. The formation of caves in the Sharon Conglomerate in Geauga County, Ohio. Cleve-O-Grotto News, 20(6): 51-61, 63.

Williams, Arthur B. 1940. Geology of the Cleveland Region. Cleveland Mus. Nat. Hist., Pocket Nat. Hist. Bookl., 9: 1-61.



Orconectes inermis inermis Cope, a troglobitic crayfish from southern Indiana (photo by Hobbs).

BOOK REVIEW

CAVE MINERALS
By: Carol A. Hill

Reviewed by: Terence J. Madigan

Carol A. Hill, Cave Minerals, National Speleological Society, Huntsville, Alabama, 1976, 157 pp, hb or pb.

Cave Minerals is a reference book of high quality that describes in depth almost every mineral known to occur as a secondary mineral in caves. In addition, the forms and shapes that typify cave deposits are all described, each being exemplified by a photograph of an outstanding specimen.

Carol Hill also describes the processes that are undergone in the formation of each mineral type and shape. She also lists certain areas of the world where each specimen is commonly (relatively speaking) found.

The text is concluded with a short description of field laboratory mineral identification techniques, a glossary of terms used in the text and an index.

THE ROCKY FORK CAVES (SEVEN CAVES)

by H. H. Hobbs III

INTRODUCTION

Rocky Fork Caves, second largest group of solution caves in the state (Put-in-Bay being first), are developed in the massive [redacted] dolomite (Peebles formation) of the Niagara Series. These caves are located in a rugged, wooded and very scenic portion of Highland County. Here Rocky Fork (Creek) has cut a narrow gorge through the Silurian Age rock where the sponge-like walls rise perpendicularly for up to 30 m above the stream bed. The caves of the area are small, dry (Cave of the Springs and Ellison's Cave being exceptions) and generally have entrances which open on the sides (cliffs) of Rocky Fork Gorge or of tributary ravines (e.g., Cave Run Ravine) (Fig. 1).

Currently the region is referred to as the "Seven Caves" and three trails have been developed which provide easy access to seven lighted caves, to the steep gorges, winding streams, and lush vegetation of the 40.5 ha. (100 acres) plot, all trails, caves, etc. being self-guided.

ORIGIN OF THE GORGE AND CAVES

Rocky Fork is a tributary to the larger surface stream, Paint Creek, the ontogeny of both being heavily influenced by processes of glaciation. The maximum glacial boundary lies approximately 8 km (5 miles)east of the caves and melt waters from the glaciers played a major role in forming the gorge. White (1926) states that during preglacial (Tertiary) times the area drainage was not through the gorge (it was not yet formed) but was located approximately 13 km (8 miles) to the southwest. Although there are differing opinions concerning how much of Ohio was covered by the Kansan Glacier (and thus how much effect the glacier had on various parts of the state) it can be stated with certainty that the Illinoian Glacier advanced over the present Seven Caves site and probably dammed the preglacial Rocky Fork in its southwestward course and forced the stream to reverse its flow. The deep Rocky Fork Gorge (Canyon), also called the "Yellowstone of Ohio" (Ayres, 1971), was subsequently cut by meltwaters which channeled through the present site. Undoubtedly these waters followed major joints (fractures) in the dolomite bedrock, as can be noted by observing the present angular path of the stream (Fig. 1). In addition, the stream carried large volumes of water which facilitated rapid down-cutting along these joints. It lowered its bed (the local base level) so rapidly that the smaller tributary streams (many probably flowing from caves) were "abandoned" since they could not down cut as rapidly; several hanging valleys on both north and south sides of the Gorge and along Cave Run Ravine attest to this.

Entrances to most of the Seven Caves (actually 23 plus caves) presently known along the Gorge and ravines are situated at approximately the same elevation (see Fig. 1). The caves formed as solutional cavities along joints and bedding planes and their development may indicate a rock stratum that is more readily soluable than adjacent (above or below) rock units. However, it is more likely that the common level of the present caves reflects a period when surface water trickled through the soil and mantle rock into vertical fractures in the dolomite and followed along the bedding plane which was at grade to the then higher surface stream. It is probable that the caves found in Cave Run Ravine were, at this earlier time, part of a much larger cavern that occupied the position of the present Ravine. The caves were simply side passages bringing waters to the main cave which probably drained toward the then young Rocky Fork. As increased glacial outwash flowed through the Rocky Fork channel it rapidly incised the bedrock, thus swiftly deepening the Gorge and increasing the local relief (fig. 2). Water falling to the surface was carried almost immediately overland to the Gorge and contributing inlet surface streams and thus little made it into the subterranean aquifers (caves).

The lowered local base level and increased runoff led to the rapid development of surface topography, corrosion and corrasion both involved. It is postulated that once the overlying Devonian shale was breached, then the [redacted] resistant underlying dolomite was rapidly "eroded" and the main passage of the large cavern was intersected by surface downcutting. Simply stated, the roof of the cavern became too thin to support its weight, collapsed, and surface waters continued to cut down through the floor of the former cavern. The contributing side passages no longer carried large volumes of water and thus did not down cut as rapidly; consequently they were abandoned and today the caves are situated high in the Ravine and are merely remnants of these former side passages.

Similar conditions existed in the ravines in which are found Ellison's, Marble, and other caves (see Fig. 1 and below); that is, these caves were formerly side passages to larger caves which occupied the present ravines. Also, White (1926:116) mentioned a hanging valley near Seven Caves that "is about 40 feet above Rocky Fork, and is a former cave with the roof fallen in, because at the mouth of the valley several large blocks of stone are present in the stream bed, that match, and if raised in place would fit perfectly, restoring

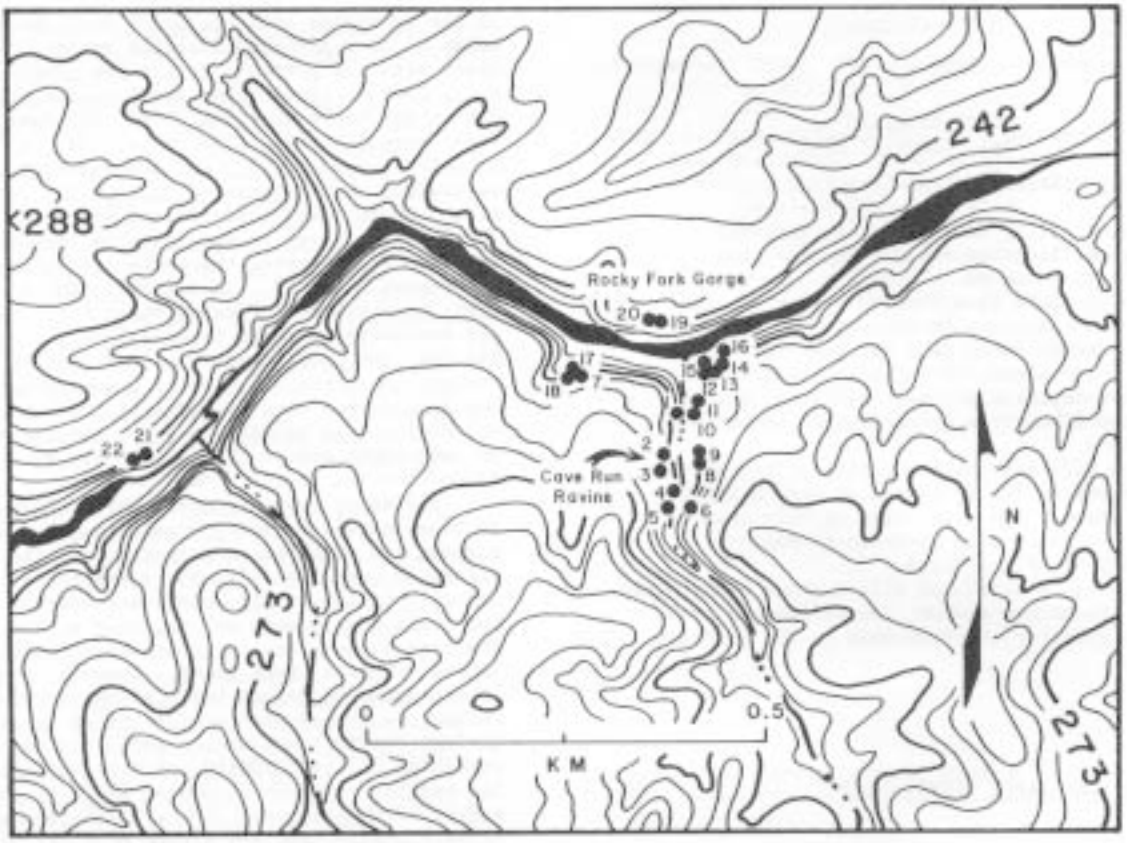


Figure 1: Rocky Fork area showing approximate locations of caves. 1. McKinzie, 2. Witches, 3. Cave of the Springs, 4. Phantom, 5. Dancing, 6. Bear, 7. Marble, 8. Fairy Grotto, 9. Icicle Grotto, 10. Cliff, 11. Tepee Grotto, 12. Raccoon, 13. Gator, 14. Alpha, 15. Pseudo, 16. Devil's Ice Box, 17. Hidden, 18. One-Shot, 19. Funnel, 20. Ellison's, 21. Dare, 22. Tunnel.

the one time arch-shaped character of the former cavern." The caves whose entrances open directly high up on the cliff face of Rocky Fork Gorge (Tunnel, Dare, Tepee, Raccoon, Gator, and Alpha) represent small, former tributary subterranean drains to the Gorge. These were "stranded" as Rocky Fork cut more rapidly through the dolomite.

From the above discussion, it can be summarized that the picturesque features of the "Seven Caves" area are postglacial in age and that their origin and development can be closely linked to the cumulative and multiple effects of the continental glaciers which extended into and covered much of Ohio during the Pleistocene Epoch.

Figure 2. View of Rocky Fork Gorge looking west (upstream).

LITERATURE PERTAINING TO THE ROCKY FORK CAVES

The following is a list of the literature which treats the Rocky Fork caves. In addition, references that have mentioned individual caves are annotated at the end of the description of that cave (see below). Complete citation for each reference is given in the "Literature Cited" section at the end of the paper.

Anonymous 1928, 1939, 1940, 1948, 1950, 1966, no date (after 1969); Ayres 1971; Bole and

Moulthrop 1942; Bowman 1943; Brannan 1960; Brucker 1956, 1979; Carman 1946; Crow and Smith 1931; Elfin, Stucky, and Melvin 1973; Fess 1937; Harper 1952; Henderson 1932; Hobbs and Flynn 1981a, b; Hubbell 1936; Izant 1953; McVicker 1969; Melvin 1970, 1977; Moore and Nicholas 1964; Morgan 1943, 1946; Moseley 1970; Orton 1871; Patton 1956; Reed 1906; Rogers 1936; Shetrone 1928; Sloan and Gurnee 1966; Soule 1976; Sperling 1969; Thompson 1878; White 1925, 1926.

CAVE DESCRIPTIONS

Following are descriptions of the caves associated with Rocky Fork. Caves that are open to the public will be treated first, starting with those formed in Cave Run Ravine. The small, unlit caves found in the ravines and along the Gorge will be treated as well. The reader is referred to Hobbs and Flynn (1981b) for a description of Dry Cave, a cave located approximately 1.6 km (1 mile) west (upstream) and considered the 23rd member of the Rocky Fork cave group. The stippled areas on some of the accompanying maps represent paved trails.

Figure 3. McKimie Cave.

MCKIMIE CAVE

McKimie (=McKimie's, McKimmey's, Crescent) Cave is the northermost cave located in Cave Run Ravine, just south of its junction with Rocky Fork. The 3m high x 2m wide main entrance is found on the vertical west wall of the ravine and a railed walk allows easy access. A second, smaller (1m high x 2.5m wide) entrance (north) opens onto a small ravine located north of the main entrance which drains into Cave Run Ravine. The cave is developed along joints which solution has widened to form the passages for a total 70.8m (fig. 3) length.

Approximately 10m inside the main entrance (see front cover photograph) a low, wide passage intersects the cave; this passage enters from the north entrance and has a small dead-end pocket leading off the east wall. As one proceeds further into the cave a noticeable increase in active speleothems is observed; that is, water is entering and slowly dripping down the walls depositing calcite. In this area, approximately 22m into the cave, a small crawlway leads in a southerly direction for about 4m and abruptly terminates. From this point the main passage becomes high and narrow (2.5m x 1m) for approximately 10m. A small low crawl leads off the north wall for several meters and another tight crawlway trends northeast into a small room at the point where the main passage angles to the southwest. The paved trail ends approximately 8m from this point; however, a small, low, tight passage extends out of this area for about 10m where the cave terminates (dimensions of 0.9m high x 0.5m wide). The cave spider, Meta menardi, is common within the cave as are various dipterans, crickets, and phalangids.

At one time this cave was probably well decorated. Flowstone and draperies still cover the walls and roof in many places but there is much evidence of vandalism. White (1926:112,113) stated that "No stalactites remain, but the bases of many, most of which are about two inches in cross section, bear out the statement of Mr. Ellison [Charles A. Ellison, former land owner and caretaker] that when these caves were first opened to the public, stalactites were broken off and carried away by almost every visitor, some removing many."

Following the Civil War, sometime during the late 1880's the cave was used as a hideout by Robert McKimie, a notorious bandit who terrorized the countryside of southern Ohio. At that time the larger entrance was inaccessible and the cave was thus easily defended.

Sperling (1969:18) wrote "Red-haired Bob McKimie, who was five feet eight inches tall, was a native of Ohio. When Bob rode with the Daltons in the west in his early years, he earned the nickname, "Little Beddy." This name eventually followed him back to Ohio.

"When McKimie returned to Ohio from the west, he settled down to a prosperous respectability until a western sheriff came looking for him. Then, he began robbing Ohio stagecoaches and terrorizing the country's residents. Withdrawing into the cave's winding passages during the daylight hours, he and his men sallied forth at dusk to do their mischief. McKimie was later captured and spent time in prison. When he was released, he changed his name and left Ohio. It is said that he eventually became a Texas law officer and lived above reproach."

References:

Anonymous 1948:508; Ayres 1971:26, 871, 873; Henderson 1932:400; Morgan 1943:7, 1946:6; Sperling 1969:18; White 1925:59, 60; 1926: 105, 112, 113.

The following organisms have been observed in the cave:

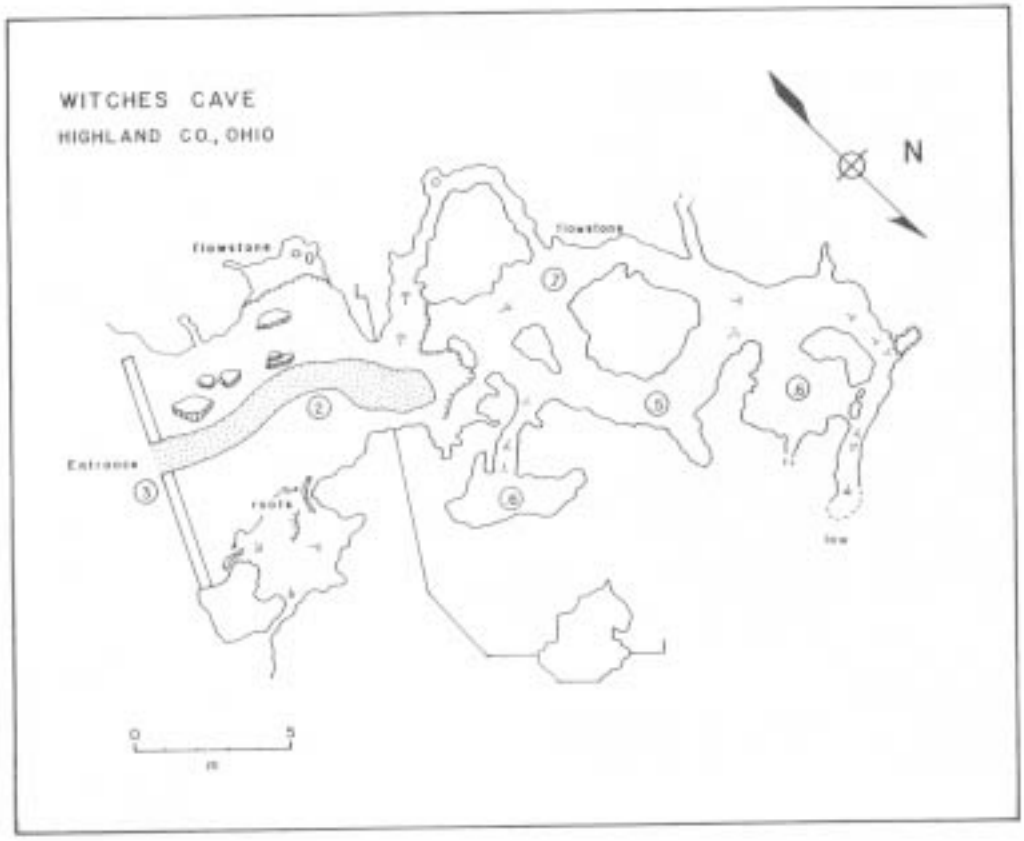
Ceuthophilus gracilipes (Haldeman) - cricket
Leiobunum bicolor (Wood) - phalangid

WITCHES CAVE

By moving further into Cave Run Ravine (south) from McKimie Cave and by remaining on the west side one can enter Witches (=King's Wardrobe) Cave. Ayres (1971:871) states that it is called Witches Cave "because the opening into it is dark, gloomy and forboding." White (1926:111) described it as "King's Wardrobe Cave" since, at one time, "... near the entrance there was a mass of stalactites arranged in a circle three feet in diameter, having a fancified resemblance to an inverted crown. These have been destroyed, but the bases remain and still somewhat resemble a crown,..."

The cave is entered through a 2.5m high x 6.5m wide entrance (Fig. 4). Here the floor is partially covered with breakdown and tree roots can be observed on the northeast side of the cave.

Figure 4. Witches Cave.



The paved path extends into the cave only 9m where the floor rises and the passage continues in a number of low, stoop and crawl loops. The cave has only a few active speleothems, but the walls and ceiling are virtually covered with inactive flowstone. The cave is developed along a number of joints for a total horizontal length of 55.5m.

A variety of fauna is found in this cave: the moth, Scoliopteryx libratrix, the spider, Meta medardi (Latreille), crickets Ceuthophilus gracilipes (Haldeman) and Ceuthophilus brevipes (Scudder), collembola Tomocerus flavescens (Tullberg), dipterans(Anopheles sp., Culex sp., and a mycetophilid), and terrestrial isopods [Hylonicus riparius (Koch) and Haplophthalamus danicus (Budde-Lund)].

References:

Ayres 1971: 871; Henderson 1932: 400; Morgan 1943: 7, 1946: 5; Sperling 1969: 16; White 1925: 58, 59; 1927: 105, 111, 112.

CAVE OF THE SPRINGS

Cave of the Springs (=Wet Cave) is the largest cave in the Rocky Fork area (246m THC) and is one of two caves (Ellison's Cave the other) with an active stream flowing through its chambers (Fig. 5). The large entrance (2.8m high x 13m wide) is situated approximately 23m south of Witches Cave. Sperling (1969:16) and Anonymous (1948:508) indicate that the entrance room ("Giant's Hall") is 175 feet (53m) long, 65 feet (19.7 m) wide, and 28 feet (8.5m) high; however, the current survey reveals the room to be 49m long, 17m wide, and 6.7m high. The small stream that flows through the main cave does not exit at the entrance but sinks into the floor and percolates down to Cave Run Ravine. Approximately 100m into the main passage the cave widens and a pool 5.5m long and 2.8m wide is encountered (Fig. 6). This "Jade Pool" is reported to be "bottomless;" actually it is 2.7m from the surface to the "bottom" where a submerged passage can be observed sloping steeply down beneath a ledge. This is the source of the stream which flows through the main cave and is a passage that should be checked with the aid of SCUBA gear.

Extending northwest out of this room for 47m is an upper level passage which is sinuous and, for the most part, a crawlway. This avenue terminates in a small "signature room" which has many dates carved into the soft rock (e.g., 1911, 1912, 1922, 1923, 1927, 1936, 1939). Many other dates are found along the walls and ceiling of this upper level.

Approximately 12m from the entrance another passage trends off in a northwesterly direction, paralleling the above mentioned side passage. Considerable drip input occurs along this part of the cave and a small upper level can be reached 37m into the passage. This upper cavity loops for approximately 20m and again intersects the passage where a 5m high dome is encountered. The corridor continues for approximately 10m upslope and terminates in a small room, also having many dates and signatures.

Voice connection can be made between this cave and Phantom Cave at a point approximately 10m into the cave. Further discussion of this is represented below in the secription of Phantom Cave.

The passages of Cave of the Springs are developed along a major fracture and two paralleling joints. Numerous sections are well decorated and many formations remain active. The fauna of the cave consists of oligochaetes and cladocerans in several drip pools, an amphipod in the drip pools and stream, and the bats, Pipistrellis subflavus and Myotis sp., collembolans (Sinella cavernarum (Packard) and Tomocerus dubius), millepede, Oxidus gracilis (Koch), phalangid, Leiobunum bicolor (Wood), and a terrestrial isopod, Haplophthalamus danicus (Budde-Lund) are also observed.

References:

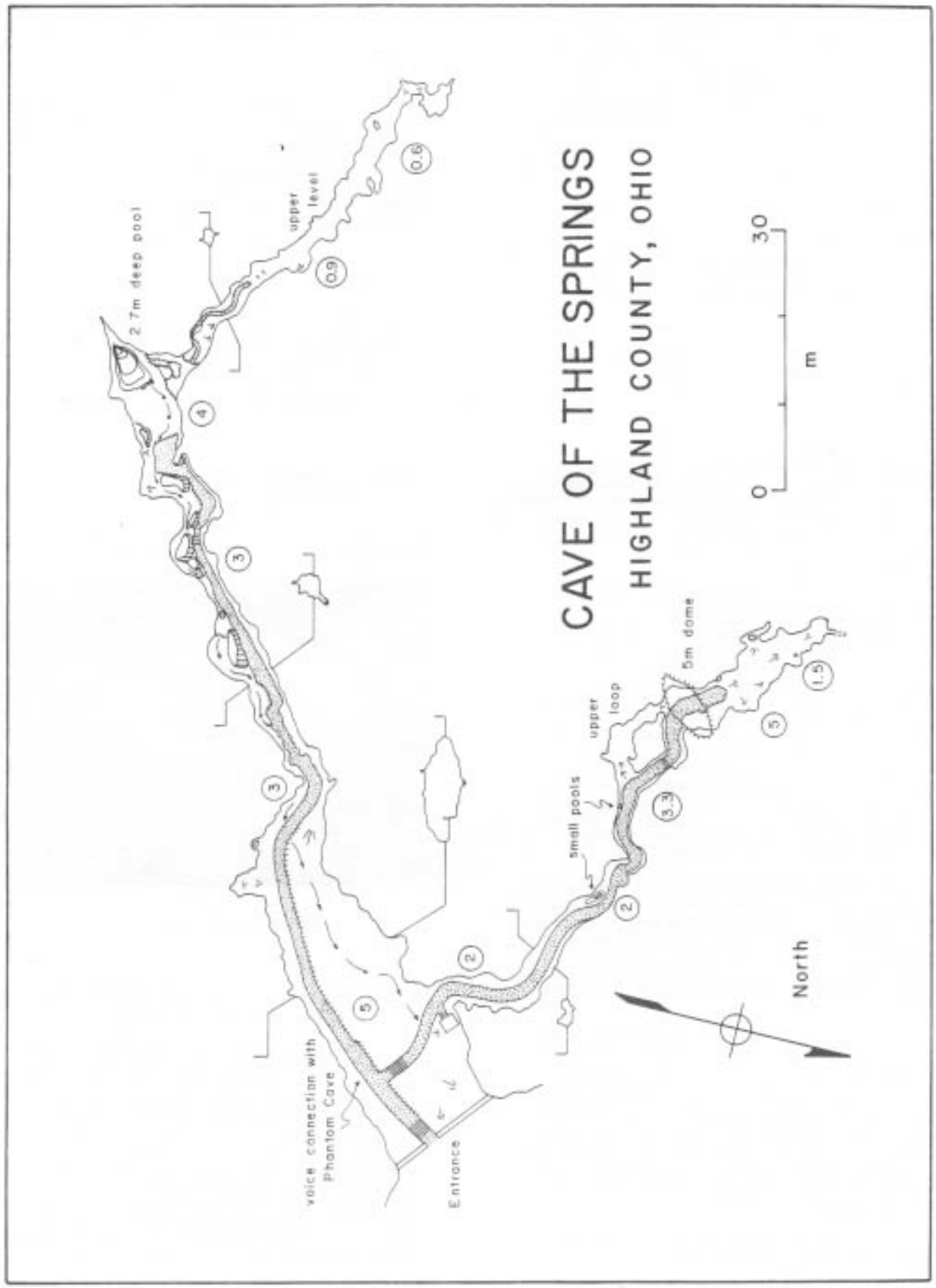
Reed 1906:407, 408; White 1925:8, 55-58; 1926: 79, 105, 109-112; Henderson 1932:400; Anonymous 1939:16; Morgan 1943:7; 1946:5; Anonymous 1948:508; Patton 1956:14, 22; Sperling 1969:16; Ayres 1971:775, 871; Brucker 1979: 157.

Figure 5. Cave of the Springs (following page).

Figure 6. "Jade Pool" in Cave of the Springs.

PHANTOM CAVE

Phantom [=Buzzard('s) Glory] Cave is a small solution feature (74m THC) that can best be described as a series of flat ceilinged, interconnected chambers developed along a bedding plane (fig. 7). Numerous rock pillars (columns of parent rock, not formed from the joining of stalagmites and stalactites) are found within the passages. Only a few formations remain active although "dead" flowstone, stalactites, stalagmites, etc. are throughout the cave. A paved path extends from the entrance to a point 23m into the cave. Here passages extend to the left (SE) and to the right (NW). The left passage characterized as low, has numerous pillars supporting the roof. The right passage also has pillars but splits approximately 9m into the chamber; the right (N) extension abruptly ends as a breakdown choke while the floor of the left (W)


CAVE OF THE SPRINGS
HIGHLAND COUNTY, OHIO
0
30
m
North
2.7m deep pool
upper level
0.6
0.9
4
3
3
5
2
2
small pools
upper loop
3.3
5m dome
1.5
5
voice connection with Phantom Cave
Entrance

chamber gradually rises to the ceiling at a point where voice connection can be made with Cave of the Springs. White (1926:109) stated that "A very small passage, hardly more than a crack, a foot wide and less than six inches high, leads from the west end of this cave to Wet Cave, the next to the north. Such a passage is of course too small to admit the body of man, although it is so narrow for only about a yard." With the trail improvement in Cave of the Springs this connection crevice has been filled, however voice connection between the two caves is still possible.

The precise etymology of the cave is unknown however, after crawling through the white encrusted, pillared chambers, it takes little imagination to understand why it is called Phantom Cave. White (1926:109) described it as "Buzzard Glory Cave" and indicated that "Buzzards have been known to nest in this cave, hence the name." Other fauna which are currently found in the cave include a phalangid - Leiobunum bicolor (Wood), the mouse Peromyscus sp., the moth Scoliopterys libratrix, the spider Meta menardi, crickets - Ceuthophilus gracilipes (Haldeman), a dipteran (Culex sp.), and a millipede - Euryurus l. leachii (Gray).

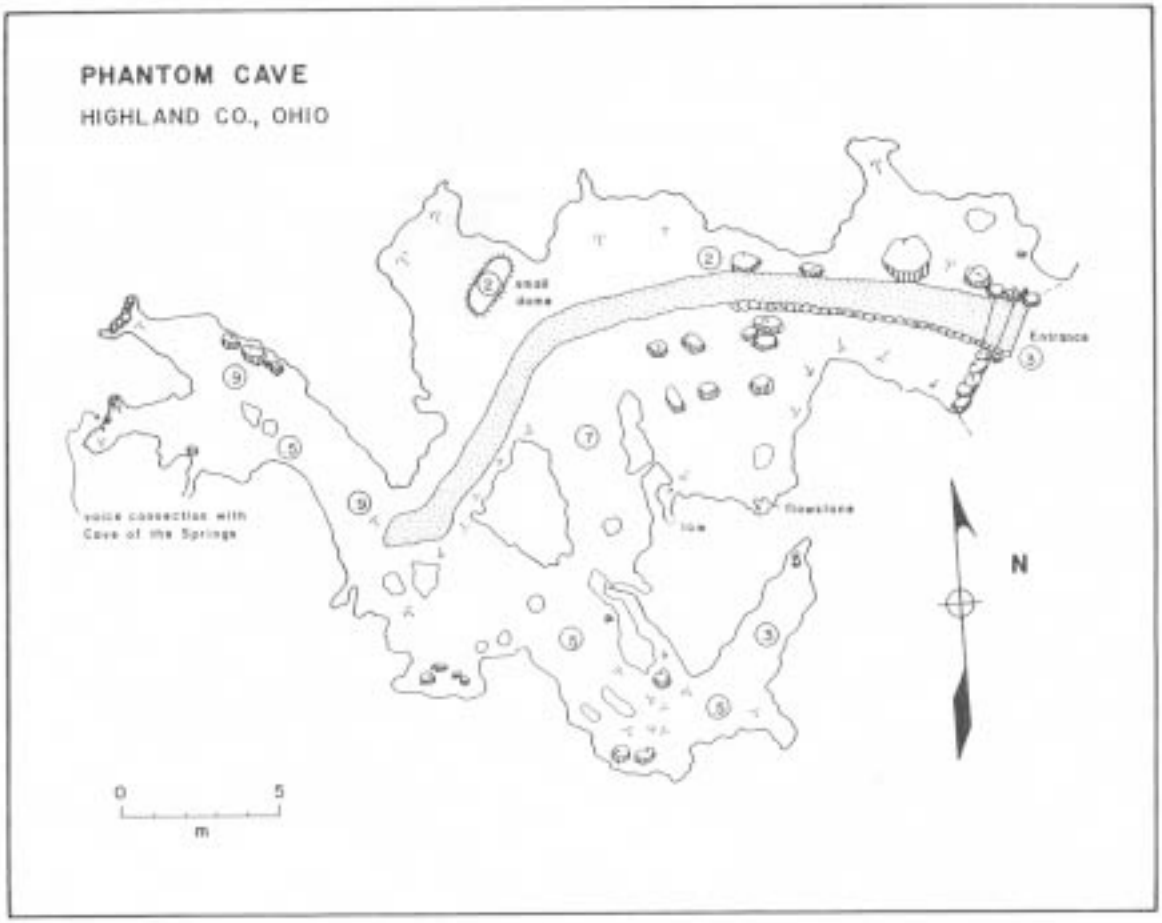
References:
White 1925:10, 12, 54, 55; 1926:105, 108, 109; Henderson 1932:400; Morgan 1943:7, 1946:5; Sperling 1969:16; Ayres 1971:871.

Figure 7. Phantom Cave.

DANCING CAVE

The main entrance to Dancing (=Cathedral, Dining, Gothic) Cave is located approximately 18m to the south of Phantom Cave. It is a small (66m TSC) cave consisting of one major passage formed by solution along a major joint; approximately 17m from the main entrance a small upper level intersects the cave, having been formed by solutional enlargement of an intersecting joint. This side passage slopes upward and terminates within eight meters.

Figure 9. Main passage of Dancing Cave.



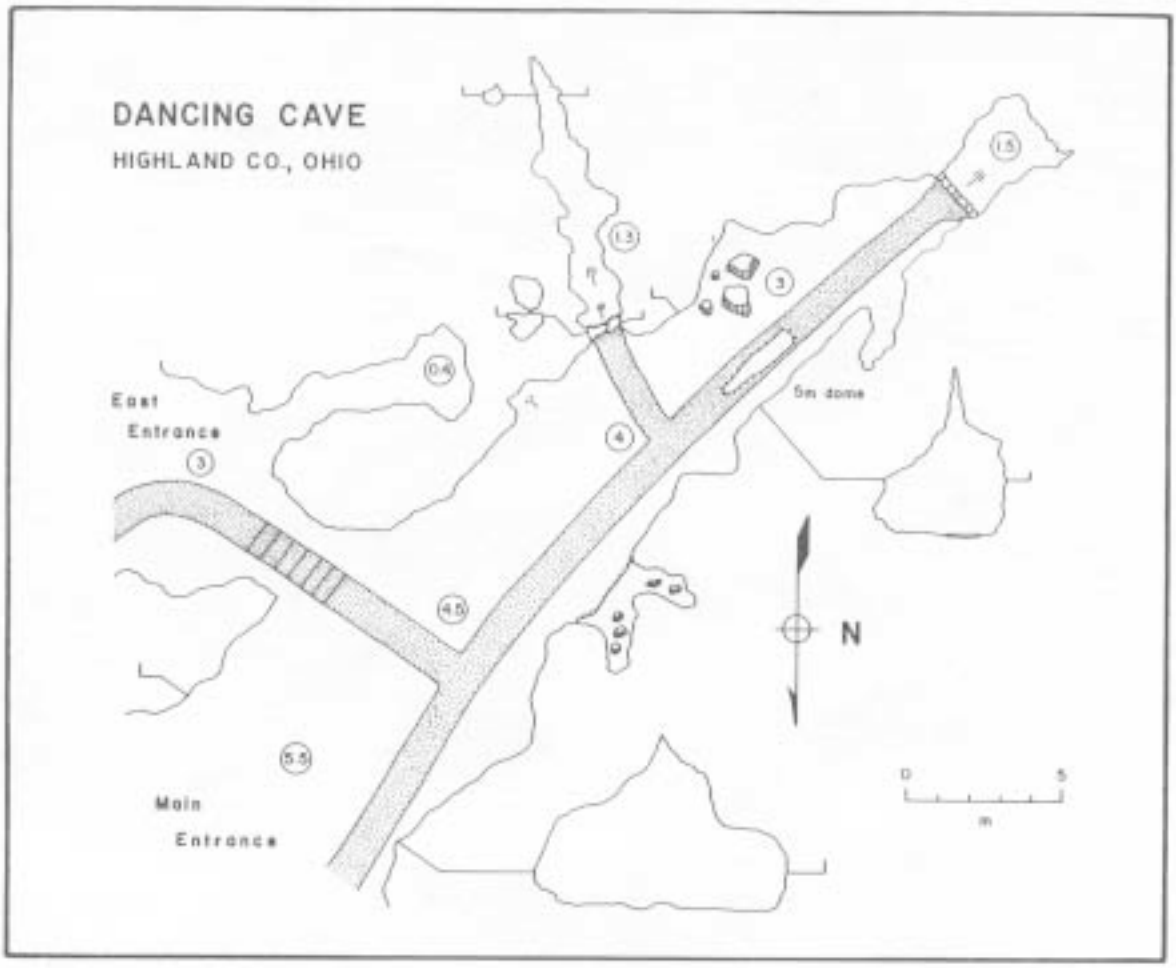


Figure 8. Dancing Cave.

Six meters into the cave a passage enters from the surface (East Entrance - see Fig. 8). A small crawlway trends in a westerly direction for 8m and ends in a low room.

As with many of the Rocky Fork caves there is very little active speleothem formation occurring, however the walls and ceiling of the cave are covered with dry flowstone.

The main entrance to the cave is quite large (5m high x 8.5m wide) and impressive. The cross-section is somewhat triangular (Fig. 9) in shape and it is easy to understand why the cave has been called "Gothic" and "Cathedral" Cave. Sperling (1969:16) wrote "The smooth, hard floor of the Dancing Cave is an indication of why the early settlers came to the cave on Saturday nights to dance to the squeaking tunes of fiddlers. Stalagmites made handy seats for tired dancers, who rested by lantern light. Long before the settlers made merry, the Shawnee Indians held tribal ceremonies and dances in the cave, which was to them a sacred place. Stone age implements have also been found at the caves."

The moth Scoliopteryx libratrix, a collembolan Tomocerus flavescens (Tullberg), crickets Ceuthophilus gracilipes (Haldeman), phalangids Leiobunum bicolor (Wood), dipterans, spiders Dolomedes scriptus (Hentz) and Tetragnatha laboriosa (Hentz), and a millipede Pseudopolydesmus serratus (Say) inhabit the cave.

References:

Reed 1906:408-410; White 1925:10, 12, 53, 54; 1926:105, 107-109; Henderson 1932:400; Rogers 1936:113; Morgan 1943:7, 1946:5; Anonymous 1948: 505; Sperling 1969:16; Ayres 1971:871, 875.

BEAR CAVE

The entrance to Bear Cave is on the east side of Cave Run Ravine approximately 200m from its junction with Rocky Fork Gorge and almost directly across the ravine from Dancing Cave. This two-entrance cave also is small (61m THC) and has a paved trail for most of its length. The entrance is arch-shaped, being 3.5m high and 6.8m wide; from this point the ceiling height decreases gradually until at a distance of 5m from the entrance the passage is only 2m high. The cave was formed by solution along a joint and is thus fairly straight. Twenty meters into the cave the ceiling is again high and a small passage intersects from the northwest, 2.7m above the floor. This is a narrow, low, joint-controlled crawlway that leads to a second entrance (Bear Den Entrance).

Several meters further into the cave from the intersecting crawlway the main passage widens into a room (see Fig. 10). Much alteration has occurred to improve the path and thus the room

Figure 10. Bear Cave.

appears to split, with the right hand branch passing a large mass of flowstone ("Stalagmite") and the left hand one being a continuation of the main passage. Remnants of small stalactites and three columns are present in this terminal area of the cave. Of interest, literally hundreds of "Daddy Long-Legs" phalangids, Leiobunum bicolor (Wood) were seen on the ceiling in this part of the cave, forming dense mats or clusters. Crickets, Ceuthophilus gracilipes (Haldeman), dipterans, and the spider, Meta menardi, are common throughout the cave.

"The cavern takes its name from having been known to pioneers of the region as a bear den. It is warm and dry, and the entrance easy of access so that of all the caves of this group it seems best suited for such a purpose" (White 1926:107).

References:
White 1925:10, 11, 51-53; 1926:105-107; Henderson 1932:400; Morgan 1943:6, 1946:4; Sperling 1969:16; Melvin 1970:49; Ayres 1971: 871; Melvin 1977:75.

MARBLE CAVE

Unlike the previously described caves which open onto Cave Run Ravine, the entrance to Marble Cave (Fig. 11) is in an unnamed tributary ravine to Rocky Fork Gorge, located approximately 100m west of Cave Run Ravine (See Fig. 1). The two entrances are developed along subparallel joints which merge approximately 5m into the cave (Fig. 12). The passage is irregular in width and the floor, walls and ceiling are covered with mostly inactive flowstone for a total horizontal cave distance of 33m.

Figure 11. Entrance to Marble Cave viewed from floor of tributary ravine to Rocky Fork Gorge.

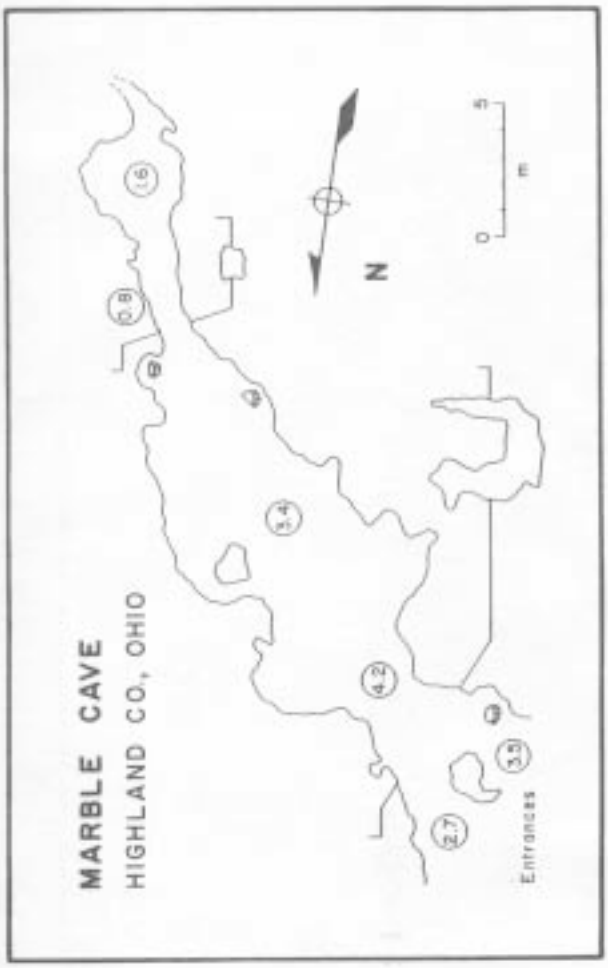


Figure 12. Marble Cave.

A small crawl-around is encountered on the north wall approximately 12m inside the cave. Twenty meters from the entrance the ceiling height decreases to 0.8m and the passage becomes constricted. This smaller corridor leads into a room 1.6m high that is covered with inactive travertine and leads off to the southwest for several meters where the passage becomes too small for further penetration. Like those observed in Bear Cave, in this terminal room were noted hundreds of phalangids, Leiobunum bicolor (Wood) forming large clusters. Crickets, Ceuthophilus gracilipes (Haldeman), dipterans, and Meta menardi are also living in the cave.

References:
Reed 1906:410, 411; White 1925:10, 61; 1926: 105, 113; Henderson 1932:400; Morgan 1943:7; 1946:6; Anonymous 1948:508; Sperling 1969:18; Ayres 1971:871, 873.

FAIRY GROTTO

Fairy Grotto (Fig. 13) is a very small "cave" located on the east side of Cave Run Ravine north of Bear Cave. It is merely an expanded joint having some active and inactive flowstone. The passage slopes upward for approximately two meters and then levels off for the remainder of the short cave (9m THC). Crickets, Ceuthophilus gracilipes (Haldeman) were observed in several areas of the cave.

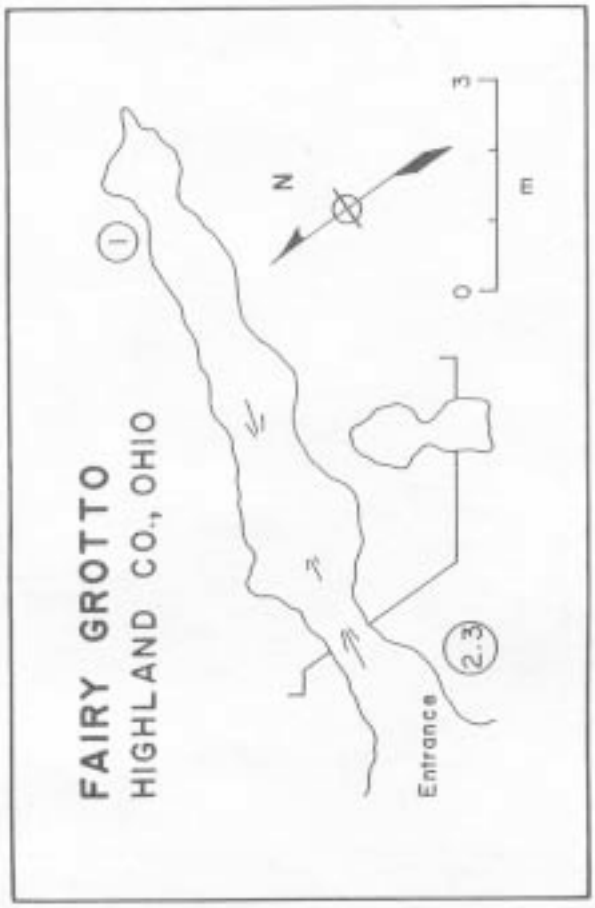


Figure 13. Fairy Grotto.

ICICLE GROTTO

Icicle Grotto is not a "cave" but only a solution pocket developed along a bedding plane. It extends back into the rock for only 1.5m and is approximately 2m wide. Numerous stalactites and small columns are present in this "window" found along a trail on the east side of Cave Run Ravine.

CLIFF CAVE

Cliff Cave is a small cave located in the cliff face of the east wall of Cave Run Ravine immediately north of the bridge which crosses the Ravine. Care should be taken in getting to the entrance; a hand-line is recommended. Total horizontal cave length is 11m and the passages are joint-controlled.

From the entrance the cave extends in a northeasterly direction for approximately 5.5m up a crawlway slope (Fig. 14). Here a very small room extends in a northerly direction off the main passage. The main cave continues with a right angle turn to the southeast for 2m and then turns sharply to extend two additional meters to the northwest where no further passage can be made.

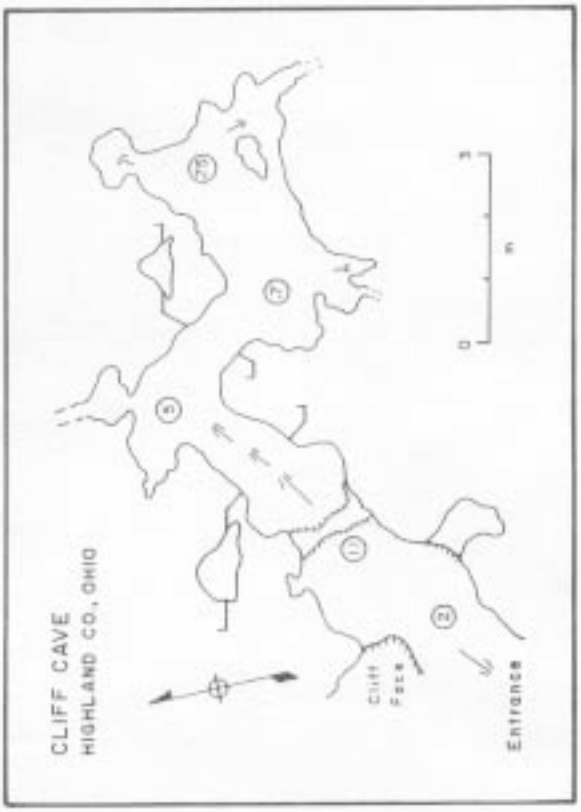


Figure 14. Cliff Cave.

The entrance room is high enough for a person to stand but the remainder of the cave is low and requires crawling. Much mammal dung is found in the passages and undoubtedly this cave is visited often by raccoons and other large vertebrates. Eurycea longicauda, the long-tailed salamander, was observed in the region of the terminal room and spiders, Meta menardi (Latreille) and crickets, Ceuthophilus gracilipes (Haldeman) and Ceuthophilus brevipes (Scudder) were common.

TEPEE GROTTO

Tepee Grotto is a very small cave (10m THC) located immediately adjacent to a path on the east side of Cave Run Ravine, north of Cliff Cave. It consists of a relatively large entrance room (1.8m high x 4m wide) and a straight passage that extends in a southeasterly direction for approximately 4.5m. Here a narrow, low crawlway extends upward for about 2.5m where the cave ends. Near the entrance a small passage functions as a window into a small extension of the entrance room (Fig. 15).

RACCOON CAVE

Raccoon (=Fox, Coon, Fox and Coon) Cave is a small enlarged joint that extends back into the cliff face for a total length of 9m (Fig. 16). The 3.5m high x 2m wide entrance rapidly constricts both horizontally and vertically until the passage is only 0.8m high approximately 6.5m into the cave. At this point a small, tight crawlway

Figure 15. Tepee Grotto.

extends to the right (south) for several meters and becomes too small for further penetration.

References:
Henderson 1932:400; Morgan 1943:7; Ayres 1971: 874.

GATOR CAVE

Gator Cave (14m THC) is another small cave located on the south cliff of Rocky Fork Gorge and is situated between Raccoon and Alpha Caves. Two entrances lead into the cave; one located immediately off the trail which traverses the cliff and the other located on the cliff face (see Fig. 17). A narrow ledge can be negotiated between the two entrances. The passages are low, sinuous crawlways which taper to a narrow terminal room. Very little speleothem development has taken place in this small grotto.

ALPHA CAVE

Immediately east of Gator Cave is the walk-in entrance to Alpha Cave (Fig. 18). From the entrance the passage extends approximately 5.5m in a southeasterly direction where an active flowstone formation covers the wall directly ahead. The cave turns to the left (northeast) and a short crawlway 0.5m high leads to a small room floored by mud. An upper level crevice continues out of this room but is too small to enter. Various active formations are throughout this small (10m THC) cave and this may be the same cave that Ayres (1971:874) referred to as "Half Moon Cave." Phalangida and the spider, Meta menardi, were noted in the cave.

Figure 16. Raccoon Cave.

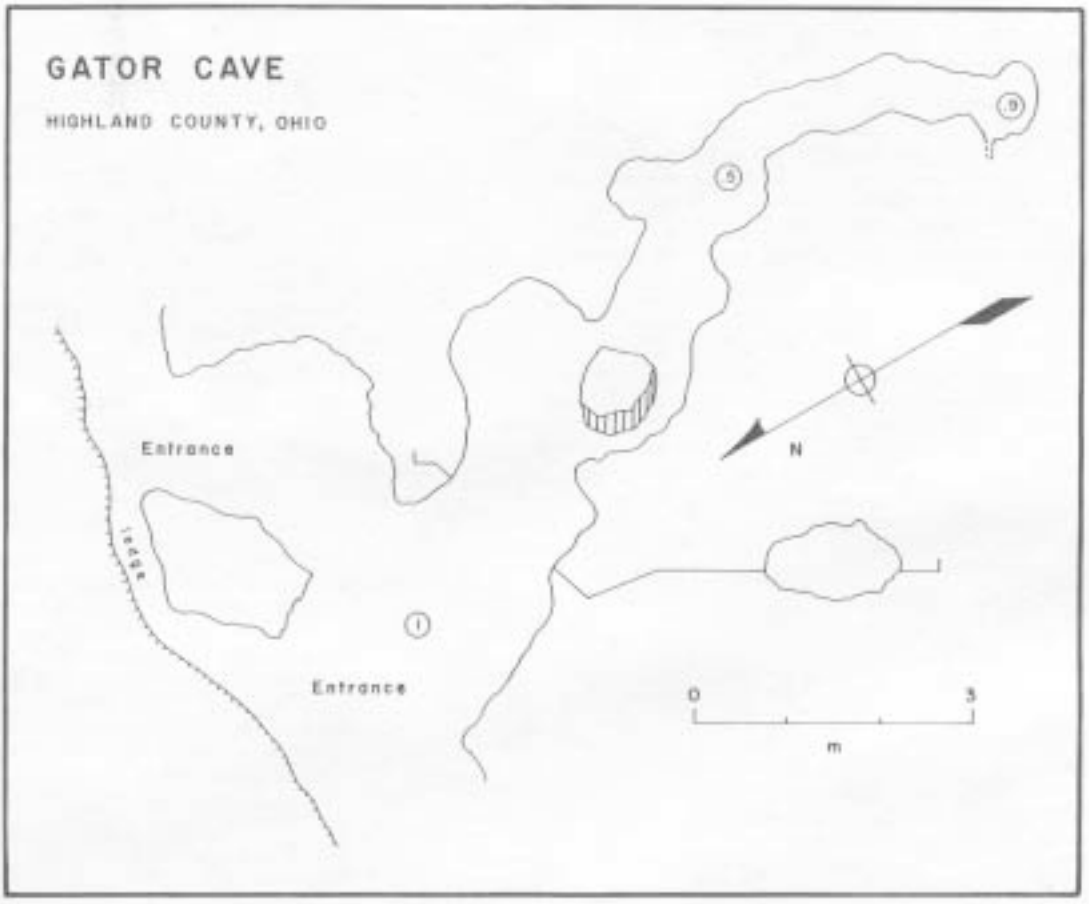


Figure 17. Gator Cave.

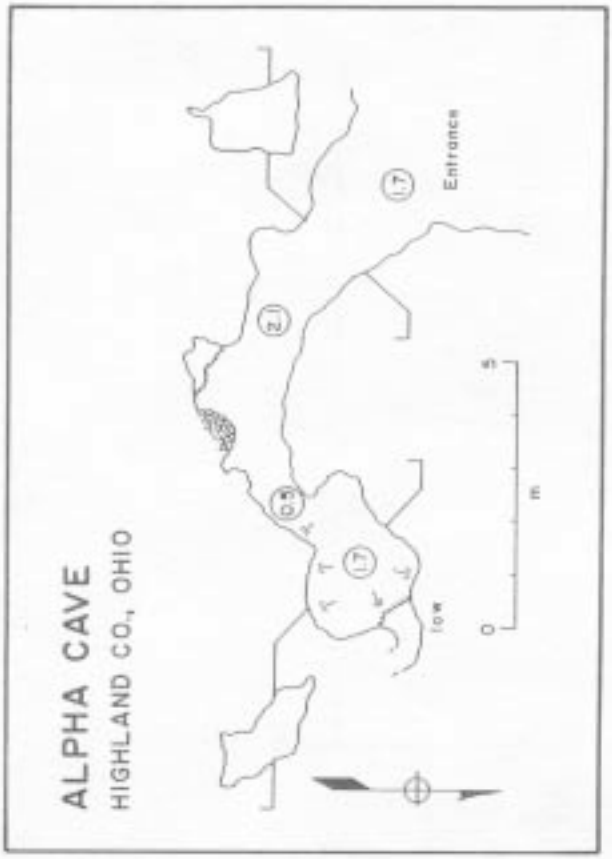


Figure 18. Alpha Cave.

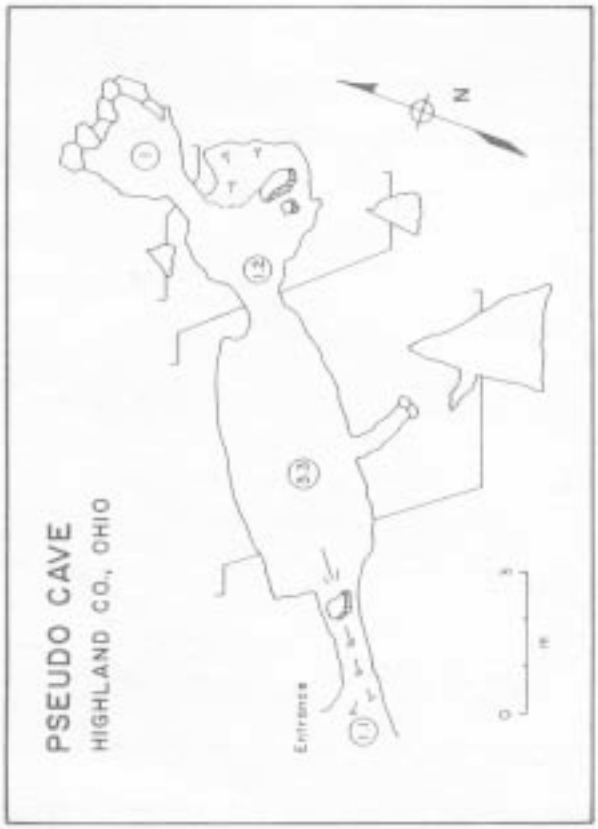


Figure 19. Pseudo Cave.

PSEUDO CAVE

Pseudo Cave is a small (13m THC) "fracture" cave situated almost directly below Raccoon Cave. The small entrance is adjacent to a path which parallels Rocky Fork and then meanders its way up the face of the south cliff of Rocky Fork Gorge, east of the junction with Cave Run Ravine. The passage was formed not by solution but by collapse of the cliff face, leaving a cavity among the fallen rocks. The narrow entrance passage slopes downward steeply to a room 6m long, 3m high, and 2.5m wide. A crawlway leads to a passage floored by cobble which trends to the northeast (Fig. 19). This tunnel constricts and a triangular-shaped crawl leads to the terminus of the cave, a small room ending in breakdown. Voice connection to the surface can be made from this point in the cave.

The cave passage crosses beneath the previously mentioned path and while one is in the cave, persons can be heard crossing overhead. Several pseudoscorpions, Hesperochernes sp., were observed in the terminal room and the cave is inhabited by terrestrial isopods, Hyloniscus riparius (Koch), crickets, Ceuthophilus gracilipes (Haldeman), phalangids, Leiobunum bicolor (Wood), Meta menardi, and Scoliopteryx libratrix.

DEVIL'S ICE BOX

Devil's Ice Box, like Pseudo Cave, is not a solution feature, but resulted from the collapse of a portion of the cliff face adjacent to Rocky Fork. The 2m high entrance slopes steeply down to a point where the passage is 4.5m high and 2m wide. This passage is triangular in cross-section (Fig. 20) and continues as a narrow slot that is blocked by breakdown. The spider, Meta menardi, and phalangids were noted in the cave.

This very small collapse cave (9m THC) is the eastern-most cave of the Rocky Fork region.

References:

White 1925:10, 53; 1926:105, 107; Ayres 1971: 874.

HIDDEN CAVE

Hidden Cave (Fig. 21) is a small (4m THC) solution pocket. The entrance is located below a trail which traverses the cliff face and passes by Marble Cave. Hidden Cave is thus found in the same tributary ravine as Marble Cave and, in fact, is situated immediately below its entrance. The cave is a single passage with a maximum height of 1.5m. It extends back from the crawlway entrance for three meters where the walls close and a small passage extends back approximately one meter and terminates. The spider, Meta menardi, was observed on the ceiling of the cave.

ONE-SHOT CAVE

One-Shot Cave, the last to be described of those found on the south bank of Rocky Fork Gorge, is located in the same tributary ravine to the Gorge as Marble and Hidden Caves. This small cave (6m THC) is located approximately half-way up the

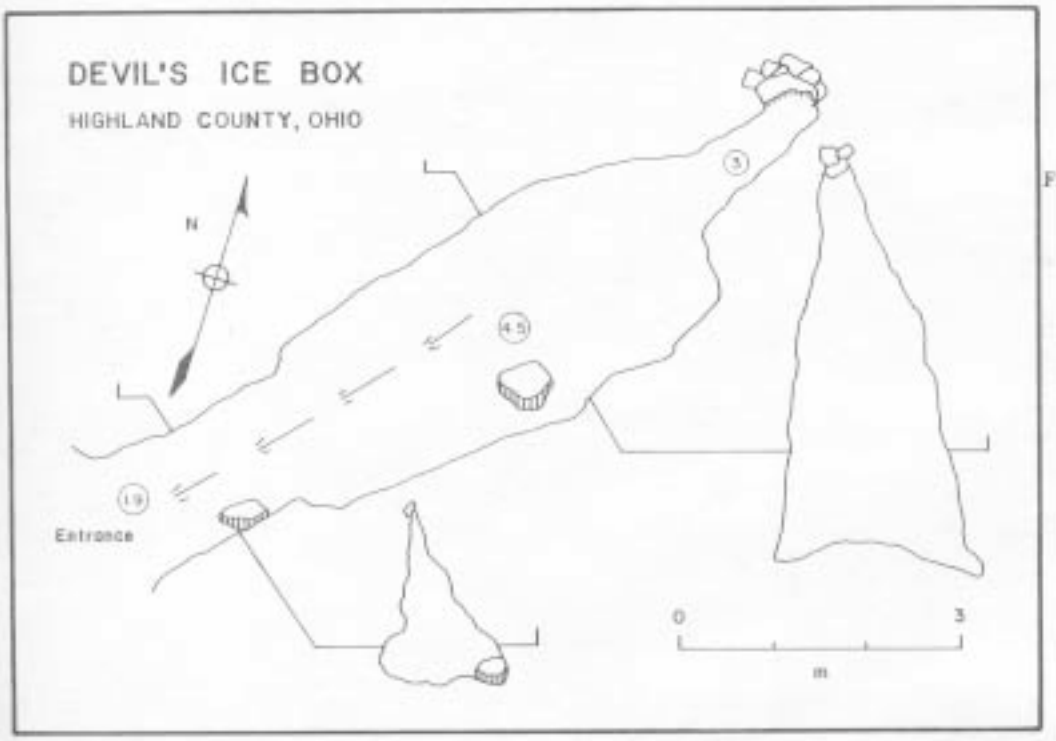


Figure 20. Devil's Ice Box.

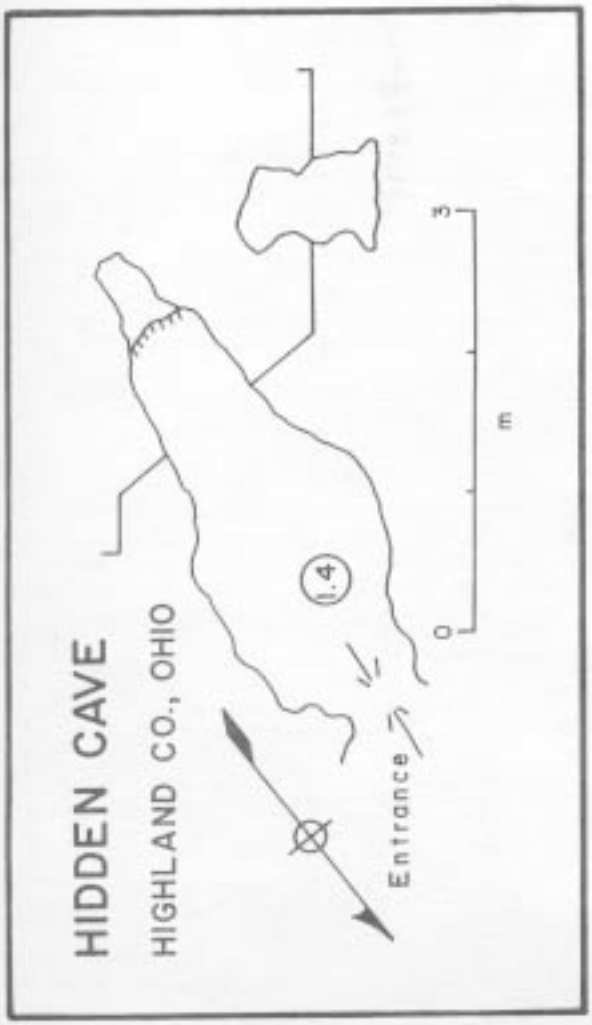


Figure 21. Hidden Cave.

cliff overlooking a telescope at the bottom of the stairs to Marble Cave. Entrance to this cave is best negotiated by a rappell from above. The 1.6m high x 2.8m wide entrance leads in a southeasterly direction, quickly narrowing as the mud floor also rises. The terminal room has a number of soda straws, flowstone, and popcorn on the ceiling and walls. A number of blind, side pockets (Fig. 22) extend out of the terminal room. Many phalangida are found in this cave.

ELLISON'S AND FUNNEL CAVES

Located on the north side of the Gorge and positioned near the top of a ravine nearly directly across (slightly west and upstream - this ravine is actually a hanging valley) are Ellison's and Funnel Caves. The entrances to both caves are opposite one another, are similar in shape and size, and occur in the same rock unit. This suggests that they were once connected as a larger single cavern. Funnel Cave (Fig. 23) appears simply to have been one end of this previous cavern. The entrance to it is weathered and large (3.5m high x 9m wide) but tapers quickly into a hole that is 1.4m wide but extends only 4m before ending. The entire length of this small cave is 9m.

Ellison's Cave has a walk-in entrance (2m high x 5m wide) and one can do so for 1/3 of its length (31m THC). A dome near the entrance has a height of 3.3m. This cave also narrows quickly but is readily passable throughout most of its length. It is only the second one in the Rocky Fork Gorge area to have an active stream flowing through it (Cave of the Springs is the other - see above). The passage is somewhat sinuous but is oriented along a N-S trending joint. At approximately 25m the cave becomes very small

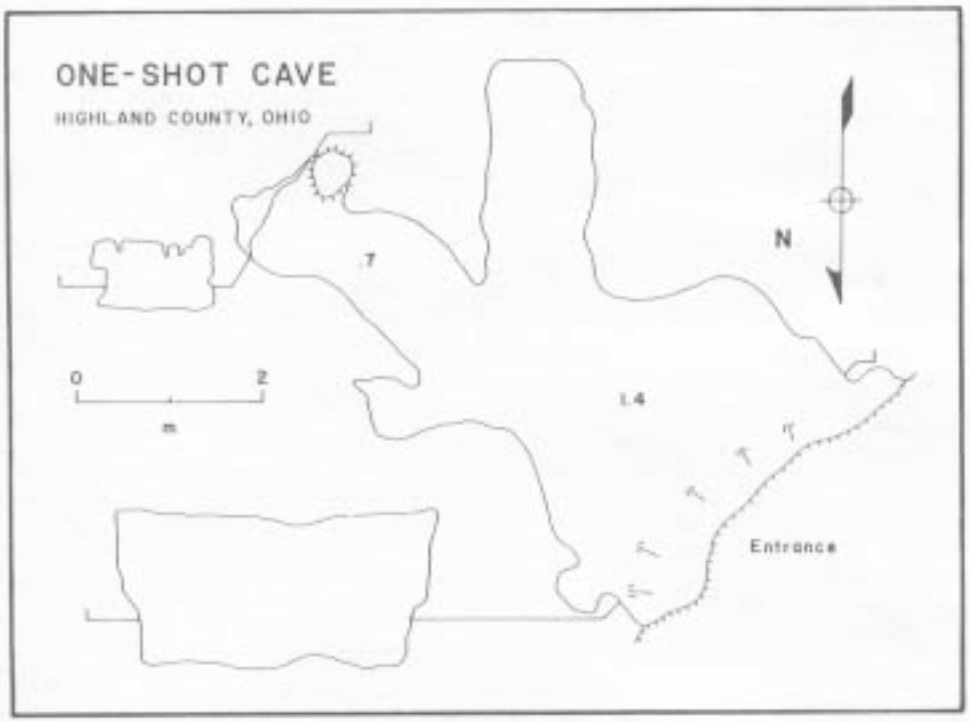


Figure 22. One-shot Cave.

Figure 23. Funnel Cave.

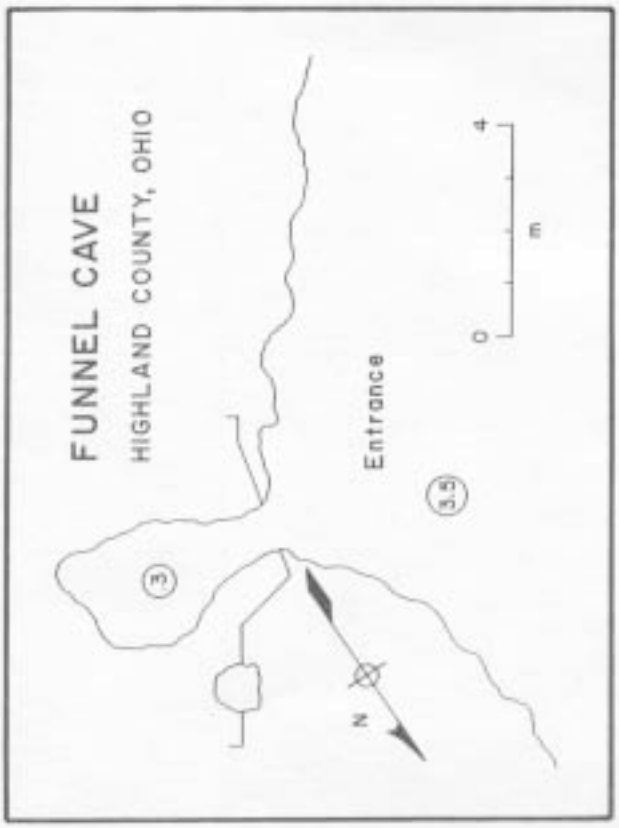
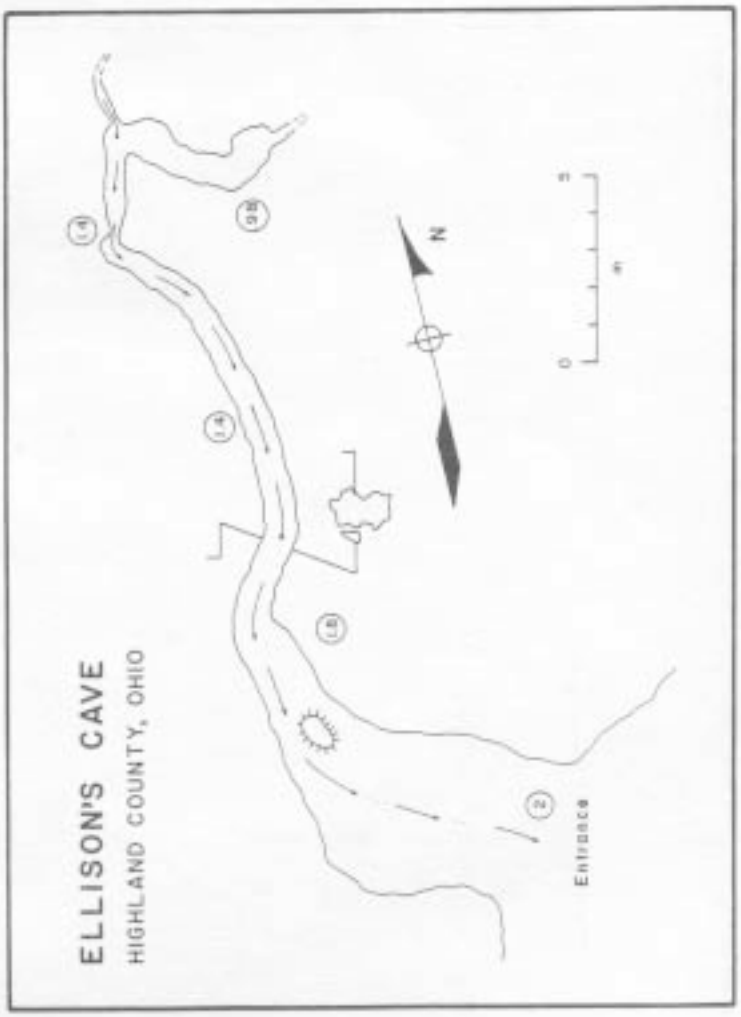


Figure 24. Ellison's Cave.



and the stream flows from this narrow passage. The corridor continues to the east (Fig. 24) and terminates within 5m. At the very end in a dry alcove area there is a "skeleton repository," consisting of bones of mammals (as many as three individuals). Other organisms noted were Meta menardi, a millipede, large numbers of phalangids, very few crickets, and Eurycea longicauda.

References:
White 1925:61, 62; 1926:105, 113, 115;
Henderson 1932:400; Morgan 1943:7.

DARE CAVE

Dare (=Where Caver's Dare) Cave is one of two caves (Tunnel the other) located approximately 1 km upstream from the above described caves and is found on the same side of Rocky Fork as are Funnel and Ellison's Caves. This grotto is located about 12m off the floor of the Gorge in a 20m high cliff. Many large rocks have fallen away from the steep rock face as a result of undercutting by the stream: Dare Cave is situated directly behind the largest block. On top of the cliff are several shallow sinkholes.

The cave can be entered only by rapelling down to the level of the entrance; one must pendulum-swing into it as the floor of the cave starts well under the overhanging cliff face. This entrance (Fig. 25) is wide (7m) and the floor here is covered by well dessicated dolomite particles.

The cave trends straight into the cliff for four meters until being intersected by a small passage that tapers at each end. The north passage appears to go on past a squeeze of flowstone, but a 0.5m rise in the floor and a small (0.4 sq. m) block of breakdown in the center of the tunnel prohibits further penetration; however, it would be large enough to permit passage of animals, the probable source of many scats covering the floor of the cave. Numerous bones are scattered throughout the cave and phalangids are also present. The south passage tapers to a narrow tunnel that permits and apparently is used by small animals, as is evident by footprints in the mud floor. Some flowstone is evident here.

TUNNEL CAVE

Tunnel Cave is located approximately 10m south of Dare Cave and is about four or five meters higher up on the same cliff. It is entirely a crawl cave that starts on one ledge and can be traversed through to an isolated ledge on the other side. The cave (Fig. 26) is entered by climbing (no rope is needed) up a crack in the cliff face. This grotto is small (6m THC) and has very little dead speleothem development. The northern entrance opens on to a small point in the cliff, on the opposite side of which lies Dare Cave; however, one cave cannot be seen from the other.

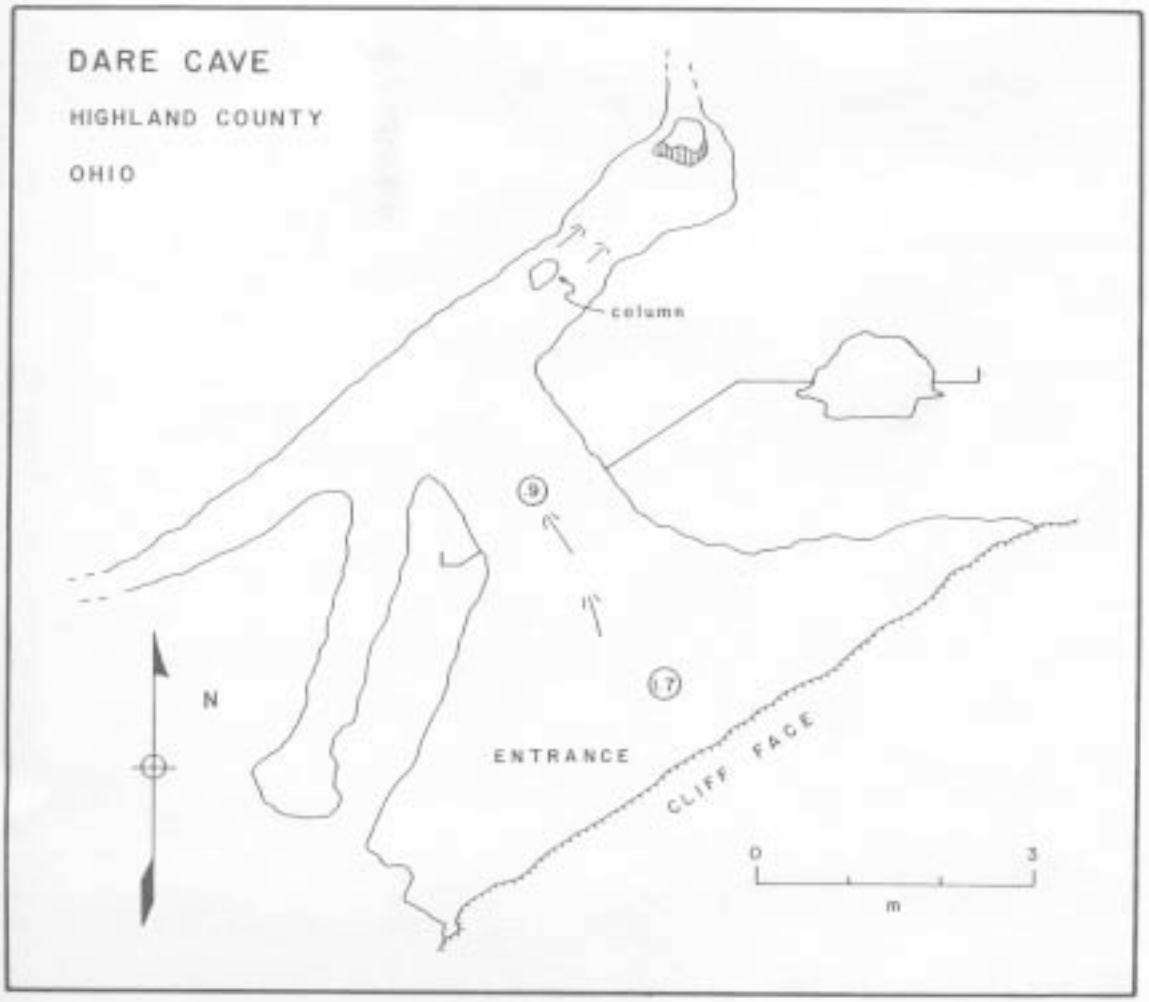


Figure 25. Dare Cave.

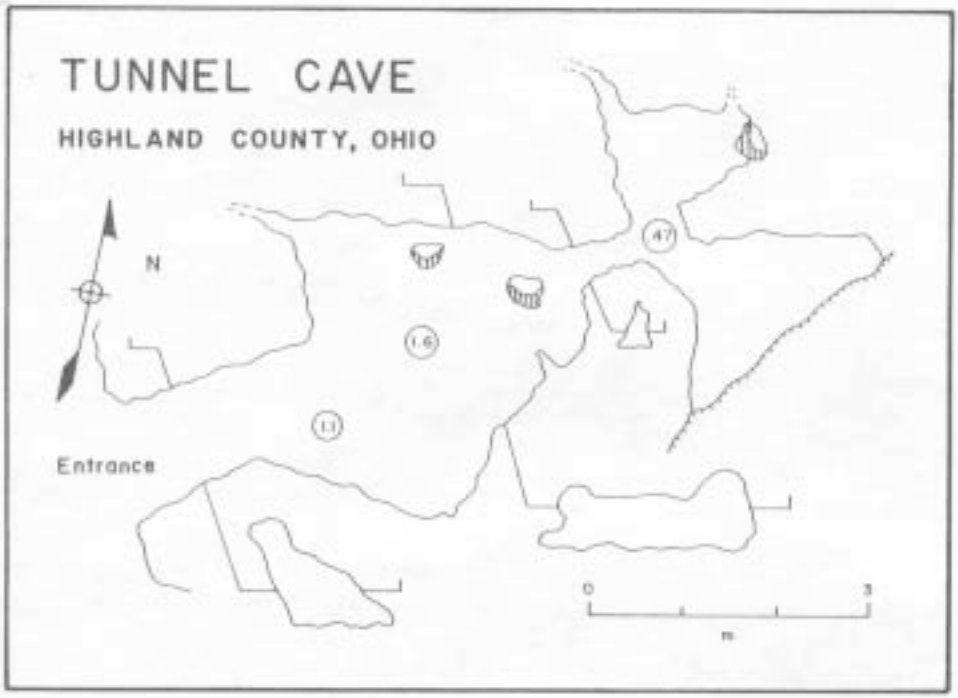


Figure 26. Tunnel Cave.

ACKNOWLEDGMENTS

Appreciation is extended to those members of the Wittenberg University Speleological Society who helped in this project. This includes: J. Bush, V. Fazio, F. Gilbert, T. Madigan, H. Parsons, J. Petot, and a special thanks is given to William Simpson who spent many hours on the long end of a short survey tape! Gratitude is extended to Dr. C. Miller, owner of "Seven Caves" whose interest and encouragement made this a most enjoyable endeavor. I would like to thank the following individuals for their determinations of the cave fauna: Kenneth A. Christianson (collembolans), B. A. Foote (flies), W. J. Gertsch (spiders), Clarence J. Goodnight (phalangids), Theodore H. Hubbell and Theodore J. Cohn (crickets) William B. Muchmore (terrestrial isopods and pseudoscorpions), and Rowland M. Shelley (millipedes). This research was supported in part by funds received from the Ohio Department of Natural Resources.

LITERATURE CITED

Anonymous. 1928. Ohio's first capital. Mus. Echoes, 1(4): 3-4.

_____. 1939. Caves in Ohio. Ohio. Cons. Bull., 3(4): 16-17.

_____. 1940. Why not explore caves in Ohio? Let's Go Ohio, 2: 3.

_____. 1948. The Ohio Guide. Oxford Univ. Press, New York, 364 pp.

_____. 1950. Ohio is calling you. Ohio Cons. Bull., 14(6): 16-17.

_____. 1966. Cavern Tour. Wond. Wld. Ohio, 30(7): 10, 11.

_____. No date (after 1969). Tour the Wonderful World of Ohio: A Directory of Travel Attraction. State of Ohio, Travel and Tourist Division, 92 pp.

Ayres, Elise Johnson. 1971. The Hills of Highland. H.K. Skinner and Son, Springfield, Ohio, 939 pp.

Bole, B. Patterson and Phillip N. Moulthrop. 1942. The Ohio recent mammal collection in the Cleveland Museum of Natural History. Sci. Publ. Cleveland Mus. Nat. Hist., 5(6): 83-181.

Bowman, David Weller. 1943. Pathway of Progress: A Short History of Ohio. American Book Co., Cincinnati, Ohio, 546 pp.

Brannan, John. 1960. Ohio caves ?!? COG Squeaks, 3(12): 1, 4-7.

Brucker, Roger W. 1956. Ohio underground. Ohio Motor Trav., 29(5): 4-5.

_____. 1979. Caves. IN, Michael B. Lafferty (ed.), Ohio's Natural Heritage, The Ohio Acad. Sci., Columbus, Ohio, 151-157.

Carman, J. Ernest. 1946. The geologic interpretation of scenic features in Ohio. Ohio J. Sci., 46(5): 241-283.

Crow, George H. and C.P. Smith. 1931. My state - Ohio. Ohio Teacher Publ. Co., Columbus, Ohio, 280 pp.

Elfner, Lynn Edward, Ronald L. Stuckey, and Ruth W. Melvin. 1973. A guide to the literature of Ohio's natural areas. Ohio Biol. Surv., Info. Cir., 3: 1-56.

Fess, Simeon D. 1937. Historical Gazetteer of Ohio. Vol. III, The Lewis Publ. Co., Chicago, Illinois, 486 pp.

Harper, Arthur R. 1952. Enjoy wildlife, hunting, and fishing in Highland County. Ohio Cons. Bull., 16(5): 16-19, 21, 30.

Henderson, Junius. 1932. Caverns, ice caves, sinkholes, and natural bridges. Univ. Colorado Stud., 19(4): 359-405.

Hobbs III, H. H. and Michael F. Flynn. 1981a. The cave fauna of Ohio. Pholeos, 1(12): 7-14.

_____. 1981b. Selected Ohio caves. Pholeos, 1(12): 15-24.

Hubbell, Theodore H. 1936. A monographic revision of the genus Ceuthophilus. Univ. Florida Publ., 2(1): 5-551.

Isant, Grace Goulder. 1953. This is Ohio. The World Publ. Co., Cleveland, Ohio, 264 pp.

McVicker, Hunsel. 1969. Seven Caves photograph. Wond. Wld. Ohio, 33(2): back cover photograph.

Melvin, Ruth W. 1970. A guide to Ohio outdoor education areas. Ohio Dept. Nat. Res., Columbus, Ohio, 143 pp.

_____. 1977. A guide to Ohio outdoor education areas. 2nd ed., Ohio Dept. Nat. Res., Columbus, Ohio, 231 pp.

Moore, George W. and Brother G. Nicholas. 1964. Speleology, the Study of Caves. D.C. Heath and Co., Boston, Massachusetts, 120 pp.

Morgan, Robert. 1943. Caves in world history. NSS Bull., 5: 1, 6, 7, 16.

Morgan, Violet. 1946. Folklore of Highland County. Greenfield Print. and Publ. Co., Greenfield, Ohio, 240 pp.

Moesley, Jr., Richard E. 1970. A family adventure. Wond. Wld. Ohio, 34(6): 12-17.

Orton, Edward. 1871. Report of progress in 1870. Part III: The geology of Highland County. Geol. Surv. Ohio, 1870: 253-309.

Patton, Wendell K. 1956. A study of the amphipod crustacea of Ohio. M.S. Thesis, Ohio State Univ., 41 pp.

Reed, Lena Kline. 1906. The romance of the Dry Cave. Ohio Mag., 1(5): 405-413.

Rogers, James K. 1936. Geology of Highland County. Geol. Surv. Ohio, 4th Ser., Bull. 38: 3-148.

Shetrone, H.C. 1928. Some Ohio caves and rock shelters bearing evidence of human occupancy. Ohio Arch. Hist. Soc. Quart., 37: 1-34.

Sloane, Howard N. and Russell H. Gurnee. 1966. Visiting American Caves, Bonanza Books, New York, New York, 246 pp.

Soule, Gary K. 1976. America's commercial caves. NSS News, 34(5): 88-91.

Sperling, Patricia W. 1969. Explore Seven Caves. Wond. Wld. Ohio, 33(3): 14-19.

Thompson, James H. 1878. The History of the County of Highland in the state of Ohio, Hillsboro Gazette Job Room, Hillsboro, Ohio, 132 pp.

White, George W. 1925. The limestone caves and caverns of Ohio. M.S. Thesis, Ohio State Univ., 65 pp.

_____. 1926. The limestone caves and caverns of Ohio. Ohio Jour. Sci., 26(2): 73-116.

INSIDE BACK COVER

Large passages in Great Onyx Cave, part of the immense Flint-Mammoth Cave System in Edmonson County, Kentucky (photos by Hobbs).