The Cave Fauna of the Garrison Chapel Karst Area: Part I, Wayne Cave

Weingartner's cave flatworm

Sphalloplana weingartneri

Cave sheet-web spider

Porrhomma cavernicola

Final Report

Division of Nature Preserves
Indiana Department of Natural Resources
and
Indiana Karst Conservancy

23 December 2008

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INTRODUCTION

The Garrison Chapel Karst Area is located about 7 miles southwest of Bloomington, in Monroe County. It lies on the eastern boundary of the Crawford Upland, in an area of sandstone capped ridges and limestone floored valleys. In about five square miles that comprises this karst area (fig. 1) the Indiana Karst Conservancy (IKC) owns or manages several major caves. Wayne Cave, at 4.2 miles in length, is the longest cave in Monroe County and 9th largest in Indiana. Purchased by the IKC in 2003, the 20 acre preserve contains the entrance as well as part of the known passages in Wayne Cave. Nearby, a short cave called Tiparillo Hole, consists of about 30 feet of passage at the bottom of a sinkhole. Other sites managed by the IKC in the Garrison Chapel karst are Grotto, Shaft and Coon caves. The purpose of this report was to compile a list of the cave fauna of the Wayne Cave Preserve.

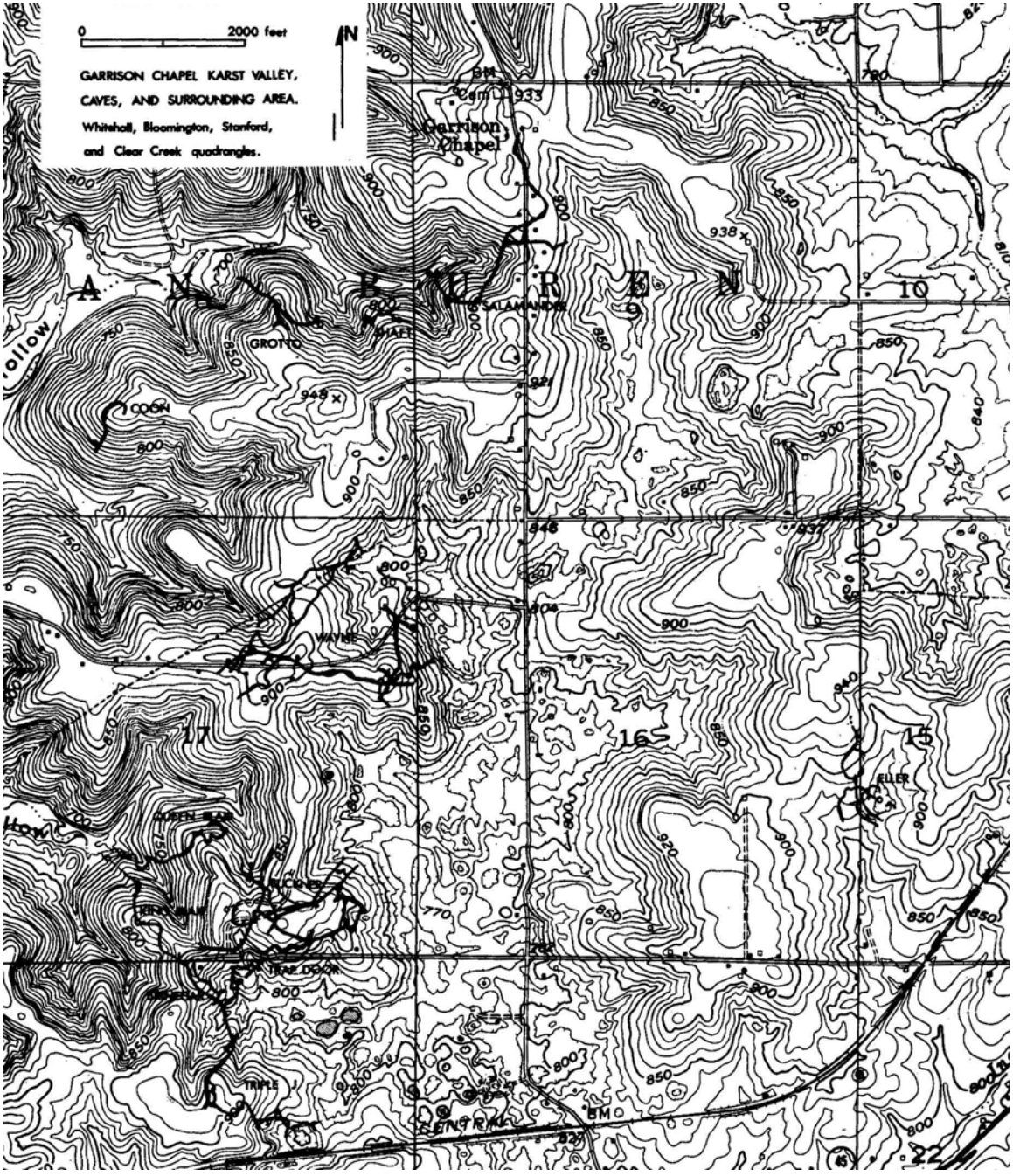
Some sampling has been conducted in caves at Garrison Chapel. The close proximity of Indiana University-Bloomington combined with the ease of entry into some of the caves has produced a few collections of a variety of invertebrates. The presence of Indiana bats has also focused attention on certain caves in the area.

Bollman (1889) reported the millipede Conotyla bollmani from Coon and Truett caves. Blatchley (1897) reported Crangonyx packardi, Caecidotea stygia, Meta ovalis, Sinella cavernarum and Amoebaleria defessa from Eller Cave. In his treatise on the fauna of Mayfield Cave, Banta (1907) summarized what was known from other Indiana caves, including Coon and Eller. Fleming (1972) listed the isopod Caecidotea stygia from Salamander Cave. Hobbs, Jr. and Barr (1972) reported the crayfish Orconectes inermis testii from Ellers, Salamander and Shaft caves, to which Hobbs, Jr. et. al (1977) added Brinegar, Buckner and Wayne Cave. In an unpublished dissertation Hobbs III (1973) reported the presence of the commensal entocytherid ostracods Sagittocythere barri (Buckner, Ellers, Salamander, Wayne caves), Donnaldsoncythere donnaldsonensis (Salamander Cave), Dactylocythere susanae (Salamander Cave) from the cave crayfish O. inermis testii. From the crayfish Cambarus laevis were Donnaldsoncythere donnaldsonensis (Buckner Cave), Dactylocythere susanae, Unacythere xania (Buckner, Wayne caves). Zhang & Holsinger (2003) reported the amphipod Crangonyx indianensis from Buckner and Salamander caves, and Crangonyx packardi from Wayne and Salamander caves. In an unpublished manuscript, Barr (email 2008) reported the presence of the cave beetle Pseudanophthalmus shilohensis mayfieldensis from Buckners, Ellers, Grotto, Mayfields, Mays, Queen Blair, Reeves, Shaft, Salamander, Strong, Truett, and Wayne caves, along with an undescribed species of the leonae group of this genus from Wayne Cave.

By far the greatest attention has been given to the bats inhabiting the area. The federal endangered Indiana bat Myotis sodalis. Brack & Duffey (2007) reported the Indiana bat from the following sites (census numbers in parenthesis): Buckner Cave (49), Coon Cave (14,099), Grotto Cave (12,891), King Blair/Brinegar Cave (218). Salamander Cave is a historic site for this species, but the bats usually roost in an area prone to flooding. Other species present in these caves are the Little brown bat Myotis lucifugus,

Big brown bat Eptesicus fuscus, Eastern pipistrelle Perimyotis subflavus and Northern bat Myotis septentrionalis. Of these, Grotto Cave may have the largest winter population of Little brown bats in Indiana, with over 2,000 found during the last four censuses. Detailed records and historical data are presented by Brack & Duffey (2007).

Figure 1. Overlay of cave passages in Garrison Chapel karst area including Wayne Cave in center left of map (from NSS 73 Convention Guidebook).



METHODS & MATERIALS

Terrestrial sampling was performed by collecting manually, placing pitfall traps and Berlese extraction of litter. The pitfalls consisted of four ounce glass specimen jars filled with 70% isopropyl alcohol as a preservative and baited with limburger cheese. Leaf litter was taken from the entrances for Berlese extraction. Litter was placed in a Berlese funnel, with overhead light/heat extracting the invertebrates into a vial of 70% isopropyl alcohol. Pitfall residues were screened, then transferred into petri dishes for sorting of the fauna under a dissecting microscope. Aquatic sampling was also performed manually as well as dipping water from pools and straining it through a plankton net. Specimens of each taxon were placed in 3 or 4 dram vials of 70% ethyl alcohol and labeled with collection site, state, county, miles to nearest town, date and collector.

ACKNOWLEDGMENTS

This bioinventory was funded by the Indiana Department of Natural Resources, facilitated by Cloyce Hedge. Permission to conduct the field work on the property was granted by the Indiana Karst Conservancy (IKC). Assistance at Sullivan Cave was kindly provided by Keith Dunlap and David Everton. The following zoologists identified specimens: Dr. Thomas C. Barr (ground beetles), Dr. John Holsinger (amphipods), Dr. R.E. Lewis (fleas), Dr. Janet Reid (copepods) and Dr. Felipe N. Soto-Adames (springtails).

FAUNAL LIST

In the following list each species is placed within a hierarchical classification. For each species there is a scientific name, original author of the species, a descriptive common name and an ecological classification. Under each taxon the site where the collection was made, the habitat, and the range of the species is given. Range information not cited was taken from the works of Lewis et al. 1983-2007 and the NatureServe website (http://www.natureserve.org/).

The ecological classifications adhere to the following system:

Classification	Abbreviation	Definition
Troglobite	TB	terrestrial, morphologically adapted and restricted to caves, must feed and reproduce in the cave environment
Troglophile	TP	terrestrial, +/- morphologically adapted to caves, not restricted to caves, but can feed and reproduce in the cave environment
Trogloxene	TX	terrestrial, not usually morphologically adapted to caves, usually leaves the cave to either feed or reproduce
Stygobite	SB	aquatic, morphologically adapted and restricted to caves, must feed and reproduce in the cave environment

Stygophile	SP	aquatic, +/- morphologically adapted to caves, not restricted to caves, but can feed and reproduce in the cave environment
Stygoxene	SX	aquatic, not usually morphologically adapted to caves, usually leaves the cave to either feed or reproduce
Accidental	AC	fall or wash into caves with no demonstrable affiliation to the habitat

Accompanying each taxon identified to the species level is a S-rank and G-rank, or State rank of rarity and Global rank of rarity, according to the following system:

State/Global Rank	Number of sites	Characterization
S1/G1	1-5	critically imperiled
S2/G2	6-20	imperiled
S3/G3	21-100	vulnerable
S4/G4	100+	apparently secure
S5/G5		secure
SE		exotic, not native to the U.S.

PHYLUM PLATYHELMINTHES
CLASS TURBELLARIA
ORDER TRICLADIDA

FAMILY KENKIIDAE

Sphalloplana weingartneri Kenk SB S3/G3 Weingartner's cave flatworm
- Locality: Wayne Cave
- Habitat: pools
- Range: endemic to southern Indiana

PHYLUM ARTHROPODA
CLASS CRUSTACEA
ORDER EUCOPEPODA

FAMILY CYCLOPIDAE

Diacyclops crassicaudis brachycercus (Kiefer) SP S5/G5 copepod
- Locality: Wayne Cave
- Habitat: drip pools
- Range: USA & Europe (Reid 2004)

ORDER OSTRACODA

FAMILY ENTOCYTHERIDAE

Dactylocythere susanae Hobbs SP/EC Susan's S3/G4 crayfish ostracod
- Locality: Wayne Cave (Hobbs 1973)
- Habitat: ectocommensal on crayfish
- Range: Indiana & Kentucky (Hobbs Jr. et al. 1977)

Sagittocythere barri (Hart & Hobbs) SB/EC S3/G4 Barr's crayfish ostracod
Locality: Wayne Cave (Hobbs 1973)
Habitat: ectocommensal on stygobitic crayfish
Range: caves in Indiana, Kentucky, Tennessee, Alabama (Hobbs Jr. et al. 1977)

Uncinocythere xania (Hart & Hobbs) SP/EC S3/G4 crayfish ostracod
Locality: Wayne Cave (Hobbs 1973)
Habitat: ectocommensal on stygobitic crayfish
Range: reported from Indiana & Missouri, poorly known (Hobbs Jr. et al. 1977)

ORDER ISOPODA

FAMILY ASELLIDAE

Caecidotea stygia Packard SB S5/G5 Northern cave isopod
Locality: Wayne Cave
Habitat: streams and pools
Range: SW Ohio, Kentucky, northern Tennessee, southern Indiana, southern Illinois, eastern Missouri

FAMILY LIGIIDAE

Ligidium elrodi (Packard) TP/TX S4/G5 Elrod's terrestrial isopod
Locality: Tiparillo Hole
Habitat: leaf litter
Range: eastern U.S. (Jass & Klausmeier 2001)

FAMILY PORCELLIONIDAE

Trachelipus rathkei (Brandt) TX SE/G5 Rathke's terrestrial isopod
Locality: Wayne Cave
Habitat: leaf litter
Range: exotic, probably European in origin

FAMILY TRICHONISCIDAE

Haplophthalmus danicus Budde-lunde TP SE/G5 terrestrial isopod
Locality: Wayne Cave
Habitat: leaf litter
Range: exotic, probably European in origin

Hyloniscus riparius Budde-Lund TX SE/G5 Riparian terrestrial isopod
Locality: Wayne Cave
Habitat: leaf litter
Range: exotic, probably European in origin

ORDER AMPHIPODA

FAMILY CRANGONYCTIDAE

Crangonyx packardi Smith SB S4/G4 Packard's groundwater amphipod
Locality: Wayne Cave
Habitat: pools, streams
Range: Indiana to Kansas (Zhang & Holsinger, 2003)

ORDER DECAPODA

FAMILY CAMBARIDAE

Cambarus laevis Faxon SP S4/G4 Karst crayfish
Locality: Wayne Cave
Habitat: pools, streams
Range: southern Illinois, Indiana, Ohio, Kentucky

Orconectes inermis testii Cope SB S2/G4 Northern cave crayfish
Locality: Wayne Cave
Habitat: pools, streams
Range: Monroe County, Indiana

CLASS ARACHNIDA
ORDER ARANEAE

FAMILY AGELENIDAE

Cicurina pallida Keyserling TP S4/G5 Pallid funnel-web spider
Locality: Wayne Cave
Habitat: under stones, entrance room
Range: eastern U.S.

FAMILY LINYPHIIDAE

Phanetta subterranea (Emerton) TB S5/G5 Subterranean sheet-web spider
Locality: Tiparillo Hole, Wayne Cave
Habitat: under stones, crevices
Range: eastern U.S.

Porrhomma cavernicola (Keys) TB S2/G4 Cavernicolous sheet-web spider
Locality: Wayne Cave
Habitat: under stones
Range: eastern U.S.

FAMILY PISAURIDAE

Dolomedes scriptus Hentz TX S4/G4 fishing spider
Locality: Wayne Cave

Habitat: entrance ceiling
Range: eastern U.S.

CLASS DIPLOPODA
ORDER CHORDEUMATIDA

FAMILY CONOTYLIDAE
Conotyla bollmani (McNeill) TB/TP S3-4/G3-4Bollman's cave milliped
Locality: Tiparillo Hole, Wayne Cave
Habitat: under stones, boards, leaf litter
Range: southcentral Indiana karst

ORDER COLLEMBOLA

FAMILY ENTOMOBRYIDAE
Pseudosinella fonsa Christiansen TB S2/G2 Fountain cave springtail
Locality: Tiparillo Hole
Habitat: under stones, leaf litter
Range: southcentral & southeastern Indiana karsts, 1 cave in SW Ohio (Christiansen & Bellinger 1998c)

Sinella cavernarum (Packard) TB S3/G4 Cavernicolous springtail
Locality: Wayne Cave
Habitat: under stones
Range: eastern U.S., 1 endogean record (Christiansen & Bellinger 1998c)

FAMILY HYPOGASTRURIDAE
Ceratophysella denticulata group engadinensis vs. granulate TP
Locality: Wayne Cave
Habitat: entrance leaf litter

Odontella rossi Christiansen & Bellinger TX S1/G1? Ross' springtail
Locality: Wayne Cave
Habitat: entrance leaf litter
Range: previously known from the type-locality in Pennsylvania (Christiansen & Bellinger 1998a)

Pseudochorutes aureofasciatus (Harvey) species complex TX S4/G5 springtail
Locality: Wayne Cave
Habitat: entrance leaf litter
Range: United States & Canada (Christiansen & Bellinger 1998a)

FAMILY ISOTOMIDAE
Folsomia candida Willem TP S5/G5 White springtail
Locality: Tiparillo Hole
Habitat: entrance leaf litter

Range: U.S. and southern Canada (Christiansen & Bellinger 1998b)

Isotoma anglicana Lubbock TX S?/G5 Anglican springtail
Locality: Wayne Cave
Habitat: entrance leaf litter
Range: few Indiana collections, but temperate North America, Europe

Isotoma (Desoria) near canadensis Brown TX
Locality: Wayne Cave
Habitat: entrance leaf litter
Range: species too poorly known to characterize range.

Isotoma (Desoria) trispinata MacGillivray TX
Locality: Tiparillo Hole
Habitat: entrance leaf litter
Range: U.S. and eastern Canada (Christiansen & Bellinger 1998b)

Isotoma (Desoria) undescribed species? TX/TP
Locality: Tiparillo Hole
Habitat: entrance leaf litter
Range: possibly conspecific with a taxon represented in material from a cave in Virginia (Soto email 2008)

FAMILY TOMOCERIDAE
Tomocerus bidentatus Folsom TP S4/G4 Two-toothed springtail
Locality: Tiparillo Hole
Habitat: leaf litter
Range: eastern U.S. (Christiansen & Bellinger 1998c)

Tomocerus elongatus Maynard TX S4/G5 Elongate springtail
Locality: Wayne Cave
Habitat: entrance leaf litter
Range: continental U.S. to Alaska (Christiansen & Bellinger 1998c)

Tomocerus flavescens (Tullberg) TP S5/G5 Golden springtail
Locality: Tiparillo Hole
Habitat: under stones, leaf litter
Range: U.S., Canada, Alaska (Christiansen & Bellinger 1998c)

FAMILY SMINTHURIDAE
Arrhopalites sp. TB cave springtail
Locality: Wayne Cave
Habitat: dark zone mud banks next to pools
Range: unknown

Ptenothrix atra Linnaeus TX S5/G5 Black springtail

Locality: Tiparillo Hole
Habitat: leaf litter
Range: cosmopolitan (Christiansen & Bellinger 1998d)

ORDER ORTHOPTERA

FAMILY GRYLLACRIDIDAE

Ceuthophilus brevipes Scudder TX S4/G4 cave cricket
Locality: Tiparillo Hole, Wayne Cave
Habitat: cave walls and ceilings; woodlands
Range: northeastern U.S. (Hubbell 1936)

ORDER COLEOPTERA

FAMILY CARABIDAE

Pseudanophthalmus shilohensis mayfieldensis (Krekeler) TB S2/G2 Shiloh cave beetle
Locality: Wayne Cave
Habitat: riparian, under stones and on mudbanks
Range: southcentral Indiana karst, Lawrence, Monroe, southeast Owen counties (Barr 2004).

Pseudanopthalmus undescribed species (leonae group) TB S1/G1 Wayne cave beetle
Locality: Wayne Cave
Habitat: riparian, under stones and on mudbanks
Range: known only from Wayne Cave (Barr, email 2008)

FAMILY STAPHYLINIDAE

Aleochara lucifuga (Casey) TP S4/G4 Rove beetle
Locality: Wayne Cave
Habitat: riparian, under stones and on mudbanks
Range: eastern U.S.

Quedius erythrogaster Mannerheim TX S5/G5 rove beetle
Locality: Wayne Cave
Habitat: leaf litter
Range: eastern U.S.

ORDER DIPTERA

FAMILY HELEOMYZIDAE

Aecothea specus (Aldrich) TX S5/G5 heleomyzid fly
Locality: Wayne Cave
Habitat: moist walls, floor surfaces
Range: eastern U.S.

FAMILY MYCETOPHILIDAE

Macrocera nobilis TP S4/G5 fungus gnat

Locality: Wayne Cave
Habitat: larval webs under stones, crevices
Range: eastern U.S.

FAMILY PHORIDAE

Megaselia cavernicola Brues TP S5/G5 Cave hump-backed fly
Locality: Tiparillo Hole, Wayne Cave
Habitat: damp areas, mudbanks
Range: eastern U.S.

FAMILY SPHAEROCERIDAE

Spelobia tenebrarum (Aldrich) TB S5/G5 Cave dung fly
Locality: Tiparillo Hole, Wayne Cave
Habitat: raccoon dung, mudbanks, damp areas
Range: eastern U.S.

ORDER SIPHONAPTERA

FAMILY CTENOPHTHALMIDAE

Epitedia wenmanni (Rothschild) PS S5/G5 Wenmann's flea
Locality: Tiparillo Hole, Wayne Cave
Habitat: ectoparasite of White footed mouse
Range: eastern U.S.

CLASS AMPHIBIA
ORDER CAUDATA

FAMILY PLETHODONTIDAE

Eurycea lucifuga Rafinesque TP S5/G5 Cave salamander
Locality: Wayne Cave
Habitat: wall ledges, under stones, larvae in pools
Range: east-central U.S.

ORDER CHIROPTERA

FAMILY VESPERTILIONIDAE

Myotis lucifugus (LeConte) TX S5/G5 Little brown ba
Locality: Wayne Cave
Habitat: passage ceiling
Range: North America south to Mexico

Perimyotis subflavus (Cuvier) TX S5/G5 Eastern pipistrelle
Locality: Tiparillo Hole, Wayne Cave
Habitat: wall ledges, under stones, larvae in pools
Range: eastern U.S. & Canada

ORDER RODENTIA

FAMILY CRICETIDAE

Peromyscus leucopus (Rafinesque) TX S5/G5 White-footed mouse

Locality: Wayne Cave

Habitat: moist areas, primarily near entrance

Range: U.S. & Canada, excluding Pacific states

DISCUSSION

A total of 47 taxa were recorded during the survey of the Wayne Cave Preserve. Of these, 14 were classified as obligate subterranean species:

Sphalloplana weingartneri Weingartner's cave flatworm
Sagittocythere barri Barr's crayfish ostracod
Caecidotea stygia Northern cave isopod
Crangonyx packardi Packard's Groundwater amphipod
Orconectes inermis Northern cave crayfish
Phanetta subterranea Subterranean sheet-web spider
Porrhomma cavernicola Cavernicolous sheet-web spider
Conotyla bollmani Bollman's cave milliped
Pseudosinella fonsa Fountain cave springtail
Sinella cavernarum Cavernicolous springtail
Arrhopalites sp. cave springtail
Pseudanophthalmus shilohensis Shiloh cave beetle
Pseudanopthalmus undescribed species (leonae group) Wayne cave beetle
Spelobia tenebrarum Cave dung fly

Compared to other cave systems sampled in Indiana, Wayne Cave ties for 5th place in the number of obligate subterranean species present:

Cave	Obligate Subterranean
Binkley Cave (Harrison Co.)	19
Wesley Chapel Gulf/Elrod Cave (Orange Co.)	18
Sullivan Cave (Lawrence Co.)	16
Marengo Cave (Crawford Co.)	15
Wyandotte Cave (Crawford Co.)	15
Wayne Cave (Monroe Co.)	14
Donnaldson Cave (Lawrence Co.)	13
Blowing Hole (Harrison Co.)	12
Tucker Lake Spring Cave (Orange Co.)	12
Buddha-Christian Cave (Lawrence Co.)	11
Patton Cave (Monroe Co.)	11
Spring Springs Cave (Orange Co.)	11
Sibert's Well Cave (Crawford Co.)	11
Black Medusa Cave (Harrison Co.)	11
Patton Cave (Monroe Co.)	11
Dillon Cave (Orange Co.)	11
Hudelson Cavern (Orange Co.)	10
Linds Cave (Harrison Co.)	10
Murray Spring Cave (Orange Co.)	10
May Cave (Monroe Co.)	10
King/Bug Ear Cave (Lawrence Co.)	10

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