

THE INVERTEBRATE FAUNA OF THE CAVES OF THE UINTA MOUNTAINS, NORTHEASTERN UTAH

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ABSTRACT.— Seven large caves in the Uinta Mountains, Utah, were surveyed for their invertebrate faunas. Thirty-eight species were found, and 30 of these are typical cave inhabitants. Diptera are the predominant group. Cave-restricted species are an amphipod, two diplurans, and possibly a *Rhagidia* mite. The caves were probably uninhabitable in the past glacial because of severe periglacial environmental conditions, and the faunas have moved into the present cave sites since deglaciation of the Uintas.

Since the helpful checklist of Nicholas (1960), much additional survey work has been completed on the cavernicolous invertebrate faunas of the United States (see review in Peck and Lewis 1978). However, gaps still exist in certain western states, and these should be filled in an attempt to achieve a comprehensive understanding and a unified general theory of the evolution and distribution of North American cave invertebrates (Peck 1978, 1981).

The Uinta Mountains of northeastern Utah are ringed by limestone and contain many caves, but no effort seems to have been made to characterize their fauna. Field work was conducted in August 1979 to remedy this.

Extensive information is available on the caves of Utah, although much of it exists in obscure publications. A general overview of Utah speleology is given by Green (1963a), and White (1979) discusses karst landforms in the Uinta Mountains. Brief information on the caves studied follows. These are the largest known in the Uintas and are the most likely to have a variety of microhabitats, and thus to support the greatest diversity of invertebrate fauna.

Cave locations are shown in Figure 1. They are indicated on USGS topographic maps and on U.S. Forest Service maps of the Ashley and Uinta Forests. All the caves are formed in the Madison and Deseret lime-

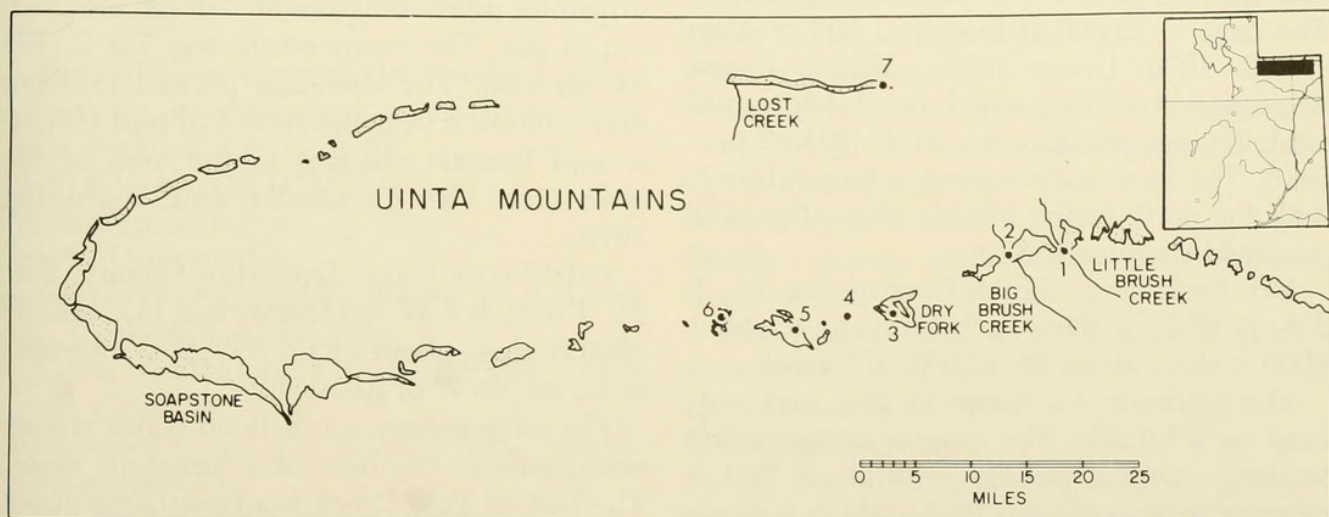


Fig. 1. Pattern of outcrop of Mississippian limestones ringing the Uinta Mountain uplift (adapted from White 1979). Caves surveyed for invertebrate faunas are: 1, Little Brush Creek Cave; 2, Big Brush Creek Cave; 3, Dry Fork Cave; 4, Ice Cave; 5, White Rocks Cave; 6, Pole Creek Cave; 7, Sheep Creek Cave. Inset shows location of Uinta Mountains in Utah.

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stones of Mississippian age. Because caves are fragile environments, excessive and careless visitation to them should not be encouraged.

Big Brush Creek Cave, Uintah County, Sec. 29, T 1 S, R 21 E, on Red Cloud Loop forest road 018, about 9000 ft elev., about 17 mi N of Vernal.

This cave lies in a large stream sink and has a very large entrance arch. Up and to the left of the entrance is an upper and irregular series of passages called the ice cave section. The main passage narrows somewhat before entering a huge room containing much wood debris, indicating that this and deeper areas of the cave fill completely with flood waters. The cave continues down through a series of crawls and chambers into a maze of water-scoured passages with pools. At 26,000 ft in length, and an 800 ft depth (White 1978, Green 1963b), it is the largest cave in Utah. Temperatures were 1 C in the first big room, and 6 C in the second (RH 93 percent).

Little Brush Creek Cave, Uintah County, Sec. 25, T 1 S, R 21 E, about 8000 ft elev., near route 44, about 18 mi N of Vernal.

The cave has a large arched entrance in a large sink into which flows a wet weather stream. In time of flood, water ponds in the sink and log jams occur in narrow passages. The cave is 15,000 ft long and 500 ft deep (White 1979, Green 1963a, 1963c). Fauna was found on rotting wood, flood debris, and sand. The temperature was 10 C (RH 88 percent). The local environment is boreal forest, with the north-facing hillside above the cave covered by spruce and fir.

Dry Fork Cave, Uintah County, Sec. 21, T 3 S, R 19 E, in Dry Fork Canyon, at about 8000 ft elev., about 18 mi NW of Vernal.

The entrance is a stoopway in a rock outcrop on a hillside. The cave is an ascending walking-crawling passage with about 100 ft of main passage (Green 1957), which is mostly dry but with some moist and wet areas. The cave floor is of dust, clay, sand, and small to large, rounded stream boulders. The temperature was 9 C (RH 94 percent). The sparse fauna was concentrated near moist areas and at moist *Neotoma* packrat droppings and decaying nest debris.

Ice Cave, Uintah County, Sec. 5, T 2 W, R 1 E, near the top of Ice Cave Peak, off forest

road 104, about 9700 ft elev., about 15 mi NNW of Lapoint.

The cave's slotlike entrance is at the bottom of an aspen-lined sink. The cave consists solely of a low chamber 30 feet wide and 60 feet long, floored with dirt and much ice. The fauna is concentrated on the cave ceiling and uses the cave as a daytime retreat or as an aestivation site. When insects die they fall to the ice and may be preserved there. Other arthropods are in litter and decaying debris at the base of the entrance slope. The air temperature was 4 C (RH 85 percent) 3 ft above the ice.

Whiterocks Cave, Duchesne County, Sec. 1, T 2 N, R 1 W, about 8000 ft elev., high on cliffs above Whiterocks River Canyon, about 10 mi N of Whiterocks, or 15 mi NNW of Lapoint.

The gated cave entrance is reached by an arduous climb. Entry is allowed only with forestry personnel and arrangements must be made with the Vernal office several weeks in advance. This is a large cave of irregular dimensions, and it is certainly in need of protection to conserve it. Much of this cave, about 3000 ft long, is generally moist but lifeless, and fauna was found associated with moist rat dung only near the entrance. Many dripstone pools are present but are also barren of life. The temperature was 7.5 C (RH 94 percent). The abundant packrat middens may contain a valuable record of past climatic and floristic changes in the area of the cave (see Van Devender and Spaulding 1979).

Pole Creek Cave, Duchesne County, Sec. 24, T 3 N, R 2 W, off forest road 117, around 7000 ft elev., about 12 mi NW of Whiterocks or 23 mi NNW of Roosevelt.

The cave entrance is a flood-water stream resurgence at the base of a limestone slope. The sink of Pole Creek is a broad area about ½ mi north. The low entrance leads to a large ascending stream passage floored with sand, mud, and water-sculptured rock. About 600 ft of passage exists before a deep pool floods the cave from wall to wall. The air temperature was 8.5 C (RH 87 percent) and the water was 8 C. The fauna was on damp soil near scarce bits of organic debris, or on the ceiling at the entrance.

Sheep Creek Cave, Daggett County, Sec. 16, T 2 N, R 19 E, at 7040 ft elev., about 7 mi SW of Manila.

The cave is formed in vertical limestones on the west wall of Sheep Creek Canyon where this intersects the Uinta Crest fault. The Forest Service has protected the cave entrance, some 30 m above the cave stream resurgence, by a gate, but this has been vandalized. The main cave passage is the abandoned upper level of the stream that now resurges at a lower level. I judge the ashy nature of much of the cave floor, the "burnt" smell in the cave, and the soot-darkened ceiling to indicate that large accumulations of organic matter, such as packrat nests, formerly existed here but have been burned. This likely happened in or before 1950, and is regrettable because a valuable paleoenvironmental record (see Van Devender and Spaulding 1979) has been mostly lost. A few isolated middens still exist near the entrance. The "burned" part of the cave is barren. Lower levels near the stream had a sparse fauna on mud banks. The stream seems to carry only finely divided organic matter. The air temperature was 9.5 C (RH 94 percent) at the stream and the stream was 9 C.

ANNOTATED FAUNAL LIST

The following contains the standard terminology for cavernicolous animals (see Barr 1968, Peck and Lewis 1978).

PHYLUM ANNELIDA

CLASS OLIGOCHAETA

Family Lumbricidae

Aporrectodea tuberculata (Eisen), D. Schwert det., troglophile-edaphobite.

Little Brush Creek Cave, 3. Big Brush Creek Cave, 5.

Allolobophora sp., D. Schwert det., troglophile-edaphobite.

Big Brush Creek Cave, 1 immature.

Family Enchytraeidae

Genus and species undetermined, troglophile-edaphobite.

Big Brush Creek Cave.

PHYLUM ARTHROPODA

CLASS CRUSTACEA

Order Amphipoda

Family Crangonyctidae

Stygobromus sp., J. Holsinger det., troglobite.

Pole Creek Cave, abundant in flooded passage. These are an undescribed species, very similar to several others in the western *hubbsi* group (Holsinger 1974). This is the first collection of subterranean amphipods from Utah.

CLASS ARACHNIDA

Order Aranea

Family Erigonidae

Anacornia proceps Chamberlin, W.J. Gertsch det., troglophile.

Big Brush Creek, 1 female and 1 immature. Dry Forks Cave, 1 male, 11 females, 8 immatures.

Order Acarina

Family Rhagidiidae

Rhagidia sp., cf. *grahami* Elliott, troglophile or troglobite.

Little Brush Creek Cave (type locality), Sheep Creek Cave, Ice Cave, Big Brush Creek Cave, and Dry Forks Cave. The species was previously reported only from the type locality (Elliott 1976), but the above abundant records may represent other species as well in this poorly known genus.

Family Oribatidae

Genus and species undetermined, troglophile.

Big Brush Creek Cave, abundant on flood debris.

CLASS CHILOPODA

Order Scolopendromorpha

Family Scolopendridae

Genus and species undetermined, accidental?

Big Brush Creek Cave, one in flood debris.

CLASS DIPLOPODA

Order Polydesmoidea

Family, genus, and species undetermined, troglophiles?

Dry Forks Cave. A small eyeless species abundant on damp debris.

CLASS INSECTA

Order Collembola

Family Onychiuridae

Onychiurus decus Christiansen, K. Christiansen det., troglophile.

Big Brush Creek Cave. The species was previously known only from a snowfield in Montana (Christiansen and Bellinger 1980:431).

Onychiurus similis Folsom, K. Christiansen det., troglophile.

Pole Creek Cave. The species is widespread across the United States, with only

one cave record from Texas (Christiansen and Bellinger 1980:437).

Onychiurus ramosus Folsom, K. Christiansen det., troglophile.

Whiterocks Cave, on moist rat dung. The species is widespread across the United States, with only two cave records from Virginia (Christiansen and Bellinger 1980:453).

Family Tomoceridae

Tomocerus flavescens (Tullberg), K. Christiansen det., troglophile.

Big Brush Creek Cave, Little Brush Creek Cave, Pole Creek Cave. Christiansen (1964) notes that the species is spread across the continent and is known from caves in 14 states.

Order Diplura

Family Campodeidae

Haplocampa sp., L. M. Ferguson det., troglobite.

Pole Creek Cave. This is a new species with an unusual morphology. The genus contains cavernicolous species in Illinois, Missouri, California, and Washington; and epigeal species in California, Montana, Oregon, Washington, and Alberta.

Haplocampa sp., L.M. Ferguson det., troglobite.

Sheep Creek Cave, Little Brush Creek Cave, Big Brush Creek Cave. This is a new species and may represent a new genus.

Order Coleoptera

Family Carabidae

Bembidion sp., accidental.

Big Brush Creek Cave, on flood debris.

Rhadine sp., troglophile.

Dry Forks Cave, one dead on sand bank.

Family Staphylinidae

Quedius spelaeus Horn, troglophile.

Dry Forks Cave, many in *Neotoma* dung and nest debris. The species occurs across the continent, frequently in caves (Smetana 1971).

Genus and species undetermined, troglophile?

Ice Cave, two in entrance debris. These are in the subfamily Aleocharinae, which is frequently found in caves.

Family Scarabaeidae

Aphodius sp., accidental.

Ice Cave, three in entrance debris.

Order Lepidoptera

Family Noctuidae

Euxoa auxiliaris (Grote), D. LaFontaine det., troglaxene.

Ice Cave. This and the following species of fairly widespread moths often retreat to caves to aestivate or to seek a daytime retreat.

Euxoa idahoensis (Grote), D. LaFontaine det., troglaxene.

Ice Cave.

Apamea amputatrix (Fitch), D. LaFontaine det., troglaxene.

Ice Cave.

Scoliopteryx libatrix (Linnaeus), troglaxene.

Pole Creek Cave. The species is worldwide, and commonly uses caves as overwintering sites.

Order Siphonaptera

Family Ceratophyllidae

Orchopeas sexdentatus (Baker), G. Holland det., ectoparasite.

This is a widespread flea on *Neotoma* wood rats, and these specimens were abundant in a *Neotoma* nest in Dry Forks Cave.

Order Diptera

Family Tipulidae

Pterelachisus sp., H. Teskey det., troglaxene.

Ice Cave, on ceiling.

Yamatipula sp., H. Teskey det., troglaxene.

Ice Cave, on ceiling.

Family Mycetophilidae

Rymosia sp., R. Vockeroth det., troglaxene.

White Rocks Cave, Ice Cave.

Bolitophila sp., R. Vockeroth det., troglaxene.

Ice Cave.

Bolitina sp., R. Vockeroth det., troglaxene.

Ice Cave.

Exechia sp., R. Vockeroth, troglaxene.

Ice Cave.

Exechiopsis sp., R. Vockeroth det., troglaxene.

Pole Creek Cave, abundant on ceiling at entrance; Ice Cave.

Mycetophila sp., R. Vockeroth det., troglaxene.

Ice Cave.

Family Sciaridae

Lycoriella sp., R. Vockeroth det., troglaxene or troglophile.

White Rocks Cave, Dry Forks Cave.

Family Spheroцерidae

Leptocera sp., R. Vockeroth det., troglaxene or troglophile.

Ice Cave, Dry Forks Cave.

Family Phoridae

Megascelia sp., R. Vockeroth det., troglaxene or troglophile.

Ice Cave.

Family Heleomyzidae

Genus and species undetermined, troglaxene or troglophile.

Ice Cave.

Family Anthomyidae

Genus and species undetermined, accidental.

Ice Cave.

DISCUSSION

A total of 38 species were found in caves in the Uinta Mountains. Of these, 30 species are in taxa that are typical of caves and cave-like habitats in North America in their behavioral, ecological, and evolutionary characteristics. The only true cave-limited species are the amphipod, 2 dipturans, and possibly the *Rhadidia* mite.

As habitats, the caves themselves are probably preglacial in time of origin, especially White Rocks Cave. The caves may not have been overridden by the Pleistocene piedmont and valley glaciers coming from the Uinta Mountain uplands (Atwood 1904, Hansen 1975), but they would have suffered extreme and prolonged flooding and scouring by meltwater streams. The caves were probably uninhabited during glacials because they were colder, there was less food input due to periglacial climatic conditions, and because of meltwater scouring. Thus, the fauna probably represents an occupation of caves sometime in the past 10,000 years since the last glacial. In this respect the fauna is very similar to that of Ontario, Canada, caves which have been occupied since the last glacial, and have an abundance of troglaxenic diptera (Peck, unpubl. ms.).

The amphipod may be an exception to this generalization. Holsinger (1980) thinks that some groundwater amphipods may have existed under glacial ice masses, but I am inclined to keep open the alternative of movement from unglaciated peripheral refugia, through interstices in groundwater, into the

area after deglaciation (Peck and Lewis 1978). A large fauna is known to live in the west in the interstices of gravels and coarse streamside sediments (Stanford and Gaufin 1974), which knowledge supports the possibility of such faunal movements.

Future research can contribute by surveying cave faunas in the western Uintas. The area of greatest present ignorance of cave faunas is in the details of their life cycles and seasonal dynamics. Most rewarding would be careful ecological study of the troglobites or of the troglaxenic Diptera.

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