

Melrose Caverns: A Late Pleistocene Vertebrate Locality in Virginia, U.S.A.

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Abstract

A 1- by 2-meter site within Melrose Caverns, Rockingham County, Virginia has yielded significant vertebrate remains. Work at the site has produced an assemblage of 46 vertebrate taxa including amphibians, fish, birds, reptiles, and mammals. The bone deposit appears to represent the den site of a small mammalian carnivore and possibly other contributors. A significant find is *Geomys* sp., a first record for Virginia. *Geomys* sp. is an extirpated form that now lives in western and southeastern U.S. The Melrose fauna includes other extirpated forms which now live in the west: *Microtus ochrogaster* and *Spermophilus tridecemlineatus*; extirpated forms which now live in more northern areas: *Phenacomys intermedius* and *Synaptomys borealis*; and the extinct: *Mylohyus fossilis*.

The nearest *Geomys* sp. occurrence is a fossil occurrence in New Trout Cave in West Virginia. Lower levels of the New Trout Cave site date older than 30,000 years ago and contain *Geomys* sp. and *Cryptobranchus alleganiensis*, but the small rodent, *Microtus xanthognathus*, is not present. *Geomys* sp. and *Cryptobranchus alleganiensis* have not been found in the upper levels of latest Pleistocene age where the extirpated *Microtus xanthognathus* is relatively common.

An attempt to date the Melrose Caverns site failed when no collagen was found in the bone sample sent for AMS dating. The presence of *Geomys* sp. and *Cryptobranchus alleganiensis* and the absence of *Microtus xanthognathus* are evidence that the Melrose Caverns site may date as early Wisconsinian. The recognition of early Wisconsinian sites is problematical in that they lack the extinct microtines that distinguish Irvingtonian sites, there is little to distinguish them from later Pleistocene sites and they are too old to date by carbon methods.

Introduction

Awareness of how few of Virginia's caves were known to contain paleontological resources and a subsequent brief series of caver finds of Pleistocene-aged remains in the mid-1990s, prompted a paleontological inventory of the Commonwealth's caves. The Paleontological Resource Inventory of Virginia Caves (PRIOVAC) initiative was first permitted in October 1996 to make surface collections of non-human vertebrate and invertebrate remains in caves. One such collection made in Melrose Caverns in March 2000 contained the remains of *Phenacomys intermedius* (heather vole) – an extirpated animal, which now lives in more northern areas. Additional surficial collections yielded more extirpated forms, including *Geomys* sp. (pocket gopher), and an extinct peccary. An additional permit, to allow a limited excavation of the site, was applied for and received in October 2000. This paper details our findings at the Melrose Caverns bone site through February 2000. The cave resources of Melrose Caverns are protected, as they are in all non-federally owned caves in the Commonwealth, by the Virginia Cave Protection Act.

Physical Setting

Melrose Caverns is a 410 m-long cave (HOLSINGER, 1975) in the middle-Ordovician New Market Limestone in the Valley and Ridge physiographic province. The cave is developed in a small wooded hill, bounded to the east by a normally dry stream course. At least four natural entrances are known, all of which are sealed or gated, in addition to the gated tunnel-entrance to this former commercial cave. The commercial entrance was opened by tunneling at the rear of the cave, approximately 40-m from the deposit. The floor sediments were trenched in some areas of the cave during commercialization. Floor trenching exposed a depth of sediment up to 0.4-m along the two-meter-long alcove in which the bone deposit is located. The

width of the alcove is about three-quarters of a meter across the upper sediments. Initial collections were from the upper 15-cm of the deposit. Excavation revealed a meter-wide passage or elongate solution pocket oriented parallel to the cave passage trend and behind the quarter-sphere shaped alcove.

Faunal Remains

Prior to the start of the excavation, surficial collections of exposed bone matrix yielded the remains of *Phenacomys intermedius* (heather vole), *Geomys* sp. (pocket gopher), *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel), *Synaptomys borealis* (northern bog lemming), *Cryptobranchus alleganiensis* (hellbender), and the extinct *Mylohyus fossilis* (peccary). The vole, pocket gopher, ground squirrel, and lemming are all extirpated from the state, while the hellbender is extirpated from the Potomac River basin, in which the site is situated. The record of *Geomys* sp. is a first for the state.

Matrix was wet screened to recover fragments coarser than about 0.5- to 0.7-mm. Carbonate-cemented clasts were solutionally reduced by the use of dilute acetic acid. The upper 15-cm contained the fragmental remains of about 44 vertebrate taxa (Table 1) including amphibians, fish, birds, reptiles, and mammals. Most of the identified remains are teeth, jaws, and cranial fragments. Some post-cranial elements have been identified to taxa. This upper layer contained single elements of three different carnivores: a canine of *Procyon lotor* (raccoon), a premolar of a Mustelidae (large weasel or mink), and a caudal vertebra of a large long-tailed Felidae (cat). The next lower 10- to 13-cm have further defined some taxa to species, increased the numbers of individual faunas, and added only two more records. *Lutra canadensis* (river otter) is represented by a radius and fits well with the aquatic faunal portion of the assemblage. A possible determination of *Spilogale putorius* (eastern spotted skunk), by a deciduous molar, represents a fifth carnivore.

The location of the site and its faunal assemblage lead us to conclude it represents the den of at least one carnivore. The combination of fish, tree frogs, and small rodents presents an interesting assemblage, especially if the site represents a single carnivore. The sucker, catfish, hellbender, muskrat, and river otter imply a sizeable flowing stream in contrast to the dry streambed that presently exists near the site.

Site Dating

A bone fragment, suspected to be part of a peccary skull, was submitted to the National Science Foundation (NSF) Accelerator Mass Spectrometer (AMS) laboratory at the University of Arizona for an AMS radiocarbon measurement. The sample proved to lack collagen and could not be carbon-dated.

A late Pleistocene age of the bone deposit is implied by the presence of: *Mylohyus fossilis* (extinct peccary) and extirpated forms presently living in the western U.S. - *Microtus ochrogaster* (prairie vole) and *Spermophilus tridecemlineatus* (thirteen-lined ground squirrel), extirpated forms presently living in the northern U.S. or Canada - *Phenacomys intermedius* (heather vole) and *Synaptomys borealis* (northern bog lemming), and *Geomys* sp. (pocket gopher) - an extirpated form that now lives in western and southeastern U.S. The nearest site that contains a similar fauna is the New Trout Cave deposit in West Virginia (GRADY & GARTON, 1982). This site also is located within the Potomac River Basin, which presently lacks *Cryptobranchus alleganiensis* (hellbender). Lower levels of the New Trout Cave site date older than 30,000 years ago and contain *Geomys* sp. (GRADY, 1984) and *Cryptobranchus alleganiensis*. Curiously these lower levels lack *Microtus xanthognathus* (yellow-cheeked vole) a common microtine in upper layers of the site and in many other sites of latest Pleistocene age in the Virginias (MCDONALD *et al.*, 1998). Because of the absence of the extinct microtines that distinguish Irvingtonian sites, the Melrose bone site is suspected to date as early Wisconsinan.

We plan to attempt another AMS bone date when we find an adequate sample. As excavations advance in depth and into the narrow fissure behind the alcove another dating opportunity may await. Within the fissure, a narrow stalactite can be seen protruding through the upper layers of the deposit. Perhaps the base of this calcite speleothem will lie within the deposit and be adequate for a U/Th date for a horizon within the deposit.

Scientific Name	Common Name	Minimum #
Osteichthyes	Bony fish	
Cyprinidae	minnow(s)	1+
Catostomidae	sucker	1
Ictaluridae	catfish	1
Amphibia	Amphibians	
<i>Cryptobranchus alleganiensis</i>	hellbender	1
Caudata	salamander(s)	1+
Hylidae	peeper(s)	2+
Reptilia	Reptiles	
Squamata	lizard	1
Colubridae	non-poisonous snake(s)	1+
Aves	Birds	
Anatidae	?small duck	1
Mammalia	Mammals	
<i>Sorex cinereus</i> Kerr	masked shrew	12
<i>Sorex (Microsorex) hoyi</i> (Baird)	pygmy shrew	2
<i>Blarina brevicauda</i>	short-tailed shrew	3
<i>Parascalops breweri</i>	hairy-tailed shrew	1
<i>Condylura cristata</i>	star-nosed mole	1
<i>Eptesicus fuscus</i>	big brown bat	7
<i>Pipistrellus subflavus</i>	eastern pipistrelle	7+
<i>Myotis</i> sp.	bat	20+
<i>Corynorhinus</i> sp.	big eared bat	2
<i>Lepus americanus</i>	snowshoe hare	1
Leporidae	rabbit or hare	1
<i>Tamias striatus</i>	eastern chipmunk	1+
# <i>Spermophilus tridecemlineatus</i>	thirteen-lined ground squirrel	1
<i>Tamiasciurus hudsonicus</i>	red squirrel	2
<i>Glaucomys volans</i>	southern flying squirrel	2
<i>Neotoma magister</i>	Alleghany woodrat	2
<i>Peromyscus</i> sp.	deer or white footed mouse	10
# <i>Phenacomys intermedius</i>	heather vole	2
<i>Clethrionomys gapperi</i>	red backed vole	1 or 2
<i>Microtus pennsylvanicus</i>	meadow vole	9+
<i>Microtus chrotorrhinus</i>	yellow nosed vole	1 or 2
<i>Microtus pinetorum</i>	pine vole	17
# <i>Microtus ochrogaster</i>	prairie vole	7
<i>Microtus pinetorum</i> or <i>ochrogaster</i>	vole	7
# <i>Synaptomys borealis</i>	northern bog lemming	3
<i>Synaptomys cooperi</i>	southern bog lemming	2
<i>Ondatra zibethicus</i>	muskrat	1
# <i>Geomys</i> sp.	pocket gopher	3
<i>Zapus hudsonius</i>	meadow jumping mouse	20+
<i>Napaeozapus insignis</i>	woodland jumping mouse	4
<i>Procyon lotor</i>	raccoon	1
Mustelidae	large weasel or mink	1
? <i>Spilogale putorius</i>	?eastern spotted skunk	1
<i>Lutra canadensis</i>	river otter	1
Felidae	large cat	1
* <i>Mylohyus fossilis</i>	long nosed peccary	2
<i>Odocoileus virginianus</i>	white-tailed deer	1

Table 1. Vertebrate fauna from Melrose Caverns bone site (# - extirpated from state, * - extinct).

Summary

The presence of remains of the extirpated small rodent *Phenacomys intermedius* prompted inventory speleologists to further investigate a small exposed bone deposit in Melrose Caverns. The site yielded remains of the extinct peccary *Mylohyus fossilis* and additional extirpated small rodents, including *Geomys* sp. – a new state record. The location and assemblage of some 46 fish, amphibians, reptiles, and mammals appears to represent a den site of one or more carnivores. An attempt to radiometrically date a bone sample failed for lack of collagen, however, faunal similarities to a West Virginia site, about 50-kilometers away, suggest the site may date as early Wisconsinan. Stratigraphic excavation and fine-mesh wet-screening techniques are in-use in the documentation of this significant site.

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