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POSTGLACIAL FAUNAL RECORDS FROM CAVE DEPOSITS IN JASPER NATIONAL PARK, ALBERTA, CANADA

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Abstract

In 2009, we initiated an on-going, long term research project that focuses on exploration of fossil-bearing cave deposits in Jasper National Park. Specifically, we were interested in understanding patterns of mammalian re-colonization of mountainous regions following late Pleistocene deglaciation. Our work has focused on the identification of fossil-bearing cave deposits, excavation and sampling of those deposits, and radiocarbon dating of recovered remains. Examined sites have at least an age of 9600 years BP. Research at four cave sites, located in relatively close proximity to one another, is contributing to an improved understanding of the late Quaternary record of Jasper National Park. This project is an example of a cooperating partnership between institutions (museum, national park and technical college) and assistance from a speleological society.

Introduction

Previous studies concerning Quaternary faunal remains from the Canadian Rocky Mountains highlighted the potential for recovery of rich vertebrate assemblages in cave deposits (Burns 1982, 1989, 1991, 2004). Despite those studies, relatively few caves in the mountainous interior of western Canada have been systematically explored and evaluated for paleontological remains. In 2009, we initiated a research project that focused on exploration of fossil-bearing cave deposits in Jasper National Park.

At the outset of the project our objectives were to better understand prehistoric resources preserved within park boundaries and to explore research questions surrounding the Quaternary record of animals in western Alberta. Specifically, we were interested in understanding patterns of recolonization in mountainous

regions of Alberta following recession of Cordilleran Ice in the late Pleistocene. Here we summarize the results of fieldwork at four cave localities situated within Jasper National Park and discuss the implications of that work for understanding Quaternary vertebrate biogeography at northern latitudes.

Discussion

Disaster Point Cave

Disaster Point Cave is located in the front ranges (eastern side) of the Canadian Rocky Mountains at 1082 m. The cave entrances occur at the base of a rather steep natural depression. Because of the position and structure of the cave entrances, the cave acts as a funnel for sediments, drifting snow and debris deposited upslope of the entrances. The cave also serves as a natural trap for many animals because of near-vertical aspects of its two entrances.

Fieldwork took place in 2009 and 2010, and included floor surface collection throughout the cave and systematic excavation of stratified sediments in an area known as the Terminal Dig. A working summary of identified fauna from Disaster Point Cave is presented in Table 1. Remains of mammals and anurans are the most common components of the assemblage, and a surprisingly rich assemblage of land snails was recovered.

AMS radiocarbon dates of 1700 ± 30 yr BP and 2650 ± 30 yr BP on charcoal collected from stratified sediments in the Terminal Dig suggest that the sequence of late Holocene faunal remains is relatively continuous. A slightly older AMS radiocarbon date (6090 ± 40 yr BP) on bone collagen from a pelvis of *Ursus americanus* provides the current known maximum age for fauna preserved in the cave.

Table 1. Summary of identified faunal remains from Disaster Point Cave (DPC), Procrastination Pot and Ice Trap. X = present, cf. = tentative identification.

TAXON	DPC - Terminal Dig	DPC – Surface Survey	Procrastination Pot	Ice Trap
Osteichthyes				
Osteichthyes indet.	X	-	-	-
Serpentes				
Serpentes indet.	X	-	-	-
Amphibia				
Anura indet.	X	-	-	-
<i>Bufo</i> sp.	X	-	-	-
Caudata indet.	X	-	-	-
Mammalia				
Chiroptera indet.	X	X	X	-
<i>Sorex</i> sp.	X	-	-	-
Heteromyidae	X	-	-	-
<i>Erithizon dorsatum</i>	-	X	X	-
<i>Tamiasciurus hudsonicus</i>	-	X	X	-
<i>Marmota</i> sp.	-	-	X	X
Muridae	X	-	-	-
Arvicolinae indet.	X	-	-	-
<i>Neotoma</i> sp.	-	X	X	X
<i>Lepus</i> sp.	-	X	-	-
<i>Lynx</i> sp.	-	X	-	-
<i>Mustela</i> sp.	X	X	-	-
<i>Gulo gulo</i>	-	X	X	-
<i>Ursus americanus</i>	-	X	-	-
<i>Ursus</i> sp.	-	X	X	-
<i>Ovis canadensis</i>	-	X	cf.	-
<i>Oreamnos americanus</i>	-	-	-	cf.

Procrastination Pot

Procrastination Pot is a cave located on a ridge below tree line at 1650 m along the front ranges of the Canadian Rocky Mountains. Like Disaster Point Cave, the triple pit entrances of Procrastination Pot act as natural funnels or traps. Living inhabitants of the cave include bushy-tailed wood rats (*Neotoma cinerea*) and little brown myotis (*Myotis lucifugus*). The most recent winter census (2011) recorded 700 bats using the cave as a hibernaculum. Vast quantities of bat bones (some calcified) occur in the cave, suggesting long-term use of this cave. A radiocarbon date of 5780 ± 110 yr BP on a sample of bear (*Ursus*) bone indicates a mid-Holocene age for portions of the cave.

Ice Trap

Ice Trap is a high elevation cave, situated above tree line at 2183 m. The vast majority of the cave environment remains at subzero Celsius temperatures throughout the year and houses impressive ice formations. With a total surveyed length of over 3 kilometres and a depth of -347 m, it is Jasper's longest and deepest cave. Surface skeletal remains and dung of woodrats (*Neotoma* sp.) and marmots (*Marmota* sp.) are abundant near the entrance. Woodrat droppings are found more than 500 m from the single known entrance. Indurated woodrat middens occur in at least two areas of the cave. Radiocarbon dating of individual dung pellets from one of the middens resulted in an early post-glacial age assignment (9600 ± 40 yr BP) for at least one area of the cave. That record is significant because it represents a rare, direct date on Quaternary microfauna from western Canada. Another radiocarbon date (4620 ± 40 yr BP), based on a bulk sample from a second indurated midden, suggests a mid-Holocene age for use of the entrance areas of the cave.

Anticline Arch Cave

Anticline Arch Cave is situated near Ice Trap at a similar elevation. Environmentally and structurally, Anticline Arch Cave is significantly different from Ice Trap. This cave is only 28 metres long and -13 metres deep. However, a radiocarbon date on an ungulate tibia (9000 ± 40 yr BP) indicates that faunal material from the site is of comparable age to the oldest remains sampled from Ice Trap Cave.

Conclusion

Caves of the Canadian Rocky Mountains, for the most part, are relic fossil passages left over from before the

most recent glacial periods. The known caves often are found in alpine plateaus, ridges, or steep slopes. Glacial and fluvial sediment infilling have made valley bottom cave entrances a rare phenomenon. Recovered remains provide insight into the post-glacial recolonization of the Canadian Rocky Mountains following deglaciation. AMS radiocarbon dates on woodrat dung from Ice Trap indicate the presence of small mammals at high elevations of the Canadian Rocky Mountains by 9600 yr BP and even some ungulates by 9000 yr BP (Anticline Arch Cave). Faunal remains from Procrastination Pot and Disaster Point Cave suggest that much of the modern biota of Jasper National Park was present by the mid-Holocene at the latest.

The large quantities of bat bones accumulated on the floor of Procrastination Pot, resembling a bed of pine needles, implores more investigation. Although the current residents are little brown myotis (*Myotis lucifugus*), examination of skulls could be undertaken to determine if there has been any shift in species use of this cave.

This research project is an example of a cooperating partnership between institutions (museum, national park and technical college) and assistance from a speleological society. The Royal Alberta Museum has the paleontological expertise, Jasper National Park provides the local area knowledge and logistic support, Northern Alberta Institute of Technology brings field study and travel skills and the Alberta Speleological Society travel skills and logistic support. Three of the four caves require single rope technique to access the cave environment.

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