

Cold, dry glacial conditions enabled Arctic ground squirrels to form dense, widespread populations in regions such as Dawson City and Fairbanks where they are rare or absent now. The fossil midden records support earlier proposals that this species evolved in, and is well-adapted to, open steppe-tundra vegetation, soils composed of wind-blown silt and glacial climates of Beringia.

Ground squirrels (genus *Spermophilus*) began spreading and diversifying as early as the Hemphillian (about 7 to 5 million years ago). The earliest-known fossils (teeth) that apparently represent Arctic ground squirrels are from Fish Creek, northern Alaska (about 2.5 million years ago) and Cape Deceit, west-central Alaska (about 1.8 million years ago). So, the species probably evolved in the northern parts of Eastern Beringia, although an origin from Siberian long-tailed susliks (*Spermophilus undulatus*) has been postulated. Numerous radiocarbon dates and recovery of nests in association with sediments of known age indicate that this species lived in Yukon and Alaska throughout the Wisconsinan from about 100,000 to 11,000 years ago. Altogether, the fossil record indicates that perhaps Arctic ground squirrels survived several glacial phases in Eastern Beringia. The species' general absence in parts of interior Alaska and Yukon is probably due to the disappearance of its preferred habitat near the end of the Wisconsinan glaciation some 11,000 years ago.

C.R. Harington and G.D. Zazula
February, 2007

Additional Reading

- Banfield, A.W.F. 1975. *The Mammals of Canada*. University of Toronto Press, Toronto.
- Eddingsass, A.A., B.K. Jacobsen, E.P. Lessa, and J.A. Cook. 2004. Evolutionary history of the Arctic ground squirrel (*Spermophilus parryii*) in Nearctic Beringia. *Journal of Mammalogy* 85(4):601-610.
- Guthrie, R.D. 1990. *Frozen Fauna of the Mammoth Steppe. The Story of Blue Babe*. University of Chicago Press, Chicago.
- Harington, C.R. 2003. *Annotated Bibliography of Quaternary Vertebrates of Northern North America – with Radiocarbon Dates*. University of Toronto Press, Toronto.
- Harington, C.R. 2007. Late Pleistocene mummified mammals. In: S.A. Elias, ed. *Encyclopedia of Quaternary Science*. Elsevier, Oxford. Pp. 3197-3201.
- Korth, W.W. 1994. *The Tertiary Record of Rodents in North America*. Plenum Press, New York.
- Walker, L. 1984. The 'moon-egg' that contained an Arctic ground squirrel. *BIOME* 4(1):3.
- Zazula, G.D., D.G. Froese, S.A. Elias, S. Kuzmina and R.W. Mathewes. In press. Arctic ground squirrels of the mammoth steppe: Paleoecology of Late Pleistocene middens (~24 000 – 29 450 14C yrs BP), Yukon Territory, Canada. *Quaternary Science Reviews*.

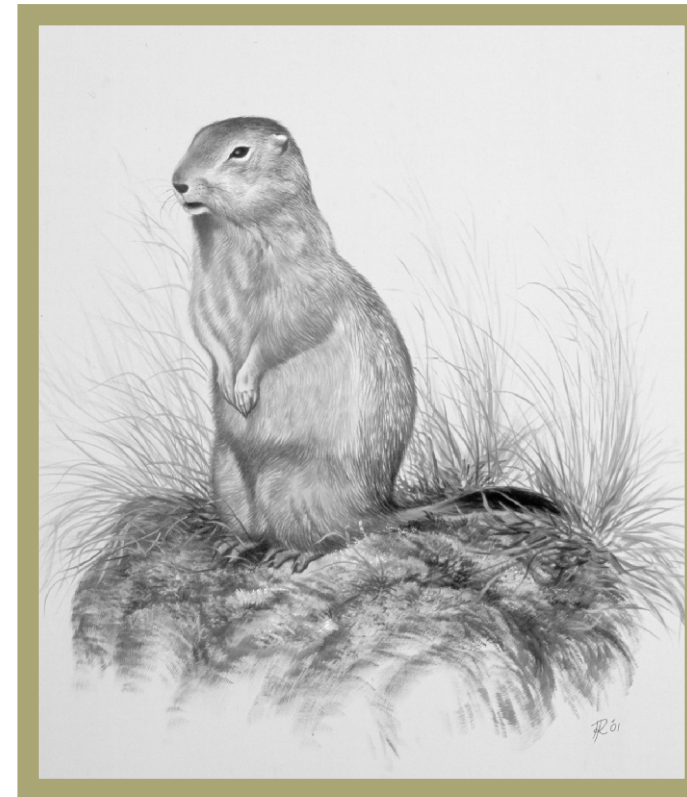


Figure 1: Arctic ground squirrel. From a painting by George Teichmann.

Ancient Arctic Ground Squirrels and the Story of the “Moon-Egg”

Bones, seed caches, dung, nests, burrows and, rarely, carcasses of ice age Arctic ground squirrels (*Spermophilus parryii*) are common in “muck” (placer miners' term for frozen organic silt) deposits in Yukon and Alaska – especially near Dawson City and Fairbanks. Highlights of these finds are the so-called “Moon-Egg” – a remarkable carcass dating to over 47,000 years ago from Glacier Creek, Yukon; and over 100 fossil Arctic ground squirrel middens (nests and seed caches) from muck near Dawson City, Yukon.



Figure 2: A. Outer appearance of the “Moon-Egg” (greater than 47,000 years old) from Glacier Creek, Yukon. Note the fine hairs on the dried skin surface.

The Arctic ground squirrel (Figure 1) is the largest and most northern of American ground squirrels. The species has a head and body length of 215 to 350 mm, a tail length of 75 to 150 mm and weighs between 530 and 850 g. It is tawny to reddish brown and flecked with white resembling the Columbian ground squirrel (*Spermophilus columbianus*) in colour. However, it differs from that species in its strongly-arched skull, wide cheek bones and long tail with its bushy black tip.

Arctic ground squirrels still occupy arctic and alpine tundra from Siberia eastward to Hudson Bay, and prefer habitats beyond the treeline and clearings within northern forests. They are restricted to well-drained silty, sandy or gravel mounds away from permafrost, as well as open meadows farther south.

Modern observations show that the species forms colonies of up to 50 animals. Females may bear 5 to 10 young after a gestation period of about 25 days. After 8 weeks they are about 80% adult weight. They become independent and are ready to breed when they emerge from the first hibernation. They make a unique alarm cry when startled, which gives them their traditional Inuit name of “siksik”. The species is an important spring and autumn prey for arctic carnivores such as ermine, wolf, arctic fox and grizzly bear, as well as a variety of hawks and other raptors.

Permafrost restricts burrowing and their tunnel systems may be spatially extensive, though confined to the zone of seasonal thaw or active layer. Hibernation dens of roughly 25cm in diameter are constructed off the main burrows about 100cm below the surface. The animals hibernate for 7-8 months a year, rolling up in balls with their backs uppermost and tails covering head and shoulders. They emerge in late April and early May. They eat a wide variety of



B. X-ray of the “Moon-Egg” showing the complete skeleton of an Arctic ground squirrel coiled head to tail as if it had died during hibernation.

vegetation including seeds, leaves, fruits, stems, flowers and roots of many grasses, forbs and woody species. Seeds and fruits are cached overwinter in hibernation dens and nearby tunnels by males and are consumed when they awake just before spring emergence, when mating begins.

A remarkable specimen, the “Moon-Egg” (Figure 2A), was found in 1981 by placer miner Manfred Peschke while monitoring (hosing down) the stream bank at Glacier Creek in the Sixtymile area west of Dawson City. He noticed a curious egg-shaped object about 7.5 x 11 cm floating on the backwash from the bank. It appeared to be a dried ball of silt with bits of brownish hair projecting. An x-ray of this strange object (Figure 2B) revealed the complete skeleton of an Arctic ground squirrel curled up in hibernation position. Evidently the animal had died underground over 47,000 years ago. The specimen seems to have been preserved by a natural process of freeze-drying.

Analyses by one of us (GDZ) of fossil Arctic ground squirrel middens recovered from muck near Dawson City provide important palaeoenvironmental information on that region during the onset of glacial conditions of the early Wisconsinan (90,000 years ago) and late Wisconsinan (25,000 years ago). Seeds, fruits, and leaves from at least 60 kinds of plants including grasses, steppe and tundra forbs, dwarf shrubs, sage and, rarely, spruce trees have been recovered from the middens. Many are the first recorded fossils for those plants in Eastern Beringia, adding to our knowledge of the floristic composition of ice age plantscapes and biogeography of the region. So, Arctic ground squirrels could be considered small, furry botanists because of the variety of local vegetation they cache in underground “herbaria”.