

ALASKA MARMOT

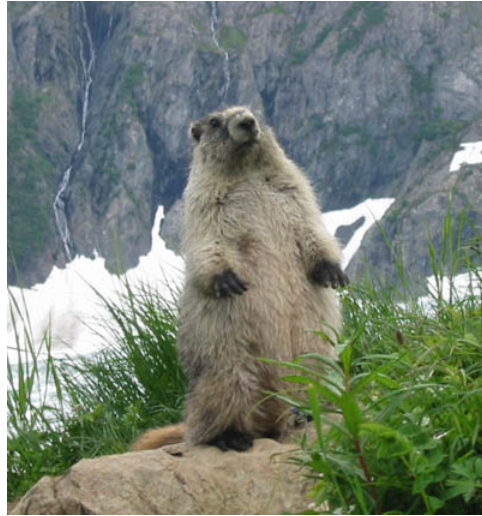
TAXONOMY

Scientific name: *Marmota broweri* Hall and Gilmore, 1934

Common name: Alaska marmot, Arctic marmot, Brooks Range marmot

Family: Sciuridae

Taxonomic comments: *Marmota broweri* was regarded as a synonym of *M. caligata*, the hoary marmot of western North America, by Hall and Gilmore (1934), but Rausch and Rausch (1965), followed by Hoffmann et al. (1979), provided evidence that *broweri* is a distinct species. Since then, most authors (e.g., Hoffmann and Nadler 1968) believed this Alaska endemic to be most closely related to the black-capped marmot, *M. camtschatica*, of northeastern Asia, representing a late Pleistocene migrant to Alaska and subsequent speciation. However, this view has been recently challenged by a molecular study comparing cytochrome *b* sequences (Steppan et al. 1999) that found no close sister species relationship to either *M. camtschatica* or *M. caligata*, and suggests that the ancestry of the Alaska marmot dates back earlier in the Pleistocene, a view also put forward by Rausch and Rausch (1971). These and other studies (e.g., Cardini 2003, Polly 2003, Cardini et al. 2005) have so far failed in their attempts to reject hypotheses of either a Nearctic or Palearctic origin for this enigmatic marmot.



DESCRIPTION

Basic description:

A large, ground-dwelling rodent in the squirrel family endemic to Alaska's northern mountains.

General description:

The Alaska marmot has a heavy body with short neck and bushy tail, powerful legs and feet, and claws well-suited to digging. Adult pelage is solid black on the dorsal surface of the head and nose, dark brown elsewhere on the body. Incisors are sharp and chisel-like and grow indefinitely throughout life; thumbs of the front limbs have a flat nail, whereas other digits have claws. Distinguished from hoary marmot by its darker face and rump and much softer fur; it also lacks the light patch on the snout (Alaska Geographic Society 1996). In addition, dorsal guard hairs have a tri-colored banding pattern, feet are lighter in color, and ventral color appears dark gray (Hoffmann et al. 1979). The Alaska marmot

produces a slurred, low-pitched warning call rather than the loud whistle of both the hoary marmot and woodchuck (*M. monax*) (Curby 1989).

Body size fluctuates during the year because of hibernation. A marmot leaves its winter sleep very thin but quickly gains weight, with fat stored for hibernation making up 20% of its body weight at the end of summer. This species displays slight sexual dimorphism: average adult male total length is 605 (582-605) mm and weight is 3.63 (3-4) kg, while average adult female total length is 579 (539-599) mm and weight is 3.18 (2.5-3.5) kg (Hoffmann 1999).

Length (mm): 605 (male average), 579 (female average)

Weight (kg): 3.63 (male average), 3.18 (female average)

Reproduction:

Individuals reach sexual maturity at 3 years. Males mate with one or more females living in their territory, once per year, usually in early spring while still in the den. Litter size is 3-8; offspring born in late spring to early summer; female gives birth after a gestation period of roughly 5 weeks in an underground, excavated den. Pups are born naked, toothless, and helpless with their eyes closed. Around six weeks of age, the young have dense, soft fur, and are independent enough to explore outside the den. Offspring live and hibernate with parents for two years (MacDonald 1999).

Ecology:

Common predators include wolverines, wolves, bears and raptors. Grizzly bears are able to dig marmots out of their dens, hence, construction of dens in boulder fields is important protection. Eagles are principal predators of juveniles (Hoffmann 1999). *M. broweri* have long been hunted by native Alaskans for pelts and sometimes meat (Curby 1989). Life span unknown, but believed to be similar to that of *M. marmota* of Europe, 13-15 years (Nowak 1983). Alaska marmots are social creatures and can live in colonies of up to 50 animals, all sharing an immense burrow system.

Food:

Eats grasses, flowering plants, berries, roots, mosses, and lichen (Alaska Geographic Society 1996).

Phenology:

Diurnal, hibernates/aestivates in winter. Hibernation in dens begins with first snowfalls in August/September and ends in May/June with the emergence of food plants. Average body temperature of a hibernating marmot is 4.5-7.5°C; hibernation is not continuous and marmots awaken periodically (every 3 or 4 weeks) to urinate and defecate (MacDonald 1999).

Habitat:

Dens located in extensive boulder fields, rock outcroppings, or active talus slopes with large rocks adjacent to productive tundra (Bee and Hall 1956, Manville and Young 1965, Cook and MacDonald 2003). Rocks must be large enough and accumulated to a depth sufficient to give subsurface protection. Shallow accumulations of boulders or slides of

any depth that have been completely sealed in with vegetation are uncommonly used, nevertheless, stabilized rock fields and lateral moraines in mountain slopes in the later seral stages of succession are inhabited. Dens are often located near an observation post, such as a tall rock or cliff edge, within 10 m of the entrance (Bee and Hall 1956). Dens are created by burrowing into permafrost soil under rocks (Hoffmann 1999). Summer dens have several entrances and are lined with grass. Winter dens have a single entrance on a windswept ridge that becomes snow-free in early spring; Alaska marmots plug the entrance with dirt, vegetation, and feces once all members of the colony are inside the den (usually by September) and hibernate through the winter. No animals leave the den until the following May. Winter dens are relatively permanent for each colony, and some have been used regularly for at least 20 years (Rausch and Rausch 1971, Alaska Geographic Society 1996).

STATUS

Global rank: G4 (7Apr1997)

Global rank reasons:

See State rank reasons below.

State rank: S4 (7Apr1997, reviewed 3Mar2006)

State rank reasons:

Alaskan endemic; species is unique genetically, morphologically, and evolutionarily compared to other marmots worldwide. Wide ranging but patchily distributed across the Brooks Range and southward into the Ray Mountains and Kokrines Hills. Overall abundance and trends unknown. Potential concerns over the retreat of alpine habitats and the northerly expansion of treeline as a result of climate change.

DISTRIBUTION AND ABUNDANCE

Range

State range:

Brooks Range of northern Alaska from near the coast of Chukchi Sea to at least the Alaska-Yukon border (Hoffmann et al. 1993). Records from Cape Thompson, Cape Lisburne, near headwaters of the Kukpowruk River (type locality; Rausch 1953), headwaters of the Utukok River, 50 mi. inland from Wainwright, headwaters of the Colville River, the Kurupa River, the Endicott Mountains, head of Killik, Fortress Mountain, Nunushuk River, Chandalar Lake, Anaktuvuk Pass, 30 to 35 mi. north of Tulugak Lake, the south end of Lake Peters, the mouth of Chamberlin Canyon, Mount Mary, Whistler Creek, the south end of Lake Schrader, the Hulahula River in the foothills south of Barter Island, and near Arctic Village (Bee and Hall 1956, Cook and MacDonald 2003, Slater Museum of Natural History). There are also reports of marmot sign in the northern Baird Mountains near the Nakolik River and Copter Peak in the DeLong Mountains and a sighting in the Mulik Hills on the lower Noatak (MacDonald and Cook 2002) (Figure 1).

Alaska marmot

This species' range has recently been extended south of the Brooks Range with specimens (held at the University of Alaska Museum of the North) from Spooky Valley in the Ray Mountains northwest of Rampart and in the Kokrines Hills near Horner Hot Springs on the north side of the Yukon River northeast of Ruby.

Figure 1. Distribution of the Alaska marmot, *Marmota broweri*.



Map courtesy of S.O. MacDonald
and J.A. Cook, 2006.

Abundance

State abundance:

Patchily distributed and widely scattered as individuals or in loose colonies throughout the Brooks Range but population densities believed to be low and stable within range (Hoffmann 1999). This species' status and abundance south of the Brooks Range in the isolated Ray Mountains and Kokrines Hills is unknown.

Trends

State trend:

Unknown, although suspected stable (Hoffman 1999).

PROTECTION

State protection:

Habitat protected where species occurs within the Arctic National Wildlife Refuge (Bee and Hall 1956) and Gates of the Arctic National Park (Cook and MacDonald 2003); thought to occur within Cape Krusenstern National Park (Cook and MacDonald 2004) and Noatak National Park and Preserve (MacDonald and Cook 2002), but presence there has not yet been documented. The apparently isolated populations in the Ray Mountains and Kokrines Hills are outside the boundaries of any national park or refuge.

THREATS

State threats:

Potential concerns for Alaska marmot populations include vulnerability to natural and anthropogenic perturbation as a result of low population densities and patchy distribution. Although the overall effects are unknown, this species' alpine tundra habitat may be retreating as a result of global climate change.

RESEARCH AND INVENTORY NEEDS

State research needs:

Genetic studies are needed to understand the effects of patchy habitat distribution on marmot population subdivision and genetic isolation. Studies are needed to evaluate the effects of climate change on alpine tundra habitats used by marmots.

State inventory needs:

Status and distribution of the Alaska marmot is poorly understood and needs study (Cook and MacDonald 2003). Baseline data on species' distribution needed. Conduct aerial and ground surveys to identify populations throughout known and suspected range.

CONSERVATION AND MANAGEMENT NEEDS

State conservation and management needs:

Establish a long-term monitoring program to identify marmot population shifts (i.e. in response to climatic warming).

LITERATURE CITED

- Alaska Geographic Society. 1996. Mammals of Alaska: a comprehensive guide from the publishers of Alaska Geographic. 176 pp.
- Bee, J. W. and E. R. Hall. 1956. Mammals of northern Alaska on the Arctic Slope. Univ. Kansas Mus. Nat. Hist. Misc. Publ. No. 8. 309 pp.
- Cardini, A. 2003. The geometry of the marmot (Rodentia: Sciuridae) mandible: phylogeny and patterns of morphological evolution. Syst. Bio. 52: 186-205.
- Cardini, A., R. S. Hoffmann, and R. W. Thorington, Jr. 2005. Morphological evolution in marmots (Rodentia, Sciuridae): size and shape of the dorsal and lateral surfaces of the cranium. Journal of Zoological Systematics and Evolutionary Research 43:258-268.
- Cook, J. A. and S. O. MacDonald. 2003. Mammal inventories of Alaska's national parks and preserves: Gates of the Arctic National Park and Preserve. Annual Report 2002.
- Cook, J. A. and S. O. MacDonald. 2004. Mammal inventory of Alaska's national parks and preserves: Western Arctic National Parklands: Kobuk Valley National Park, Cape Krusenstern National Monument. Annual Report 2003.
- Curby, C. 1989. Marmot. Wildlife Notebook Series, Alaska Department of Fish and Game.
- Hall, E. R., and R. M. Gilmore. 1934. *Marmota caligata broweri*, a new marmot from northern Alaska. Canadian Field-Naturalist 48:57-59.
- Hoffmann, R. S. 1999. Alaska marmot, *Marmota broweri*. Pp. 393-395 in: Wilson, D.E., and S. Ruff (eds.). The Smithsonian book of North American mammals. Smithsonian Institution Press, Washington, D.C., in association with the American Society of Mammalogists. 750 pp.
- Hoffmann, R. S., C. G. Anderson, R. W. Thorington, Jr., and L. R. Heaney. 1993. Family Sciuridae. Pp. 419-465 in: Wilson, D.E. and D.M. Reeder (eds.). Mammal species of the world: a taxonomic and geographic reference. Second Edition. Smithsonian Institution Press, Washington, D.C. 1206 pp.
- Hoffmann, R. S., J. W. Koepl, and C. F. Nadler. 1979. The relationships of the amphiberian marmots (Marmota: Sciuridae). Univ. Kansas Mus. Nat. Hist. Occas. Pap. No. 83. 56 pp.

- Hoffmann, R. S., and C. F. Nadler. 1968. Chromosomes and systematics of some North American species of the genus *Marmota* (Rodentia: Sciuridae). *Experientia* 24:740-742.
- MacDonald, D. 1999. The encyclopedia of mammals. Andromeda Limited, Oxford, U.K.
- MacDonald, S. O. and J. A. Cook. 2002. Mammal inventory of Alaska's National Parks and Preserves northwest network: western Arctic parklands. Annual Report 2001. University of Alaska Museum. 34 pp.
- Manville, R. H. and S. P. Young. 1965. Distribution of Alaskan mammals. Bird and Mammal Laboratories, Division of Wildlife Research. Circular 211. Published by the Bureau of Sport Fisheries and Wildlife, Washington. 70 pp.
- Nowak, R. 1983. Walker's mammals of the world. Fourth edition. Johns Hopkins University Press, Baltimore, MD.
- Polly, P. D. 2003. Paleophylogeography: the tempo and geographic differentiation in marmots (*Marmota*). *Journal of Mammalogy* 84:369-384.
- Rausch, R. L. 1953. On the status of some arctic mammals. *Arctic* 6:91-148.
- Rausch, R. L. and V. R. Rausch. 1965. Cytogenetic evidence for the specific distinction of an Alaskan marmot *Marmota broweri* Hall and Gilmore (Mammalia: Sciuridae). *Chromosoma (Berl.)* 16:618-623.
- Rausch, R. L., and V. R. Rausch. 1971. The somatic chromosomes of some North American marmots (Sciuridae), with remarks on the relationships of *Marmota broweri* Hall and Gilmore. *Mammalia* 35:85-101.
- Steppan, S. J., M. R. Akhverdyan, E. A. Lyapunova, D. G. Fraser, N. N. Vorontsov, R. S. Hoffmann, and M. J. Braun. 1999. Molecular phylogeny of the marmots (Rodentia: Sciuridae): tests of evolutionary biogeographic hypotheses. *Syst. Biol.* 48:715-734.

Acknowledgements

State Conservation Status, Element Ecology & Life History Author(s): Gotthardt, T.A., and A. Jansen, Alaska Natural Heritage Program, Environment and Natural Resources Institute, University of Alaska Anchorage, Anchorage, AK, <http://aknhp.uaa.alaska.edu>.

State Conservation Status, Element Ecology & Life History Edition Date: 3Mar2006

Reviewed and modified by: S. O. MacDonald, Museum of Southwestern Biology, University of New Mexico, November 2005.

Alaska marmot

Life history and Global level information were obtained from the on-line database, NatureServe Explorer (www.natureserve.org/explorer). In many cases, life history and Global information were updated for this species account by Alaska Natural Heritage Program zoologist, Tracey Gotthardt. All Global level modifications will be sent to NatureServe to update the on-line version.

Element Ecology & Life History Edition Date: 20Apr1993

Element Ecology & Life History Author(s): Hammerson, G., revised by S. Cannings

Copyright Notice: Copyright © 2005 NatureServe, 1101 Wilson Boulevard, 15th Floor, Arlington Virginia 22209, U.S.A. All Rights Reserved. Each document delivered from this server or web site may contain other proprietary notices and copyright information relating to that document.
