

NORTHERN COLLARED LEMMING and ALASKA SUBSPECIES

Dicrostonyx groenlandicus Traill, 1823
(Muridae)

Global rank	G5	(22Jun2000)
<i>D. g. exsul</i>	G5T3	(14Mar2006)
<i>D. g. unalascensis</i>	G5T3	(26Apr2001)
<i>D. g. stevensoni</i>	G5T3	(14Mar2006)
State rank	S4	(14Mar2006)

State rank reasons

D. groenlandicus is widespread in western coastal Alaska throughout Aleutian Archipelago; insular populations restricted to St. Lawrence, Umnak, and Unalaska Islands. Suspected periodic high abundance although overall abundance unknown; likely fluctuates, although trends in periodicity are difficult to determine. High summer predation and effects of climate change on species' habitat are potential threats.

Subspecies of concern ranked below:

D. g. exsul: S3 (14Mar2006)

Insular taxa; state endemic with restricted range (St. Lawrence Island); current status unknown; suspected periodic high abundance; population trend unknown. There are no obvious threats at present. However, due to its isolated and restricted habitat, this subspecies may be vulnerable to introduced threats (e.g., rats).

D. g. unalascensis: S3 (26Apr2001)

Insular taxa; state endemic with restricted range (Unalaska Island); current status unknown; suspected periodic high abundance. Restricted range increases vulnerability to threats and disturbances; including high levels of predation from introduced mammals.

D. g. stevensoni: S3 (14Mar2006)

Insular taxa; state endemic with restricted range (Umnak Island); current status unknown; suspected periodic high abundance. Restricted range increases vulnerability to threats and disturbances; impacts of introduced reindeer, domestic sheep, and arctic ground squirrels on lemming populations unknown.

Taxonomy

Taxonomy is complex and unresolved. Regarded as part of a single circumpolar species, *D. torquatus*, until the 1970s when karyological and breeding studies indicated the possible existence



of a superspecies complex among North American *Dicrostonyx* (Rausch and Rausch 1972, Rausch 1977, also see Krohne 1982). Former subspecies occurring in western Canada and Alaska were recognized as separate species based mainly on karyotypes (Rausch and Rausch 1972, Rausch 1977, Krohne 1982, Honacki et al. 1982, Baker et al. 2003). Musser and Carleton (1993) noted, however, that although *D. groenlandicus*, *D. hudsonius*, *D. richardsoni*, and *D. unalascensis* are morphologically distinct, the distinctness of *D. kilangmiutak*, *D. nelsoni*, and *D. rubricatus* is more subtle and in need of further careful study. Jarrell and Fredga (1993) and Engstrom (1999) suggest treating *D. hudsonius*, *D. richardsoni*, and *D. groenlandicus* as full species (the latter including the other North American populations as subspecies).

Subspecies occurring in Alaska include *D. g. exsul* (St. Lawrence Island collared lemming), *D. g. nelsoni* (Nelson's collared lemming), *D. g. rubricatus* (North Slope collared lemming), *D. g. unalascensis* (Unalaska collared lemming), *D. g. stevensoni* (Umnak collared lemming) and *D. g. peninsulae* (Alaska Peninsula collared lemming).

See Borowik and Engstrom (1993), Engstrom (1993), Eger (1995), Fedorov et al. (1999), Fedorov and Goropashnaya (1999), and Ehrich et al. (2000) for information on chromosomal, morphological, and genetic variation and evolutionary relationships.

General description

A short, stocky rodent with a thick pelage that varies seasonally: in summer the coat is light to dark grey with a buffy to reddish-brown tone, with dark lines down the back and on the sides of the head; in winter, coat is pure white, except in the lemmings on Unalaska and Umnak islands

(which do not molt to white pelage and also do not acquire snow slaws in the winter).

Dicrostonyx is the only genus in Rodentia in which individuals have completely white coats in the winter season. They also develop unique double digging claws on the front toes to break through ice and snow.

Length (cm) 16

Weight (g) 112

(UAM 2002 unless otherwise noted).

D. g. exsul: Total length =146 mm; tail length=17mm; hind foot=20 mm (type specimen; Allen 1919).

D. g. nelsoni: Total length =115 (11.8-153) mm (N=65); tail length=9.5 (1.2-21) mm (N=60); hind foot=16.6 (1.4-24) mm (N=65); ear=3.2 (0.6-5) mm (N=5); weight=41 (5.9-73.9) grams (N=65).

D. g. rubricatus: Total length =110.1 (9-150) mm (N=45); tail length=13 (8-20) mm (N=44); hind foot=16.3 (5-20) mm (N=44); ear=6 (2.6-11) mm (N=37); weight=36 (9-108) grams (N=123).

D. g. peninsulae: Total length =105.2 (88-119) mm (N=5); tail length=10.2 (9-12) mm (N=5); hind foot=16.2 (15-18) mm (N=5); ear=5 mm (N=1); weight=36.7 (33-41) grams (N=4).

Reproduction

Female estrus cycle lasts 9-10 days, occurring several times during the breeding season, January through September. Gestation lasts 19-21 days; litter size up to 11; 2-3 litters per year. Average weight of young is 3.8 g at birth; weaning occurs at 15-20 days (Marsden 1964, Nowak 1999).

Ecology

Populations likely cycle in “booms” and “busts” over several years (Marsden 1964, Nowak 1999), but trends in periodicity are difficult to determine, and some studies suggest no cyclic fluctuations (Predavec et al. 2001). It is uncommon for individuals of this species to live longer than one year in the wild (Marsden 1964). With a short lifespan and high reproductive capacity, entire populations may turn over in a single season (AGS 1996).

Predators include Snowy Owls (*Bubo scandiacus*), Short-eared Owls (*Asio flammeus*), gulls (*Larus* spp.), hawks, ermines (*Mustela erminea*), Pomarine Jaegers (*Stercorarius pomarinus*), foxes (*Vulpes*, *Alopex*), wolves

(*Canis lupus*), least weasels (*Mustela nivalis*), wolverines (*Gulo gulo*) and polar bear (*Ursus maritimus*). Mortality from summer predation may be as high as 50% or 65% in one month and may force declines even when populations are reproducing at a maximal rate (Gilg 2002). Native people use the soft white winter coats for clothing decoration and toys (Nowak 1999).

Food

Herbivore. Diet includes grasses, sedges, bearberry, and cottongrass in summer, twigs and buds of willow in winter (Whitaker 1980). Dicotyledons, particularly willows, may be locally important (Batzli and Pitelka 1983). *Salix lanata* has been identified as an important food item during winter months when collared lemmings live under snow (Predavec et al. 2001).

Habitat

Arctic tundra; often found in relatively dry habitats such as ridges and hummocks and habitats with an abundance of willow (*Salix* spp.) shrubs. Occupies runways beneath snow; also tunnels down to permafrost level. In a study of microhabitat use in northern Canada, collared lemmings preferred tundra with high hummocks, high percent cover of plants (especially *Salix lanata*) and numerous burrows; this pattern of habitat use is likely related to reducing detection and capture by predators (Predavec and Krebs 2000).

Global range

Northern Greenland and Queen Elizabeth Islands, south to the mainland tundra of Nunavut, Northwest Territories, Yukon (including an isolated population in the Ogilvie Mountains), and Alaska (Nagy and Gower 1999). Replaced by *D. richardsoni* in the tundra west of Hudson Bay and by *D. hudsonius* in northern Quebec and Labrador.

State range

 See Figure 1.

D. g. exsul: St. Lawrence Island, Alaska.

D. g. nelsoni: Western coastal Alaska.

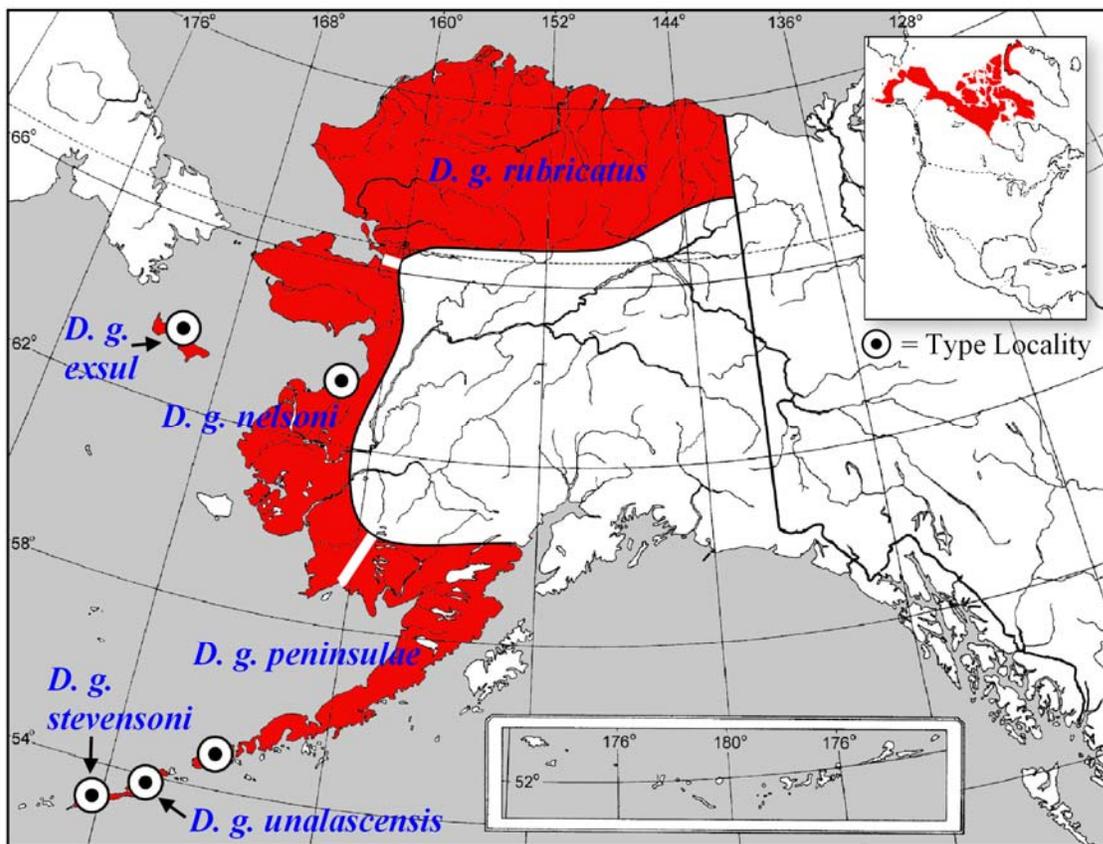
D. g. rubricatus: Northern Alaska; throughout the Arctic slope from the coastline of the Arctic Ocean to vegetated altitudes in the Brooks Range (Bee and Hall 1956).

D. g. peninsulae: Alaska Peninsula, Alaska.

D. g. unalascensis: Unalaska Island, Aleutian Archipelago, Alaska.

D. g. stevensoni: Umnak Island, Alaska.

Figure 1. Distribution of *Dicrostonyx groenlandicus* and Alaska subspecies.



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

Global abundance

A study of *D. groenlandicus* from the Northwest Territories, Canada, estimated density during the population's increase phase at 1.9 individuals/ha (Predavec and Krebs 2000). A study in Greenland reported a decline in density from one population of >10 individuals/ha in 1998 to <0.1 individual/ha in 2000 (>100-fold decrease) (Gilg 2002); poor recruitment and high summer predation were causes for the observed declines. This study highlights the extreme population fluctuations the species can experience.

State abundance

Suspected periodic high abundance although overall abundance unknown; likely fluctuates, although trends in periodicity are difficult to determine.

D. g. rubricatus: No population estimate available; most abundant on uplands of the Plateau Province or gently sloping ridges between lowland marshes on the Coastal Plain (Bee and Hall 1956).

D. g. unalascensis: No population estimate is available for Unalaska Island population (Jarrell pers. comm.). Unalaska Island is approximately 137,849 hectares; sampling on the island in 1931 (Gilmore 1933) and 1964 (Peterson 1967) resulted in the capture of only four specimens.

D. g. stevensoni: No population estimates are available for Umnak Island population (Jarrell pers. comm.). Umnak Island is approximately 85,920 hectares.

State trend

Populations probably cycle in “booms” and “busts” over several years (Marsden 1964, Nowak 1999), but trends in periodicity are difficult to determine; other studies suggest random, not cyclic, fluctuations (Predavec et al. 2001). Although Fay and Sease (1985) and Murie (1959) did not believe that *D. g. unalascensis* populations on Umnak Island were cyclic, they noted that populations fluctuated widely from scarce to abundant. No information has suggested a positive or negative population trend for these taxa.

Global protection

Unknown.

State protection

No occurrences protected and managed. No known protection measures are in place. Lemmings are listed as unclassified game by the U.S. Fish and Wildlife Service with no closed season and bag limit. No protection measures currently are needed; however, population should be monitored to ensure protection needs don't change.

Global threats

A study of mammal diversity patterns in Canada suggests that climate change could alter and effectively remove approximately 60% of *D. groenlandicus* habitat with unpredictable but likely detrimental consequences for this species in the future (Kerr and Packer 1998).

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Extreme population fluctuations and restricted range of this species increases its vulnerability to outside threats (e.g., a rat introduction could be devastating to island populations). Effects of development in Nikol'ski village, Umnak Island, appear to be insignificant (Fay and Sease 1985). This is an important prey for red fox and predatory birds on Umnak and Unalaska islands (Fay and Sease 1985, Peterson 1967); however, red fox is native to these islands so *Dicrostonyx* populations may be able to tolerate fox predation. The effects of Norway rat, house mouse, and ground squirrel introductions on Unalaska Island

and European hare introduction on Umnak Island are unknown. Arctic fox was introduced on Unalaska Island in 1922, but has since disappeared (Bailey 1993).

State research needs

Genetic analysis needed to substantiate the species or subspecies status of these animals. Determine factors which affect fluctuations of island populations. Habitat preferences and ecosystem structure need study. Determine effects of winter breeding and reproductive patterns in relation to population fluctuations.

State inventory needs

Limits of species' and subspecies' distributions should be determined. Monitor populations to determine abundance and trends.

State conservation and management needs

Survey to determine the status of island populations and regularly monitor the potential impact of development. Preventive measures should be developed to protect endemic island taxa from non-native predator/competitor introductions. Habitat use patterns need study to determine where and if important habitat should be conserved.

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Acknowledgements

State Conservation Status, Element Ecology & Life History

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

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.

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Element Ecology & Life History Author(s): Hammerson, G.
