

VANCOUVER ISLAND MARMOT

Marmota vancouverensis

Original¹ prepared by Andrew A. Bryant

Species Information

Taxonomy

The Vancouver Island Marmot, *Marmota vancouverensis* (Swarth 1911), is endemic to Vancouver Island and is the only member of the genus *Marmota* that occurs there (Nagorsen 1987). Five other species of marmot occur in North America: the Woodchuck, *M. monax*; Hoary Marmot, *M. caligata*; Yellow-bellied Marmot, *M. flaviventris*; Olympic Marmot, *M. olympus*; and Brower's Marmot, *M. browerii*). Worldwide, 14 species are recognized (Barash 1989).

Marmota vancouverensis was described from 12 specimens shot on Douglas Peak and Mount McQuillan in central Vancouver Island in 1910 (Swarth 1912). *Marmota vancouverensis* is considered a “true” species on the basis of karyotype (Rausch and Rausch 1971), cranial-morphometric characteristics (Hoffman et al. 1979), and reproductive isolation from Hoary (*M. caligata*) and Olympic (*M. olympus*) marmots on the North American mainland (Nagorsen 1987). *Marmota vancouverensis* differs from the closely related Hoary and Olympic marmots in colour (Hoffman et al. 1979) and behaviour (Heard 1977). Recently published DNA phylogenies suggest relatively recent divergence in the three species (Kruckenhauser et al. 1999; Stepan et al. 1999).

Description

Fur colour is diagnostic. Vancouver Island marmots have a rich chocolate-brown coat with contrasting patches of white fur on the nose, chin, forehead, and chest. Pups (young-of-the-year) have uniformly dark, almost black, coats. As summer progresses the fur fades to a more rusty, rufous colour. Unlike most mammals, Vancouver Island Marmots apparently do

not complete their molt every year. For this reason yearlings are typically a uniform faded rusty colour in June and 2 year olds have dark fur. Older animals can take on a decidedly mottled appearance, with patches of old, faded fur contrasting with new, dark fur.

Marmots have large, beaver-like incisors, sharp claws, and very powerful shoulder and leg muscles. Adults typically measure 65–70 cm from nose to tip of the tail. Weights show large seasonal variation. An adult female that weighs 3 kg when she emerges from hibernation in late April can weigh 4.5–5.5 kg by the onset of hibernation in mid-September. Adult males can be even larger, reaching weights of up to 7 kg. Marmots generally lose about one-third of their body mass during winter hibernation.

Distribution

Global

The Vancouver Island Marmot is one of only five mammal species considered endemic to Canada (Wilson and Reeder 1993).

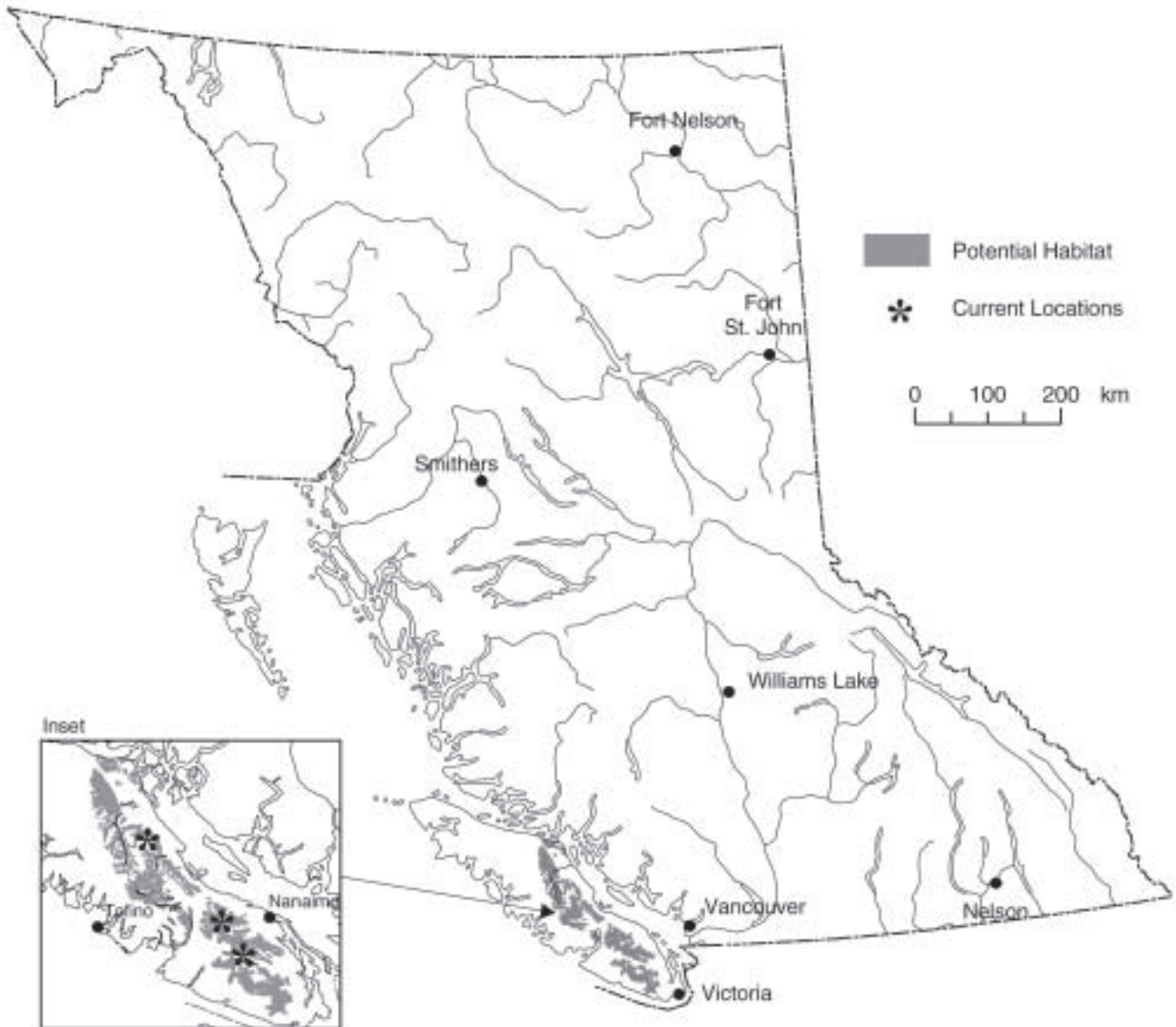
British Columbia

The distribution is now highly restricted on Vancouver Island. Most of the few remaining marmot colonies occur in south-central Vancouver Island at the headwaters of the adjacent drainages of the Nanaimo, Chemainus, Nitinat, Cameron, and Cowichan rivers. One small isolated colony occurs on Mount Washington in east-central Vancouver Island. The recent historical range (from 1864 to 1969) was apparently considerably broader, including records from at least 25 mountains on the leeward spine of Vancouver Island (Bryant and Janz 1996). In addition there are five additional known prehistoric location records (Nagorsen et al. 1996).

¹ Volume 1 account prepared by B. Forbes and L. Hartman.

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(Marmota vancouverensis)



Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, Biogeoclimatic and Broad Ecosystem Inventory) as well as current knowledge of the species' habitat preferences. This species may or may not occur in all areas indicated.

Forest region and districts

Coast: Campbell River, South Island

Ecoprovinces and ecosections

GED: LIM

Biogeoclimatic units

AT:

CWH: mm2

MH: mm1, mmp1

Broad ecosystem units

AV, FR, SM, TA

Elevation

800–1600 m (natural colonies); 700–1200 m (clearcuts)

Life History

Diet and foraging behaviour

Vancouver Island marmots are herbivorous. Martell and Milko (1986) used fecal samples from three natural subalpine colonies to identify food plants. They concluded that marmots depend on oatgrass (*Danthonia intermedia*) and sedges (*Carex* spp.) in early spring, and shift to forbs (especially *Lupinus latifolius* and *Eriophyllum lanatum*) in summer and fall. Spreading phlox (*Phlox diffusa*) is apparently an important food item in early summer. Similar work has not been conducted at other colonies; however, known food plants at clearcut sites include grasses, *Anaphalis margaritacea*, *Fragaria* spp., *Epilobium angustifolium*, and *Lupinus latifolius* (Bryant, unpubl. data).

Typical Vancouver Island Marmot behaviour involves spending much of the day resting on boulders, logs, or stumps. Relatively little time is spent feeding. Marmots are more likely to be seen in early morning or late afternoon than during the middle of the day.

Reproduction

Vancouver Island Marmots are slow to achieve sexual maturity. Most males and females do not breed until 4 years old, although two females are known to have bred when 2 years old. In most cases

there is a non-reproductive interval of at least 1 year between litters. Mating occurs within several weeks of emergence in the spring. Gestation is approximately 31 days. Most litters are three or four pups; litters of two, five and six occur infrequently. Pups are born blind and hairless and remain underground for approximately 1 month. Young have been observed above ground as early as 22 June but the bulk of litters emerge from 28 June through 7 July (Bryant 1998).

Site fidelity

Marmot pups and adults predictably use the same burrows and adjacent meadows and cliffs from year to year. Natal and hibernation burrows are often reused in consecutive years, as are escape burrows and “lookout” boulders or stumps (Bryant 1998). This consistent use allows easy detection of marmots, particularly in clearcuts where mud-stains on stumps are diagnostic. Yearlings sometimes hibernate away from the mother and 2 year olds and adult males commonly do. New burrows and lookout spots are a common feature of new or expanding colonies. Transplanted marmots quickly found and used abandoned burrows (Bryant et al., in press), and immigrant marmots will commonly use the same burrows and lookout spots as residents (Bryant, unpubl. data).

Home range

Heard (1977) documented home ranges of several hectares for individual adult marmots at one colony. Subsequent radio-telemetry generally corroborates these results but suggests that larger movements are occasionally made, particularly by yearlings and adult males. Marmots commonly shift their areas of use between early spring/late fall and summer periods. In natural colonies several habitat patches may be used. In clearcuts, marmots are often seen travelling along logging roads; daily movements of 500–1000 m are not uncommon (Bryant 1998, unpubl. data).

Movements and dispersal

A substantial fraction of subadult marmots disperse, apparently when 2 or 3 years old. Seven records of

tagged and/or radio-telemetered subadults indicate movements greater than 10 km are common. One 2-year-old male moved 27 km within a month before being captured. Records of solitary marmots in low elevation habitats also suggest dispersal capability of 20–50 km (Bryant and Janz 1996).

Habitat

Structural stage

- 1: non-vegetated/sparse
- 2: herb
- 3a: low shrub

Important habitats and habitat features

Vancouver Island marmots require three essential habitat features: (1) grasses and forbs to eat, (2) colluvial soil structure for construction of overnight and overwintering burrows, and (3) microclimatic conditions that permit summer foraging, thermoregulation, and successful hibernation. Habitat scarcity is the fundamental reason for the rarity of *M. vancouverensis* (Bryant and Janz 1996).

Milko (1984) studied vegetation at three natural subalpine meadows and identified six major communities (*Phlox*-moss, *Anaphalis*-*Aster*, *Ribes*-*Heuchera*, *Pteridium aquilinum*, *Senecio*-*Veratrum* and *Vaccinium*-*Carex*). He concluded that such meadows are maintained by avalanches or snow-creep. Some natural meadows may be created by wildfires (Mount Whympier, Hooper North). Vancouver Island Marmots also inhabit clearcuts resulting from forestry, meadows created by ski-run development (Mount Washington and Green Mountain), and mine tailings (Mount Washington).

Bryant and Janz (1996) used average abundance (1972–1995) data to describe habitats used by marmots. They reported that most (81%) marmots were found between 1000 and 1400 m in elevation. Colonies in logged habitats were generally lower (median = 990 m; range = 730–1140 m) than natural subalpine meadows (median = 1240 m;

range = 1040–1450 m). Most marmots were found on south- to west-facing slopes (74%). Most colonizations of clearcuts occurred within 10 years of logging (median = 8.5 years; range = 1–15 years) and within 1 km of natural colonies (median = 0.82 km; range = 0.4–4.5 km). Only a small fraction (<2%) of logged sites above 700 m elevation was eventually colonized by marmots. Maximum occupancy at logged sites is 21 years, but most (83%) animals inhabited clearcuts from 5–15 years after harvest (Bryant, unpubl. data). All marmot colonies in clearcuts are apparently now extinct.

Burrows

Vancouver Island marmots construct burrows in which to hibernate, bear young, hide from predators, and avoid environmental extremes. Burrows (including hibernacula) are commonly reused in multiple years by the same individuals (Bryant 1990; unpubl. data). One excavated burrow was >4 m in length with the sleeping chamber more than 1 m underground (Bryant et al., in press).

Escape burrows (used to avoid predators) may be a shallow excavation under a rock or tree root. Burrows used overnight or as birthing chambers are more elaborate, and often feature multiple entrances. As with escape burrows, they are typically constructed underneath a boulder or tree root system, which presumably offers supporting structure. Hibernacula are presumably deep enough that marmots can be underneath the frost layer. Work on alpine marmots (*M. marmota*) suggests that a critical feature of hibernacula may be its ability to maintain stable ambient temperatures close to 5°C (Arnold 1990; Arnold et al. 1991).

Burrow entrances are typically 30–45 cm in diameter and generally located on the downhill side of boulders or, in clearcut habitats, below stumps. Burrows used as hibernation or birth sites will almost always have some dirt mounded on the low side of the burrow entrance. Lounging spots are identifiable by mud stains on rocks or stumps.

Conservation and Management

Status

The Vancouver Island Marmot is on the provincial *Red List* in British Columbia. It is designated as *Endangered* in Canada (COSEWIC 2002).

Summary of ABI status in BC and adjacent jurisdictions (NatureServe Explorer 2002)

| BC | Canada | Global |
|----|--------|--------|
| S1 | N1 | G1 |

Trends

Population trends

The Vancouver Island marmot is one of the rarest mammals in North America. The September 2001 population numbered fewer than 30 animals in the wild, distributed among five mountains. An additional 47 animals are in captivity.

Recent decades have seen a drastic reduction in occupied range and numbers (Bryant and Janz 1996). A short-term expansion occurred as marmots colonized clearcuts in the Nanaimo Lakes region during the 1980s. Populations expanded to a peak of 300–350 animals in 1984 and have declined drastically since then. Much of the decline was due to distinct “episodes” of high mortality at particular colonies (Bryant 2000). Per-capita birth rates have remained stable but death rates have increased. The spatial and temporal pattern of “crashes” is consistent with a hypothesis of predation and disease (Bryant 1998).

Black-tailed deer abundance declined dramatically from the mid-1970s through the late-1990s. Current populations are about 40% of the long-term average. Predation by cougar and wolf is largely responsible for the deer declines and circumstantial evidence suggests that predator-effort upon marmots has likely increased, especially in clearcut habitats.

Habitat trends

Milko (1984) suggested that vegetation changes have reduced habitat availability in recent decades (a view supported by Nagorsen et al. 1996). Under this interpretation, sites formerly occupied by marmots have changed in some qualitative way, and the species is confined to a shrinking geographic region in which suitable climatic and vegetation conditions are found. Several possible mechanisms have been suggested, including invasion of subalpine meadows by trees or *Pteridium* ferns, altered fire regime (Milko 1984), and changing food-plant availability (Martell and Milko 1986).

The evidence remains ambiguous. Invasion of subalpine meadows by trees has been documented for several areas in the Olympic (Fonda and Bliss 1969; Schreiner and Burger 1994) and Cascade mountains (Franklin et al. 1971). However, dendro-chronological work at historic and extant colonies has produced surprising results (Laroque 1998; unpubl. data). In Strathcona Provincial Park, where marmots apparently disappeared some 10–30 years ago, most trees are more than 300 years of age, and there is little evidence of forest succession. Paradoxically, some of the highest-quality habitats within the present core area of distribution show considerable evidence of tree invasion within the past 50 years, probably as a result of post-fire regeneration (i.e., the Green-Gemini-Haley-Butler ridge system).

Previous speculation about the impact of dogs, ski-hill development, and all-terrain vehicles (Dearden and Hall 1983) has been discredited (Bryant 1998).

Forestry activities have changed the landscape dramatically in recent decades, particularly in the Nanaimo Lakes region (Bryant 1998). There was little forest harvesting prior to 1956 and much of what occurred was concentrated along valley bottoms. This pattern continued through the 1960s. Harvest rates increased during the 1970s, particularly at higher elevations. By 1976 over 75% of the annual harvest occurred above 700 m in elevation. At least 60% of all forests classified as mature were

harvested in a 25-year period. Road development took place at a similar pace and increased five-fold in density. Potential clearcut marmot habitat was first created during the late 1960s and large amounts (>10 000 ha) became available during the 1970s.

Threats

Population threats

Ultimately the wild population is so small and fragmented that recovery is probably impossible without active human intervention in the form of captive breeding combined with reintroduction (Janz et al. 2000).

A major cause of mortality is predation. The number of potential predators is relatively small compared with other marmot species, with the only confirmed species being wolves (*Canis lupus*), cougars (*Puma concolor*), and golden eagles (*Aquila chrysaetos*). It is likely that bald eagles (*Haliaeetus leucocephalus*) and other diurnal raptors may occasionally take marmots, especially pups. Black bears are not known to prey upon marmots.

Habitat threats

Forestry activities continue adjacent to recently occupied marmot habitats, although the proportion of young clearcuts (potential marmot habitat) has declined significantly in recent years.

Death during hibernation has been confirmed only once although circumstantial evidence suggests this may occur often, especially in clearcuts. There is as yet no empirical evidence for a specific disease organism, although spatial and temporal patterns of mortality are consistent with a disease hypothesis (Bryant 2000).

Possible vegetation dynamics resulting from global warming remain impossible to predict. It may become necessary in the future to manipulate habitats to retain suitability for Vancouver Island Marmots.

Legal Protection and Habitat Conservation

Under the provincial *Wildlife Act*, the Vancouver Island Marmot is protected from killing, wounding, hunting and trapping, taking, and transporting including importing and exporting. It is listed as Endangered under the B.C. *Wildlife Act*.

The only currently occupied site on Crown land is partially protected within the Green Mountain Critical Wildlife Management Area (300 ha) and Haley Lake Ecological Reserve (120 ha).

Two currently occupied sites occur within private managed forest land. For a species at risk to be considered for special management under the Private Managed Forest Land regulations it must be designated as Identified Wildlife.

One currently occupied site occurs on private land.

Coarse filter provisions of the results based code are not sufficient to protect the habitats of this species.

Identified Wildlife Provisions

Wildlife habitat area

Goal

Maintain suitable habitat.

Feature

Establish WHAs at known colonies, reintroduction sites.

Size

Typically between 5 and 100 ha but will ultimately depend on the extent of the colony, or suitable habitat.

Design

The WHA should include a core area delineated by the outer perimeter of the colony and a 50–200 m management zone. The width of the management zone must be sufficient to maintain the micro-climatic regime of the core area.

General wildlife measures

Goals

1. Protect burrows and denning animals.
2. Ensure integrity of burrow systems.
3. Maintain soil and drainage characteristics suitable for burrowing.

Measures

Access

- Do not construct roads or landings. Consult MWLAP when road maintenance, deactivation, or rehabilitation activities are required to ensure species requirements are adequately addressed.

Harvesting and silviculture

- Do not harvest or salvage in core area.
- Single tree or group selection systems may be determined to be appropriate in the management zone.
- Where timber harvesting with ground-based equipment is approved, it should only be conducted with low ground pressure equipment, to avoid damaging burrows.
- Do not use mechanical site preparation techniques that will damage burrows.

Pesticides

- Do not use pesticides.

Information Needs

1. Identification and mapping of suitable reintroduction sites.

Cross References

“Vancouver Island” White-tailed Ptarmigan

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