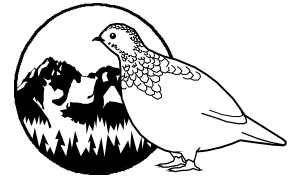


Vancouver Island White-tailed Ptarmigan
Lagopus leucurus saxatilis



SPECIES INFORMATION

Taxonomy

Five subspecies of white-tailed ptarmigan (*Lagopus leucurus*, Order: Galliformes, Family: Phasianidae) are currently recognized including the Vancouver Island white-tailed ptarmigan (*Lagopus leucurus saxatilis*), which is believed to be endemic to Vancouver Island (Campbell et al. 1990, Braun et al. 1993). This subspecies was described in 1938 by Ian McTaggart-Cowan who found morphological and plumage differences between white-tailed ptarmigan from Vancouver Island and the mainland of British Columbia and Washington State (McTaggart-Cowan 1938). McTaggart-Cowan reported that the Vancouver Island birds had a darker first primary feather, a greater tail length, and a bill that was more hooked than mainland specimens. No subsequent work was done on the morphology, ecology, or genetic differences between Vancouver Island birds and other white-tailed ptarmigan until the research initiated in 1995 by K. Martin. Consequently, this subspecies designation requires further scientific confirmation.

Description

Like other North American ptarmigan, white-tailed ptarmigan are noted for their cryptic plumage that changes from mottled brown, gray, and white in summer to entirely white in winter. White-tailed ptarmigan are the smallest grouse in North America, and are easily distinguished from other grouse by their white retrices. A detailed description of the species and subspecies is provided by Braun et al. (1993).

Compared to white-tailed ptarmigan in Colorado, Vancouver Island birds have shorter wings and a heavier body mass during the breeding season (no data for winter, K. Martin, unpublished data). Breeding females are approximately 10 g heavier than females in Colorado in July and 40 g heavier in September (Braun et al. 1993, K. Martin, unpublished data). Breeding males increase mass in late summer weighing an average of 411 g in September, 50 g heavier than males in Colorado at this same time. Wing chords of Vancouver Island birds average 180 ± 0.63 (s.e.) mm for adult females (n=57) and 185 ± 0.79 (s.e.) mm for adult males (n=50). Mean wing chords are 13 mm shorter for females and 15 mm shorter for males on Vancouver Island than in Colorado.

Status

L.l. saxatilis is Blue-listed (S3) in British Columbia, likely due to lack of information about its current status and distribution (Martin and Elliott 1996, CDC 2000). The subspecies is not listed nationally by COSEWIC. Globally, the Vancouver Island white-tailed ptarmigan is considered a vulnerable subspecies of an otherwise secure species (G5T3 Global ranking; CDC 2000). The IUCN lists white-tailed ptarmigan as a lower risk species (Storch 2000).

Trends

Population

Sufficient data for establishing total population size are currently unavailable so population trends cannot be estimated at this time. However, some population size and life history data for different habitats and landscapes have been collected but not yet analyzed (K. Martin, unpublished data).

Habitat

Vancouver Island ptarmigan are year-round residents of a variety of alpine, sub-alpine, and upper montane habitats during the year (Martin and Hitchcock 1997). The amount of alpine habitat on Vancouver Island has remained fairly constant, although ski resort developments in the central and southern portion of the island may have impacted localized areas. Forest harvesting in the southern part of the island may have changed habitat conditions in winter and early spring.

Threats

Population

The subspecies is vulnerable to population extinction processes because the birds exist in very low densities in patchy habitats with stochastic population dynamics and environmental conditions (Martin et al. 2000). Additionally, their distribution is limited to higher elevations (>822 m) on Vancouver Island.

Habitat

There are four main threats to Vancouver Island white-tailed ptarmigan habitat: recreational conflicts, air and ground-based pollutants, forest harvesting, and climate change. Generally, the extent of these threats has not been determined.

Conflicts with recreational users:

Numbers of alpine recreationists have increased throughout British Columbia over the past 50 years because of the increasing popularity of winter activities such as skiing, heli-skiing and snowmobiling and summer activities such as mountain biking and hiking. Human presence in the alpine can be associated with the introduction of generalist predators and exotic plant species and the creation of barriers to animal movement when trails and roads are developed (Martin 2001). The extent to which recreational activities disrupt white-tailed ptarmigan populations on Vancouver Island is not well understood. However, negative impacts of these activities have been documented elsewhere with other grouse (Storch 2000, Martin 2001). Impacts can include: loss of habitat, population declines, increased predation, and altered foraging behaviour (Martin 2001).

Air-borne and ground-based pollutants:

Regional air and water pollution is an increasing concern for high elevation species such as the white-tailed ptarmigan. Pollutants are carried by wind from urban and industrial centers and deposited at high elevations in many areas, including the Pacific Northwest (Blais et al. 1998, Brace and Peterson 1998). As a result, the concentration of persistent organic pollutants (POPs) such as PCBs in alpine snowpacks increases with increasing elevation in Western Canada (Blais et al. 1998). In addition to POPs, several authors have found a positive relationship between elevation and ozone concentration in Washington State; high concentrations of ozone are known to damage vegetation and human health (Brace and Peterson 1998, Cooper and Peterson 2000).

There are also naturally occurring high levels of heavy metals in some alpine areas (Larison 2000). Thus, there is a possibility of ground-based pollutants in the poorly filtered alpine soils

Forest harvesting:

Logging decreases the amount of mature forest and increases fragmentation. Removing forest cover changes microclimate conditions including wind and insolation patterns, which may influence the rate of snowmelt. Fewer or smaller snowfields restrict birds to a smaller amount of snowfield habitat (see Habitat Requirements section) making them vulnerable to increased risk of predation and increasing travel distances between snowfield patches (Martin 2001). Because seasonal migration to lower elevations is a part of the life history of the subspecies, increased fragmentation of montane forest may result in longer seasonal migrations with predicted higher mortality (Martin and Hitchcock 1997).

Climate change:

Climate change, including global warming, has the potential to alter the amount of alpine and subalpine habitat and to increase alpine fragmentation because of rising sub-alpine treelines that may accompany higher temperatures (Roland et al. 2000, Martin 2001). Increased climatic variability and frequency of extreme weather events associated with climate change may impact ptarmigan populations adversely (Martin and Wiebe 2001, submitted). The cost for these cold-adapted birds to adjust behaviourally and physiologically to higher temperatures is also a concern.

Ecology

Diet

White-tailed ptarmigan feed on buds, stems, seeds, leaves, fruits, flowers, and insects (Braun et al. 1993). Plants consumed by Vancouver Island birds include *Vaccinium*, *Poa* and *Carex* species, *Empetrum nigrum*, *Arctostaphylos alpina*, *Cassiope mertensiana*, *Phyllodoce empetriformis* and *Sedum oregonum* (Weeden 1967, K. Martin, unpubl. data).

Reproduction

Nesting for this typically monogamous species is initiated in early June to mid July (Braun et al. 1993). Males accompany females from pair formation; mate guarding in

this species is thought to be a result of behavioural coordination that enhances a female's foraging opportunities during incubation (Artiss and Martin 1995, Artiss et al. 1999). Renesting will occur if the first nest is lost (Braun et al. 1993).

Mean *L.l. saxatilis* clutch size for first clutches is 6.2 eggs (n=5, s.d.=0.45). Brood size of Vancouver Island females ranges from one to eight chicks with an average brood size for successful hens in July and August of 4.1 ± 0.31 (s.e.) chicks (n=32 broods, 1995-1999). Fledging success for Vancouver Island white-tailed ptarmigan may be higher than those in Colorado (Martin and Commons 1997, K. Martin, unpublished data). However, on Vancouver Island we were likely less efficient at locating unsuccessful hens.

Site Fidelity and Nesting Habitat

White-tailed ptarmigan have high fidelity to breeding territories after their first breeding season (Braun and Rogers 1971, Martin et al. 2000). Nesting habitat varies but nests are always located on the ground (Braun et al. 1993). On Vancouver Island, nests were placed in exposed rocky areas with little vegetation and also in sites with good overhead cover from trees and shrubs (K. Martin, unpublished data from six nests).

Home Range and Migration

L.l. saxatilis live at lower elevations and use a wider range of habitats than white-tailed ptarmigan on the mainland. Habitat elevation ranges differ between the breeding and winter seasons, and between the south, central, and north parts of the island (see Elevation Range section, below). The distance adult birds migrate between winter locations and breeding areas is on average 1.4 km in the southern portion of the island and 2.0 km in the northern portion of the island (based on 66 winter observations, Martin and Hitchcock 1997).

Distribution

Global

White-tailed ptarmigan occur in western Alaska, south and central Yukon, and mountain ranges from northern British Columbia to New Mexico (Braun et al. 1993).

Provincial

L.l. saxatilis is considered endemic to Vancouver Island (Campbell et al. 1990, Braun et al. 1993). Historically, the distribution is known to range from as far south as Mount Brenton (48°54'00") to as far north as Tsitika Mountain (50°26'00"; based on 160 observations gathered from naturalists on Vancouver Island, 1905-2000, Hitchcock et al. 1998). All 25 mountains surveyed by K. Martin and associates, ranging from El Capitan (48°57'00") to Mount Cain (50°14'00"), showed signs of white-tailed ptarmigan between 1995 and 1999, suggesting the subspecies still occupies most of its historical range.

Forest regions and districts

Vancouver: South Island, Campbell River, Port McNeill

Ecoprovinces: ecosections

COM: NIM, WIM
GED: LIM

Biogeoclimatic units

CWH: CWHxm, CWHvm
MH: MHmm
AT: AT

Broad ecosystem units

AH, AM, AN, AT, AU, AV, CL, EW, FP, GL, HP, MF, SG, SM, TA, WB, WP, YM

Elevation range (based on unpublished data from K. Martin)

South Island

Summer: 1240 to 1890 metres
Winter: 822 to 1788 metres

Central and North Island

Summer: 1320 to 2200 metres
Winter: 966 to 1889 metres

Habitat requirements

Vancouver Island ptarmigan appear to use coastal alpine habitats differently from mainland white-tailed ptarmigan. The majority of habitat used by white-tailed ptarmigan on Vancouver Island could be considered marginal or sub-optimal habitat when compared to the large expanses of alpine on the mainland (Martin and Elliot 1996). Despite some data on habitat use, habitat requirements are difficult to determine because of few sightings for individuals. Habitat requirements may vary between south and central island populations.

Breeding Habitat:

During the breeding season, Vancouver Island birds are typically found in alpine and subalpine mountain habitats, particularly in rocky tundra areas with sparse vegetation above the treeline. Birds occur in alpine heather communities as well as in subalpine heather communities with Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) tree islands (K. Martin, unpublished data). Persistent snowfields are important habitats as they facilitate birds remaining cryptic when their plumage is white, cooling for birds during warm periods, and continual new plant growth through summer.

Wintering:

Like other white-tailed ptarmigan, some Vancouver Island birds migrate to lower elevations in winter while others remain close to their breeding areas (Martin et al. 2000, K. Martin, unpublished data). Habitats both above and below the treeline are used in winter; birds can be found in alpine bowls, hemlock and cedar forest, and clearcuts, as well as on unvegetated rocky outcrops and cliffs; 93% and 70% of birds relocated during winter in the south (54 observations) and central (50 observations) portions of Vancouver Island respectively were found in the Mountain Hemlock Biogeoclimatic Zone (104 observations in winter by K. Martin, unpublished data). Median tree height in these upper montane forest habitats was 4 m (range: 1-27.5 m, 26 observations). Additionally, 66% of relocated birds were found on south, southeast, or southwest facing slopes.

Unlike birds from Colorado, Vancouver Island white-tailed ptarmigan have not been found to congregate in large flocks during winter (Martin and Hitchcock 1997). This may be due to patchy alpine habitats and the generally low densities of birds on Vancouver Island.

Dispersal:

In Colorado, dispersal to other mountains is thought to sustain white-tailed ptarmigan populations in patchy alpine habitats (Martin et al. 2000). On Vancouver Island chicks have dispersed up to 34 km to other mountains (mean=2.4 km, n=7; Martin and Hitchcock 1997). Based on observations of droppings, marginal or unsuitable habitat such as forested rocky outcrops may be used as stop-over points when white-tailed ptarmigan disperse to other peaks (K. Martin, personal communication).

Population parameters

Total population size is unknown but some population data are available for 25 mountains across the range of alpine and subalpine habitats on Vancouver Island. To determine population structure and density more data are required on annual variation in reproductive success, survival, and habitats used in relation to landscape context (e.g., extent of fragmentation).

CONSERVATION AND MANAGEMENT

Legal Protection and Habitat Conservation

Hunting white-tailed ptarmigan is prohibited on Vancouver Island. Their habitat is only protected where alpine is located in provincial or regional parks. A core area of white-tailed ptarmigan habitat is protected in Strathcona Provincial Park.

There is an initiative to establish two white-tailed ptarmigan Important Bird Areas on Vancouver Island - Strathcona Provincial Park and Mount Arrowsmith Area Mountains (see www.ibacanada.com for more information). Although IBAs give no legal protection to the birds or their habitat, this initiative signifies the national priority for conserving this subspecies.

Given that white-tailed ptarmigan use montane forest, some white-tailed ptarmigan habitat may be conserved where wildlife tree patches or forest ecosystem networks are implemented under the Forest Practices Code.

Wildlife habitat area planning objectives

To maintain suitable wintering habitat for Vancouver Island white-tailed ptarmigan.

Wildlife habitat area

Feature: Establish WHAs in upper montane areas where known populations of white-tailed ptarmigan live in winter.

Size: Two times the size of the alpine/subalpine area on mountains with known populations of white-tailed ptarmigan. At least 66% of the WHA should be on the south, southeast, or southwest side of the mountain.

Design: The WHA should include upper montane forest that will create a continuous buffer around the adjacent subalpine and alpine habitat in order to provide cover, maintain microclimatic conditions suitable for retaining snowfields, and allow access to lower elevations.

General wildlife measure management objectives

1. Minimize disturbance during the critical winter season (November 1 to April 15) and spring and fall dispersal periods (April 15 to May 5 and September 1 to October 31).
2. Maintain microclimatic conditions that sustain subalpine and alpine snowfields during the summer months (May 5 to August 31). Important microclimatic conditions to maintain are low local temperatures and local wind patterns.

General wildlife measures

Access

Road building and vehicle traffic in alpine and subalpine should be minimized during the critical months for this subspecies.

Silviculture

Restrict herbicide and insecticide application in the upper montane areas adjacent to alpine or subalpine with known populations of white-tailed ptarmigan on Vancouver Island. For aerial applications, avoid alpine and subalpine areas (fly around them).

Harvesting

Use partial harvesting silvicultural systems in upper montane areas with known populations of Vancouver Island white-tailed ptarmigan.

Management considerations

Management should focus on mitigating threats to the bird population and their habitat (discussed above in the Threats section).

- Maintain ban on hunting Vancouver Island white-tailed ptarmigan.
- Free running dogs in the alpine should be restricted.
- Hikers should be discouraged from leaving food in the alpine to avoid enhancing generalist predator survival.
- Avoid spilling toxic substances and discarding cords and wire associated with installations of infrastructure in the alpine and subalpine (e.g., repeater towers).
- The number of ground and air based-motorized vehicles (such as snowmobiles and helicopters) should be kept in check in alpine and subalpine areas so to minimize disturbance caused by these vehicles.
- Air pollution levels in the alpine should be monitored. These data will benefit not only alpine ecosystems in which white-tailed ptarmigan live but also the lower-elevation communities that depend on alpine basins for drinking water.

Information needs

1. Breeding season, winter, and dispersal habitat use and requirements.
2. Population size.
3. Seasonal movements.
4. Summer and winter feeding behaviour.

Cross references

Blue grouse, Rosy Finch, Common Raven, Townsend's Solitaire, American Pipit

Literature Cited

- Artiss, T. and K. Martin. 1995. Male vigilance in paired white-tailed ptarmigan *Lagopus leucurus*: mate guarding or predator detection? *Animal Behavior* 49: 1249-1258.
- Artiss, T., W.M. Hochachka, and K. Martin. 1999. Female foraging and male vigilance in white-tailed ptarmigan (*Lagopus leucurus*): opportunism or behavioural coordination? *Behavioral Ecology and Sociobiology* 46: 429-434.
- Blais, J.M., D.W. Schindler, D.C.G. Muir, L.E. Kimper, D.B. Donald, and B. Rosenberg. 1998. Accumulation of persistent organochlorine compounds in mountains of western Canada. *Nature* 395: 585-588.
- Brace, S., and D.L. Peterson. 1998. Spatial patterns of tropospheric ozone in the Mount Rainer region of the Cascade Mountains, U.S.A. *Atmospheric Environment* 32: 3629-3637.

- Braun, C.E., K. Martin, and L.A. Robb. 1993. White-tailed Ptarmigan (*Lagopus leucurus*). In: Poole, A. and F. Gill (editors). The Birds of North America, No. 68. Philadelphia; The Academy of Natural Sciences, Washington, D.C. USA.
- Braun, C.E., and G.E. Rogers. 1971. The white-tailed ptarmigan in Colorado. Colorado Division of Wildlife, Tech. Pub. No. 27.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. The Birds of British Columbia. Volume II: Diurnal birds of prey through woodpeckers. Royal British Columbia Museum, Environment Canada and The Canadian Wildlife Service. Victoria, BC.
- CDC (Conservation Data Centre). 2000. Provincial Rare and Endangered Species Tracking List. Ministry of Environment, Lands and Parks, Victoria, British Columbia. <http://www.elp.gov.bc.ca/rib/wis/cdc/tracking.htm>
- Cooper, S.M. and D.L. Peterson. 2000. Spatial distribution of tropospheric ozone in western Washington, USA. *Environmental Pollution* 107: 339-347.
- Hitchcock, C.L., M.L. Commons, and K. Martin. 1998. Where are the white-tailed ptarmigan on Vancouver Island? A summary of observations by hikers and naturalists. Centre for Alpine Studies, Department of Forest Sciences, University of British Columbia. Vancouver, BC.
- Larison, J.R., G.E. Likens, J.W. Fitzpatrick, and J.G. Crock. 2000. Cadmium toxicity among wildlife in the Colorado Rocky Mountains. *Nature* 406: 181-183.
- Martin, K. 2001. Wildlife communities in alpine and subalpine habitats. In: Wildlife-habitat relationships in Oregon and Washington. D.H. Johnson and T.A. O'Neil (Editors), Chapter 9. Oregon University Press, Corvallis. pp. 239-260.
- Martin, K., and M.L. Commons. 1997. Vancouver Island White-tailed Ptarmigan Inventory Project: Progress Report. 1997 Summer Surveys. Centre for Alpine Studies, Department of Forest Sciences, University of British Columbia. Report WTP VI-3. <http://www.forestry.ubc.ca/alpine/docs/wtpvi-3.pdf>
- Martin, K., and L. Elliott. 1996. Vancouver Island White-tailed Ptarmigan Inventory Progress Report (1995-1996). Centre for Alpine Studies, Department of Forest Sciences, University of British Columbia. Report WTP VI-1. <http://www.forestry.ubc.ca/alpine/docs/wtpvi-1.pdf>.
- Martin, K., and C.L. Hitchcock. 1997. Vancouver Island White-tailed Ptarmigan Inventory: Progress Report, May 1997. Winter Surveys and GIS Work. Centre for Alpine Studies, Department of Forest Sciences, University of British Columbia. Report WTP VI-2. <http://www.forestry.ubc.ca/alpine/docs/wtpvi-2.pdf>

- Martin, K., P.B. Stacey, and C.E. Braun. 2000. Recruitment, dispersal, and demographic rescue in spatially-structured white-tailed ptarmigan populations. *Condor* 102: 503-516.
- Martin, K., and K.L. Wiebe. 2001. Environmental stochasticity and reproductive compromises for birds breeding at high elevation. Unpublished manuscript, April 2001.
- McTaggart-Cowan, I. 1938. White-tailed ptarmigan of Vancouver Island. *Condor* 41: 82-83.
- Roland, J., N. Keyghobadi, and S. Fownes. 2000. Alpine *Parnassius* butterfly dispersal: effects of landscape and population size. *Ecology* 81: 1642-1653.
- Storch, I. (editor) 2000. Grouse Status Survey and Conservation Action Plan 2000-2004. WPA/BirdLife SSC Grouse Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK and the World Pheasant Association, Reading, UK. 112 pp.
- Weeden, R.B. 1967. Seasonal and geographic variation in the foods of adult White-tailed Ptarmigan. *Condor* 69: 303-309.

Authors: Kathy Martin and Lindsay Forbes, March 2001. University of British Columbia.

Further information, publications, maps and unpublished reports on the White-tailed Ptarmigan study on Vancouver Island and in Colorado are available on the Centre for Alpine Studies Website: <http://www.forestry.ubc.ca/alpine/index.htm>