

Haley Lake

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ECOLOGICAL RESERVES COLLECTION
GOVERNMENT OF BRITISH COLUMBIA
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**“Genetic variability and minimum viable populations in the
Vancouver Island Marmot (*Marmota vancouverensis*)”**

A year-end report of field activities

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Executive Summary:

Between May 13th and September 12th, 1988, a total of 94 days were spent working on the project, including 62 days in the field. A total of 28 marmots were captured, sampled and tagged, including 4 re-traps from last summer. My total sample size is thus 36 animals. No injuries or fatalities occurred as a result of handling.

Marmots continued to expand their use of logging-slash habitats near Haley Lake, Green Mountain and especially in the Pat Lake Bowl near Mt. Whympet. Concurrently, marmots have seemingly disappeared from the Mount Washington and "P" Mountain sites. No marmots were found at the "type locality" site near Mount Douglas despite the presence of much suitable habitat.

Adult survivorship from last year was excellent, but only one of five young made it through their first winter. 1988 saw dramatically improved reproduction, including 4 litters at Haley Lake, 2 more in the Haley slash site, and two more on Green Mountain. One adult female on Green has produced young in both years of this study.

As with last year, there was much public interest in the project, including a nationally-televised short segment on CTV. In August the B.C. government established a formal Vancouver Island Marmot Recovery Team, and I have been asked to write the draft recovery plan. Finally, all samples and data will be analysed over the course of this winter, and the results should be ready by May 1989. A budget for continued 1989 work is included.

Restatement of Project Objectives:

This project was designed to:

- 1) determine the degree of genetic variation between and among subpopulations of *M. vancouverensis*.
- 2) evaluate the degree of gene transfer between subpopulations.
- 3) collect such data on population ecology as will be required to calculate minimum viable population (MVP) size.
- 4) design a management plan to maintain these levels.

Progress to Date: Logistics and Project Infrastructure

Field work got off to a much earlier start this year, mostly due to the timely donation of funds by the Cowichen Valley Field Naturalist's Club: my first day in the field was May 13th. Actual trapping and observation of marmots was hindered both by very poor weather conditions and by delays incurred by having to find and train a new field assistant. I eventually hired Donna "Georgie" Milne, B.Sc from U.B.C., on June 1st. She stayed with the project until August 6th.

As with last year, the project was materially assisted by the gracious cooperation of many individuals and organizations. In August, the Wildlife Branch took the lead in establishing a formal "Vancouver Island Marmot Recovery Team", comprised of government, university and industry representatives, which will oversee the implementation of a recovery plan for the species. World Wildlife Fund (Canada) approached MacMillian Bloedel to secure a 5 year financial commitment to co-sponsor this work, but this appears to have been unsuccessful.

Trapping Success:

1988 efforts resulted in the the capture of 24 "new" marmots and 4 "retraps" from last summer. Together with the 12 from last year, the total number of marked and sampled marmots is now 36 from 3 distinct colonies. The survivorship of animals tagged last year is presented as Appendix I.

Trapping began on May 24th with poor initial success; despite intensive efforts we did not catch our first marmot until June 16th. A variety of baits and trap placements were used without results. At one point we built a "coral" from fishing net, but this did not work. We even contemplated the use of "soft-catch" leg-hold traps but this idea was abandoned as it was felt that it would be difficult to remove a squirming animal without risk of injury. An additional factor was the danger of adverse public reaction to the project.

One method which eventually worked was termed the "active-trap" method, whereby the trap was placed at the entrance of a burrow which was known to harbour a marmot. Burlap was placed in such a way as to leave the animal no choice but to enter the trap. This method often worked but was very labour-intensive; many hours were spent confirming which animals used which burrows overnight, and traps would be placed and set before sunrise each morning. Often the animal would dig-out the burlap and escape or out-wait the researchers and simply refuse to leave the burrow. In addition, difficult terrain at several burrows precluded the use of this method, particularly in slash colonies where debris was abundant and there are many different entrances to the same burrow. In any event, all the marmots captured before August 2nd were taken with this method. A nice feature of the technique is that it is very possible to avoid re-traps because you know exactly which animal you're after.

After we moved our operations to the "Pat Lake Bowl" (slash colony) in early August, trapping success increased noticeably. At this site it was impossible to use the "active-trap" method because of terrain problems, and we relied instead upon the more traditional method of baiting with peanut butter and placing the traps on known runways. To our astonishment it worked, despite having attempted this for over two months at other locations. Peanut butter proved to be an effective lure during the latter part of the season, and several animals became quite "trap-happy" and were re-captured on one or more occasions. I also captured young-of-the-year from Green Mountain using this method.

In general, it would appear that the species is very trap-wary, but there is much individual variation. Females and young-of-the-year are easy to trap when compared to adult males; one individual developed a great fondness for peanut butter and was hand-fed at the Pat Lake Bowl, while others would not enter a trap under any circumstances.

Genetic Aspects:

A preliminary analysis conducted at the University of Calgary last winter with 12 marmot blood samples suggested that this species could have lower levels of genetic variability than other common mammals.

I emphasize that these results are tentative, and that the genetic component of the project is really only now getting started. Electrophoresis is a finicky process and requires much trial and error before the results from given samples can be reliably interpreted. More importantly, a sample size of 12 does not allow for any statistical analyses.

All of the blood samples from this project are now in storage at the Pacific Biological Station in Nanaimo. They will be analysed over the winter by Aqua-life consultants, who routinely conduct electrophoretic experiments under contract with Fisheries and Oceans Canada and who are well-equipped for the work. The choice of genetic loci to be surveyed is based upon the following criteria:

- enzymes found to be polymorphic in yellow-bellied marmots (*Marmota flaviventris*) by Schwartz and Armitage.
- enzymes found to be commonly polymorphic in a wide variety of mammalian species.
- "targets of opportunity", i.e., those additional enzymes which Aqua-life is geared up to survey at minimal additional cost.

A survey of 30-40 enzymes from 36 individual marmots will provide a concrete statistical basis for analysis. The work should be completed by January 1st.

Population Ecology:

Observations over the course of two summers suggest that marmots are doing well in the central portions of their range, but that outlying colonies have shrunk or even disappeared.

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At the Haley Lake Bowl Ecological Reserve, marmot numbers remained fairly stable although there was at least one coterie (family complex) that was not there last year. Most of the adults identified last summer were captured or observed this year, and one of two young-of-the-year made it to the yearling stage. Reproduction was higher this year; one litter of two in 1987 was increased to at least four litters (12 YoYs) in 1988.

In the Haley "Slash" colony there were at least 2 litters of 3 (6 YoY) and these animals have become quite "territorial" in the sense that they predictably utilize the same burrows and foraging habitats. The adult male (#4342) captured last summer was not observed here this year, and presumably dispersed.

On Green Mountain, all of the adults tagged from last year survived the winter, although none of the 3 young from last year were seen again. Two litters of 3 were produced this year and, in particular, "Betsy" (#1820) produced her second litter in two years. Other marmots were found inhabiting the slash environments around the mountain's base, and numerous reports were received about other marmots in the general vicinity.

At Pat Lake Bowl, marmots have expanded their use of the logged-over environment and have radically increased their numbers. Only small numbers have been reported here in the past; this year I captured 13 (including 4 YoY) and suspect that the total population approaches 20-25.

These sites are all within about 15 km of the Haley Lake Ecological Reserve. At these colonies there is no evidence to suggest that the animals are suffering from inbreeding depression or the effects of land-use changes, except in a positive sense. Adult survivorship is high (at least 8/10) and while only 1 of the 5 young survived their first winter, this is close to the survivorship values found in yellow-bellied marmots (Orlando Schwartz, personal communication).

However, the trend is somewhat different at more peripheral colonies. On "P" Mountain, burrows which were observed to harbour marmots last year are now apparently empty, and no marmots or fresh sign were observed on the east-facing meadow. On Mount Washington, no marmots or recent signs of occupancy were found despite two weeks of effort and the assistance of the operators of the ski hill there, who assured us

that there were marmots in abundance. On Douglas Peak, the "type locality" for the species, a search of suitable habitat yielded no recent signs of occupancy. Despite the well-travelled nature of Stratcona Provincial Park, no marmot reports have been received since 1979. A search of Mt. Strata, Brooks and Albert Edward last year was fruitless. Similarly, while Dave Nagorsen (of the B.C. Provincial Museum) located marmot bones in a limestone cave at Sutton Pass, searches of the surrounding habitat turned up no living animals or signs of recent occupancy.

Publicity and Public Involvement:

As with last year, I made considerable efforts to promote a high public profile for the project.

A marmot slide talk was presented to the Cowichen Field Naturalist's Club in Duncan on May 17th and to the Nanaimo Field Naturalists' on July 14th. An "Endangered Species" talk was given as part of the National Environment Week activities in Nanaimo on May 30th, and a follow-up presentation was given to children at the Quarterway elementary school in Nanaimo.

On May 27th I guided Lars Lindblad of the IUCN (International Union for the Conservation of Nature) into the Haley Slash marmot colony, and on June 17th I toured the Haley Lake Ecological Reserve with representatives who were attending the Federal/Provincial Wildlife Conference in Victoria. On August 17th I presented a brief "work-in-progress" note at the annual Society for Conservation Biology conference in Davis, California.

On June 29th I was accompanied to the Haley Lake Bowl by CHEK-TV of Victoria. A short 4 minute segment was aired locally on several occasions and was eventually picked up and rebroadcast nationally by CTV. Finally, as always I attempted to act as an ambassador on behalf of marmots and my funding agencies; numerous flyers and brochures from World Wildlife Fund and COSEWIC were distributed.

Project Assessment:

In general it was a very successful summer, and I am very close to fulfilling the objectives of the project.

My original proposal called for the capture of 30-40 marmots from 4 discrete colonies: 36 animals have been sampled from 3 such colonies. This number is adequate to calculate reliable estimates of genetic variability; however, unfortunately no animals were taken from a geographically-distant colony such as Mt. Washington, which would have provided crucial information regarding "normal" levels of genetic variability and the effect of lack of genetic exchange between subpopulations. This is a serious flaw in my data, although I can't capture animals if they no longer exist!

Population data suggest that juvenile mortality during the first hibernation period is probably the most significant factor keeping populations at low levels. However these data are limited by the small numbers of marmots and, in particular, by the small numbers of young produced last year. My data set would be dramatically improved by simply monitoring the survivorship of this year's large cohort of young.

In addition, now that a reasonable number of animals have been permanently marked, it will be possible to carry out additional experiments, notably concerning the role of dispersal in colony establishment and maintenance. My interpretation of the marmot distribution data suggests that dispersal may be a significant factor in determining whether marmot colonies become established or survive, particularly in the peripheral regions. The influence of new logging-slash habitats on historical dispersal patterns is, I think, the key to understanding why marmots are not doing well at some sites.

All of the evidence points towards translocation as a desirable management tool for this species; it is my opinion that, while marmots are doing well in the center of their range, peripheral colonies and not and we are rapidly approaching an "eggs in one basket" scenario. As the situation stands, virtually all the individuals of this species are found within a radius of about 15 kilometres from the Haley Lake Ecological Reserve.

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A Prognosis for 1988:

I recommend the following activities be carried out in 1989:

- 1) Continued monitoring of the three "intensive study" colonies to gather additional data on survivorship and reproductive rates.
- 2) Additional searches for marmots on Mount Washington with the objective of either obtaining more blood samples or verifying that the colony has in fact been extirpated.
- 3) Ground inspection of possible sites for reintroduction efforts. Particular attention should be given to the Strathcona Park region and the mountains near Woss, together with the type locality near Douglas Peak.

The overall objective of the 1989 work should be to gather additional data with which to revise MVP calculations, and to gather data necessary for specific reintroduction efforts beginning in 1990.

Acknowledgments:

The project was assisted by a large number of organizations and individuals. In particular, the Wildlife Branch (Nanaimo Region) provided office space and materials, the Pacific Biological Station furnished sample storage facilities, and Ken Langelier provided veterinary advice and materials. Donna "Georgie" Milne acted as my very capable field assistant.

Dave Carter, Ken Langelier, Knut Atkinson and Cheryl Biernes all accompanied me in the field and helped to carry heavy traps up steep hills; my thanks to them all.

Appendix I: survivorship of 1987 marmots

Haley Lake Bowl:	tags	sex	age	1988 obs?	notes
Haley's Comet	2829	m	3+	yes	recaptured
Blackie	3132	f	3+	yes	
Tonto	3334	f	adult	yes	3 yoy 1988
Oprah Winfrey	3536	f	3+	yes	recaptured
Boss	3738	m	3+	?	no positive i.d.
Oscar	6162	m	adult	yes	Tonto's mate?
Cardinal	4748	m	adult	yes	"Mom's" mate
Mom	5354	f	adult	yes	3 yoy 1988
Baby #1		?	YoY	no	
Baby #2	8586	f	yr1g	yes	
Fang="live-wire"	7172	f	2+	yes	
Killer="Newfie"	6364	m	2+	yes	
Mom #2	6970	f	adult	yes	new marmot; 3 yoy '88
Mom #3	7879	f	adult	yes	new marmot; 3 yoy '88
Green Mountain:					
Rocky Raccoon	1213	f	adult	yes	
Baby #3	1415	?	Yoy	no	
Baby #4	1617	?	Yoy	no	
Baby #5		?	Yoy	no	
Betsy	1820	f	adult	yes	2 litters in 2 yrs
Friar Tuck	2225	f	adult	yes	3 Yoy in 1988
Opportunity Nox	2627	m	adult	yes	fathered two '88 litters
Haley Slash:					
Sylvester	4243	m	2+	no	

Note: only those animals which could be positively identified from last year are included in this table, whether they were captured or not (n=23). Several other individuals were "first-time" captures this year, including 2 Yoy from Green Mountain and 13 animals from the Pat Lake Bowl. These animals will be included in next year's survivorship analysis.

The total n of marmots captured is now 36, but other animals will be identifiable next year, particularly the yearlings.

Appendix II: 1988 Project Budget

	<i>Estimated</i>	<i>Actual</i>
Vehicle Charges	\$9,500	\$9,100
Salaries		
-principal researcher	\$10,500	\$10,500
-field assistant	\$9,600	\$4,400
Equipment and Incidental	\$2,100	\$2,611
Electrophoresis	\$900	\$2,000
Final Report Preparation	\$600	\$600
Sub-total	\$33,200	\$29,211
Administration Costs (10%)	\$3,320	\$2,921
TOTAL	\$36,520	\$32,132

The following agencies provided funds to the project in 1988:

Wildlife Branch (Habitat Conservation Fund)	\$15,000
Cowichen Valley Naturalist's Club	\$6,900
World Wildlife Fund (Canada)	\$5,000
Canadian Wildlife Service	\$1,750
V.I.M. Liason Committee	\$600
Nanaimo Field Naturalists	\$100
TOTAL	\$29,350
1988 project deficit	-\$2,782
1987 project deficit	- \$807
Total project deficit (Nov. 1st, 1988)	- \$3,589

Appendix III: Funding requirements for 1989

Vehicle charges (8000 km at \$0.475/km)	\$3,800
Helicopter charges (6 hours at \$500/hour)	\$3,000
Salaries	
-principal researcher (two months at \$1800/month)	\$3,600
-field assistant (two months at \$1600/month)	\$3,200
Equipment and Incidental	\$1,000
Electrophoresis	\$300
Final Report Preparation	\$200
Sub-total	\$15,100
Administration Costs (10%)	\$1510
Redress of project deficit	\$3589
TOTAL	\$20,199

Note: World Wildlife Fund (Canada) has already allocated \$5000 for this project in 1989.