Habitat Associations and Movement Patterns of Reproductive Female Wolverines (*Gulo gulo luscus*) on the Southeast Alaska Mainland: A Pilot Project

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"SE Alaska Mainland Project"

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Alaska Game Management Units (GMU) 1(B) and southern 1(C), including portions of the Petersburg and Wrangell Ranger Districts.

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INTRODUCTION

Despite significant gains in our understanding of wolverine ecology and habitat associations in North America and Scandinavia during the last two decades (Hornocker 1981, Magoun 1985, Gardner 1985, Banci 1987, Copeland 1996, Persson 2003, and others), a major gap exists in our current knowledge of wolverines inhabiting coastal ecological zones. In Southeast Alaska, most aspects of wolverine ecology and population demographics remain unknown. From other studies, we know that home range size is relatively large for this medium-size carnivore, with the smallest home ranges having been documented for reproductive females and the largest for subadult males (Banci 1994). In other habitat types where wolverines have been studied, home ranges for resident adult female wolverines are between 100 and 400 km² and those of resident male home ranges are 4-6 times larger than those of females and overlap the ranges of 2-6 females (unpublished data from on-going research projects). Ranges of non-resident, subadult animals are much larger and have been documented at over 37,000 km² (Inman et al. 2004). Large home range size for wolverines, along with relatively low reproductive rates, results in naturally low-density populations.

A key component of viable wolverine populations is the survival of reproductive females (Persson 2004). Although mature female wolverines have the capacity to produce 2-3 young per year, studies have shown that the actual birth rate for wolverines is much lower than their reproductive potential suggests, primarily due to delayed maturity and frequent failure to recruit young in years following successful reproduction (Persson 2004). Research conducted in other study areas indicates that survival rates for wolverines are substantially higher in untrapped populations than in trapped populations, and logistic growth rate estimates for trapped populations indicate that wolverine populations would decline in the absence of immigration from untrapped populations (Krebs *et al*. 2004). Population viability analyses of wolverines in Sweden indicate that, for populations to remain viable according to IUCN classification criteria (IUCN 2000), the number of sexually mature females (3 years old, or older) should exceed 46 individuals (Persson 2003). Sealing records for Southeast Alaska (including GMUs 1-5) indicate an average annual harvest of 24 wolverines, yet there is no information currently available on the age or reproductive status of harvested animals.

Resource development, human settlements, and increased human access in wolverine habitat can have negative impacts on wolverine populations, especially where dispersal potential for wolverines is compromised by disjunct habitats or lack of refugia (Weaver *et al*. 1996). Landscape-scale development activities in wolverine habitat such as those resulting from forest management activities not only modify habitat characteristics but affect wolverine movements (unpublished data from studies in British Columbia and Ontario). Road construction associated with forest management activities can greatly improve trapper access to otherwise inaccessible areas that presently function as refugia for reproductive segments of a wolverine population (unpublished data from studies in British Columbia and Ontario). Mortality rates for wolverines in trapped populations has been reported to be as high as 55% depending on the sex and age class, therefore, we know that trapping can have a significant effect on wolverine population demography (Krebs *et al*. 2004). Roads also provide travel corridors for wolves, further increasing the potential for mortality of denning females and their kits (Magoun and Copeland 1998; unpublished data).

Increasing access for trapping and other recreational uses, as well as habitat fragmentation by human development, are threatening the sustainability of wolverine populations in other portions of North America (unpublished studies in British Columbia, Montana, and Ontario; see the "Current Research" page on this website for project summaries). Little if any information currently exists on wolverine populations in coastal ecosystems, yet sealing records indicate that GMU 1B typically produces the highest wolverine harvest of any game management unit in Southeast Alaska. During the 10-year period 1994-2003, trappers and hunters harvested an average of 24 wolverine annually in Southeast Alaska, with GMU 1B producing an average of 7 (range 1-18) wolverine annually. It is likely that opportunities for harvesting wolverines will increase with improved access to remote areas that currently go untrapped. The large expanse of remote, mountainous habitat in SE Alaska has historically provided wolverines with expansive refugia from trapping, which combined with immigration from Canada by way of major river systems, has probably helped sustain viable populations in the region. However, recent genetic studies indicate that there may be less interchange between mainland southeast Alaska wolverine populations and those in adjacent Canadian provinces, and further genetic studies are needed to determine the extent of female dispersal between populations (Tomasik and Cook 2005). Krebs *et al*. (2004) and Magoun and Copeland (1998) emphasized the importance of maintaining functional refugia (i.e., large enough and with suitable habitat for reproductive females to successfully den and rear kits) to maintain source populations for sink habitats where trapping occurs. There is, however, no information currently available on what reproductive female wolverines require for denning habitat in Southeast Alaska, how large their home ranges are, or how extensive or frequent extra-territorial movements might be.

There have been no studies of wolverines in coastal ecosystems, largely due to the expense and inherent difficulties associated with studying the species in these ecosystems, and only two studies have specifically addressed the effects of logging on

wolverine movements and habitat use, one in British Columbia (Krebs, personal communication) and one in Ontario (Boreal Wolverine Project). We propose to study the habitat requirements and movements of reproductive females in GMU 1B in relation to potential timber harvest activities in the region. Significant portions of the GMU 1B Mainland are likely to be impacted by forest management in the foreseeable future. The USFS and the State of Alaska DNR each have plans to log portions of the GMU 1B Mainland and much of this timber harvest activity is scheduled to occur in currently undeveloped areas known to support wolverines. Once initiated, Federal and State forest management activities and road development activities could potentially reduce habitat capability for wolverines and lead to increased human-caused mortality.

Wolverine populations are notoriously difficult to study because of the remoteness of their habitats, the size of their home ranges, and low-density populations compared to other mid-size carnivores. At least 4 years have been required in field studies of wolverines to obtain sufficient information to make management decisions based on region-specific ecological knowledge of the species. Acquiring information on reproductive females is particularly difficult because their home ranges are often distributed in the most remote areas of occupied wolverine habitat. Studying the reproductive female segment of a wolverine population requires long-term, costly research; past experiences of wolverine researchers suggests that a pilot study should be undertaken to determine the most feasible and cost-effective way to carry out wolverine research in ecosystems that have not yet been studied. For this reason, we propose to conduct a pilot study to determine which portions of the GMU 1B Mainland are most likely to support reproductive female wolverines and what methods are suitable for determining habitat associations. The information from this 1-year pilot study will not only help in developing a more comprehensive study of the habitat requirements and movements of reproductive females, but also provide information on the distribution of potential source habitats for wolverines in the region.

GOALS AND OBJECTIVES

The goals of the pilot project are to 1) determine the general areas where reproductive female wolverines are most likely to den in the GMU 1B Mainland by following the movements of adult male wolverines with satellite collars, 2) determine the best methods for studying movements and habitat associations of reproductive females 3) develop a comprehensive proposal for a study of movements and habitat associations of reproductive female wolverines, with the ultimate goal of providing wildlife managers with the information necessary to ensure that functional reproductive habitat is maintained in the face of increasing human development and access to remote areas in the region.

Specific objectives:

1. collar up to 3 adult male wolverines with ARGOS/VHF collars
2. collar up to 3 adult and/or subadult female wolverines with VHF collars
3. ear-tag and release ear-tagged subadult males

4. test the efficacy of using ground-based detection methods for wolverine, including hair snares and infra-red cameras
5. obtain DNA samples from wolverines in SE Alaska and adjacent areas of British Columbia and Yukon, Canada for evaluation of dispersal potential of wolverines in the region
6. determine the feasibility of using aerial track detection in winter in the study area as a means of establishing wolverine distribution and relative abundance in the region
7. evaluate the various methods outlined above for studying wolverines in SE Alaska and formulate a comprehensive plan for studying the movements and habitat associations of reproductive females

APPROACH

We will test a number of approaches to acquiring information on wolverine distribution, movements, and habitat associations in the study area, including satellite collars, VHF collars, hair snares, infra-red cameras, and aerial track surveys in winter. No single approach may be adequate for acquiring this information under the conditions for studying wolverines in SE Alaska, but rather a combination of methods may be necessary to gather sufficient information on to make informed management decisions.

We will live-trap wolverines during December-April with the goal of equipping three adult males with ARGOS satellite collars (manufactured by Sirtrack of New Zealand) in order to determine their home ranges and areas of concentrated use. These collars (weighing less than 200 gms) were tested on 7 wolverines in the Ontario Boreal Wolverine Project in 2004 and provided information on movements, home range, and potential den locations and other areas of concentrated activity. Locations of the ARGOS Ptts were compared to standard VHF locations and found to provide similar information on home range size and shape. These collars were custom made for the project to reduce weight and bulk and eliminate wear on the animal. Minor adjustments to the design have been made after the Ontario study. Trapping in this field season (December 2006-April 2007) will be along the coast and river systems accessible by boat, areas where adult resident males and transient wolverines are the most likely segment of the population to be captured. Resident mature male wolverines have home ranges that overlap those of reproductive females and visit these females regularly during the denning season (late February-early May). This project and others (Persson 1993; Copeland 1996) have shown that mature males visit natal den sites of females in their home ranges and spend a disproportionate amount of time in territories with reproductively active females. The ARGOS satellite collars, used in boreal forest habitats in Ontario and mountainous, forested terrain in Montana and Idaho, will be tested for suitability and accuracy in the coastal forests and mountainous terrain of SE Alaska. We will use the VHF feature of the ARGOS collars to radio-track the collared animals to compare home range size and shape to that determined by the satellite locations.

Three additional VHF collars from Sirtrack will be available (same design as the

combination collars) if reproductive females or subadult females are captured. Subadult males will be ear-tagged and released with no collar, because few subadult males are expected to remain in the study area and the primary focus of the pilot project is to identify reproductive habitat. All collared wolverines will be tracked with a PA-18 Supercub during the denning period (late Feb-early May) in an attempt to locate areas of concentrated us, which is often an indication of a den site during this period, and to verify Argos satellite locations.

During the pilot project, we will investigate the progress and potential of Global Positioning System (GPS) technology for studying wolverines by collaborating with other wolverine researchers and manufacturers of GPS transmitters. Although investigators are using this technology in mountainous and forested terrain for a number of species, thus far these collars are still proving to be less than reliable and/or too unwieldy for wolverines. We will contact investigators who have ongoing projects using this technology and if possible work with them and the various manufacturers to develop a reliable and appropriately sized unit for use on wolverines. If some of the existing design flaws can be overcome, GPS technology may prove to be the most cost-effective method for studying wolverines in Southeast Alaska on a larger scale.

We will livetrap wolverines using box traps built with 4"x5" rough hewn timbers and measuring roughly 60" long, 30" wide, and 20" deep. The heavy timber lid is triggered by the wolverine when it pulls at a piece of bait, secured tightly inside the trap at the back near the floor and connected by a cable to a panic snap on the outside of the trap. A cable, which runs from the front of the trap lid, over a cross member above the trap, to the back of the trap where it is attached to the panic snap, holds the lid up until the wolverine tugs on the bait and releases the panic snap. Hide will be removed from baits made from animal carcasses to prevent the wolverine from stripping lengths of hide from the bait that might lengthen the distance between the bait and the back of the trap. This will prevent the possibility of the wolverine triggering the trap while its head is up or its body is in the trap opening. A self-latching mechanism will secure the lid so that it cannot be pushed up by the wolverine. A “chew” log will be attached to the front side of the trap where wolverines most often try to chew out of the trap. This log is easily replaced when it becomes worn. This trap design has been used successfully for livetrapping wolverines in Ontario and British Columbia and similar log traps have been used in Montana, Idaho, and Washington. Traps that have been set will be checked daily. Prebaiting traps and setting only those that show wolverine activity will limit the amount of time needed to monitor trap sites.

All wolverine capture and handling procedures will follow approved animal care guidelines established in the department's Animal Welfare Policy. Wolverines captured in the livetraps will be anesthetized using tiletamine HCl and zolazepam HCl (Telazol®) at a dosage of 10 mg/kg administered with a jabstick and a modified 4 cc Cap-Chur® dart. This drug and dosage has worked well for wolverine studies in North America and no drug-related mortalities have been reported, with well over 50 wolverines anesthetized to date. We will estimate the weight of the animal by raising the trap lid a small amount and viewing the wolverine with a flashlight. Adult males are usually a

third or more heavier than females and have broader heads relative to their body size. Males in the study area can be expected to average between 30-40 pounds. All wolverines will be anesthetized, weighed and measured, ear-tagged, and photographs taken of the identifying chest and throat markings. A hair sample will be taken for DNA analysis. Dr. Joseph A. Cook, Professor and Curator of Mammals at the University of New Mexico, has agreed to analyze the DNA material from livetrapped wolverines as well as wolverines taken by trappers in SE Alaska, British Columbia, and Yukon to examine the degree of movement between wolverine populations in the region.

Ground-based, non-invasive methods for studying wolverines will also be tested. These include the use of hair snares and infra-red remotely triggered cameras to identify the minimum number of wolverines using an area (R. Mulders, personal communication; Boreal Wolverine Project). We will test several designs of hair snares in the study area and use DNA analysis to determine the number of individual wolverines that have been “captured” with the snares. We will also use several models of infra-red cameras to identify individual wolverines in the study area. Wolverines can be identified by the markings on the chest, throat, and chin area. These cameras will be set at baited sites where a run pole is erected facing the camera and a bait is positioned so that a wolverine will look up at the bait as it approaches the end of the run pole. The cameras are set so that they trigger only when the head of the animal is raised. We tested this camera “trap” using 16 captive animals in a large enclosure at a facility in Washington over a 2-day period and were able to identify 13 of the 16 animals by the chest/throat patterns recorded on the cameras.

Finally, we will test the feasibility of using aerial track surveys in winter to determine the distribution and relative abundance of wolverines in SE Alaska. Aerial track surveys have recently been used in Ontario, Labrador, and interior Alaska to provide information on the probability of occurrence of wolverines over large areas (A. Magoun, unpublished data; I. Schmeltzer, unpublished data; C. Gardner, unpublished data). Reports on the Ontario Boreal Wolverine Project provide information on survey design. Analysis of tracking data will make use of recent advances in modeling presence - absence data (see Journal of Wildlife Management Special Section: The Value and Utility of Presence - Absence Data to Wildlife Monitoring and Research, Volume 69, No. 3; MacKenzie 2006; Latimer *et al*. 2006). Although tracking will not be possible in habitats with closed forest canopies, there will be open areas at higher elevations, in meadows and frozen lakes, and along rivers and streams that could provide enough tracking opportunities to use recent statistical models and presence/absence data to examine wolverine distribution and resource use (Mackenzie 2006; Latimer *et al*. 2006). A combination of aerial tracking and ground-based detection devices (hair snares and cameras) may be the most effective non-invasive approach in coastal Alaska habitats for examining wolverine distribution and habitat use.

STUDY AREA

This study will take place on the mainland coast of Southeast Alaska from Port Houghton southward to the Stikine River drainage. This area of the Alaska Mainland

includes portions of GMUs 1B and 1C, as well as portions of the Petersburg and Wrangell Ranger Districts. Emphasis will initially be place on the Thomas Bay and Le Conte Bay drainages, as these locations have provided a high percentage of the GMU 1B wolverine harvest in recent decades. Depending on the success of wolverine capture efforts in Thomas Bay and LeConte Bay, research activities may be expanded to include the Port Houghton and Farragut Bay drainages.

Link to study area photos

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