Making Scat Count: Citizens Help Inventory Grizzly Bear Populations in Alberta, Canada

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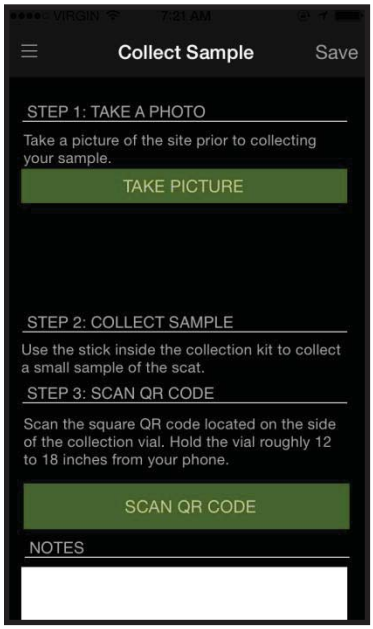
The ability to accurately inventory and monitor bear populations is fundamental to guide management actions and direct conservation and recovery efforts. Non-invasive techniques such as DNA hair snags have been used widely in North America as a robust means to estimate bear population size over space and time (Proctor et al. 2010). As a result, these approaches are now used widely in many countries. Although useful, application of DNA hair snag projects can be cost prohibitive, particularly over large geographic areas, making repeated surveys difficult to implement at time intervals necessary to measure changes in bear populations (Stetz et al. 2010).

In Scandinavia, researchers have successfully used DNA from scats collected by hunter volunteers to obtain robust estimates of population size, which allows for monitoring of brown bear population trend (Kindberg et al. 2011). Until recently, application of this technique in North America has been problematic due to inconsistent DNA extraction success (Wasser et al. 2004). In 2013, the Foothills Research Institute Grizzly Bear Program (fRIGBP) in collaboration with a Norwegian DNA lab improved the DNA extraction technique yielding more consistent results using grizzly bear scats from Alberta. This important advancement has taken us one step closer to using scat DNA as a technique to monitor populations of bears in Alberta.

The Yellowhead bear management study area in west-central Alberta, Canada.

The advantage of the Scandinavian approach is that genetically-based inventories of bears can occur across large geographic areas without the exorbitant costs and logistical difficulties typically associated with DNA hair snag surveys. However, this approach is not without flaws and presents numerous challenges, some of which relate to data quality. If population estimation is the research objective, careful design is imperative as heterogeneity in detection probability, further compounded by the low detection probability of grizzly bears, can lead to imprecise estimates that question their value for management (Boulanger et al. 2004; Bellemain et al. 2005). Following this, there is the need to evaluate the robustness of the scat DNA method to estimate bear population size, and to determine the possible impacts of using volunteers to collect these data.



Screen shot of grizzly scat application.

Implementing scat DNA surveys using a citizen science approach could prove to be highly valuable to grizzly bear conservation in Alberta where population estimates derived from past DNA hair snag surveys have not been widely accepted by the public. In Scandinavia, hunter participation was instrumental in local acceptance of the results of brown bear population surveys (Bellemain et al. 2005). In September of 2014, the fRIGBP launched a pilot citizen science based scat DNA project within the Yellowhead bear management unit to evaluate the DNA scat technique as a potential management tool. Our objectives were to 1) engage local hunters, trappers, and other user groups to participate in the inventory work during the 2014 hunting season (August-October); 2) supplement citizen sampling using biological staff; 3) compare population distribution and abundance estimates obtained from both scat and hair snag (May-July, 2014) DNA inventories; and 4) evaluate the costs and benefits associated with each approach.

Scat collection vial with unique bar code identifier.

Although engaging citizens to participate in scat collection is fundamental to the success of this project, we need an efficient way to gather and store information. To do this, we have

developed a smartphone application (*grizzlyscatapp.ca*) for Android and iPhone devices. This app, once activated, records the travel route of the user. When a scat is located, the user can scan a unique barcode associated with each sample vial, which links the spatial and temporal information of the collection site. The app automatically transmits data to our network database for storage. We have also integrated automatic text messaging to keep users informed on the status of sample processing and laboratory analysis to help ensure ongoing interest and participation. For citizens without a smart phone, we will provide a GPS unit capable of tracking the user's route and recording the locations of scat samples. To ensure adequate sampling across the study area (Kindberg et al. 2011), biological staff will supplement citizen scientist's efforts by following pre-determined transects along linear features (pipelines, seismic lines, and roads) and forestry cutblock edges.

We believe that this project will allow us to further understand how a citizen science approach to gather non-invasive genetic samples can be used to monitor bear populations, and in addition, this research will assess how different approaches can be used. Results from this pilot study will be available later in 2015.

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Biological Research

Artificial Den Creation in Coastal British Columbia, Canada

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A project is underway on Vancouver Island that is attempting to create black bear dens in existing forest structures and in artificial structures. The project is aimed at increasing the availability of black bear dens in the Jordan River watershed on Vancouver Island using a new and innovative approach.

Black bears in coastal British Columbia (BC) use large diameter (mean = 143 cm) trees or wooden structures derived from trees (logs, windfalls and stumps) for winter dens (Davis 1996) and generations of bears often reuse the same den (Davis et al. 2012). Black bears den from three to six months in coastal BC and females give birth to cubs in their dens. Coastal black bears likely use only wooden structures in BC because of the cool and wet weather during the winter, unlike other parts of North America where they may dig dens in the earth or den in nests on the ground.

Current and past land management practices, including hydro-electric development and forest harvesting, removes large trees from the potential den supply on Vancouver Island. The BC provincial government does not provide any regulatory protection for these structures; however, some forest companies take the initiative to conserve dens during harvesting that are found during layout (i.e., preparation for harvesting).

Helen Davis of Artemis Wildlife Consultants installed 3 artificial black bear dens in July 2014. The dens simulate naturally-occurring dens in hollow logs but are made from plastic culverts closed at one end and open at the other, to allow entry by black bears. An industrial designer is also designing artificial dens made of more suitable materials that will more closely mimic natural dens. Davis hopes that artificial den structures can fill the gap between potential declines in den supply due to the removal of existing dens and decay of residual structures and creation of new dens through appropriate forest management at the landscape scale.

The effectiveness of this new pilot approach to creating artificial dens will be monitored and assessed for effectiveness by