It's All in the Poop

Grades: 7-10
Subject: science
Skills: comparison, calculation, observation, graphing
Duration: 60 minutes
Vocabulary: scat, scatology, rumen, predator-prey relationship

Objectives:

Students will be able to: 1) Collect and identify individual hair samples taken from wolf scat.

2) Determine the percentage of specific prey consumption by Eastern Wolves in Algonquin Provincial Park.

Method:

Students examine random hairs from wolf scat and compare them to known samples from a variety of species in order to determine the wolf's prey species and their abundance.

Background:

Scatology is the study of animal droppings also known as scat, or feces. Scat analysis is a very important tool for wildlife researchers in determining the type of food an animal is consuming. Researchers can also determine the ratio of different prey being consumed. Scat is especially important for researchers studying large carnivores, such as bears and wolves since these species are rarely observed.

One of the best signs of what an animal has been eating is accomplished through analysis of hairs extracted from scat. Hairs of animal species are characteristic. Using known samples, identification can be relatively straightforward.
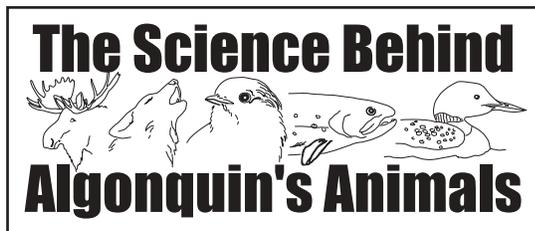
Prior to the first wolf research project undertaken by Dr. Doug Pimlott of the Ontario Department of Lands and Forests (forerunner to present day Ontario Ministry of Natural Resources), little was known

about the prey consumed by Algonquin Park's wolves. It was known that wolves did eat deer, as well as Moose, but it was unclear in what proportions.

During Dr. Pimlott's research, from 1957 to 1965, there were two methods used to determine what wolves were eating; locating kill sites and collecting and examining wolf scat. The second method was utilized between June and November from 1958 to 1962, with scat collected during the winter of 1962. During this period 1435 scats were collected and analyzed. Three main prey items were found in the scat; White-tailed Deer (80%), Moose (8%) and beaver (7%). The remaining five percent consisted of other prey species such as Snowshoe Hare, Muskrat, Groundhog, Porcupine, Raccoon and various small rodents.

From 1986 to 1999, Dr. John Theberge of the University of Waterloo, in Ontario, conducted an intensive study of wolves in Algonquin Park. During the study, Dr. Theberge and his graduate students were able to document a shift in the wolf-prey system in the Park. Since the mid-1970s, the Moose densities in Algonquin had changed from 0.12 to 0.18 per square kilometre in 1974/75, to 0.44 per square kilometre in the winter of 1986/87. During the first years of the research (1987 to 1992), Moose densities were estimated to be 0.35 to 0.39 per square kilometre. The deer population during the winter had also changed from almost none in the early 1980's, to periodic pockets of small numbers during the research period. In the winters of 1987/88 and 1988/89, wintering deer were either absent or very low in numbers. In the winter of 1989/90 surveys estimated the population in the eastern part of Algonquin Park around 80/100 deer.

From 1987 to 1992, wolf scat was collected and analyzed year-round and categorized as summer or winter. During this period 1380 summer and 1436 winter scat were collected and analyzed. Additionally, 41 Moose carcasses were analyzed to determine whether they were killed by wolves or had died of other causes.

The analysis of these scats revealed that wolves consumed Moose (39%), deer, (23%) and beaver (31%) during the winter months. This result was a dramatic shift from Dr. Pimlott's findings in which the carcasses of 676 deer that had been killed and utilized by wolves in the winter and that of only four Moose, two of which had been scavenged. Other species found to be utilized by wolves in the winter
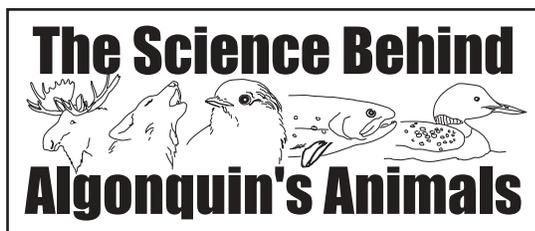
included Snowshoe Hare, Red Squirrel, *Cricetinae spp.*, and Black Bear, which represented seven percent of the total.

During the summer Dr. Theberge found the occurrence of prey species remained fairly constant to those of the winter analysis; Moose (35%), deer (28%), beaver (33%), and all other species less than five percent of the total.

Apart from determining the predator-prey relationship of Algonquin Park wolves, Dr. Theberge also explored the use of scavenging by wolves on Moose. This was accomplished by examining carcasses of Moose that wolves were feeding on, and determining if the animal had been killed by wolves or had died of other causes. The investigation revealed that 35% of prey consumed was Moose, of that, 71% were scavenged after dying of other causes. Dr. Theberge also noted that in certain years, the amount of scavenging was extensive, with all carcasses found in 1987/88, and all but one in 1988/89, having been scavenged.

Required Equipment:

| ✓	Items Required	Quantity
	Computer with internet connection	One per student
	'It's All in the Poop' on-line activity	One per student
	'Hair ID' overhead (provided)	One
	'Hair ID' hand out (provided)	One per student
	Scatology Inquiry Sheet (provided)	One per student
	blank paper for brainstorming	One per student
	Pencil	One per student
	Calculator	One per student

Procedure:

1) Convey to the students that an important part of some wildlife research is determining the type and proportion of food that the research animals are consuming.
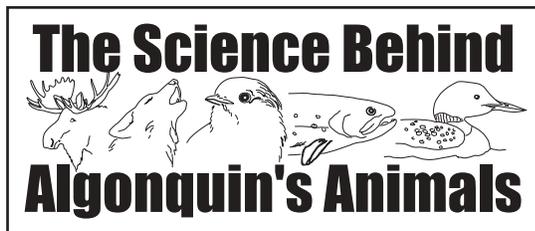
2) Ask students "How wildlife researchers can determine what their research subjects are eating, and in what proportions?" Have students brainstorm and list ideas. Some possible answers would be visual observations, examining stomach contents, and examining scat.

3) Have students expand on the use of scat. Ask students "How can you tell what an animal has been eating when examining scat?" Answers: bones (skull), scales, hairs, undigested plant material, e.g. seeds, berries etc.

4) Explain to students that animal hairs have a cuticular scale pattern unique to each species. Have students refer to the 'Hair ID' handout. Show examples on overhead.

5) Hand out data sheets and an inquiry sheet to each student. Instruct the students to log onto the Web site www.sbaa.ca, and navigate to the 'It's All in the Poop' on-line activity. Have the students work through the online activity until all samples have been processed and all data entered on the two sheets.

6) Once all data has been tabulated instruct students to complete the inquiry sheet.

Variations:

Divide the class into two groups. Assign each group a different wolf research project (i.e. Pimlott, or Theberge). Have each student graph their individual results. Put data from all groups on an overhead or blackboard. Have each student create a new graph for both study results.

Evaluation:

Ask students to:
1) Complete and hand in the two data sheets (Pimlott and Theberge).
2) Complete and hand in the Scatology Inquiry Sheet.
3) Graph the results of each study in a single graph to illustrate the change in diet composition for the Pimlott and Theberge studies.

Activities:

1) Have students research why the ratio of deer to Moose in wolves' diet changed from the Pimlott study to the Theberge study.

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2) Have students research why beaver is consumed more frequently in the fall.
3) Have students research why Algonquin Provincial Park wolves scavenge rather than kill Moose.