

## LEMMING WINTER NEST ANALYSIS

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### OBJECTIVES

1. Identify the lemming species that used each nest during the winter season;
2. Determine if predation has occurred inside the nest;
3. Determine if breeding has occurred during the winter using the frequency distribution of weight of lemming faeces found inside the nest (Duchesne 2009).

### FOCAL SPECIES

Brown Lemming (*Lemmus sibiricus*)  
Collared Lemming (*Dicrostonyx* spp.)

### PROCEDURE

#### Step 1 - Dissection

Nests are oven dried for 24 hours at 45°C and weighted dry with an electronic scale. Nests are dissected under a light. The goal is to collect faeces, hairs and bones inside the nest. If detecting hair and small faeces is hard to do the observer can use a magnifying glass. Hairs, faeces and bones found should be collected and place in a plastic bag and identified. A separate bag should be used for each type of samples and, for each nest. Bag should be identified as followed: sample type/nest ID/year/initials of observer. For example, bones coming from nest N152 collected in the summer 2008 by Vanessa Duclos should be identified as: bones/N152/2008/VD.

The number of faeces found inside one nest can be relatively high. However, it is not necessary to collect them all: a minimum of 40 to 50 faeces per nest should suffice. Be careful in finding juvenile faeces. They are generally found in the center of the nest while those from adults are usually found inside an antechamber around the edge of the nest. Be sure to dissect the entire nest even if you manage to obtain the amount of faeces needed by dissecting only part of the nest. By doing so, you will ensure to retrieve the maximum of information available on that particular nest and enhance your chances of finding signs of predation.

If lemming bones or a **dense** carpet of lemming hairs are found in the center of the nest (see Fig. 1), this is a reliable sign that predation by a weasel has occurred and it must be noted. Generally, bone legs are also found inside the nest. When two lemming species have used the nest over winter (see below) and the nest shows signs of predation it is possible to identify the species when remains or the entire skulls and jaw bones are present. Figure 2 shows how to differentiate Brown and Collared Lemmings using teething. As for the carpet of hairs it indicates a lemming nest where a weasel stayed following the predation. It is also important to distinguish between a carpet of hairs due to predation and a thin layer due to the lemming moult which is less dense and more spread around (Fig. 3).

## Step 2 – Faeces: species and reproduction

Faeces previously collected into plastic bags need to be observed carefully to determine: (1) the lemming species that has (or have) used the nest during the winter, and (2) signs of reproduction inside the nest.

The winter nests of Brown and Collared Lemmings are similar but there are some differences. The lining of **Brown Lemming** nests is usually similar to the external layers of the nest while the internal layers of **Collared Lemming** nests are generally made of pieces of shredded vegetation while the exterior is made of bigger pieces of vegetation. Despite these distinctions, the identification of the species must be made using the faeces found inside the nest. At a field site where more than two species are present and show evidence of competition, more than one species can occupy the same nest over the winter. Adult **Brown Lemming** faeces measure between 6 and 10 mm. They are generally of a light greenish brown color with rounded tips. As for the **Collared Lemmings**, their faeces measure from 4 to 6 mm with pointed tips, are usually of a dark brown color and frequently show a pronounced curved (Fig. 4). Note that the shape of faeces can vary between individuals of the same lemming species. In some cases, the humidity or water could have altered the appearance of faeces and this can render the identification harder to do. If this is the case, another option to identify the species is to use the dermal sheath pattern of hairs (see **Step 3 – Hairs: dermal sheath inspection**, below).

It can happen that a large number of small aggregations of reddish faeces are found outside nests (Fig. 5). The identification of those faeces is relatively hard since they were exposed to the elements. They appear to have the same shape as those of the Collared Lemming but it is hard to determine if their small size is due to desiccation or if they are juvenile faeces. In these cases, it is best to use other faeces collected inside the nest to determine with more certainty if reproduction has occurred or not.

We determine if breeding has occurred during the winter using the frequency distribution of weight of lemming faeces found inside the nest. It can be determined by the presence of weaned juvenile faeces (Fig. 6) and based on two factors: (1) at least 35% of faeces should be of juvenile size, i.e. three to four times smaller than adults, and (2) this needs to be determined using a sample of at least 40 faeces. More details can be found in Duchesne (2009).

## Step 3 – Hairs: dermal sheath inspection

This is a difficult task and it is greatly recommended to do some trials before hand. The steps and details of this method can be found in Teerink (1991).

1. Hairs must be washed and degreased with xylene. They must be soaked into the solution for only a few seconds.
2. Apply a thin layer of clear nail polish on a microscope slide. Xylene can be replaced with agar or 5% gelatine.
3. Gently place a hair on the nail polish before it congeals (5 seconds).
4. After the nail polish has solidified, remove the hair using small forceps or tweezers. The nail polish must be completely solidified in order to obtain a well defined hair print.
5. The hair print will show the pattern in the dermal sheath and allow the identification of the species under a microscope. The hair print can be compared to those from an already established hair collection.

## MATERIAL

- electronic scale
- plastic bag
- xylene
- clear nail polish, agar or 5% gelatine
- small forceps or tweezers
- microscope
- hair collection

## LITTERATURE CITED

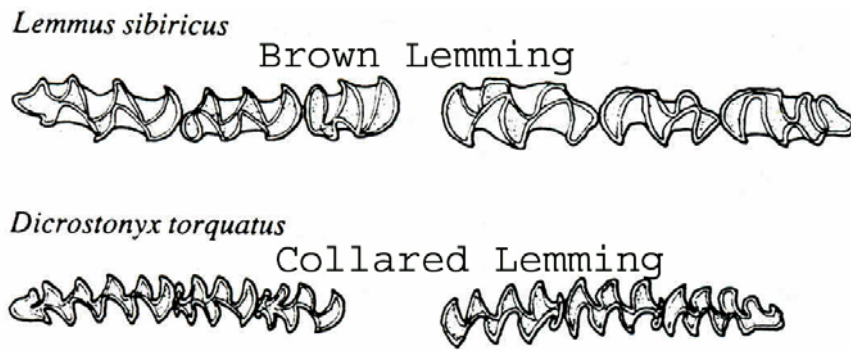
Duchesne, D. 2009. Sélection de l'habitat, reproduction et prédation hivernales chez les lemmings dans l'Arctique. MSc thesis, Université Laval.

Teerink B. J. 1991. Hair of West-European mammals. Cambridge University Press. Cambridge.



**Figure 1.** Examples of lemming nests with a dense carpet of hair showing predation by a weasel.





**Figure 2.** Identification of Brown and Collared Lemmings using teething.



**Figure 3.** Example of a lemming nest where moult occurred.



**Figure 4.** Faeces of Brown (top) and Collared (bottom) Lemmings. In the bottom left corner you can see the pronounce curve frequently observed in Collared Lemming faeces.



**Figure 5.** Aggregations of small reddish faeces found outside a lemming nest.



**Figure 6.** Example of faeces distribution found inside a nest with evidence of reproduction.