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Pellet counts of herbivores in snowbeds

Motivation

Snowbeds are important habitats of small rodents, especially lemmings. They are also important summer feeding habitats of reindeer. Because the plant community of snow beds is dependent on snow, these habitats are likely to be sensitive to climate change. Mammalian herbivory has the potential to modify climate-driven vegetation changes. Herbivore abundance recording in snowbeds is part of the small rodent modules monitoring of interactions between climate, small rodents and snowbed vegetation.

State variables: Pellet counts in snowbeds are used for calculating abundance of lemmings (state variables V33) and ungulates (state variable V31). Other herbivore presence (ptarmigan, hare, geese) is also registered.

Reference to method: first publication of these data is in progress (Soininen et al, *in prep*).

Spatial study design

Herbivore pellets are recorded in the intensive study design at Varanger, at 81 snowbed sites, nested in four mountain slope sections (19-20 snowbeds per section). Each of the intensive localities has two mountain slope sections. Vestre Jakobselv has two additional sites from other sections. These were added to match the pellet count design with the design of small rodent enclosure study (partly for logistic reasons and partly to extend the altitudinal transect).

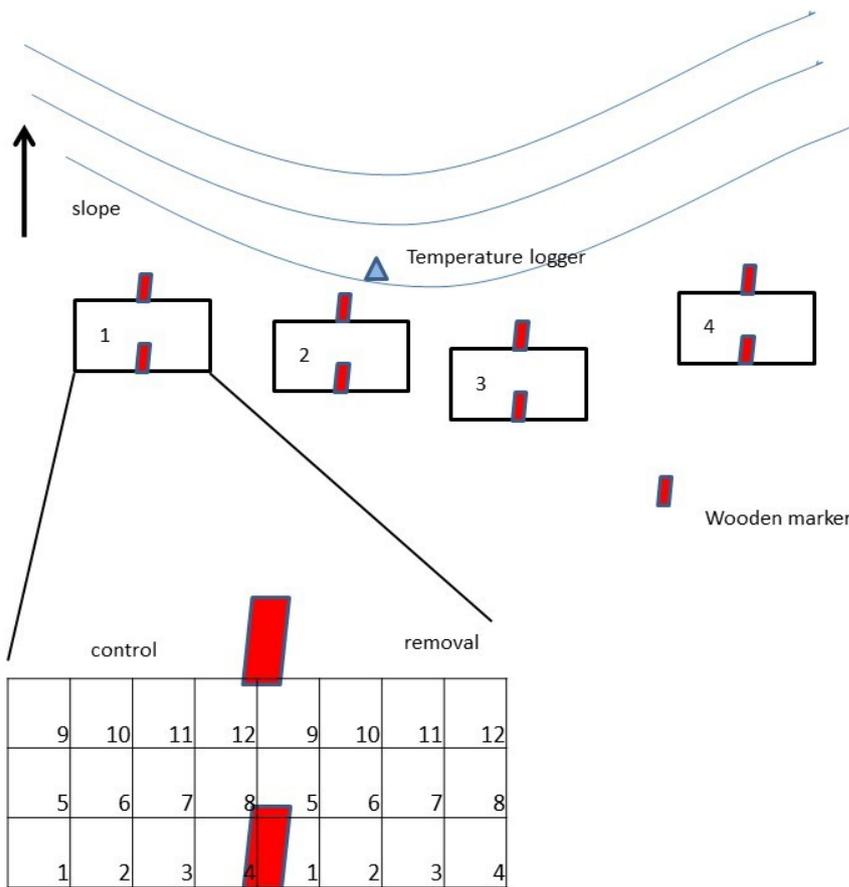
The complete list of siteIDs included in the current data collection is:

locality	section	site_id
Komagdalen (ko)	Kjøltindan (kj)	ko_kj_sn_1, ko_kj_sn_2... up to ko_kj_sn_19
	Ruossachokka (ru)	Ko_ru_sn_1, ko_ru_sn_2... up to ko_ru_sn_20
Vestre Jakobselv (vj)	Torvhaugdalen (to)	vj_to_sn_2, vj_to_sn_3, vj_to_sn_4, vj_to_sn_5, vj_to_sn_6, vj_to_sn_8, vj_to_sn_9, vj_to_sn_12, vj_to_sn_13, vj_to_sn_14, vj_to_sn_15, vj_to_sn_16, vj_to_sn_19, vj_to_sn_20, vj_to_sn_21, vj_to_sn_22, vj_to_sn_24, vj_to_sn_25, vj_to_sn_26, vj_to_sn_27
	Bearaveaijohka (be)	vj_be_sn_1, vj_be_sn_2, vj_be_sn_3, vj_be_sn_4, vj_be_sn_5, vj_be_sn_6, vj_be_sn_7, vj_be_sn_8, vj_be_sn_11, vj_be_sn_12, vj_be_sn_13, vj_be_sn_14, vj_be_sn_15, vj_be_sn_17, vj_be_sn_19, vj_be_sn_20, vj_be_sn_21, vj_be_sn_22, vj_be_sn_24, vj_be_sn_25
	Tranemyra (tr)	vj_tr_sn_2
	Gåsevannan (ga)	vj_ga_sn_2

These sites are in the GPS-files “snowbeds lemming transect 2019.gpx” and “small mammal cameras 2019.gpx”. These sites are in the GPS-file “snowbeds lemming transect 2019.gpx”. The file is stored in the COAT Box folder “Fieldwork/Varanger GPS files for fieldwork”.

Each site has 4 plots (see Figure). The plots are numbered as 1 to 4 from left to right when facing the slope. Numbers are written on the wooden poles (some have laminated plastic notes). In each plot, the part to the left of the wooden poles is a control plot (Control plot = C) and the part to the right is a removal plot (Removal plot=R). The removal plot is aimed for monitoring herbivore presence, and the control plot for monitoring of vegetation. The plots are placed at minimum 5m distance from each other, to ensure that observations of vegetation are independent (i.e. the same plants are not present in several plot pairs).

As melt water can disturb both lemming faeces and vegetation remnants, the plots were placed with the criteria to avoid depressions and places with clear signs of running water as well as steep places.



Setup of the pellet count plots and dwarf shrub recording plots within the snow bed design.

Temporal study design

The counts are conducted once per year, soon after snowmelt (during 8.-11.7.). Pellet counts are done simultaneously with the recording of dwarf shrub presence in the same snow beds.

Procedure

Pellet counts are done in the removal plots, i.e. the right side of the plot when facing uphill. Number of pellets of different herbivores are counted per subplot. Dead vegetation and all faeces are removed from the removal plot. The sampling frame should be placed perpendicularly to the slope. The control plot is aimed for vegetation monitoring.

When the numbers on the wooden poles start to fade, they should be re-marked. When the wooden poles are removed/poorly attached, they should be re-entered properly or replaced.

Equipment needed

- Metal sampling frame (50*37.5 cm, divided into 12 sub-plots with thread)
- Notebook, pencil
- Permanent marker (for re-writing plot number on the poles)
- A couple of new wooden poles (to replace the broken ones)

Information recorded in the field

Data is recorded using field sheets that combine observations of dwarf shrubs and pellet counts in snowbeds. The field sheet is called "fieldsheet_snowbed_plant_pellet_COAT_2021.xlsx", and stored in the COAT Box folder "Protocol/Data typing templates".

For each snow bed, record: sampling date, observer. NB if some plots are below snow and you return to do them later, record date separately for each plot.

For each subplot within the removal plot, record:

- The number of lemming faecal pellets. Actual pellet numbers are noted from 0 to 20 and numbers in excess of 20 are noted as >20. Note if you think the pellets are old.
- Actual number of pellets for other herbivore species than lemmings (ptarmigans, reindeer and hare). For reindeer, we may find clumps of faeces that are fairly difficult to transform to individual pellets. In that case **clumps** are assumed to contain approximately 20 pellets; clumps and pellets and summed up and registered as a total sum of pellets.

Data processing

All field observers are in charge of typing their data into digital format (unless otherwise agreed with the data set responsible). Data is typed using a template called "Template snowbed pellet counts_version 2019.xlsx", stored in the COAT Box folder "Protocol/Data typing templates".

The template file is accompanied with instructions (an additional sheet of the template excel file). This includes information on how to record specific types of observations in the template. Follow the datasheet exactly; use exactly the same column names, large/small letters, for factorial values do not add new categories etc.

After completing a data file in excel, it should be saved as txt-file. Thereafter (unless otherwise agreed), data files are sent to dataset responsible (Eeva Soininen) who will quality-check them and store them in COAT data portal.

Training requirements and specialized skills

Field workers must be able to reliably identify the relevant herbivore species feces. See appendix. New field observers must work in teams with more experienced observers until this skill has been acquired.

Appendix: herbivore feces



Reindeer



Reindeer clump



Ptarmigan



Lemming/ Vole



Moose



Hare