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Camera trapping of small mammals

Motivation

Small rodents are key herbivores in tundra food webs. Climate change impact is expected to be especially pronounced on lemmings, as they are the most arctic species of the rodent community present at COAT Varanger study region. Specialist predators are expected to modify small rodent population dynamics.

State variables: Camera trapping data is used to calculate state variables on lemmings (V33, “Norwegian lemming abundance and demographic structure per season (winter/spring/fall) and habitat”), voles (V32, “Grey-sided vole and tundra vole abundance and demographic structure per season (spring/fall) and habitat (heath/riparian meadow)”), and rodent specialist predators (V37, “Stoat and least weasel abundance indices per rodent habitat and season”).

Reference(s) to method: Soininen et al. 2015 give the first description of the camera trap.

Spatial study design

The camera trapping of small mammals is conducted within the intensive design of Varanger. Two locations (Komagdalen and Vestre Jakobselv) are included, with two sets of camera trapping sites in each. Each site has one camera trap.

Design targeting lemmings: At both locations, cameras are placed on 4-5 “lemming block” sections with 12 sites per section. The sites are distributed between snowbed habitat (presumed optimal lemming winter habitat) and hummock-mire habitat (presumed optimal lemming summer habitat). The complete list of site IDs included in the current data collection is in the Appendix and coordinates are included in the GPS-file “small_mammal_cameras_2021.gpx”, stored in the COAT Box folder Fieldwork/Varanger GPS files for fieldwork.

Design targeting voles: At both locations, cameras are placed on 2-3 river valley sections, including meadow sites (targeting tundra voles) and heath sites (targeting grey-sided voles). Each river valley section has 4-5 sites in meadow habitat, 4-5 sites in heath habitat near to productive areas (river valleys) and 4-5 sites in heat habitat far from productive areas. The complete list of site IDs included in the current data collection in 2021 is in the Appendix, and coordinates are included in the GPS-file “intensive sites meadow heath Varanger 2020.gpx”, stored in the COAT Box folder Fieldwork/Varanger GPS files for fieldwork.

The exact location of each trap is chosen to minimize the chance of the cameras to be flooded at same time that it is placed adjacent to small-scale structures (hummocks or stone piles) that are likely to be used by rodents for cover. The camera box is carefully “stoned” to (1) avoid compression by a thick/heavy snow layer by means “fundament stones” along the sides of the box that can support flat “lid stones” on the top of the box, and (2) hinder infiltration of drifting snow by means of a system of “labyrinth stones” in front of the two entrances of the box. Lid stones are sat so that their weight lies on the fundament stones, not on the box itself.

Temporal study design

The camera traps are visited annually, usually in early July. The traps function year-round, except in the meadow habitat. Here, cameras are placed out in early July, and collected in early September. This is done to avoid camera drowning during the spring flood.

Procedure

During the July visit, silica sheets, silicon fat sealing, batteries and memory cards of all camera traps are changed. It is not recommended to do this work in very wet weather (rain) as the electronics of the cameras are very sensitive to moisture. In case of accidental rain showers, the operations with cameras can be done under a "jervenduk" with the aid of a headlamp.

Camera box action: Carefully remove "lid stones" so that the lid of the box can be opened to get access to the camera. Make certain that "labyrinth stones" placed in front of the two entrances of the box are not distorted by this operation. In addition, check that the stone labyrinths have not been distorted by other means (wind, frost or animals) so they still allow for small mammal passages through the box, but is also still a labyrinth that obstructs drifting snow to directly enter the box. After checking the camera, set the stones back.

Camera action: Open the camera, while the camera is still fastened to the lid of the box. Push the "OK" button to check whether the camera is normally functional; meaning, that it has power left (normally 99%), has taken at least ~650 pictures (time laps photos) and is dry inside. Turn off the camera, remove batteries and memory card.

Insert the memory card in the field computer/pad, and check that the camera is normally functional: i) it has taken photos until you turned it off, ii) it has not taken enormous amount of empty photos (e.g. hundreds of photos per day), iii) the flash is working, iv) the photos seem to correspond to the settings described below, v) photos are focused, vi) the box has not been filled with snow during winter, vii) nothing else seems to be wrong. Download the photos from the memory card to the folder which name corresponds to the trap locality. Write the trap number and year on a paper note and store this together with the memory card in a ziplock bag. Do NOT delete the images from the SD card.

If the camera is not normally functional: then replace it with a new camera and bring the non-functional camera back from field. If you see from the pictures that the camera has been filled with snow during winter, improve the stoning to avoid the same next year.

For functional cameras, insert new batteries, a new memory card in the camera, and a new silica sheet placed over the batteries. Wipe away old silicon fat from cover the gasket with a paper wipers and put on new silicon fat. Make sure that the fat doesn't smear the fronts of the lens, flash and IR sensor. Turn the camera on, check that the power is 99% and press camera armed: OK.

Equipment needed

Empty memory cards, Lithium-batteries (12 per camera), plastic bags for used batteries, something to note camera trap number on memory cards (pen/pencil, zip lock/paper bags), silica sheets to put inside the cameras (1 per camera), wrench or other tool to screw off the camera if needed, extra screws, silicon grease, paper wipers, extra cameras, "jervenduk", headlamp, notebook and a field computer with a fully charged battery.

NB the memory cards should be pre-programmed in Tromsø using the Reconyx software "Hyperfire 2 Pro settings". They are programmed to match the settings of the "model 2020" cameras. Older cameras are programmed manually, but pre-programmed memory cards can also be used in them.

Information recorded in the field

For each camera trap: date and time when you visited the camera [i.e. exchanged batteries and memory cards for each trap], what was the % remaining power and number of pictures taken. If you change the camera, note down the serial number of both the camera you bring back from the field and the newly installed camera. Also note if you improved the stone structures or did other changes, and any other possible comments.

For cameras that are replaced (and hence brought back to the lab), write what is the problem (e.g. empty battery, water inside) also on the back of the camera with a permanent marker pen. Note the serial number of the camera in your notebook and state the problem here as well.

Data processing

The field observers should fill in metadata using the template "Small mammal camera trap metadata field template 2021.xlsx" (stored in COAT Box folder Protocol/Data typing templates).

The template file is accompanied with instructions (an additional sheet of the template excel file). This included additional 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 metadata file in excel (one datafile per year and locality), 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.

When back in Tromsø the field computers, SD cards, and all other material must be handed over to either Eeva Soininen or Eivind Flittie Kleiven.

Training requirements and specialized skills

No special skills are needed.

References

Soininen, E. M., Jensvoll, I., Killengreen, S. T., & Ims, R. A. (2015). Under the snow: a new camera trap opens the white box of subnivean ecology. *Remote Sensing in Ecology and Conservation*, 1(1), 29-38.

Appendix 1 – sites for camera traps

Sites for camera traps in the lemming blocks.

Locality	Section	Site ID snowbed (sn)	Site ID Hummock tundra (hu)
Komagdalen (ko)	Kjøltindan (kj)	ko_kj_sn_19 ko_kj_sn_21 ko_kj_sn_22 ko_kj_sn_23 ko_kj_sn_24 ko_kj_sn_25	ko_kj_hu_1b ko_kj_hu_2b ko_kj_hu_3b ko_kj_hu_4b ko_kj_hu_5 ko_kj_hu_6
Komagdalen (ko)	Gargas (ga)	ko_ga_sn_1b ko_ga_sn_2b ko_ga_sn_3 ko_ga_sn_4b ko_ga_sn_5 ko_ga_sn_6	ko_ga_hu_1b ko_ga_hu_2 ko_ga_hu_3 ko_ga_hu_4b ko_ga_hu_5 ko_ga_hu_6
Komagdalen (ko)	Hubejohka (hu)	ko_hu_sn_1 ko_hu_sn_2 ko_hu_sn_3 ko_hu_sn_4 ko_hu_sn_5 ko_hu_sn_6	ko_hu_hu_1 ko_hu_hu_2b ko_hu_hu_3b ko_hu_hu_4 ko_hu_hu_5 ko_hu_hu_6
Komagdalen (ko)	Ryggfjellet (ry)	ko_ry_sn_1 ko_ry_sn_2 ko_ry_sn_3 ko_ry_sn_4 ko_ry_sn_5 ko_ry_sn_6b	ko_ry_hu_1b ko_ry_hu_2 ko_ry_hu_3 ko_ry_hu_4 ko_ry_hu_5 ko_ry_hu_6
Komagdalen (ko)	Røyskattfjellet (ro)	ko_ro_sn_1 ko_ro_sn_2 ko_ro_sn_3 ko_ro_sn_4 ko_ro_sn_5 ko_ro_sn_6	ko_ro_hu_1 ko_ro_hu_2 ko_ro_hu_3 ko_ro_hu_4 ko_ro_hu_5 ko_ro_hu_6
Vestre Jakobselv (vj)	Reinhaugen (re)	vj_re_sn_1 vj_re_sn_2 vj_re_sn_3 vj_re_sn_4 vj_re_sn_5 vj_re_sn_6	vj_re_hu_1 vj_re_hu_2 vj_re_hu_3 vj_re_hu_4 vj_re_hu_5 vj_re_hu_6
Vestre Jakobselv (vj)	Gåsevannan (ga)	vj_ga_sn_1 vj_ga_sn_2 vj_ga_sn_3 vj_ga_sn_4 vj_ga_sn_5 vj_ga_sn_6	vj_ga_hu_1 vj_ga_hu_2 vj_ga_hu_3 vj_ga_hu_4 vj_ga_hu_5 vj_ga_hu_6

Vestre Jakobselv (vj)	Skoarrajojka (sk)	vj_sk_sn_1 vj_sk_sn_2 vj_sk_sn_3 vj_sk_sn_4 vj_sk_sn_5 vj_sk_sn_6	vj_sk_hu_1 vj_sk_hu_2 vj_sk_hu_3 vj_sk_hu_4 vj_sk_hu_5 vj_sk_hu_6
Vestre Jakobselv (vj)	Tranemyra (tr)	vj_tr_sn_1 vj_tr_sn_2 vj_tr_sn_3 vj_tr_sn_4 vj_tr_sn_5 vj_tr_sn_6	vj_tr_hu_1 vj_tr_hu_2 vj_tr_hu_3 vj_tr_hu_4 vj_tr_hu_5 vj_tr_hu_6

Sites for camera traps in the river valley sections.

Locality	Section	Site ID meadow (m)	Site ID heath_near (hn)	Site ID heath_far (hf)
Komagdalen (ko)	komagdalen_ovre (ko)	ko_ko_m_a ko_ko_m_b ko_ko_m_c ko_ko_m_d ko_ko_m_e	ko_ko_hf_a ko_ko_hf_b2 ko_ko_hf_c ko_ko_hf_d2 ko_ko_hf_e	ko_ko_hf_a ko_ko_hf_b ko_ko_hf_c ko_ko_hf_d ko_ko_hf_e
Komagdalen (ko)	Komagdalen_midtre (km)	ko_km_m_a ko_km_m_b ko_km_m_c ko_km_m_d ko_km_m_e	ko_km_hf_a ko_km_hf_b ko_km_hf_c ko_km_hf_d ko_km_hf_e	ko_km_hf_a ko_km_hf_b ko_km_hf_c ko_km_hf_d ko_km_hf_e
Komagdalen (ko)	Sandfjorddalen (sa)	ko_sa_m_b ko_sa_m_c ko_sa_m_d ko_sa_m_e ko_sa_m_f	ko_sa_hf_b ko_sa_hf_c2 ko_sa_hf_d ko_sa_hf_e ko_sa_hf_f	ko_sa_hf_b ko_sa_hf_c ko_sa_hf_d ko_sa_hf_e ko_sa_hf_f
Vestre Jakobselv (vj)	Torvhaugdalen (to)	vj_to_m_a vj_to_m_b vj_to_m_c vj_to_m_d	vj_to_hf_a2 vj_to_hf_b2 vj_to_hf_c vj_to_hf_d	vj_to_hf_a vj_to_hf_b vj_to_hf_c vj_to_hf_d
Vestre Jakobselv (vj)	Bearaveaijohka (be)	vj_be_m_a vj_be_m_b vj_be_m_c vj_be_m_d vj_be_m_e	vj_be_hf_a vj_be_hf_b vj_be_hf_c2 vj_be_hf_d2 vj_be_hf_e2	vj_be_hf_a vj_be_hf_b vj_be_hf_c vj_be_hf_d vj_be_hf_e

Appendix 2 – Settings for small mammal cameras

Settings for HyperFire SM750 (“model 2015”):

Trigger: Motion sensor ON
Sensitivity: High
Pictures per trigger: 2
Picture Interval: Rapidfire
Quiet period: 1 minute
Quick set advanced: Time lapse:
AM time period: ON, start AM 01, end AM 02
PM time period: ON, start PM 01, end PM 02
Picture interval: 1 hour
Resolution: 720 P
Correct date and hour Temperature Celsius

Settings for HyperFire 2 (“model 2020”):

Motion

Motion pictures: on
External trigger pictures: off
Number of pictures: 2
Picture interval: rapid fire
Motion videos: off
External trigger videos: off
Quiet period: 1m
Sensitivity: very high
Motion schedule: 24h (i.e. use default and do not define periods)

Time lapse

Time lapse pictures: on
Number of pictures: 1
Time between pictures: cannot be edited as we only use 1 picture
Time lapse videos: off
Time lapse interval: 1 hour
Schedule; add fixed; add same two periods as for older model (AM 01 to AM 02 and PM 01 to 02)

Day/night

Take pictures: both day and night
Take videos: both day and night
Flash output: high
Minimum shutter speed: 1/480th
Maximum ISO: 3200

Display

Add no label
Time format: 24 hour
Temperature units: Celsius
Show logo: yes

Other

Use code loc: no
Resolution: 4:3 standard
Loop recording: off
Record audio: off
PIR type: High frequency
Delay start: off