

Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- | | | |
|-------------------------------------|-------------------------------------|--|
| ☐ | ☒ | The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement |
| ☐ | ☒ | A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly |
| ☐ | ☒ | The statistical test(s) used AND whether they are one- or two-sided
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☐ | ☒ | A description of all covariates tested |
| ☐ | ☒ | A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons |
| ☐ | ☒ | A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals) |
| ☐ | ☒ | For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings |
| ☐ | ☒ | For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes |
| ☐ | ☒ | Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated |

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection No software was used.

Data analysis We used the open source statistical software R and the packages "survival" and "AICcmodavg" to implement the cox proportional hazards models and model selection described in detail in the Methods section. Code for the implementation of these analyses are available from the Dryad Digital Repository and the corresponding author upon request.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

Data available from the Dryad Digital Repository <https://doi.org/10.5061/dryad.bzkh1896b> (Peers et al., 2020).

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Analysis examining how changes in environmental conditions (snow depth, snow hardness, temperature, daily snowfall, days since snowfall) influence the behaviour and cause-specific mortality of snowshoe hares. This study was conducted to examine whether changes in weather conditions associated with climate change may impact population cycles of hares and influence the predator-prey community of the boreal forest.
Research sample	Between January 2015 and May 2018, we captured hares in Tomahawk live-traps (Tomahawk Live Trap Co. Tomahawk, WI, USA) on three different trapping areas within an ~ 8 km stretch of forest. Only hares weighing over 1100g were used in this study which represents weight restrictions approved by the University of Alberta Animal Care and Use Committee (Protocol: AUP00001973). Survival: 321 snowshoe hares over 4 winters, which includes 153 predator-caused mortalities. 106 mortalities were identified to a specific predator, including 65 mortalities from lynx and 27 from coyote for cause-specific analyses. For age-specific analyses, this sample size was reduced to 236 individuals and 116 mortalities. Behaviour: 137 individuals were equipped with accelerometers for a total of 4530 hare-days.
Sampling strategy	We continuously deployed VHF collars and accelerometers on hares between December-March to ensure we had an adequate sample of hares to examine how the environment correlates with survival and behaviour. Adult and sub-adult hares as well as males and females were used in our study. The temporal span of the study was large in order to capture variation in environmental conditions, and extend across the increase, peak, and decline of the snowshoe hare cycle. Locations of daily snow measurements were kept consistent throughout the four years of the study and a minimum of three sample sites at each trapping area were measured. Long-term monitoring of snow depth in our study region has been conducted since 2001, along a 25 km transect. Snow depth measurements were recorded throughout the winter (Nov-March) at consistent locations every 5 km, less than 72 hours following snowfall events.
Data collection	VHF collars and accelerometers were deployed on hares by MJLP, YNM, AKM, EKS, or research technicians, and these individuals monitored survival and daily snow conditions over the study. Survival was checked near daily over this time. Snowfall was monitored daily at each study area between December-March, and snow depth and hardness were measured on greater than 60% of days. A minimum of two lbuttons recorded temperature 6 times per day between December-March.
Timing and spatial scale	Survival and accelerometer data used in this paper occurred between February 2015 and March 2018. This temporal scale ensured we captured variation in snow conditions and temperature. Hares were monitored from three trapping areas within an ~ 8 km stretch of forest. These study areas were chosen as they were established locations for monitoring snowshoe hares as part of the Community Ecological Monitoring Project (CEMP), a long-term project ongoing in the region (https://www.zoology.ubc.ca/~krebs/kluane.html).
Data exclusions	There were no exclusions of data in this study.
Reproducibility	The information provided above, details provided in the manuscript, and data available in a public repository gives sufficient information to repeat this study. However, aspects not controlled by the methodology such as natural temporal variation in environmental covariates cannot be repeated.
Randomization	Snowshoe hares to be collared were selected based on weight restrictions established by the University of Alberta Animal Care and Use Committee (Protocol: AUP00001973), as well as available equipment at the time of capture.
Blinding	Blinding participants was not relevant to this study.
Did the study involve field work?	☒ Yes ☐ No

Field work, collection and transport

Field conditions	All field conditions relevant to this study are included in the study design and analyses and are described in detail in the manuscript.
Location	This study was conducted in southwestern Yukon, Canada (Lat: 60.9 N, Long: -138.0 W) in the Kluane Lake region which is comprised primarily of white spruce (<i>Picea glauca</i>).

Access & import/export

Working with wildlife in our study region requires a Yukon Scientists and Explorers Permit and a Wildlife Research Permit from the Yukon Government. We had the appropriate permits that were renewed each year of our study.

Disturbance

There was no perceivable disturbance caused by the study, apart from animal handling which was approved by the University of Alberta Animal Care and Use Committee (Protocol: AUP00001973).

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☐	☒ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Animals and other organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research

Laboratory animals

The study did not involve laboratory animals.

Wild animals

We captured hares in Tomahawk live-traps (Tomahawk Live Trap Co. Tomahawk, WI, USA) baited with alfalfa, rabbit pellets, and apple slices. After measurements were taken, and select animals were collared, the individual was released at the location it was trapped.

Field-collected samples

This study did not include laboratory work on field collected samples.

Ethics oversight

Ethical approval occurred through the University of Alberta Animal Care and Use Committee (Protocol: AUP00001973).

Note that full information on the approval of the study protocol must also be provided in the manuscript.