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Reporting Summary

Nature Portfolio 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 Portfolio 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 *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☐	☒	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 *Give P values as exact values whenever suitable.*
☐	☒	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 to collect data.
Data analysis	We used a variety of programs – specifics including version number are included in the manuscript

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 Portfolio 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 description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our policy

Provide your data availability statement here.

Research involving human participants, their data, or biological material

Policy information about studies with human participants or human data. See also policy information about sex, gender (identity/presentation), and sexual orientation and race, ethnicity and racism.

Reporting on sex and gender	*Use the terms sex (biological attribute) and gender (shaped by social and cultural circumstances) carefully in order to avoid confusing both terms. Indicate if findings apply to only one sex or gender; describe whether sex and gender were considered in study design; whether sex and/or gender was determined based on self-reporting or assigned and methods used. Provide in the source data disaggregated sex and gender data, where this information has been collected, and if consent has been obtained for sharing of individual-level data; provide overall numbers in this Reporting Summary. Please state if this information has not been collected. Report sex- and gender-based analyses where performed, justify reasons for lack of sex- and gender-based analysis.*
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Population characteristics	*Describe the covariate-relevant population characteristics of the human research participants (e.g. age, genotypic information, past and current diagnosis and treatment categories). If you filled out the behavioural & social sciences study design questions and have nothing to add here, write "See above."*
Recruitment	*Describe how participants were recruited. Outline any potential self-selection bias or other biases that may be present and how these are likely to impact results.*
Ethics oversight	*Identify the organization(s) that approved the study protocol.*

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

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

Ecological, evolutionary & environmental sciences study design

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

Study description	Study in the wild with field experiments by presentation of mimics of carnivores (bears) with control of herbivore (caribou); different study areas (Asian and Alaskan Arctic), with replication and statistical models based on Bayesian approaches. Challenging field work during Arctic winters,
Research sample	Total number of playback experimental exposures = 127; details of presentation captured in Tables in Methods
Sampling strategy	Field studies during Arctic winters were reliant on ambient conditions and opportunistic - especially because of unreliable over-snow machines in Russia and constraints due to Russian military); access better in Alaska but still challenging
Data collection	All 'experimental approaches' (EA) to muskoxen groups commenced at ~800+ m except when impeded by hills or valleys (<7% of N=127 approaches). All approaches were meandering to imitate the typical foraging of bears (or caribou), and downwind to avoid olfactory detection. To avoid the possibility of pseudo-replication, we never repeated EA to the same group within a season, which necessitated on average about 1500 kms of over-snow travel/year in Alaska and about half that in Chukotka, Russia. Given the above winter conditions, we reasoned a datum per day was a reasonable target because a next group could be miles away, and opportunities to warm by a fire or in a cabin were unavailable or extremely limited.
Timing and spatial scale	Our data were gathered across five years and study areas were in the eastern Russian Arctic (Wrangel Island, a UN Biosphere Reserve) and US National Park Service and BLM lands including on Bering Land Bridge and areas north several hundred kilometers.
Data exclusions	The maximum number of consecutive days of searching without success for animals was four. Data acquisition was further constrained by days of whiteout conditions, snowstorms, and dangerous ambient temperatures (below – 30oC without accounting for wind). Such exigent constraints structured how we sequenced our EA to muskoxen.
Reproducibility	The methods we employed here using animal models (mimics -- as shown in Figure 2 of the ms) are commonly used with some variation in mimic construction) but are well established and have been used during last 50+ years when initially pioneered by past

Nobel Laureates Lorenz and Tinbergen. We (Berger) have used some similarity in approach (including papers published in Science and Conservation Biology).

Randomization

Describe how samples/organisms/participants were allocated into groups. If allocation was not random, describe how covariates were controlled. If this is not relevant to your study, explain why.

Blinding

Describe the extent of blinding used during data acquisition and analysis. If blinding was not possible, describe why OR explain why blinding was not relevant to your study.

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions

Miserable - Arctic winter, temperatures to nearly -35 C (F) and with winds to 70 km/h. Playback experiemtns (e. g. presentations of mimics) were during calmer conditions but still challenging.

Location

71.2489° N, 179.9789° W for Wrangel Island (Chukotka RU); in Alaska - Bering Land Bridge - 65.9546282°N, -164.4038657°W ; for Cape Krusenstern - 67.4118786°N, -163.5019887°W

Access & import/export

We commissioned local people for employment and guidance based on either government requirements and with personal choice; this included in Alaska, Alaskan Natives as guides and biotechs, and in Russia from their Scientific Management authorities. Talks and outreach at local scales/sites were given in Russian and English languages, to be assured that citizens at all scales (local, regional, and national) were aware of the on-going work. In Alaskan villages, guidance from local authorities and from local citizens was implemented in study design.

Disturbance

We took great care in the ethical treatment of animals (explained more fully in our Methods section). As we exposed muskoxen groups to visual exposure of both bear (polar and brown) and to non-threatening mimics (caribou) it was immediately clear that group (muskoxen) responses would vary with degree of threat posed by the mimics. This resulted in an unbalanced number of exposures. Despite a goal of a matched number of approaches by the two bear mimics and single caribou model, it was clear from other studies including our own work, that the non-dangerous controls would elicit lesser responses than those perceived as dangerous. Such differential responses – flight or other forms of avoidance – raised an obvious conundrum because the desire for a statistically-balanced sampling scheme can be at odds with the ethical treatment of animals. Nowhere may this be truer than for large Arctic, subarctic, and northern temperate mammals who rely on adequate adipose tissue storage for winter survival. Flight is particularly energetically costly in winter and expenditures in deep snow and exposure to additional cold stress exacerbates caloric loss. Watching muskoxen break through deep snow in flight was not only energetically costly for them, but stressful to us. Hence, we deliberately under-sampled presentations to muskoxen herds by caribou.

Our work adhered to guidelines and regulations of the Institutional Animal Care and Use Committee at Colorado State University (CSU) and is approved under CSU Protocol ID: 15-6330.

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
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

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