# Geese reduce metabolic rate to cope with winter

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Greylag geese in winter. Credit: Dr Claudia Wascher, Anglia Ruskin University

New research shows that geese cope with the harsh winter climate by

reducing their heart rate and body temperature.

The study, led by Dr Claudia Wascher of Anglia Ruskin University and carried out at the University of Vienna's Konrad Lorenz research station in Austria, is published in the journal *Scientific Reports*.

Birds are endothermic meaning they maintain a constant body temperature, typically by increasing their energy expenditure in colder weather. However, this new research indicates that geese exhibit 'winter hypometabolism', which sees them reduce their heart rate and tolerate a lower core body temperature.

The scientists studied 25 birds, part of a flock of approximately 170 wild greylag geese, by fitting small transmitters to measure heart rate and body temperature over an 18-month period. Heart rate can be used as an estimate of an individual's energy expenditure.

In all geese studied there were profound seasonal changes of heart rate and body temperature, with peaks in summer and troughs in winter. Daily mean heart rate was on average 22% lower during December and January than at the summer peak, whereas daily mean body temperature was 1°c lower in the winter trough compared to the summer peak.

Dr Wascher, Senior Lecturer in Animal Behaviour at Anglia Ruskin University, said: "We were interested in how geese regulate their metabolic rate and therefore energy expenditure over the annual cycle, and in particular how they deal with the harsh winter months.

"In order to cope with the challenges of low ambient temperatures and food shortage in winter, it is known that some non-hibernating mammals, such as red deer or Alpine ibex, reduce their energy expenditure in winter and function with lower body temperatures. Our research shows that birds, such as these greylag geese, adopt similar

strategies.

"Although the birds at the Konrad Lorenz research station are fed year round and therefore do not face food shortages, they still showed a substantial decrease in daily mean heart rate and body temperature during winter. The main determining factors of energy expenditure were the number of daylight hours and the ambient temperature.

"Our study helps us to gain an understanding of how individuals regulate their physiology in order to adapt to environmental factors. Strikingly it shows similarities in these mechanisms between mammals and birds, despite their large genetic differences."

**More information:** Claudia A. F. Wascher et al, Free-living greylag geese adjust their heart rates and body core temperatures to season and reproductive context, *Scientific Reports* (2018). DOI: 10.1038/s41598-018-20655-z

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