**Electronic supplementary material**

1-hour averaged traces of operative and air temperature measurements

Graphical user interface

Description automatically generated with medium confidence

**Figure S1.** (a) Average hourly operative (Te) and air (Ta) temperature and (b) differences between hourly recordings of Te and Ta measured from 22 May to 07 September 2019 at Alert, Nunavut Canada. The combined solid black and red/black dashed bar represents the typical breeding period range (30 May to 25 July) while the red/black dashed bar represents the typical peak provisioning period (4 July to 25 July). The horizontal red dashed line in panel (a) represents the 11.7°C operative temperature threshold for birds to maintain thermal balance and sustain an optimal performance ≥ 4x basal metabolic rate. The dashed operative temperature traces represent the predicted operative temperature values from the artificial neural network.

Graphical user interface, application

Description automatically generated

**Figure S2.** (a) Average hourly operative (Te) and air (Ta) temperature values and (b) differences between hourly recordings of Te and Ta measured from 11 June to 19 July 2019 at East Bay, Nunavut Canada. The horizontal red dashed line in panel (a) represents the 11.7°C operative temperature threshold for birds to maintain thermal balance and sustain an optimal performance ≥ 4x basal metabolic rate.