

SUPPLEMENTARY MATERIAL

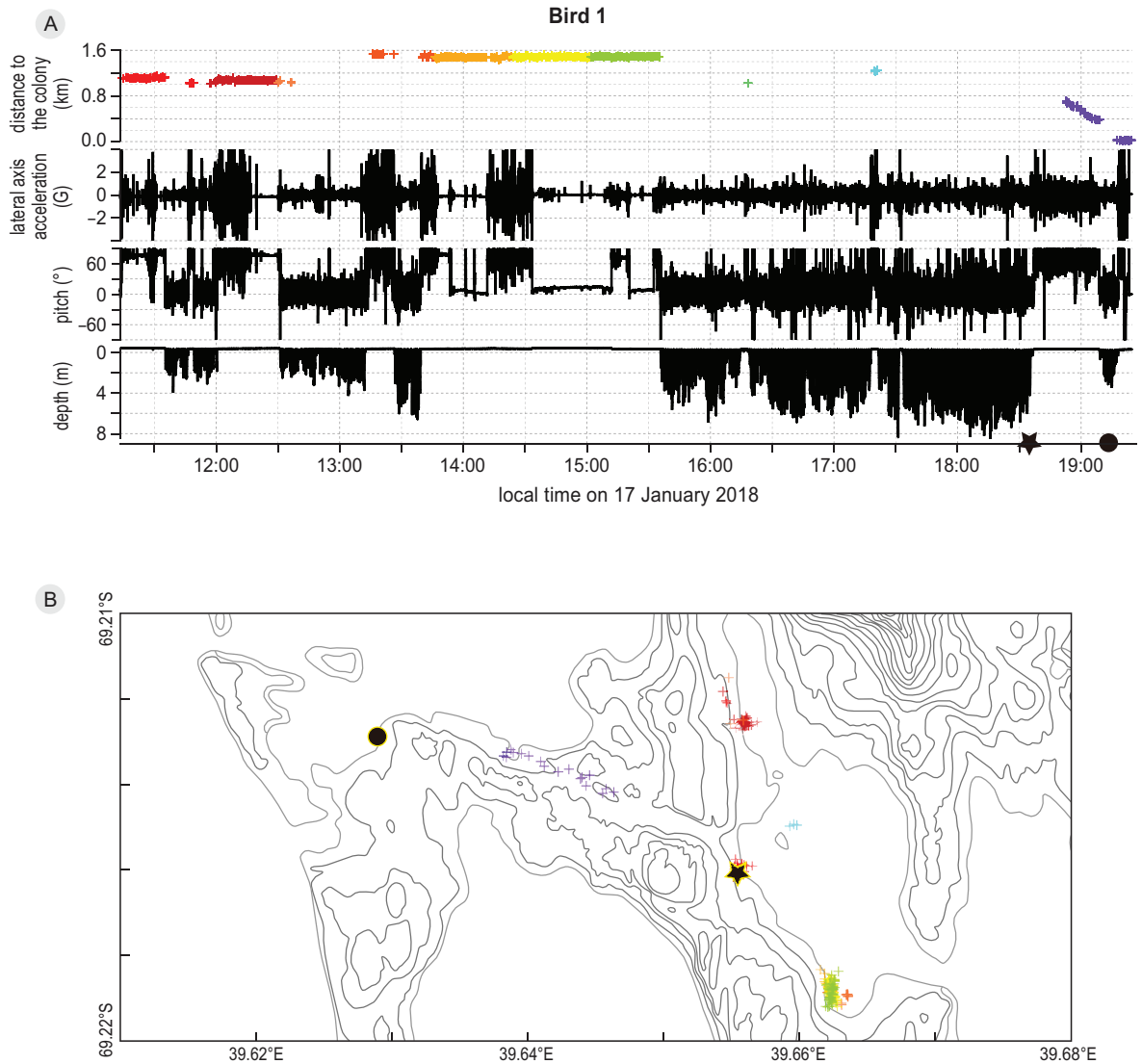


Figure S1. (A) Time series data of distance to the colony, lateral axis acceleration, pitch angle and depth and (B) positions recorded on Bird 2 from the release to arrival at the colony. A star and circle on the time axis indicate the start and end of the homing phase, respectively. Pitch angles (θ) were calculated using the equation $\theta = -\text{asin}(A)$ (Sato *et al.* 2003); A indicates the gravitational component of surge (head-tail) axis acceleration, which was extracted using a low-pass filter with a threshold value of 1.367 Hz. Higher values of pitch angles (>60 degrees) indicate that the penguins were standing on land or ice. Note that distance to the colony in (A) could be calculated only when positional fixes were recorded; it was calculated from the positional fixes with the same colour in (B).

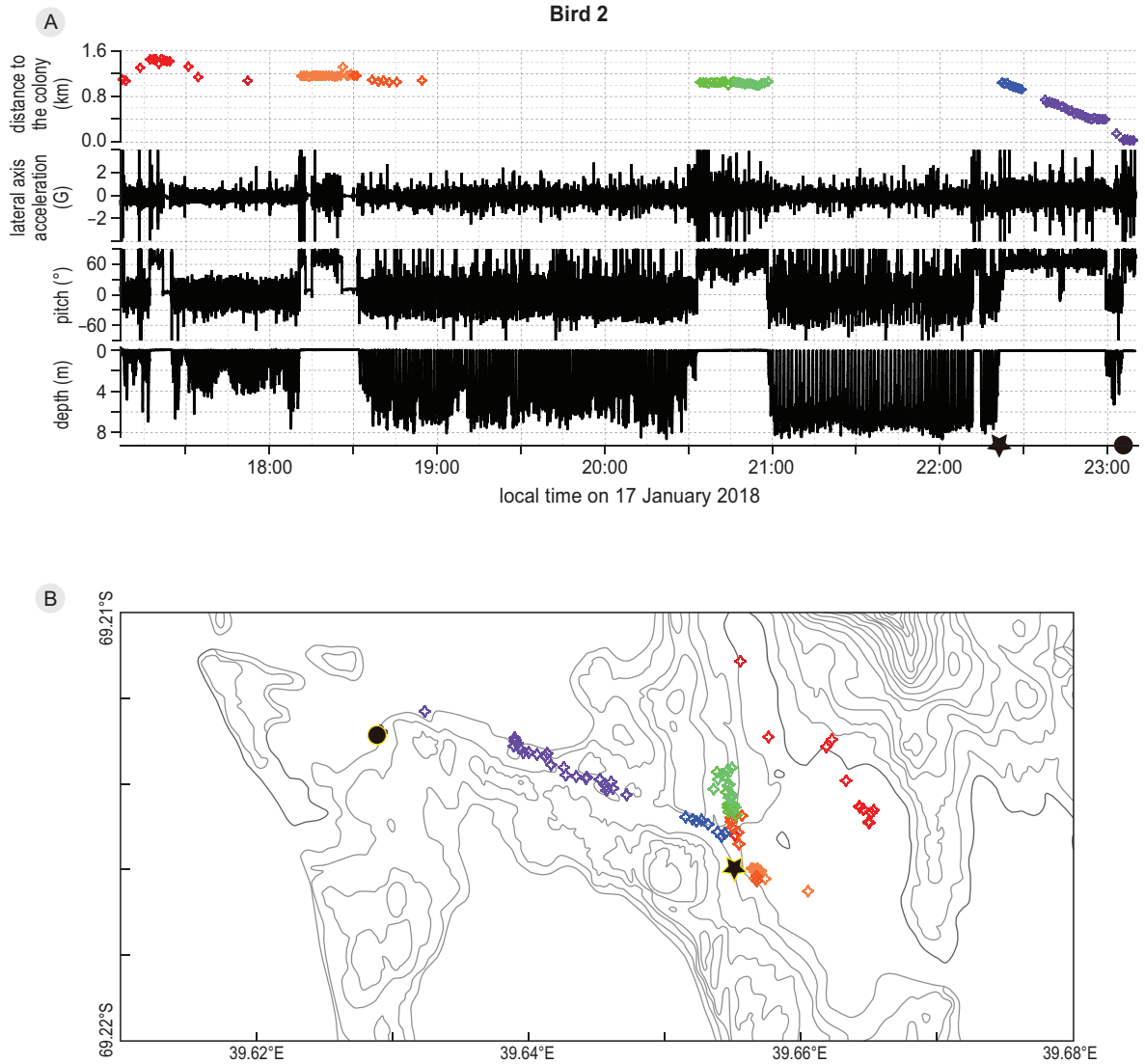


Figure S2. (A) Time-series data of distance to the colony, lateral axis acceleration, pitch angle and depth and (B) positions recorded on Bird 2 from the release to arrival at the colony. A star and circle on the time axis indicate the start and end of the homing phase, respectively (the part enlarged in Figure 2). See the caption of Figure S1 for details.

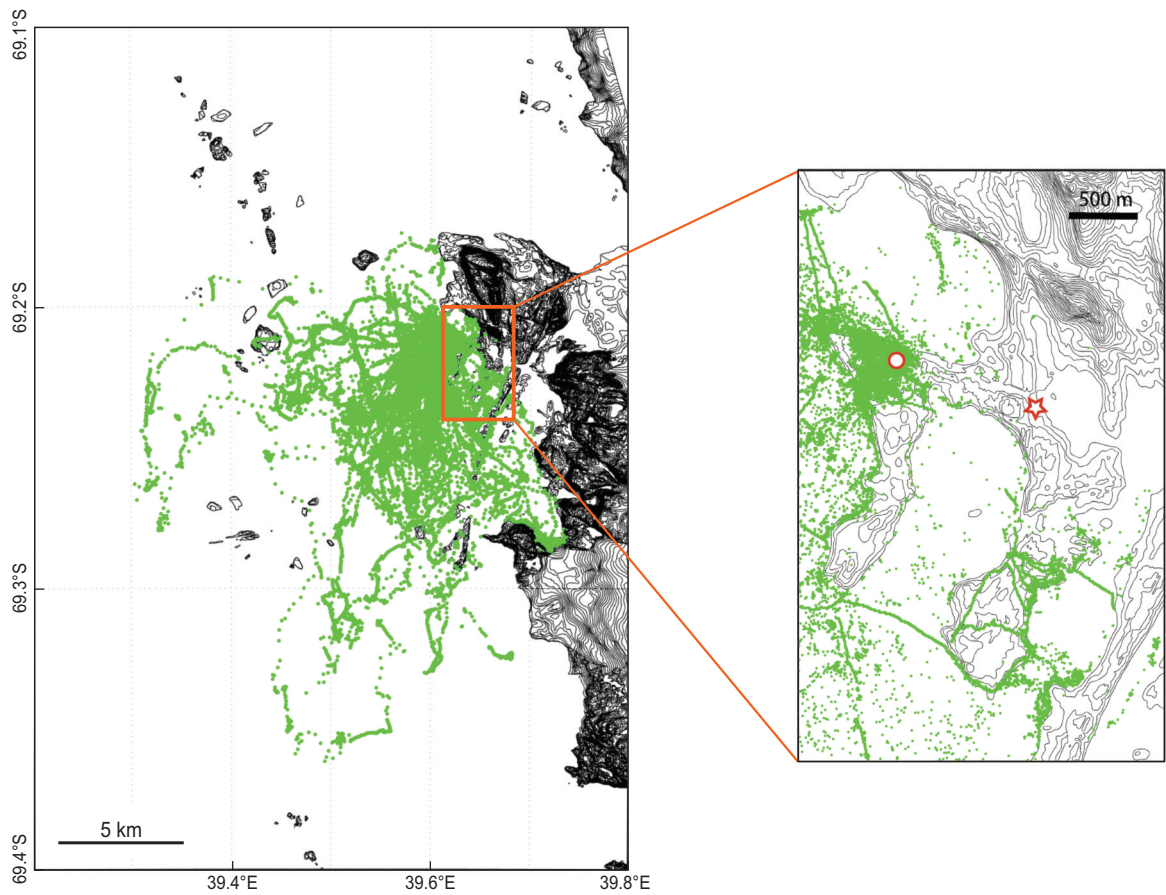


Figure S3. Movement paths of 48 Adélie Penguins during foraging trips recorded between 28 December 2017 and 15 January 2018. The position of the breeding colony and the release point in the displacement experiments are indicated with an open circle and star, respectively.

Reference

- Sato K., Mitani Y., Cameron M.F., Siniff D.B. & Naito Y. 2003. Factors affecting stroking patterns and body angle in diving Weddell seals under natural conditions. *J. Exp. Biol.* 206: 1461–1470.