Vortex wake and flight kinematics of a swift in cruising flight in a wind tunnel

P. Henningsson, G. R. Spedding and A. Hedenström

There were two errors published in *J. Exp. Biol.* **211**, 717-730.

First, in Eqns 11 and 12 (on p. 728), A was inadvertently substituted for $2A$. This was a typographical error introduced during the preparation of the manuscript, and we assure readers that the correct amplitude was used during our calculations. Consequently, this error has no numerical consequence for the results and conclusions of the paper.

Second, also in Eqns 11 and 12, there was a further factor-of-two error that did affect results of the calculations. Unlike the analogous Eqns 6 and 7 for calculating the vertical impulse, each of the five wake sections in the horizontal impulse calculations contributes to 2/5 of the projected wake area and not 1/5 because the wing moves through the tip-to-tip amplitude ($2A$) not once but twice during each wingbeat.

The correct equations are as follows:

$$I_{x,\mathrm{d},j} = \rho 2 b_j \frac{4A}{5}\left(\Gamma_5 + \Gamma_4 + \frac{\Gamma_3}{2}\right), \qquad (11)$$

and

$$I_{x,\mathrm{u},j} = \rho 2 b_j R \frac{4A}{5}\left(\frac{\Gamma_3}{2} + \Gamma_2 + \Gamma_1\right), \qquad (12)$$

The resulting drag calculation was therefore in error by a factor of two and so the drag (D) published in the original article should be doubled, resulting in $D=0.058\,$N. Subsequently, the lift-to-drag ratio (L/D) should be halved, resulting in $L/D=6.6$, and the drag coefficient (C_D) should be doubled, resulting in $C_\mathrm{D}=0.1$, with wing planform area as the reference area. Consequently, the conclusion that the swift, *Apus apus*, has a high effective lift-to-drag ratio in comparison with other birds is no longer supported, although all other conclusions are unaffected.

The authors apologise to readers for this error.