

# Aerodynamics of manoeuvring flight in brown long-eared bats (*Plecotus auritus*)

## Supplementary information S2

Effective wing angle of attack – including the flapping motion of the wing and the oncoming free stream flow to calculate the direction of the air meeting the wing. Flapping motion was calculated based on the leading edge of the wing (points 8 and 9 in figure 1 for the two wings respectively) in both vertical (y) and horizontal (z) direction. Splines were fitted to the y and z coordinates respectively and the derivative of these splines were used to find the instantaneous wing speed. From this wing speed and the free stream flow, the airflow direction relative to the wing was calculated and that, together with the geometric wing angle posture was calculated as the effective angle of attack.

Figures 1-5 correspond to figures in the main article that include angle of attack (geometric, not including wing motion). The corresponding figure in the main article is stated in the figure legends.

The effective angle of attack shows the same general pattern in terms of asymmetries as the geometric angle of attack shown in the main article.

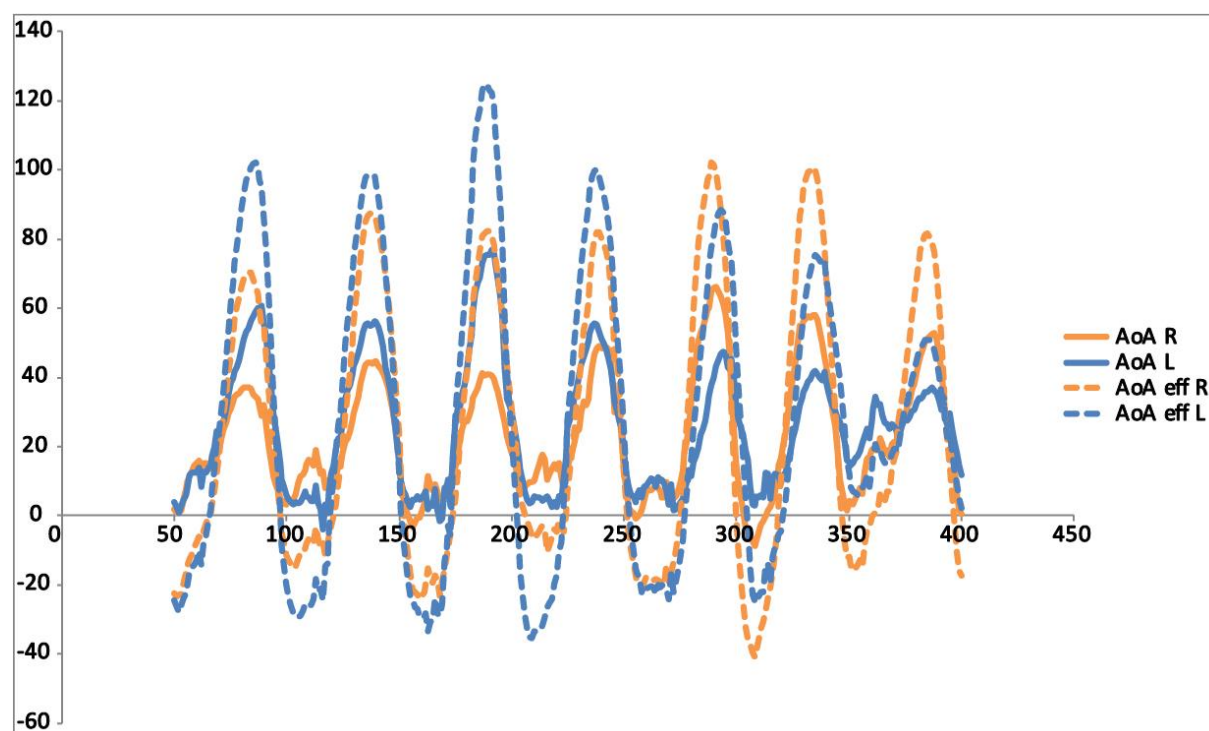


Figure 1. This figure corresponds to Figure 3B in the main article. Solid lines show the geometric angle of attack and dashed lines show the effective angle of attack.

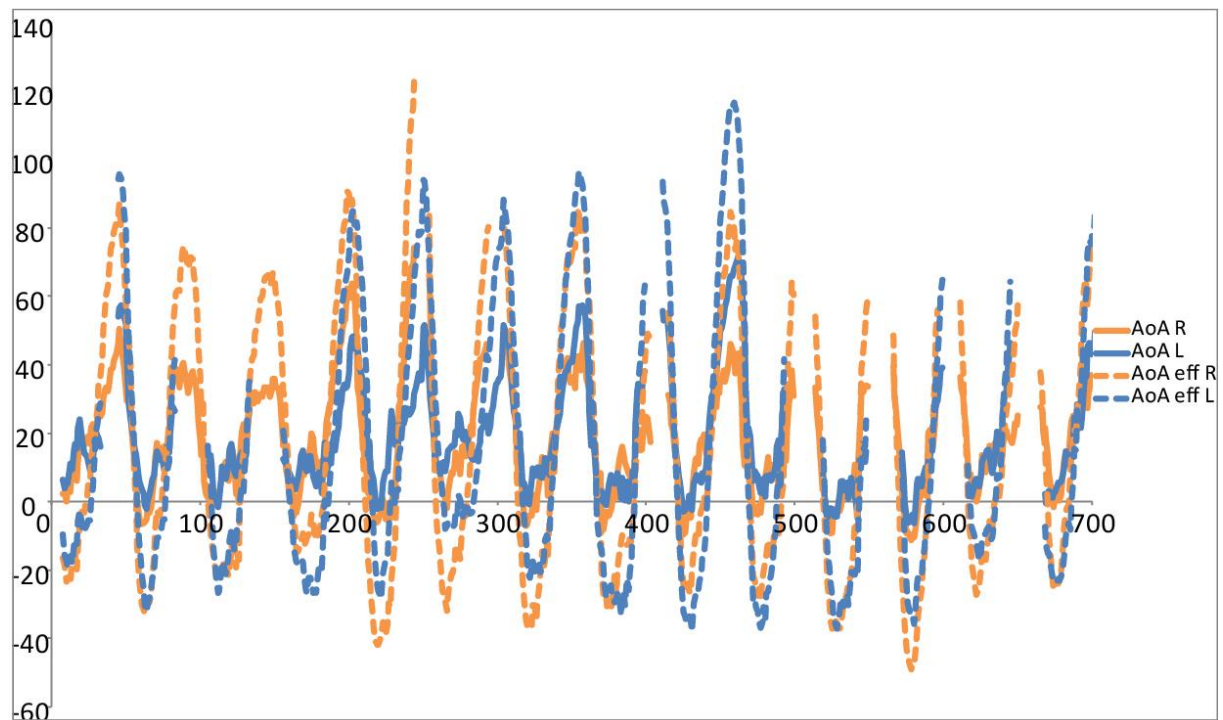


Figure 2. This figure corresponds to Figure 3C and 5B in the main article. Solid lines show the geometric angle of attack and dashed lines show the effective angle of attack.

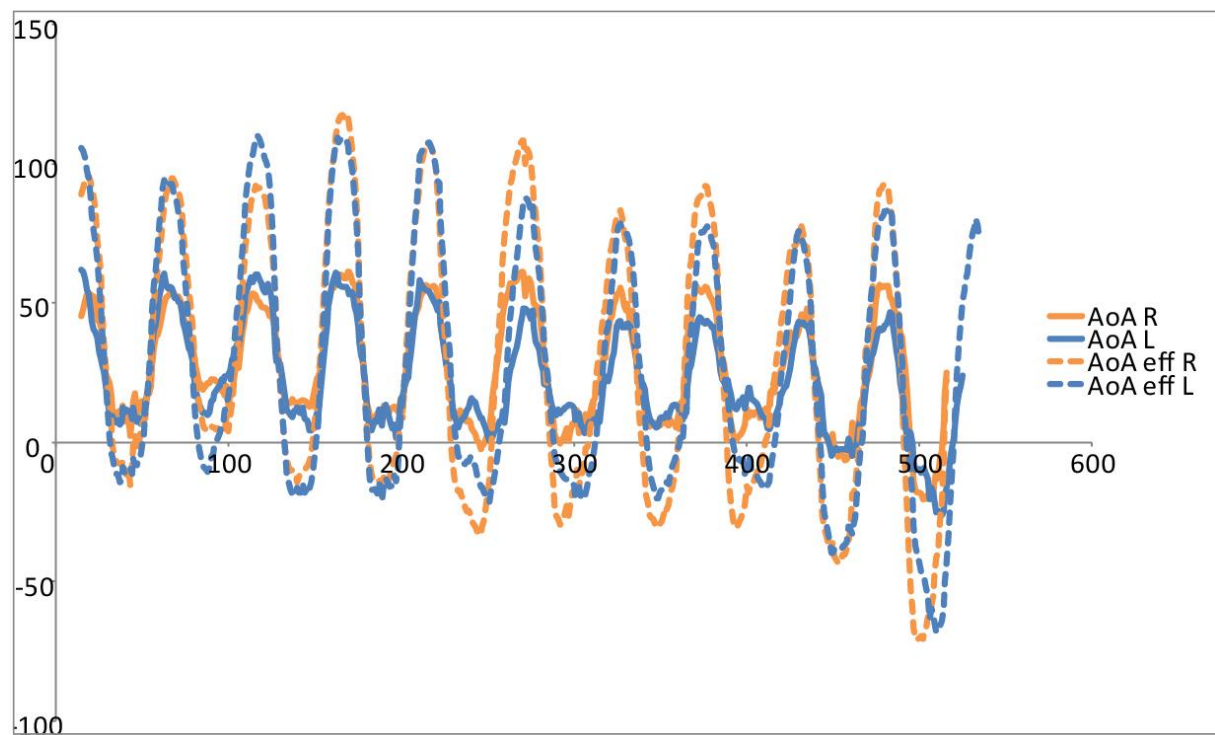


Figure 3. This figure corresponds to Figure 4B in the main article. Solid lines show the geometric angle of attack and dashed lines show the effective angle of attack.

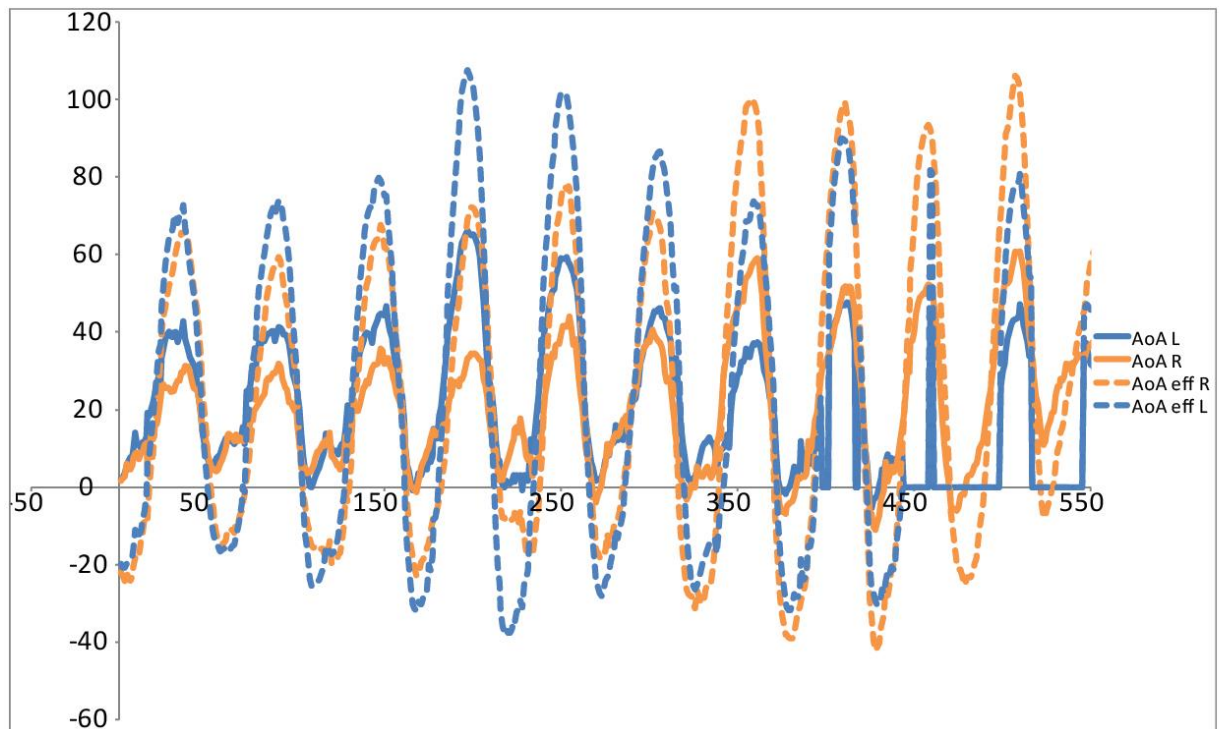


Figure 4. This figure corresponds to Figure 5C in the main article. Solid lines show the geometric angle of attack and dashed lines show the effective angle of attack.