Saturday, 10 December 2022 – Melbourne

**Thermal conductance**

We tested whether NicheMapR estimate an accurate measure of fur thermal conductance.

Calculations:

Using Krockenberger’s raw data from the wind tunnel, I summarised for each pelt, fur side (dorsal, ventral, and side), and wind treatment (0, 1, 2, 3, 4, and 6 m/s) combination: (i) heat flow (HFT), (ii) basal temperature, and (iii) fur tip temperature. Then, I apply the formula for thermal conductance:

Where is the thermal conductance, *j i*s the heat flow, *d* is the sample thickness in m, and is the difference in temperature across the sample. The sample thickness was defined for each side of the pelt (dorsal, side, ventral) based on the fur depth average calculations above. The difference in temperature was calculated using the difference between base temperature and ambient temperature.

In previous estimations, I used the fur depth averaged across sides (dorsal, ventral, and flank) to calculate thermal conductance. The result looked unrealistic for the ventral conductivity. It was too low. Lower than theoretically possible.

A possible solution was to account for intra-variability across pelts. This was done by using the average depth (n = 6 measurements) for each individual pelt and side (ventral, dorsal, flank). This is a more logical approach than assuming a constant depth. Especially since thermal conductance is sensitive to depth.

After account for this, the results look very similar. This is because the variability across pelts is not great, so we still get a very low value of thermal conductance (>0.025).

Next, I considered human error. Did I induce bias on some of the measurements taken on the ventral part of the fur? This part is tricky to measure.

This would be especially easy for the ventral area of the fur, because it is very short. A slight push with the calliper would mean double or triple the measure you would get. Thus, the sensitivity of manually measuring fur depth on the ventral part would be susceptible to human error.

I consider this possibility by increasing the depth of the pelts with the lowest value by an error rate.

I increased the error until the values of the ventral thermal conductance was closer, but below, the flank observed measurements (which would be the logical value they should get).

I then compared this new observed measure to the effective thermal conductance simulated with NicheMapR, with the idea that the values should be higher than KEFF estimations.

I would have to have induced an error across the measurements of 70-100% to have a value close to the expected reality (100% to be above the KEFF line).