

ANTHROPOGENIC CLIMATE CHANGE: ARE LITTLE PENGUINS FEELING THE HEAT?

Lauren Tworowski, Ursula Ellenberg, Peter Dann,
Emily Richardson & Kylie Robert

PROBLEM:

During recent heat waves, increased little penguin (*Eudyptula minor*) mortalities have been observed at Phillip Island, Australia. Little penguins are known to have a low tolerance to high temperatures. When temperatures exceed their thermoneutral zone (>27°C) for prolonged periods, individuals can become hyperthermic. Under a high emissions scenario, current projections for southern Australia predict mean temperatures to rise 2.7 - 4.2 °C by 2090. We are already observing increased maximum temperatures, higher frequency of hot days and longer duration of heat waves. Given these projections, successful future management requires a better understanding of the thermoregulatory capabilities and limitations of this species.

QUESTION 1:

How does microclimate differ between burrow type and placement in the environment?

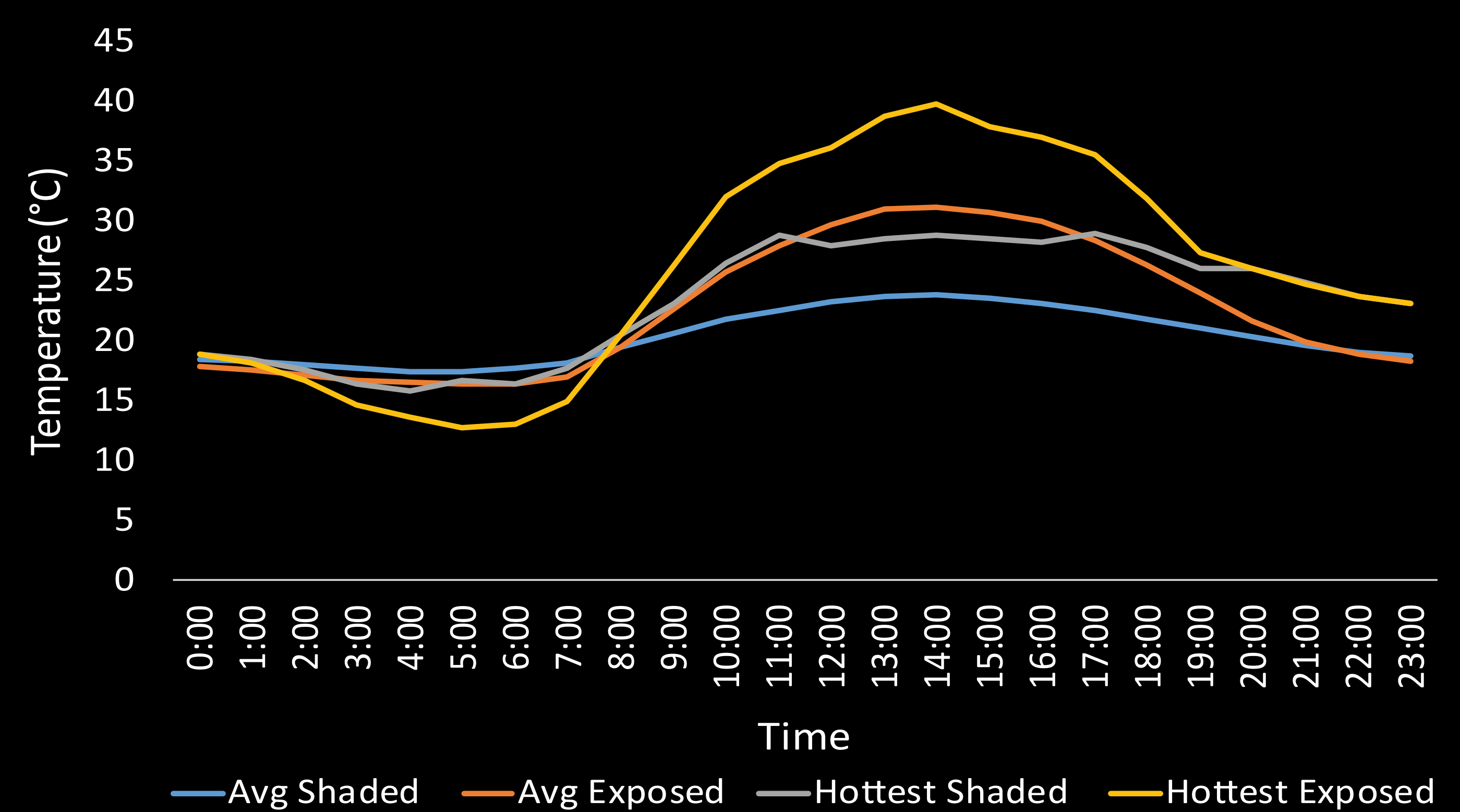


Figure 1: Average daily temperature pattern over 11 weeks from Dec 2015 – Feb 2016 (12.6 – 40.2 °C), as well as hottest day in that period. Average afternoon temperatures in the sun exposed boxes exceeded the upper limits of the thermoneutral zone (30 °C) of little penguins, whereas shaded boxes did not. On the hottest day (41°C), exposed nest box temperatures reached 42 °C, whereas shaded boxes reached a maximum of 28.9 °C. Differences between treatments are significant ($p < 0.001$).

QUESTION 2:

What are the energetic costs of thermoregulation at high temperatures in already energetically demanding periods such as incubation and moult?

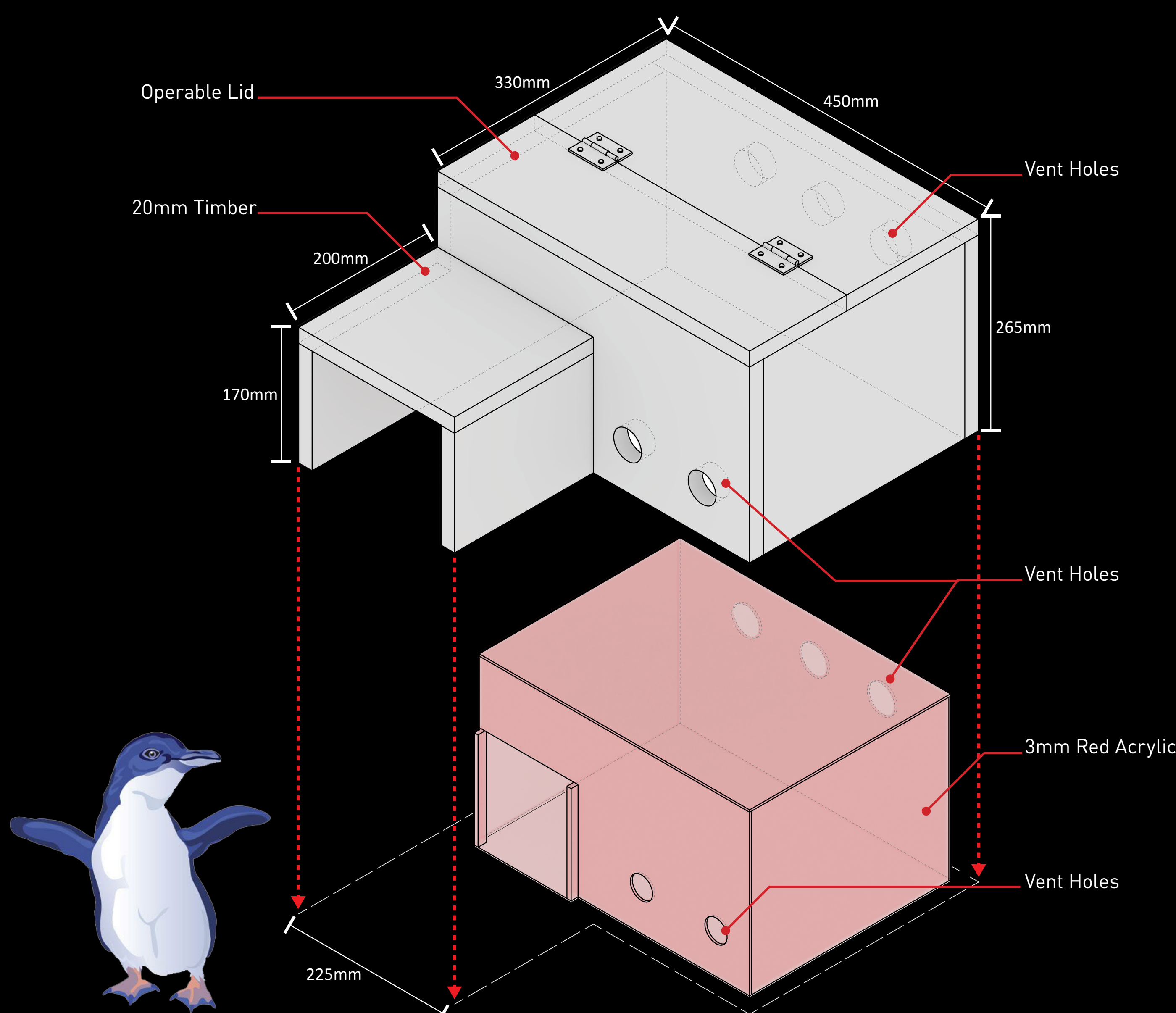


Figure 2: Custom built, field based metabolic chambers are being used to quantify stress associated with high temperatures. This novel set up will reduce the need for lab based experiments and minimise additional stress.

QUESTION 3:

Is reproductive success influenced by extreme temperature/duration of heat waves, burrow type or burrow location?

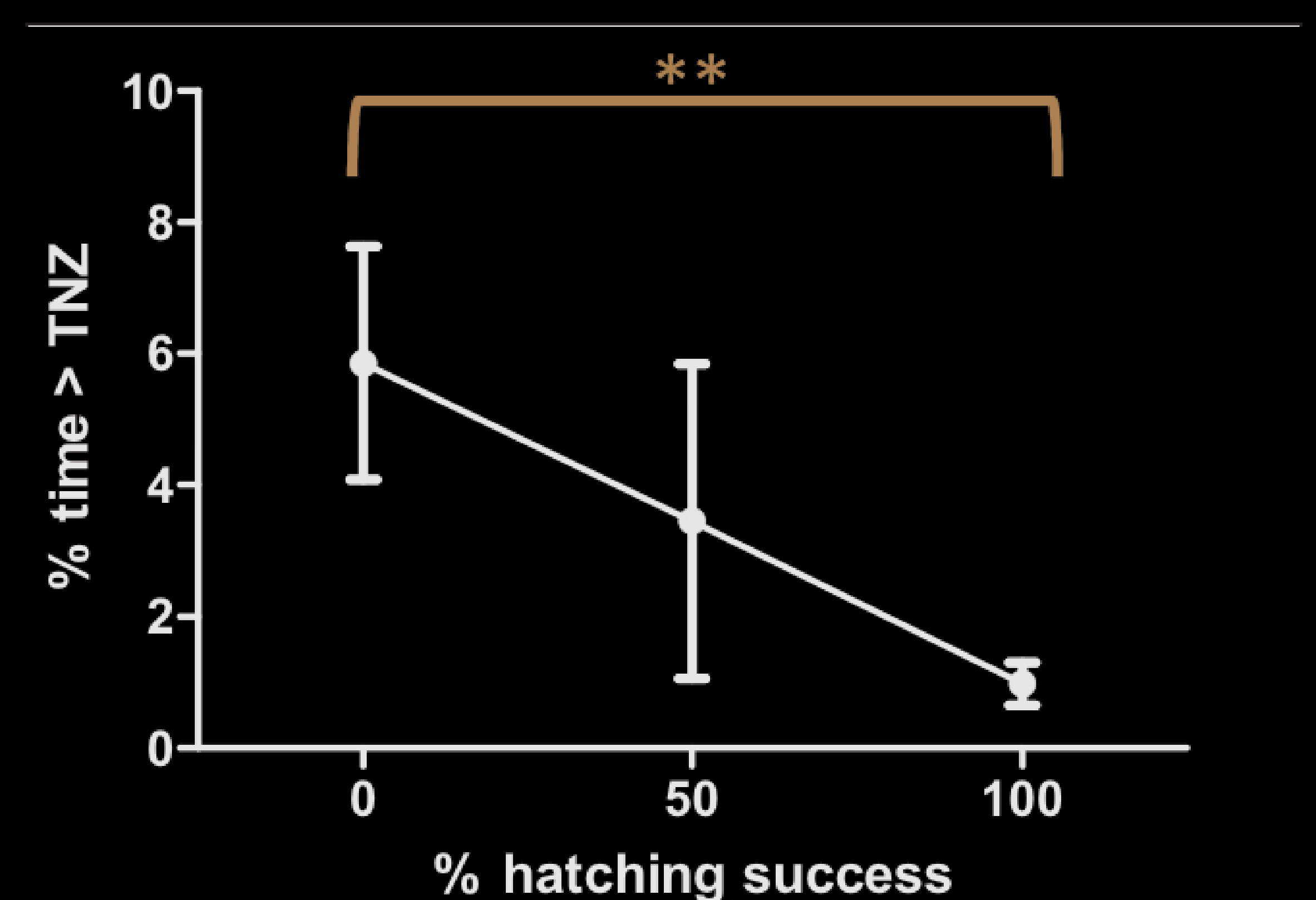


Figure 3: Little penguin hatching success in relation to the proportion of time spent in temperatures above their thermoneutral zone (27 °C). In this figure, $n_{0\%} = 9$, $n_{50\%} = 7$ and $n_{100\%} = 41$. ** represents a significant difference at $p < 0.01$. Means are represented with error bars as SE (Duquesnoy (2012), Unpublished thesis).



Thanks for your interest!
I value any suggestions or feedback you have.
Please stay and chat or feel free to contact me at:

l.tworowski@latrobe.edu.au

