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Data set for:

Sun B-J, Huebner C, Treidel LA, Clark R, Kenagy GJ, Williams CM (in press) Nocturnal dispersal flight of crickets: behavioural and physiological responses to cool environmental temperatures. ***Functional Ecology.***

Sheet 1 – Flight Tests in Lab

Crickets were thrown into the air 40 times in the laboratory, and flight-related behaviours were recorded as an index of flight propensity at two ambient temperatures. Experiments described in Methods: Thermal Dependence of Flight and flight preparatory behaviors in LW crickets

Columns:

**ID** – Individual cricket identifier

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Sex** – Male (M) or Female (F)

**Temp** – Set acclimation temperature for respirometry trial, °C

**Forewings open, Controlled Descent, Descending Flight** – These three columns sum the number of times a cricket performed each flight-related behavior, out of 40 trials. Behaviors described in detail in methods.

**Real temp** – Average temperature of cricket chamber measured during respirometry trial, °C

Sheet 2 –Tpref-field

Thermal preference of crickets was measured using an experimental gradient. Crickets were recently collected from the field, and the thermal gradient was set up outdoors at the field site. Experiments described in Methods: Behavioural Thermoregulation Hypothesis, Thermal Gradient and body temperature measurement in Supporting information

Columns:

**ID** – Individual cricket identifier

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Lane** – the Lane within the thermal gradient in which the cricket was placed (A-F).

**T1** – first record of body temperature, °C

**T2** – second record of body temperature, °C

**T3** – third record of body temperature, °C

**Tpref-mean** – average Tpref for each cricket of three records (i.e. T1, T2 and T3), °C

Sheet 3 –Tpref-Lab

Thermal preference of crickets was measured using an experimental thermal gradient. Crickets were from the laboratory colony, and were measured in the laboratory. Experiments described in Methods: Behavioural Thermoregulation Hypothesis, Thermal Gradient and body temperature measurement in Supporting information.

Columns:

**ID** – Individual cricket identifier

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Sex** – sex of the cricket; M=male, F=female

**T1** – first record of body temperature, °C

**T2** – second record of body temperature, °C

**T3** – third record of body temperature, °C

**Tpref-mean** – average Tpref for each cricket of three records (i.e. T1, T2 and T3), °C

Sheet 4 – Tpref-field flight temps

Thorax temperatures of crickets at the time of onset of muscular thermogenesis or flight were measured using a thermal imaging camera. Crickets were field collected and measured in an experimental thermal gradient outdoors at the field site. These data are from the same experiment presented in Sheet 3, but instead of body temperatures at a set time, these are the body temperatures at the onset of each flight-related behaviour. Experiments described in Methods: Behavioural Thermoregulation Hypothesis and Body temperature measurement in Supporting information.

Columns:

**ID** – Individual cricket identifier

**Behaviour** – Behaviour performed at the time body temperature was measured

**Tb** – body temperature of the cricket when it displayed according behaviors, °C

Sheet 5 – field Tb

Body temperatures of field-active crickets were measured using a digital contact thermocouple. At the same time, corresponding air and substrate temperatures were taken near the place of capture of each cricket. When the cricket was near or ran down a crevice after release, we also measured the temperature of the crevice. Experiments described in Methods: Behavioural Thermoregulation Hypothesis.

Columns:

**Sex** – Male (M) or Female (F)

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Tb** – active thorax temperatures of crickets when they were caught

**Tair** – air temperature of the site where the cricket was caught (~30 cm from surface)

**Te** –temperature of the substrate where the cricket was caught

**Tcave** –temperature of crevice (~5cm below ground)

Sheet 6 – Pre-flight warm-up - ramp

The thorax temperature at the onset of muscular thermogenesis was determined in crickets exposed to an increasing temperature ramp, starting at 18℃ and increasing at a rate of 0.2℃/min until all crickets were performing muscular thermogenesis. Experiments described in Methods: Pre-flight warm-up hypothesis

Columns:

**ID** – Individual cricket identifier

**Sequence** – the rank order in which the cricket initiated muscular thermogenesis

**Tb** – the body temperature of the cricket when it started to vibrate wings

**%** – the percentage of the crickets performing muscular thermogenesis when focal cricket started thermogenesis

Sheet 7 – Pre-flight warm-up - static

Crickets were held at constant temperatures of 18 or 25°C for one hour to acclimate, and then thorax temperatures were measured using a digital contact thermometer. Crickets were then monitored for 5 minutes to determine the onset of muscular thermogenesis. At the end of 5 minutes, cricket thorax temperature was measured again and the increase in thorax temperature was compared between crickets that performed muscular thermogenesis and those that did not.

Experiments described in Methods: Pre-flight warm-up hypothesis

Columns:

**ID** – Individual cricket identifier

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Sex** – Male (M) or Female (F)

**Tcage** – ambient temperature (cage) for crickets in heating

**Tb-1** – thorax temperature at beginning of 5 minute monitoring period

**Muscular thermogenesis** – Did the cricket perform muscular thermogenesis during the 5 min monitoring period (Y = Yes, N = No)

**Tb-2** – thorax temperature at end of 5 minute monitoring period

Sheet 8 – heat retention

Crickets were exposed to a decreasing temperature ramp in the laboratory (32 – 18°C), during which thorax temperature was measured repeatedly and compared to ambient temperatures. Experiments described in Methods: Heat retention hypothesis

Columns:

**Cage NO** – cage number during the test

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Sex** – Male (M) or Female (F)

**Body mass** – body mass of the cricket, g

**T-1 diff to T-9 diff** – differences between body temperature and cage temperature along times.T-1 diff indicates the first measurement, T-9 diff indicates the nineth measurement, ℃

**T-diff mean** – average difference between body temperatures and cage temperatures, ℃

**Tsubset** – body temperatures of a subset of crickets before cooling started, ℃

Sheet 9 –heat retention slope

Experiments described in Methods: Heat retention hypothesis

Columns:

**Cage NO** – cage number during the test

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Slope** – Slope of each cricket in body temperature decreasing during cooling

**Body mass** – body mass of the cricket, g

Sheet 10 – Met Rate

Rates of oxygen consumption and carbon dioxide production of crickets were measured over a range of temperatures as estimates of metabolic rate. Experiments described in Methods: Heat retention hypothesis.

Columns:

**ID** - Individual cricket identifier

**Morph** – Wing morph; LW = Long Winged with functional flight muscles (also referred to as LW(f)), SW = Short winged with non-functional flight muscles (also referred to as SW(h))

**Sex** – Male (M) or Female (F)

**Mass** – body mass of the cricket, g

**Test T** – test temperature, ℃

**VO2/min** – metabolic rates expressed by O2 consumption, mL/min

**VO2/min/g**– metabolic rates expressed by O2 consumption, mL/g/min

**VCO2 /min** – metabolic rates expressed by CO2 production, mL/min

**VCO2/min/g** – metabolic rates expressed by CO2 production, mL/g/min