

SURFACE AREA IS RELATED TO TEMPERATURE IN FOREST RED MILLIPEDES *CENTROBOLUS* COOK, 1897

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Abstract- Environmental temperature was correlated with surface area in red millipedes *Centrobolus*. Surface area in males was related to temperature ($r=0.51458402$, Z score= 2.47997350 , $n=22$, $p=0.00656962$) ($y = 128.01947772 \cdot x + -709.17579470$) and surface area in females was related to temperature ($r=0.53665765$, Z score= 2.61293929 , $n=22$, $p=0.00448840$) ($y = 206.88393418 \cdot x + -1,758.73485543$).

Keywords: surface area, SSD, Red Millipedes

Surface area in males was related to temperature in males (Figure 1: $r=0.51458402$, Z score= 2.47997350 , $n=22$, $p=0.00656962$) ($y = 128.01947772 \cdot x + -709.17579470$) and females (Figure 2: $r=0.53665765$, Z score= 2.61293929 , $n=22$, $p=0.00448840$) ($y = 206.88393418 \cdot x + -1,758.73485543$).

I. INTRODUCTION

Red millipedes are found in the southern African subregion with northern limits on the east coast being about -17° latitude S and southern limits being -35° latitude S. They are well represented in the littoral forests of the eastern half of the subcontinent [1-297]. It consists of taxonomically important species with 12 species considered threatened and includes nine vulnerable and three endangered species [226]. It occurs in all the forests of the coastal belt from the Cape Peninsula to Beira in Mocambique [225]. These worm-like millipedes have female-biased sexual size dimorphism [57]. Here, surface area are correlated with temperature in *Centrobolus* Cook, 1897.

II. MATERIALS AND METHODS

Horizontal tergite width measurements for 22 species of southern African *Centrobolus* were obtained from published material [57]. These were halved to get radii (r). The surface areas (mm^2) were calculated based on the equation $2 \cdot \pi \cdot r \cdot (r + h)$ for males and females (Appendix 1 & 2 respectively). A correlation between surface area with environmental temperature was generated at <https://www.gigacalculator.com/calculators/correlation-coefficient-calculator.php>.

III. RESULTS

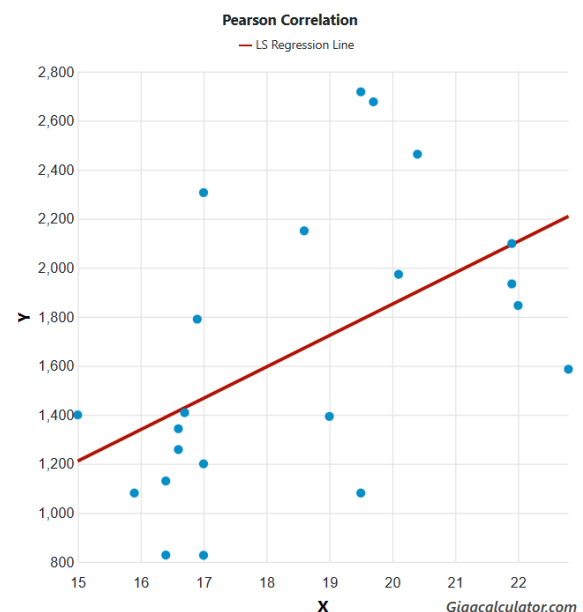


Fig. 1. Correlation between the male surface area and temperature in *Centrobolus* Cook, 1897.

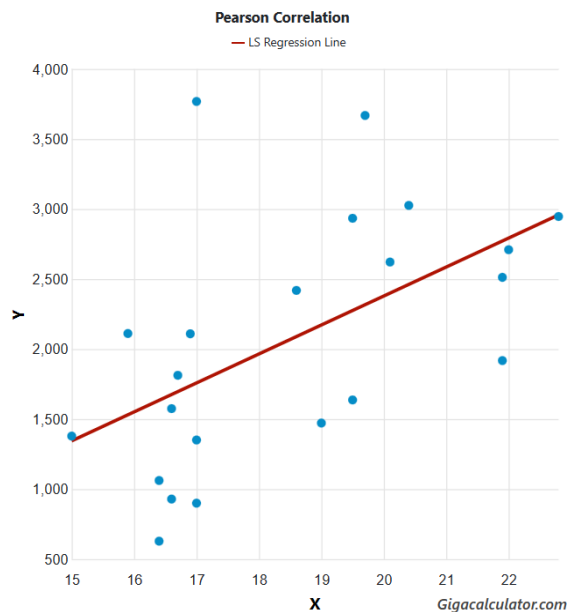


Fig. 2. Correlation between the female surface area and temperature in *Centrobolus* Cook, 1897.

IV. DISCUSSION

The significant differences between males and females in surface area are known in this genus [68]. There is a correlation between surface area and temperature in both sexes. This is an addition to one of the many correlated with body size in millipedes.

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APPENDIX 1. Environmental temperature (degrees Celsius) and surface area (mm²) for male *Centrobolus* Cook, 1897.

15.9, 1080.708
20.4, 2462.874
16.6, 1343.031
16.4, 1130.973
16.9, 1790.708
21.9, 1934.216
22.8, 1585.813
19.5, 2717.289
16.6, 1258.208
16.7, 1408.627
17.0, 2306.18
16.4, 827.872
19.5, 1080.708
21.9, 2098.579
20.1, 1972.92
22.0, 1845.749
18.6, 2150.357
19.0, 1393.359
17.0, 826.93
17.0, 1199.837
15.0, 1399.58
19.7, 2676.637

APPENDIX 2. Environmental temperature (degrees Celsius) and surface area (mm²) for female *Centrobolus* Cook, 1897.

15.9, 2111.15
20.4, 3026.009
16.6, 928.906
16.4, 1061.607
16.9, 2109.328
21.9, 2512.269
22.8, 2946.814
19.5, 2934.185
16.6, 1574.818
16.7, 1812.762
17.0, 3768.403
16.4, 628.256
19.5, 1636.707
21.9, 1917.942
20.1, 2621.596
22.0, 2709.624

18.6, 2419.026
19.0, 1471.773
17.0, 899.689
17.0, 1350.885
15.0, 1378.782
19.7, 3668.375