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SURFACE AREA IS NOT RELATED TO MONTH WITH THE HIGHEST NUMBER OF RAINY DAYS, PRECIPITATION OR MAXIMUM TEMPERATURE IN FOREST RED MILLIPEDES *CENTROBOLUS* COOK, 1897

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***Abstract*- Maximum temperature, precipitation and the month with the highest number of rainy days were tested for correlations with surface area in red millipedes *Centrobolus*. Surface area in males was not related to month with the highest number of rainy days (r=0.05659876, Z score=0.24697224, n=22, p=0.40246491) (y = 7.91957075 · x + 1,549.56094653) and surface area in females was not related to month with the highest number of rainy days (r=0.16347694, Z score=0.71903104, n=22, p=0.23606082) (y = 35.41714448 · x + 1,579.37171527). Surface area in males was not related to precipitation (r=0.15838783, Z score=0.69625831, n=22, p=0.24313347) (y = 0.32476152 · x + 1,391.91437815) and surface area in females was not related to precipitation (r=0.24913299, Z score=1.10928839, n=22, p=0.13365294) (y = 0.79155969 · x + 1,417.66312062). Maximum temperature was tested for a correlation with surface area in red millipedes *Centrobolus*. Surface area in males was not related to maximum temperature (r=0.17217395, Z score=0.75803940, n=22, p=0.22421362) (y = 25.14912855 · x + 1,047.93606942) and surface area in females was not related to maximum temperature (r=0.30908069, Z score=1.39279325, n=22, p=0.08184121) (y = 69.95794836 · x + 368.97136294).**

***Keywords:* surface area, precipitation, Red Millipedes, temperature.**

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 [1-302]. 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 month with the highest number of rainy days, precipitation, and maximum 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 - 6). A correlation between surface area with month with the highest number of rainy days, precipitation, and maximum temperature were checked at https://www.gigacalculator.com/calculators/correlation-coefficient-calculator.php.

III. RESULTS

Surface area in males was not related to month with the highest number of rainy days (r=0.05659876, Z score=0.24697224, n=22, p=0.40246491) (y = 7.91957075 · x + 1,549.56094653) and surface area in females was not related to month with the highest number of rainy days (r=0.16347694, Z score=0.71903104, n=22, p=0.23606082) (y = 35.41714448 · x + 1,579.37171527).

Surface area in males was not related to precipitation (r=0.15838783, Z score=0.69625831, n=22, p=0.24313347) (y = 0.32476152 · x + 1,391.91437815) and surface area in females was not related to precipitation (r=0.24913299, Z score=1.10928839, n=22, p=0.13365294) (y = 0.79155969 · x + 1,417.66312062).

Surface area in males was not related to maximum temperature (r=0.17217395, Z score=0.75803940, n=22, p=0.22421362) (y = 25.14912855 · x + 1,047.93606942) and surface area in females was not related to maximum temperature (r=0.30908069, Z score=1.39279325, n=22,

p=0.08184121) (y = 69.95794836 · x + 368.97136294).

IV. DISCUSSION

The significant differences between males and females in surface area are known in this genus [68]. There is no correlation between surface area and month with the highest number of rainy days, precipitation or maximum temperature in both sexes. These are an addition to the many correlations with body size in millipedes.

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APPENDIX 1. Month with the highest number of rainy days (number of days) and surface area (mm^2) for male *Centrobolus* Cook, 1897.

19.90, 1080.708
13.73, 2462.874
19.33, 1343.031
10.50, 1130,973
10.40, 1790,708
13.97, 1934,216
21.03, 1585.813
15.23, 2717.289
13.73, 1258.208
19.27, 1408.627
8.67, 2306.18
11.07, 827.872
14.07, 1080.708
13.97, 2098.579
14.26, 1972.92
13.77, 1845.749
8.67, 2150.357
8.67, 1393.359
7.10, 826.93
10.10, 1199.837
18.50, 1399.58
16.97, 2676.637

APPENDIX 2. Month with the highest number of rainy days (number of days) and surface area (mm^2) for female *Centrobolus* Cook, 1897.

19.90, 2111.15
13.73, 3026.009
19.33, 928.906
10.50, 1061.607
10.40, 2109.328
13.97, 2512.269
21.03, 2946.814
15.23, 2934.185
13.73, 1574.818
19.27, 1812.762
8.67, 3768.403
11.07, 628.256
14.07, 1636.707
13.97, 1917.942
14.67, 2621.596
13.77, 2709.624
8.67, 2419.026
8.67, 1471.773
7.10, 899.689
10.10, 1350.885
18.50, 1378.782
16.97, 3668.375

APPENDIX 3. Precipitation (mm) and surface area (mm^2)for male *Centrobolus* Cook, 1897.

919, 1080.708

893, 2462.874
962, 1343.031
498, 1130,973
408, 1790,708
944, 1934,216
1266, 1585.813
1015, 2717.289
893, 1258.208
966, 1408.627
497, 2306.18
621, 827.872
1050, 1080.708
944, 2098.579
945, 1972.92
837, 1845.749
497, 2150.357
956, 1393.359
401, 826.93
1200, 1199.837
265, 1399.58
1089, 2676.637

APPENDIX 4. Precipitation (mm) and surface area (mm^2) for female *Centrobolus* Cook, 1897.

919, 2111.15
893, 3026.009
962, 928.906
498, 1061.607
408, 2109.328
944, 2512.269
1266, 2946.814
1015, 2934.185
893, 1574.818
966, 1812.762
497, 3768.403
621, 628.256
1050, 1636.707
944, 1917.942
945, 2621.596
837, 2709.624
497, 2419.026
956, 1471.773
401, 899.689
1200, 1350.885
265, 1378.782
1089, 3668.375

APPENDIX 5. Maximum temperature (degrees Celsius) and surface area (mm^2)for male *Centrobolus* Cook, 1897.

24.7, 1080.708
25.4, 2462.874
25.6, 1343.031
15.7, 1130,973
16.6, 1790,708
25.5, 1934,216
29.0, 1585.813
25.0, 2717.289
25.5, 1258.208
24.8, 1408.627
24.8, 2306.18
15.7, 827.872
25.6, 1080.708
25.5, 2098.579
24.6, 1972.92
27.9, 1845.749
26.1, 2150.357
24.8, 1393.359
28.3, 826.93
29.5, 1199.837
19.4, 1399.58
24.2, 2676.637

APPENDIX 6. Maximum temperature (degrees Celsius) and surface area (mm^2) for female *Centrobolus* Cook, 1897.

24.7, 2111.15
25.4, 3026.009
25.6, 928.906
15.7, 1061.607
16.6, 2109.328
25.5, 2512.269
29.0, 2946.814
25.0, 2934.185
25.5, 1574.818
24.8, 1812.762
24.8, 3768.403
15.7, 628.256
25.6, 1636.707
25.5, 1917.942
24.6, 2621.596
27.9, 2709.624
26.1, 2419.026
24.8, 1471.773

28.3, 899.689
29.5, 1350.885
19.4, 1378.782
24.2, 3668.375