

# SURFACE AREA-TO-VOLUME RATIO IS RELATED TO LOWEST NUMBER OF DAILY HOURS OF SUNSHINE IN *CENTROBOLUS* COOK, 1897

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**Abstract-** Surface area-to-volume ratio was tested for a correlation with lowest number of daily hours of sunshine in forest red millipedes *Centrobolus*. Surface-area-to-volume ratio was related to lowest number of daily hours of sunshine in males (Pearson's  $r=0.44835552$ , Z score= $2.10377962$ ,  $n=22$ ,  $p=0.01769878$ ) and was related in females (Pearson's  $r=0.36699601$ , Z score= $1.67794552$ ,  $n=22$ ,  $p=0.04667884$ ).

**Keywords:** surface area, SSD, Red Millipedes

## I. INTRODUCTION

Red millipedes are found in the southern African subregion with northern limits on the east coast being about  $-17^\circ$  latitude S and southern limits being  $-35^\circ$  latitude S. They are well represented in the littoral forests of the eastern half of the subcontinent [1-326]. It consists of taxonomically important species with 12 species considered threatened and includes nine vulnerable and three endangered species [326]. It occurs in all the forests of the coastal belt from the Cape Peninsula to Beira in Mocambique [325]. These worm-like millipedes have female-biased sexual size dimorphism [57].

Here, surface-area-to-volume ratio was tested for a correlation with lowest number of daily hours of sunshine in *Centrobolus* Cook, 1897.

## II. MATERIALS AND METHODS

Surface-area-to-volume ratio for 22 species of southern African *Centrobolus* were obtained from published material [68]. These were correlated with lowest number of daily hours of sunshine and generated at <https://www.gigacalculator.com/calculators/correlation-coefficient-calculator.php>.

## III. RESULTS

Surface-area-to-volume ratio was related to lowest number of daily hours of sunshine in males (Fig. 1: Pearson's  $r=0.44835552$ , Z

score= $2.10377962$ ,  $n=22$ ,  $p=0.01769878$ ) and was related in females (Fig. 2: Pearson's  $r=0.36699601$ , Z score= $1.67794552$ ,  $n=22$ ,  $p=0.04667884$ ).

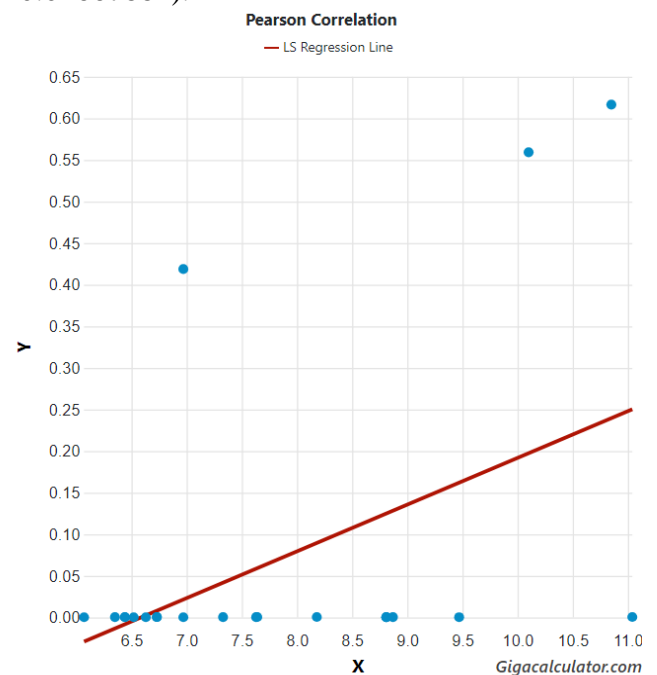
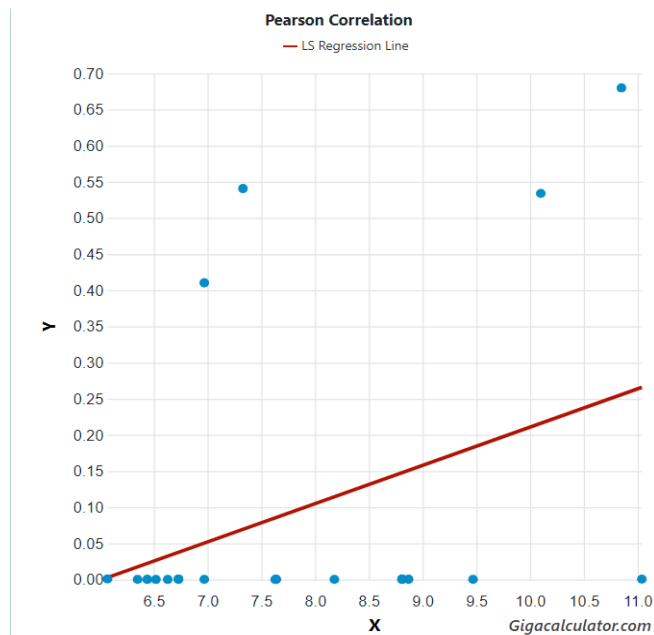


Fig. 1 Surface-area-to-volume ratio marginally correlated with lowest number of daily hours of sunshine in male *Centrobolus* Cook, 1897.



**Fig. 2 Surface-area-to-volume ratio correlated to lowest number of daily hours of sunshine in female *Centrobolus* Cook, 1897.**

#### IV. DISCUSSION

The significant differences between males and females in volumes are known in this genus [68]. There is a correlation between surface-area-to-volume ratios and lowest number of daily hours of sunshine in female *Centrobolus*. This is an addition to one of the many correlated with body size in millipedes.

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**APPENDIX 1.** Male surface-area-to-volume ratios preceded by lowest number of daily hours of sunshine (h) for 22 species of *Centrobolus* Cook, 1897.

8.18, 0.000510  
6.73, 0.000486  
7.33, 0.000365  
11.04, 0.000485  
9.47, 0.000245  
6.97, 0.000218  
7.63, 0.000294  
6.63, 0.000136  
6.73, 0.000393  
6.35, 0.000335  
8.81, 0.000156  
10.85, 0.616435  
6.44, 0.000510  
6.97, 0.418711  
6.44, 0.000220  
6.52, 0.000223  
8.81, 0.000169  
8.81, 0.000357  
10.1, 0.559114  
7.64, 0.000422  
8.87, 0.000349

6.07, 0.000136

**APPENDIX 2.** Female surface-area-to-volume ratios preceded by lowest number of daily hours of sunshine (h) for 22 species of *Centrobolus* Cook, 1897.

8.18, 0.000177  
6.73, 0.000578  
7.33 0.540690  
11.04, 0.000484  
9.47, 0.000179  
6.97, 0.000132  
7.63, 0.000108  
6.63, 0.000113  
6.73, 0.000274  
6.35, 0.000213  
8.81, 0.000716  
10.85, 0.679931  
6.44, 0.000245  
6.97, 0.4103607  
6.44, 0.000138  
6.52, 0.000113  
8.81, 0.000135  
8.81, 0.000314  
10.1, 0.533940  
7.64, 0.000335  
8.87, 0.000318  
6.07, 0.000751