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SECOND POLAR MOMENTS OF INERTNESS ARE RELATED TO ABUNDANCE IN FOREST RED MILLIPEDES CENTROBOLUS COOK, 1897

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***Abstract*- Second polar moments of area were correlated with male and female abundance in red millipedes *Centrobolus*. Male second polar moments of area were correlated with abundance (r=0.63046242, Z score=1.65957221, n=8, p=0.04850025) (y = 0.49024277 · x + -562.87348655). Female second polar moments of area were correlated with abundance (r=0.63046242, Z score=1.65957221, n=8, p=0.04850025) (y = 0.12910488 · x + -38.40963805).**

Keywords: **Polar, 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° 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, second polar moments of inertia for females are correlated with abundance 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 second polar moments of area (mm4) were calculated based on the equation $\pi/2.r^4$ for males and females. A correlation between female second polar moments of area with abundance was generated at www.gigacalculator.com. Tests for normality were conducted at https://www.statskingdom.com/kolmogorov-smirnov-test-calculator.htm.

III. RESULTS

Male second polar moments of area were correlated with abundance (Figure 1: r=0.63046242, Z score=1.65957221, n=8, p=0.04850025) (y = 0.49024277 · x + -562.87348655). Female second polar moments of area were correlated with abundance (Figure 2: r=0.63046242, Z score=1.65957221, n=8, p=0.04850025) (y = 0.12910488 · x + -38.40963805). Results of the lilliefors test indicated that there is a significant difference from the normal distribution in females , (D(22) = 0.19, p = 0.0346). Results of the lilliefors test indicated that there is a significant difference from the normal distribution in males, (D(22) = .2, p = .0255). Male and female second polar moments of area were significantly different (Z=- 3.961070, W=4.00, n=22, 22, p=0.0000746146).

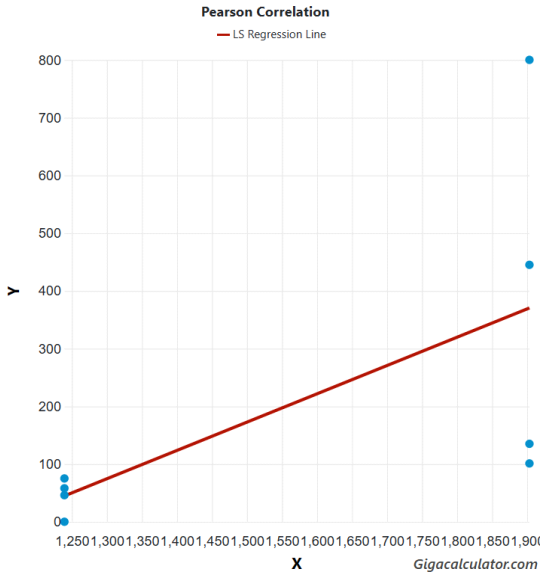

Figure 1. Correlation between the male second polar moment of area and abundance in *Centrobolus* Cook, 1897.

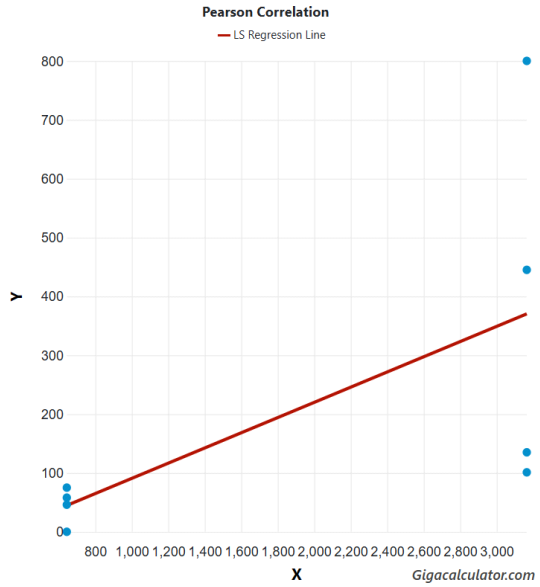

Figure 2. Correlation between the female second polar moment of area and abundance in *Centrobolus* Cook, 1897.

IV. DISCUSSION

The significant differences between males and females in second polar moments of area are known in this genus. There is a correlation between male and female second polar moments of area and abundance which is given. This is an addition to one of the many correlated with body size in millipedes. An alternative calculation including body length is another option in calculating the second polar moments of area in these millipedes with cylindrical body shapes.

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