
THE HIGHEST DAILY HOURS OF SUNSHINE ARE RELATED TO LONGITUDE ACROSS THE DISTRIBUTION OF PILL MILLIPEDES *SPHAEROTHERIUM* BRANDT, 1833

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ABSTRACT: The objectives of this study were to determine what happened when Sexual Size Dimorphism (SSD) and body size changed with an eco-geographical factor. The highest daily hours of sunshine were correlated with latitude and longitude in the forest millipede genus *Sphaerotherium*. There was a correlation between the highest daily hours of sunshine and longitude ($r=-0.88574162$, Z score= -2.80361409 , $n=7$, $p=0.00252673$). Eco-geographical variance in the polygynandrous reproductive systems occurs with larger females and higher SSD occurring in darker conditions.

KEY WORDS: Dimorphic, eco-geography, gradient, precipitation, size, species

A forest genus of diplopods belonging to the Order Sphaerotheriida found along the eastern coast of southern Africa was the subject of this study. The millipede genus *Sphaerotherium* is found in the temperate South African subregion. It occurs in all the forests of the coastal belt from the Cape Peninsula to Beira in Mocambique. While the coastal forests of the South-West and Eastern Cape are mist belt temperate forests, those of the Transkei, Natal, Zululand, and Mocambique are somewhat different, being better described as East Coast Bush, they are developed almost entirely in a narrow strip of the litoral on a dune sand substratum, and are more tropical in aspect and composition than those to the west of them. There is a summer rainfall of 76.2-101.6 cm, a uniform temperature, and an absence of frost; the component trees of the coastal bush with their abundant creepers and lianes, while not usually reaching a height of more than 11 meters, provide a dense covering with abundant shade and humidity at ground level. As essentially shade-loving Diplopoda, the members of the genus are especially well represented in these litoral forests of the eastern half of the subcontinent (Cooper, 2018).

The highest daily hours of sunshine are correlated with latitude and longitude in the sphaerotheriid millipede genus *Sphaerotherium* Brandt, 1833 (Hamer, 1998). Like other millipedes, the pill millipedes have female-biased SSD (Cooper, 2017, 2018). The null hypothesis is that there is no correlation between the highest daily hours of sunshine and latitude or longitude found.

MATERIALS AND METHODS

60 valid species were identified as belonging to the genus *Sphaerotherium* Brandt, 1833. Millipede-type localities were obtained from a checklist of southern

African millipedes (Hamer, 1998). These were tabulated and known type localities also listed in Microsoft Word online (<https://office.live.com/start/Word.aspx>). GPS coordinates were obtained from internet sources for known type localities using google (<https://www.google.co.za/maps/place>). The highest hours of daily sunshine were obtained from <https://en.climate-data.org/search/?q=> and internet sources for known type localities using google (<https://www.google.co.za>). The highest daily hours of sunshine, latitude, and longitude were checked for correlations using the Pearson Correlation Coefficient calculator (<https://www.gigacalculator.com/calculators/correlation-coefficient-calculator.php>).

RESULTS

There was a correlation between the highest daily hours of sunshine and longitude (Figure 1: $r=-0.88574162$, $Z \text{ score}=-2.80361409$, $n=7$, $p=0.00252673$) across the distribution of *Sphaerotherium*.

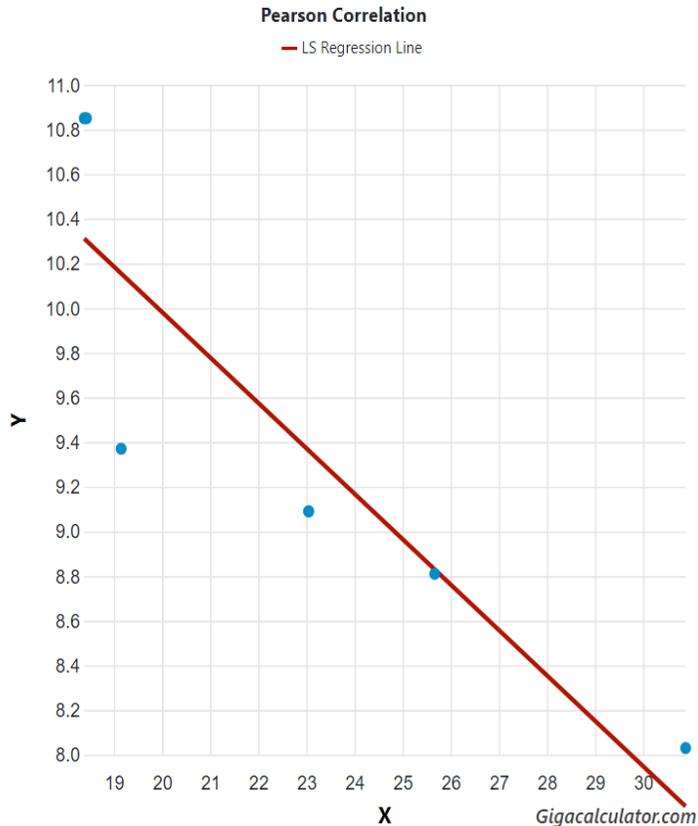


Figure 1. Correlation between highest daily hours of sunshine and longitude for *Sphaerotherium*.

DISCUSSION

Relationships between the highest daily hours of sunshine and longitude were found in *Sphaerotherium*. Near Durban (latitude: 30.1 degrees East) there was the low in highest daily hours of sunshine (8.03 hours).

This study supports the highest daily hours of sunshine as a predictor of SSD in *Sphaerotherium*. Sunshine and longitude may explain greater fecundity selection. Sunshine during the lightest month may be an explanation for activity in species showing sexual size dimorphism, such as millipedes (Cooper, 2017, 2018).

CONCLUSION

A new relationship between the highest daily hours of sunshine and longitude was found in *Sphaerotherium*.

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