International Journal of Engineering Science Invention Research & Development; Vol. 10, Issue 6, December 2023
www.ijesird.com, E-ISSN: 2349-6185

FACTORS RELATED TO SUNSHINE IN FOREST RED MILLIPEDES *CENTROBOLUS* COOK, 1897

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***Abstract*- Twelve factors were tested for a correlation with highest total hours of sunshine in a month in red millipedes *Centrobolus*. Hours of sunshine throughout the year (r= 0.6818, r^2=0.4649, n=22, p=0.000472), temperature (r=- 0.549, r^2=0.3012, n=22, p=0.008142), surface-area-to-volume ratio in males (Pearson's r=0.39827777, Z score=1.83771325, n=22, p=0.03305228), surface-area-to-volume ratio in females (Pearson's r=0.37056569, Z score=1.69595464, n=22, p=0.04494721), precipitation (r=- 0.4846, r^2=0.2348, n=22, p=0.022148), minimum precipitation (r= 0.6166, r^2=0.3802, n=22, p=0.002242), highest number of rainy days (r=- 0.436, r2=0.1901, n=22,p=0.042515), species volume (r=- 0.6604, r^2=0.4361, n=22, p=0.000831), longitude (r= 0.7191, r^2=0.5171, n=22, p=0.000163), mean ocean water temperature (Fig. 10: r=-0.89620481, Z score=-3.84320521, n=10, p=0.00006074), minimum ocean water temperature (r=-0.89339484, Z score=-3.52358458, n=10, p=0.00021292), minimum temperature (r=- 0.6193, r^2=0.3835, n=22, p=0.00213), and maximum temperature (r=- 0.5864, r^2=0.3439, n=22, p=0.004159) were correlated with total hours of sunshine in a month. Average monthly duration of sunlight was tested for a correlation with fourteen factors in red millipedes *Centrobolus*. Average monthly duration of sunlight was correlated to volume (r=- 0.4389, r^2=0.1926, n=22, p=0.040953), was marginally related to minimum precipitation (r=-0.34806911, Z score=-1.58334825, n=22, p=0.05667106), highest duration of sunshine in a day (r=0.8022, r^2=0.6435, n=22, p<0.00001), precipitation (r= 0.7672, r^2=0.5886, n=22, p=0.000031), lowest duration of sunshine in a month (r=0.9013, r^2=0.8123, n=22, p<0.00001), temperature (r= 0.5219, r^2=0.2724, n=22, p=0.012706), longitude (r= 0.6864, r^2=0.4711, n=22, p=0.000424), minimum temperature (r= -0.5702, r^2=0.3251, n=22, p=0.005614), maximum temperature (r=- 0.447, r^2=0.1998, n=22, p=0.037006), highest total hours of sunshine in a month (r=- 0.6016, r^2=0.3619, n=22, p=0.003033), hours of sunshine throughout the year (r=0.9321, r^2=08688, n=22, p<0.00001), minimum ocean water temperature (r=-0.84285802, Z score=-3.01522781, n=9, p=0.001284), mean ocean water temperature (r=-0.85467114, Z score=-3.11876809, n=9, p=0.00090811), and possibly abundance (r=-0.63046242, Z score=1.65957221, n=8, p=0.04850025). Hours of sunshine throughout the year was tested for a correlation with ten factors in red millipedes *Centrobolus*. Hours of sunshine throughout the year was correlated with mean ocean water temperature (r=-0.85918934, Z score=-3.41365378, n=10, p=0.00032054), highest duration of sunshine (r= 0.8292, r^2=0.6876, n=22, p<0.00001), longitude (r= 0.7201, r^2=0.5185, n=22, p=0.000158), temperature (r=- 0.4449, r^2=0.1979, n=22, p=0.037964), surface-area-to-volume ratio in males (Pearson's r=0.54167894, Z score2.64379727, n=22, p=0.00409913) and in females (Pearson's r=0.44390687, Z score=2.07956978, n=22, p=0.01878244), precipitation (r=- 0.7535, r^2=0.5678, n=22, p=0.000051), moments of inertia (r=- 0.6709, r^2=0.4501, n=10, p=0.033665), species volume (r=- 0.505, r^2=0.255, n=22, p=0.016523), minimum temperature (r=- 0.5656, r^2=0.3199, n=22, p=0.006037), and minimum ocean water temperature (r=-0.84222549, Z score=-3.00988739, n=9, p=0.00130679). Fifteen factors were tested for a correlation with highest duration of sunshine in red millipedes *Centrobolus*. The moments of inertia (r=- 0.6579, r^2=0.4328, n=10, p=0.038658), mass (r= 0.7322, r^2=0.5361, n=10, p=0.016047), longitude (r=- 0.8759, r^2=0.7672, n=22, p<0.00001), lowest duration of sunshine in a month (r= 0.9396, r^2=0.8828, n=22, p<0.00001), latitude (r=- 0.4684, r^2=0.2194, n=22, p=0.027902), precipitation (r= 0.6312, r^2=0.3984, n=22, p=0.001632), volume (r=- 0.5152, r^2=0.2654, n=22, p=0.014136), minimum temperature (r= 0.6229, r^2=0.388, n=22, p=0.001958), maximum temperature (r= 0.6182, r^2=0.3822, n=22, p=0.002167), minimum ocean water temperature (r=-0.9592, r^2=0.9201, n=9, p=0.000043), abundance (r=0.63046242, Z score=1.65957221, n=8, p=0.04850025), mean ocean water temperature was related to highest duration of sunshine (r=-0.9721, r^2=0.945, n=9, p=0.000012), temperature (r=- 0.5342, r^2=0.2854, n=22, p=0.010438), and highest total hours of sunshine in a month (r= 0.8586, r^2=0.7372, n=22, p<0.00001), were correlated with highest duration of sunshine. Ten factors were tested for a correlation with lowest duration of sunshine and eighteen factors with lowest number of daily hours of sunshine in red millipedes *Centrobolus*. Hours of sunshine throughout the year (r= 0.903, r^2=0.8154, n=22, p<0.00001), temperature (r=- 0.5688, r^2=0.3235, n=22, p=0.005738), precipitation (r= 0.727, r^2=0.5285, n=22, p=0.000127), mass (r= 0.7424, r^2=0.5512, n=10, p=0.013925), longitude (r=- 0.8491, r^2=0.721, n=22, p<0.00001), moments of inertia (r=- 0.6673, r^2=0.4453, n=10, p=0.035028), possibly abundance (r=-0.63046242, Z score=-1.65957221, n=8, p=0.04850025), minimum precipitation (r=-0.4566, r^2=0.2085, n=22, p=0.032671), minimum ocean water temperature (r=0.9834, r^2=0.9671, n=9, p<0.00001), mean ocean water temperature (r=-0.9671, r^2=0.9353, n=9, p=0.000021), volume (r=- 0.4893, r^2=0.2394, n=22, p=0.020825), and surface-area-to-volume ratio in males (Pearson's r=0.44835552, Z score=2.10377962, n=22, p=0.01769878) and in females (Pearson's r=0.36699601, Z score=1.67794552, n=22, p=0.04667884), were related to lowest number of daily hours of sunshine. Highest number of daily hours of sunshine (r= 0.7448, r^2=0.5547, n=22, p=0.00007), hours of sunshine in a year (r= 0.8586, r^2=0.7372, n=22, p<0.00001), precipitation (r=- 0.7173, r^2=0.5145, n=22, p<0.000173), minimum temperature (r=- 0.7098, r^2=0.5038, n=22, p<0.000214), average temperature (r=- 0.5325, r^2=0.2836, n=22, p=0.010645), species volume (r=- 0.5147, r^2=0.2649, n=22, p=0.01418), moments of inertia (r=- 0.6671, r^2=0.445, n=10, p=0.03514), month with the highest number of rainy days (r=- 0.5239, r^2=0.2745, n=22, p=0.01239), maximum temperature (r=- 0.6021, r^2=0.3625, n=22, p<0.003033), latitude (r=- 0.4365, r^2=0.1905, n=22, p=0.04199), longitude (r=- 0.8558, r^2=0.7324, n=22, p<0.00001), lowest number of daily hours of sunshine in a month (r= 0.9983, r^2=0.9966, n=22, p<0.00001), mean ocean water temperature (r=-0.98270730, Z score=-6.27298913, n=10, p=0), highest ocean water temperature (r= -0.63146459, Z score=-1.82204880, n=9, p=0.03422373), minimum ocean water temperature (r=-0.97723073, Z score=-5.46731092, n=9, p=0.00000002), minimum precipitation (r= -0.41963355, Z score=-1.94950522, n=22, p=0.02561749), and average monthly duration of sunlight (r= 0.8688, r^2=0.7548, n=22, p<0.00001) were correlated with lowest number of daily hours of sunshine in a day.**

***Keywords*: precipitation, Red Millipedes, sunshine.**

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, factors correlated with sunshine in *Centrobolus* Cook, 1897 are figured.

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. A correlation between numerous factors was generated at https://www.socscistatistics.com/tests/pearson/default2.aspx (Appendix 1-88).

RESULTS

Hours of sunshine throughout the year was related to highest hours of sunshine throughout the month (Fig. 1: (r=0.6818, r^2=0.4649, n=22, p=0.000472).

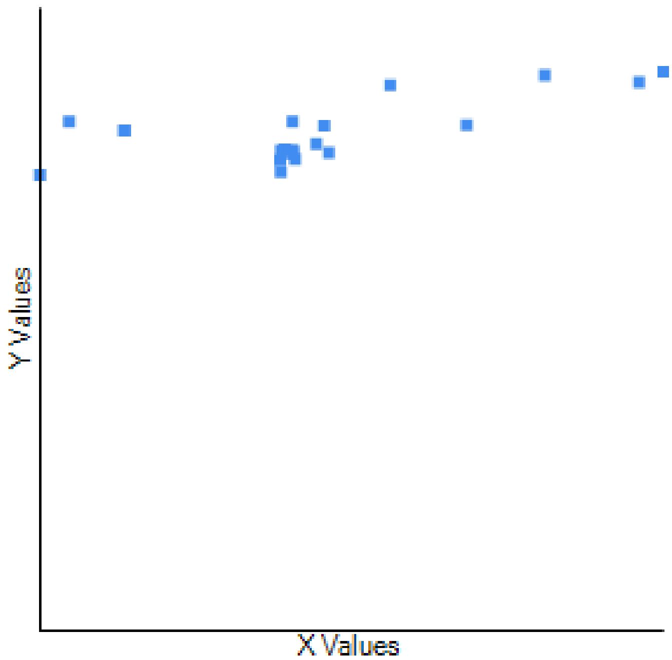

Fig. 1. Correlation between hours of sunshine throughout the year (h) and highest total hours of sunshine in a month across therange of *Centrobolus* Cook, 1897.

Highest total hours of sunshine in a month were correlated with temperature (Fig. 2: r=- 0.549, r^2=0.3012, n=22, p=0.008142).

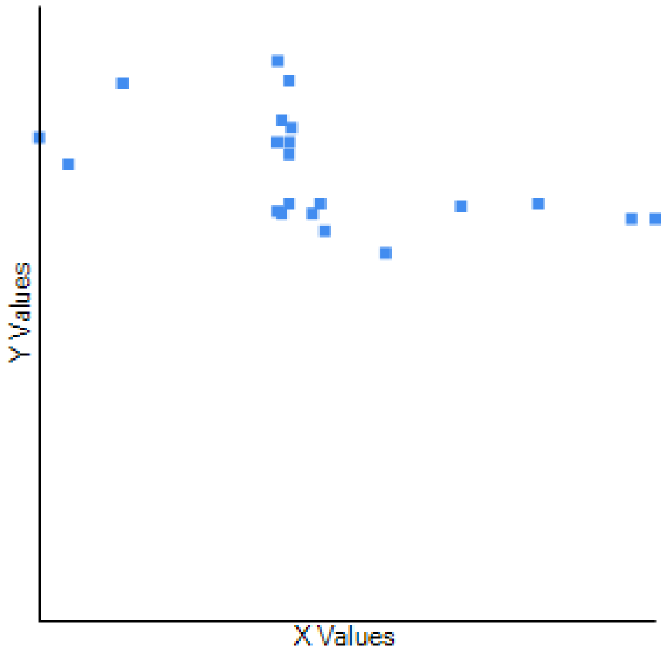

Fig. 2. Correlation between highest total hours of sunshine in a month (x) and temperature (y) across the range of *Centrobolus* Cook, 1897.

Surface-area-to-volume ratio was related to highest total hours of sunshine in a month in males (Fig. 3: Pearson's r=0.39827777, Z score=1.83771325, n=22, p=0.03305228) and in females (Fig. 4: Pearson's r=0.37056569, Z score=1.69595464, n=22, p=0.04494721).

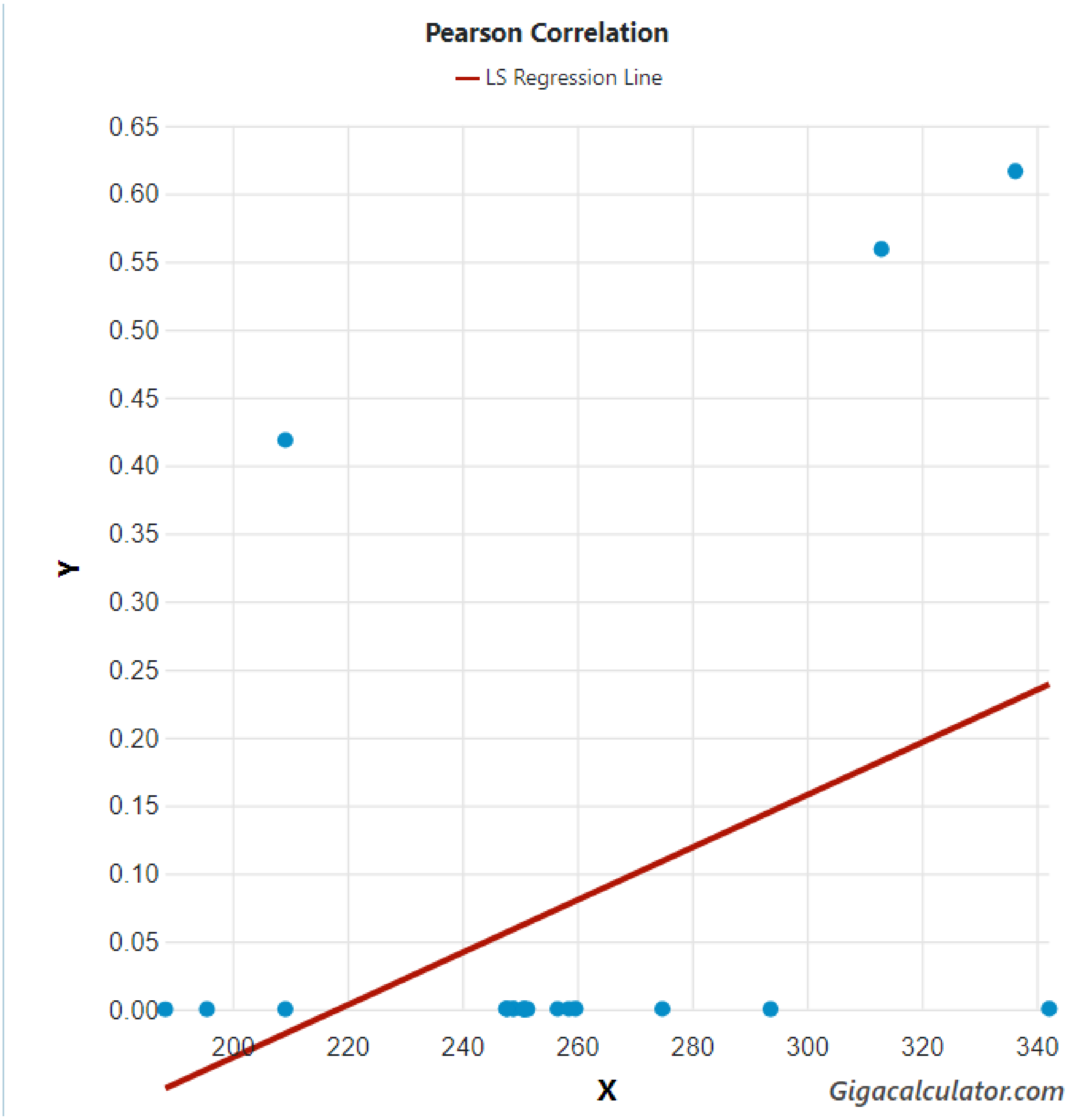

Fig. 3 Surface-area-to-volume ratio correlated with highest total hours of sunshine in a month in male *Centrobolus* Cook, 1897.

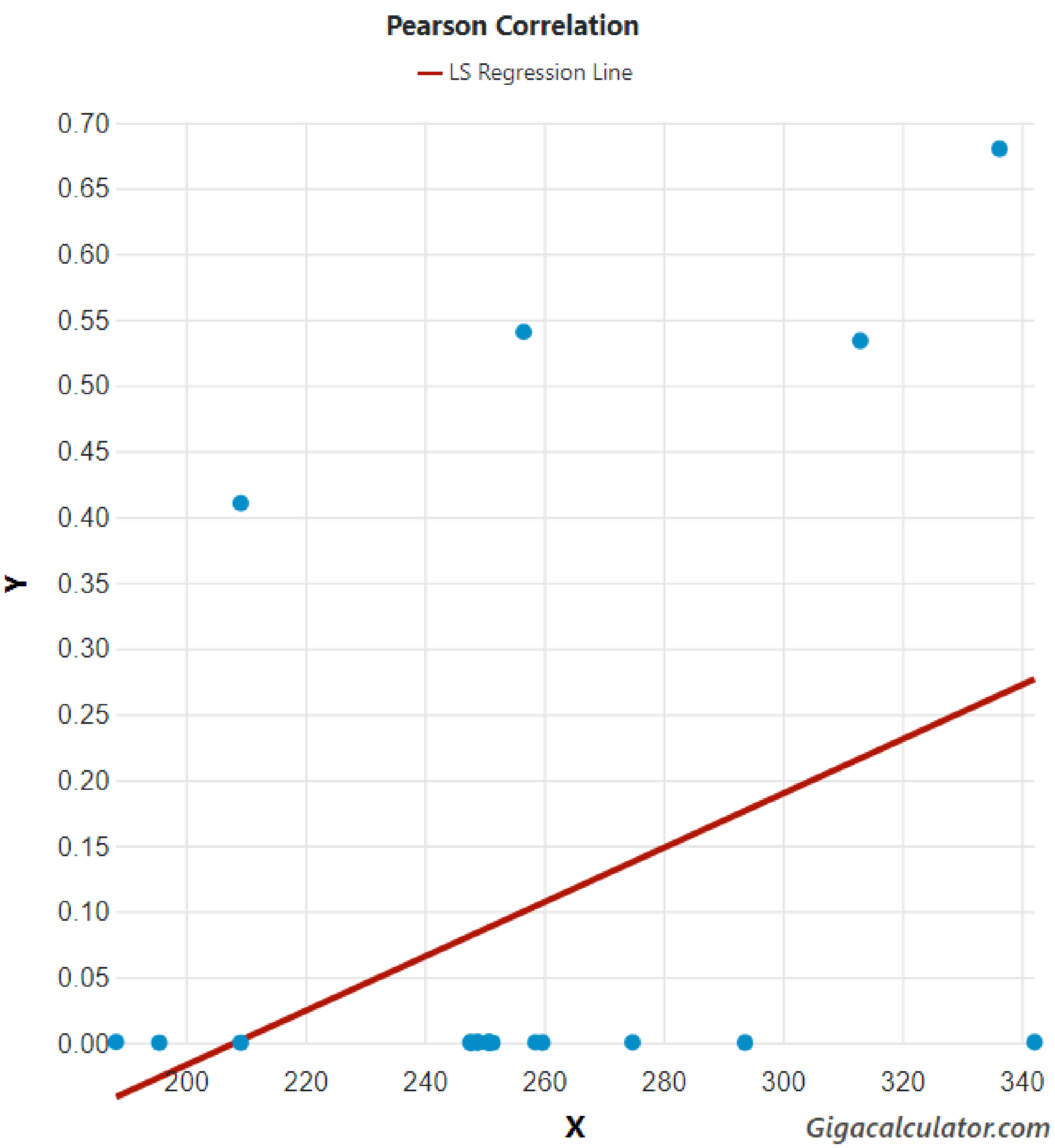

Fig. 4 Surface-area-to-volume ratio correlated to highest total hours of sunshine in a month in female *Centrobolus* Cook, 1897.

Highest total hours of sunshine in a month were correlated with precipitation (Fig. 5: r=- 0.4846, r^2=0.2348, n=22, p=0.022148).

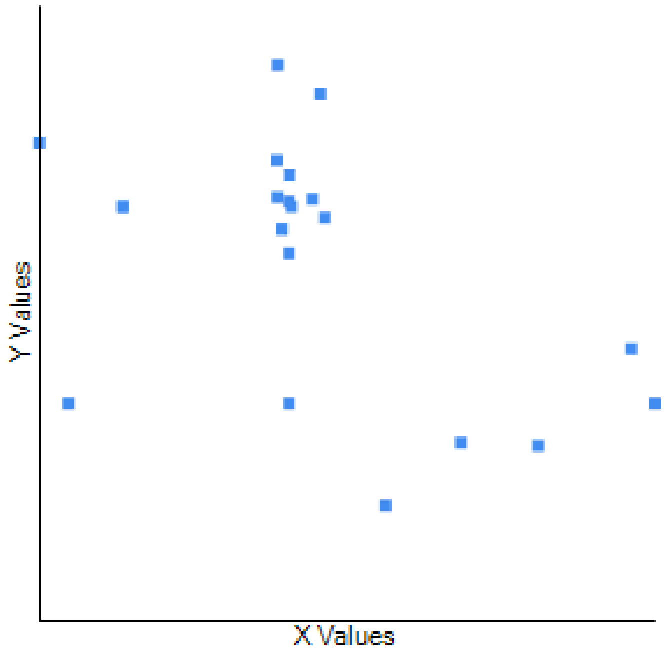

Fig. 5. Correlation between highest total hours of sunshine in a month (y) and precipitation (x) across the range of *Centrobolus* Cook, 1897.

Minimum precipitation was related to highest total hours of sunshine in a month (Fig. 6: r= -0.6166, r^2=0.3802, n=22, p=0.002242).

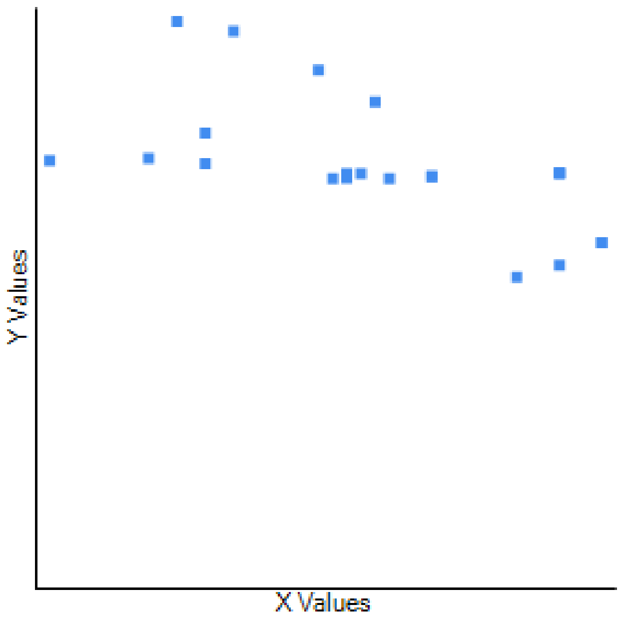

Fig. 6. Correlation between minimum precipitation (mm) and highest total hours of sunshine in a month (h) across therange of *Centrobolus* Cook, 1897.

Highest total hours of sunshine in a month were correlated with month with the highest number of rainy days (Fig. 7: r=- 0.436, r2=0.1901, n=22,p=0.042515).

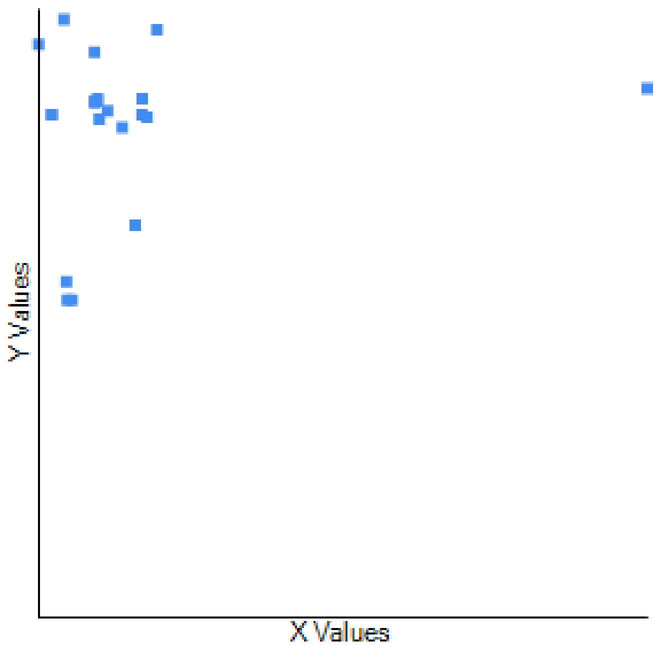

Fig. 7. Correlation between highest total hours of sunshine in a month (y) and month with the highest number of rainy days (x) across therange of *Centrobolus* Cook, 1897.

Highest total hours of sunshine throughout the year were correlated with species volume (Fig. 8: r=-0.6604, r^2=0.4361, n=22, p=0.000831).

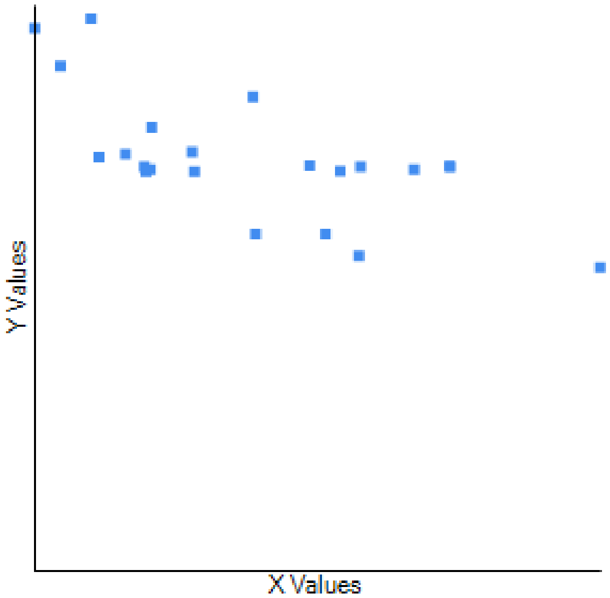

Fig. 8. Correlation between highest total hours of sunshine in a month (x) and species volume (y) across therange of *Centrobolus* Cook, 1897.

Highest total hours of sunshine in a month was related to longitude (Fig. 9: r= -0.7191, r^2=0.5171, n=22, p=0.000163).

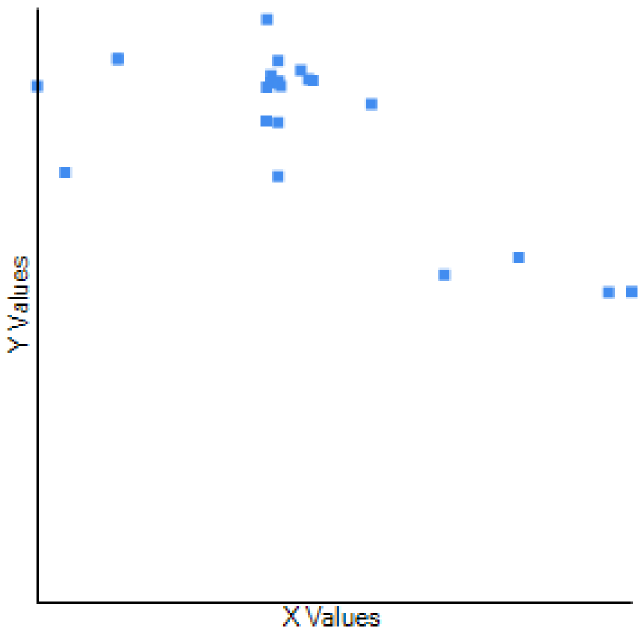

Fig. 9. Correlation between highest total hours of sunshine in a month (h) and longitude across the range of *Centrobolus* Cook, 1897.

Highest number of daily hours of sunshine was tested for a correlation with mean ocean water temperature (Fig. 10: r=-0.89620481, Z score=-3.84320521, n=10, p=0.00006074).

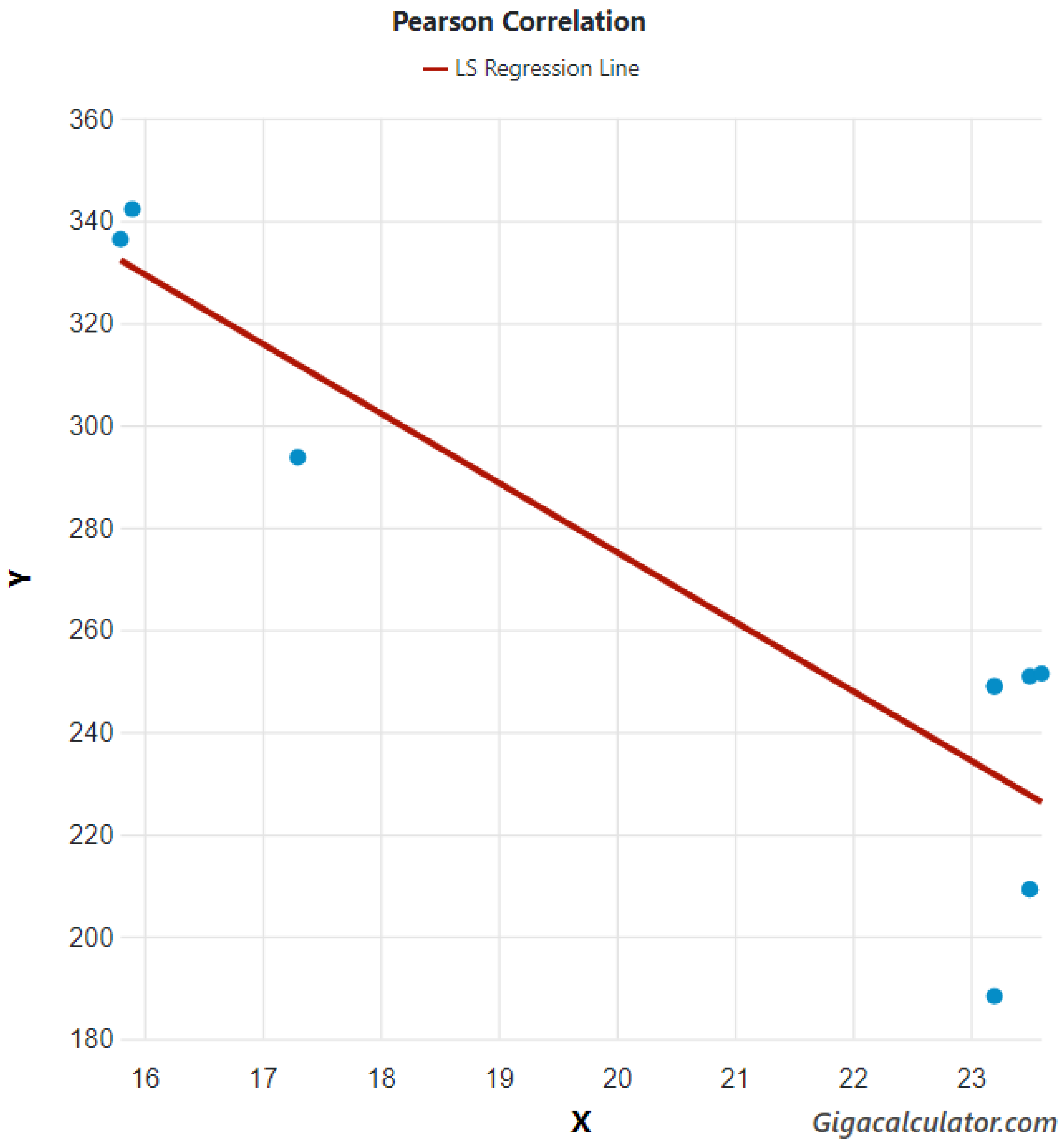

Fig. 10. Correlation between highest number of daily hours of sunshine in a month (y) and mean ocean water temperature (x) across therange of *Centrobolus* Cook, 1897.

Minimum temperature was tested for a correlation with total hours of sunshine in a month in red millipedes *Centrobolus*. Minimum temperature was related total hours of sunshine in a month (Figure 11: $r=-0.6193$, $r^2=0.3835$, $n=22$, $p=0.00213$).

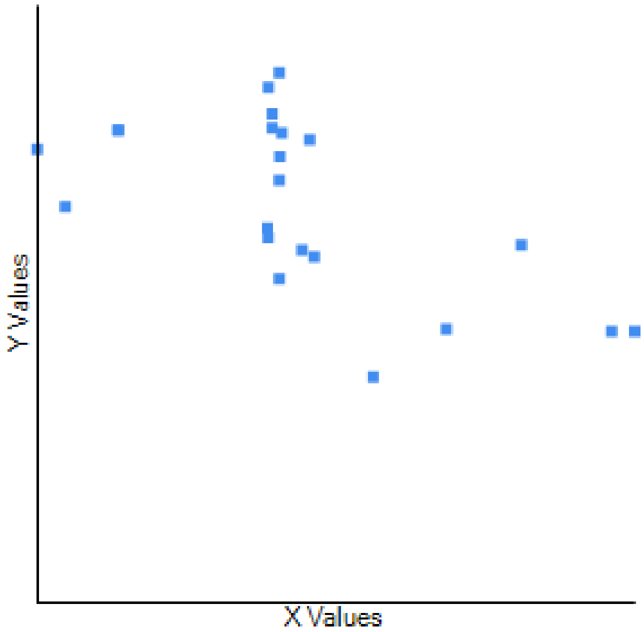

Fig. 11. Correlation between minimum temperature and total hours of sunshine in a month across the range of *Centrobolus* Cook, 1897.

Maximum temperature was tested for a correlation with total hours of sunshine in a month in red millipedes *Centrobolus*. Maximum temperature was related total hours of sunshine in a month (Figure 12: r=-0.5864, r^2=0.3439, n=22, p=0.004159).

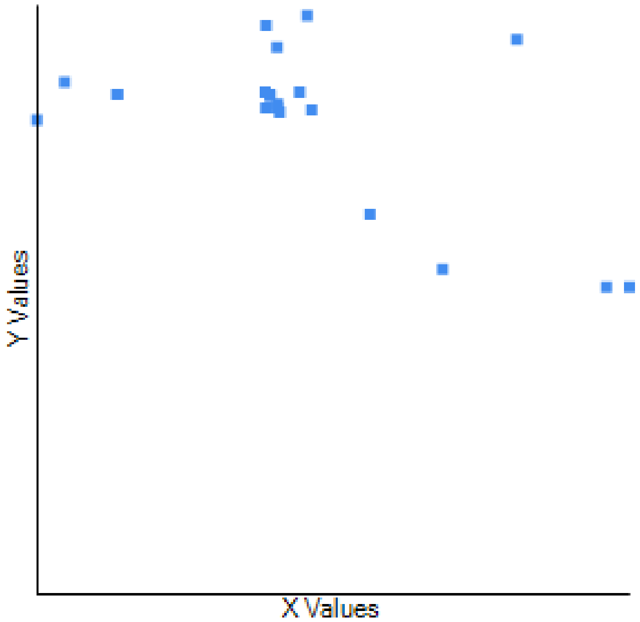

Fig. 12. Correlation between maximum temperature and total hours of sunshine in a month across the range of *Centrobolus* Cook, 1897.

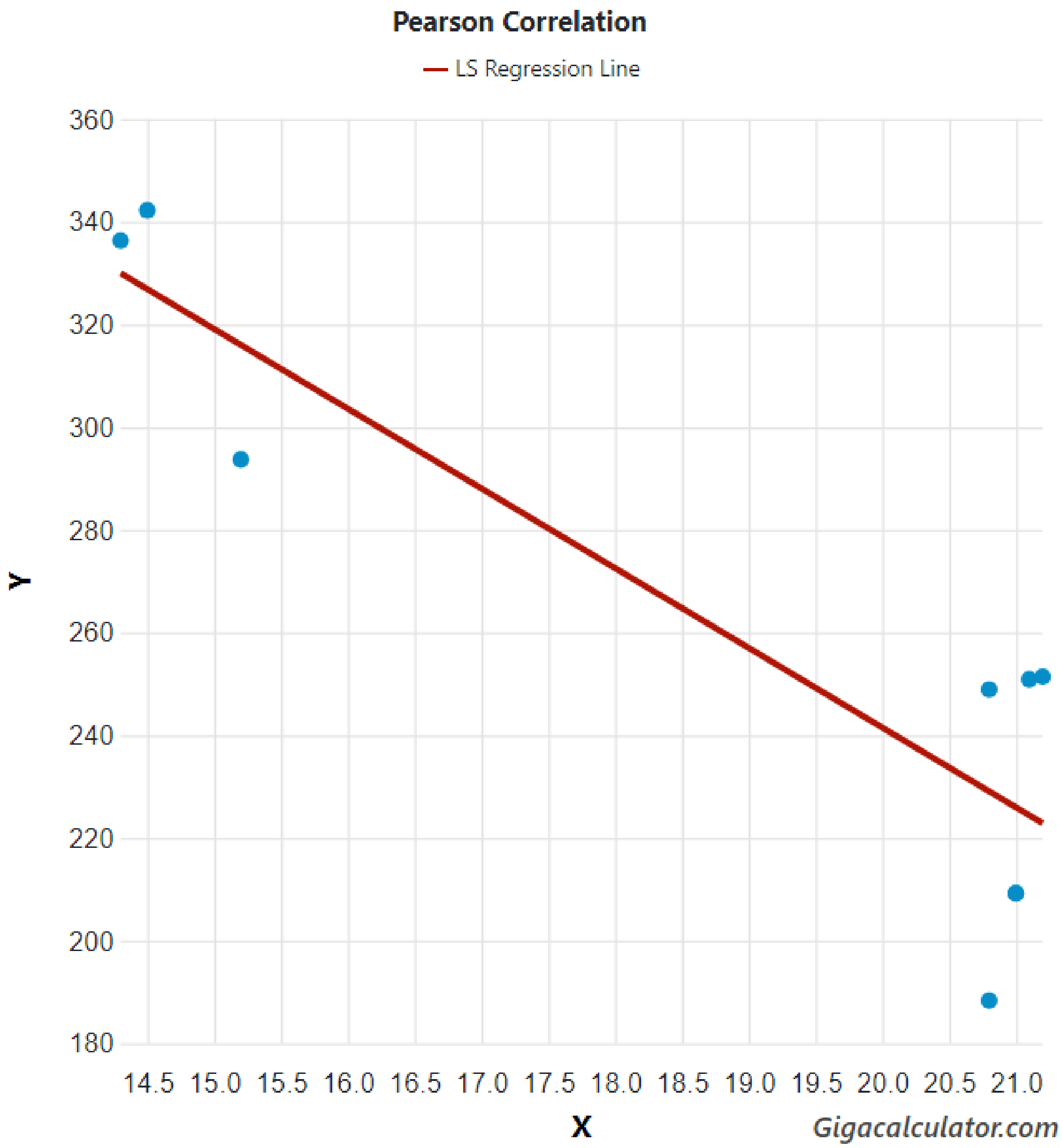

Fig. 13. Correlation between highest number of daily hours of sunshine in a month (y) and minumum ocean water temperature (x) across the range of *Centrobolus* Cook, 1897. (r=-0.89339484, Z score=-3.52358458, n=10, p=0.00021292).

Average monthly duration of sunlight was related to volume (Fig. 14: r=- 0.4389, r^2=0.1926, n=22, p=0.040953).

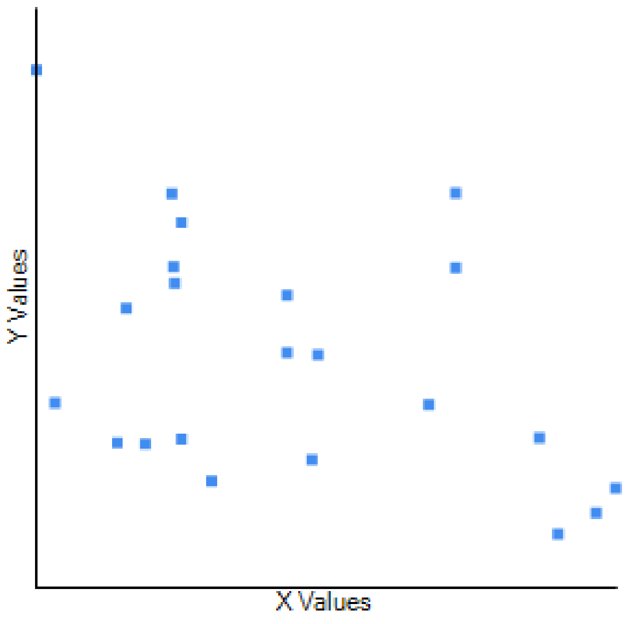

Fig. 14. Correlation between average monthly duration of sunlight (h) and volume across the range of *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was marginally related to minimum precipitation (Fig. 15: r=-0.34806911, Z score=-1.58334825, n=22, p=0.05667106).

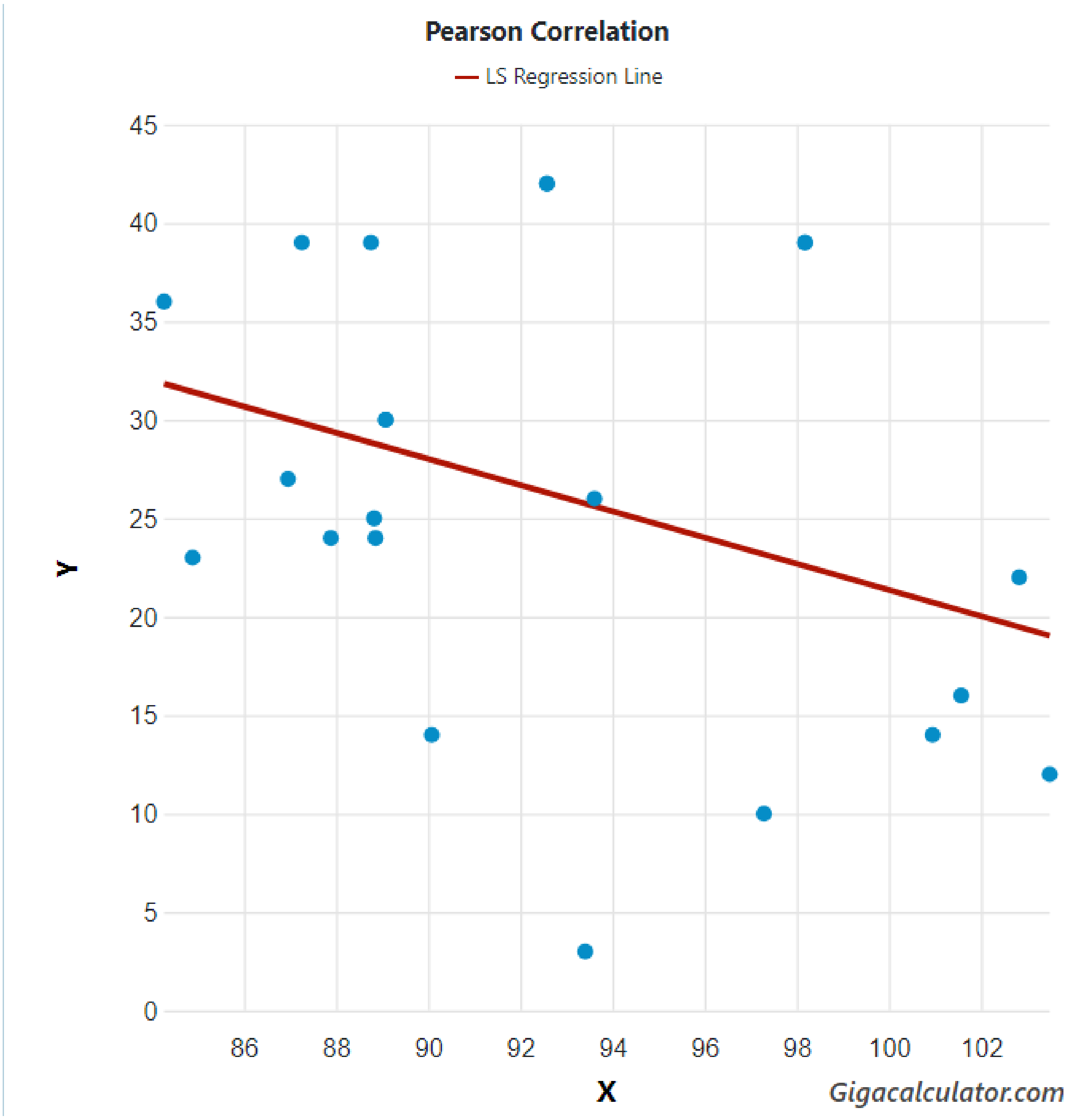

Fig. 15. Correlation between average monthly duration of sunlight (h) and minimum precipitation across therange of *Centrobolus* Cook, 1897.

Highest duration of sunshine in a month was related to average monthly duration of sunlight (Fig. 16: $r=0.8022$, $r^2=0.6435$, $n=22$, $p<0.00001$).

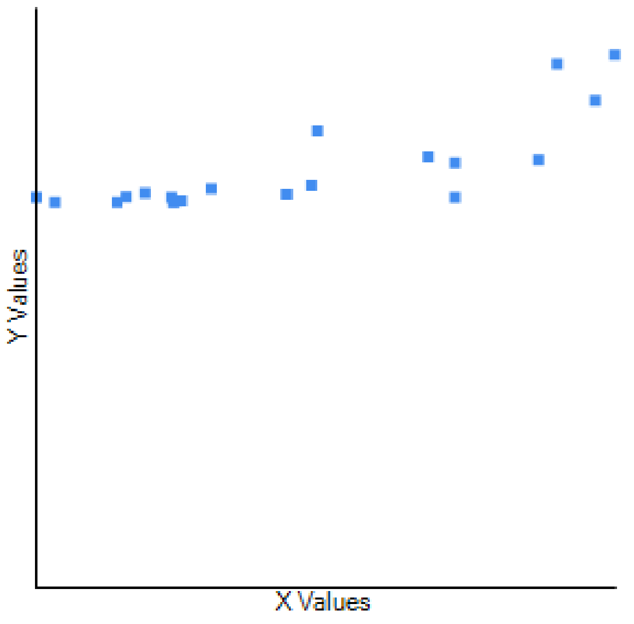

Fig. 16. Correlation between highest duration of sunshine in a day and average monthly duration of sunlight in *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to precipitation (Fig. 17: r= -0.7672, r^2=0.5886, n=22, p=0.000031).

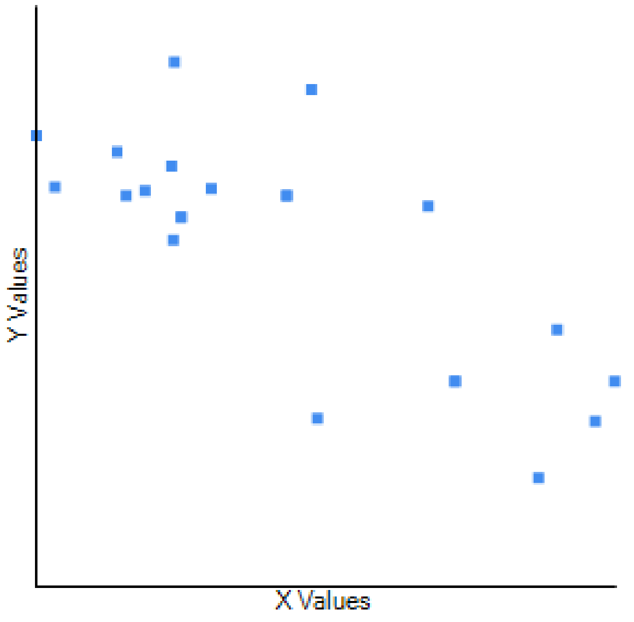

Fig. 17. Correlation between average monthly duration of sunlight (h) and precipitation across the range of *Centrobolus* Cook, 1897.

Lowest duration of sunshine in a month was related to average monthly duration of sunlight (Fig. 18: r=0.9013, r^2=0.8123, n=22, p<0.00001).

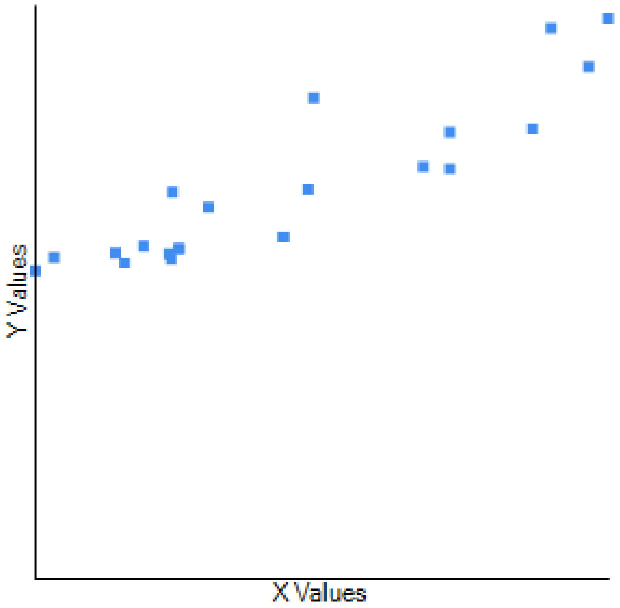

Fig. 18. Correlation between lowest duration of sunshine in a month and average monthly duration of sunlight in *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to temperature (Fig. 19: r= -0.5219, r^2=0.2724, n=22, p=0.012706).

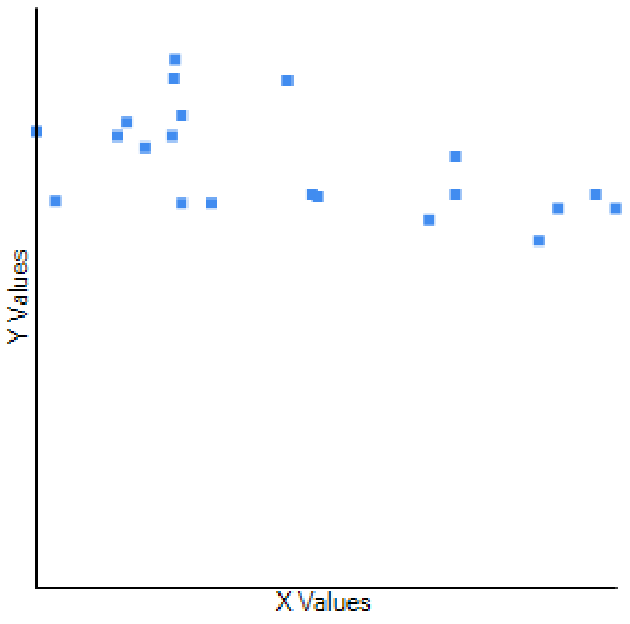

Fig. 19. Correlation between average monthly duration of sunlight (h) and temperature across the range of *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to longitude (Fig. 20: r= -0.6864, r^2=0.4711, n=22, p=0.000424).

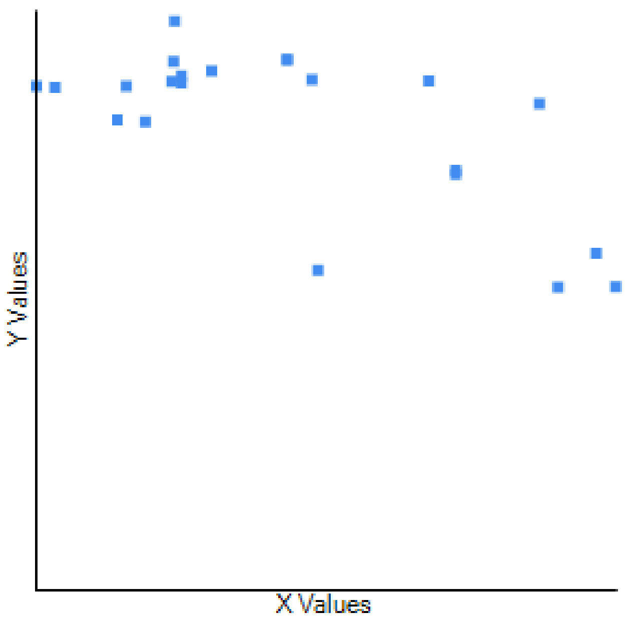

Fig. 20. Correlation between average monthly duration of sunlight (h) and longitude across the range of *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to minimum temperature (Fig. 21: r= -0.5702, r^2=0.3251, n=22, p=0.005614).

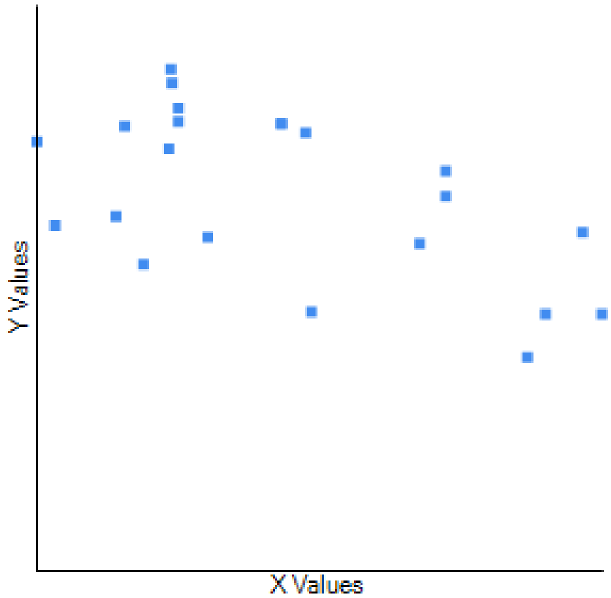

Fig. 21. Correlation between average monthly duration of sunlight (h) and minimum temperature across the range of *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to maximum temperature (Fig. 22: r=- 0.447, r^2=0.1998, n=22, p=0.037006).

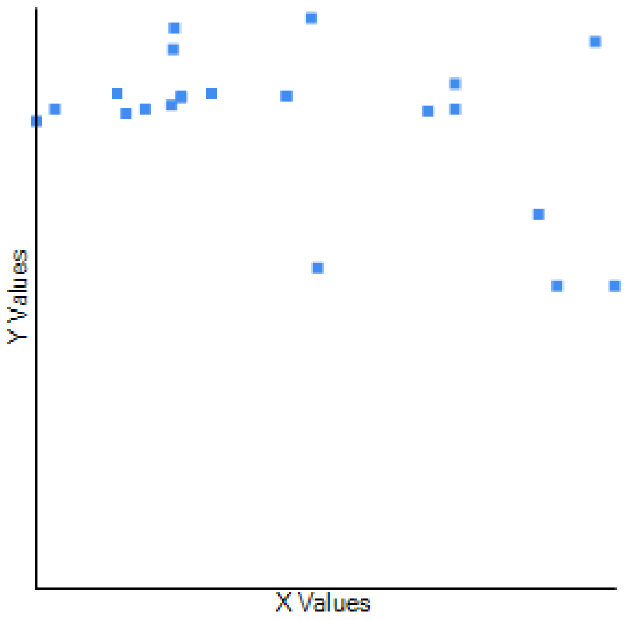

Fig. 22. Correlation between average monthly duration of sunlight (h) and maximum temperature across therange of *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to highest total hours of sunshine in a month (Fig. 23: r=-0.6016, r^2=0.3619, n=22, p=0.003033).

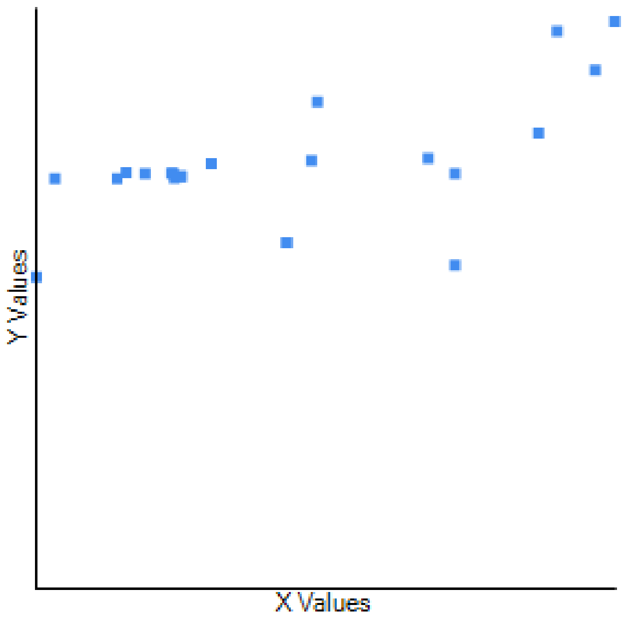

Fig. 23. Correlation between average monthly duration of sunlight (h) and highest total hours of sunshine in a month in females across therange of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was related to average monthly duration of sunlight (Fig. 24: r=-0.9321, r^2=08688, n=22, p<0.00001).

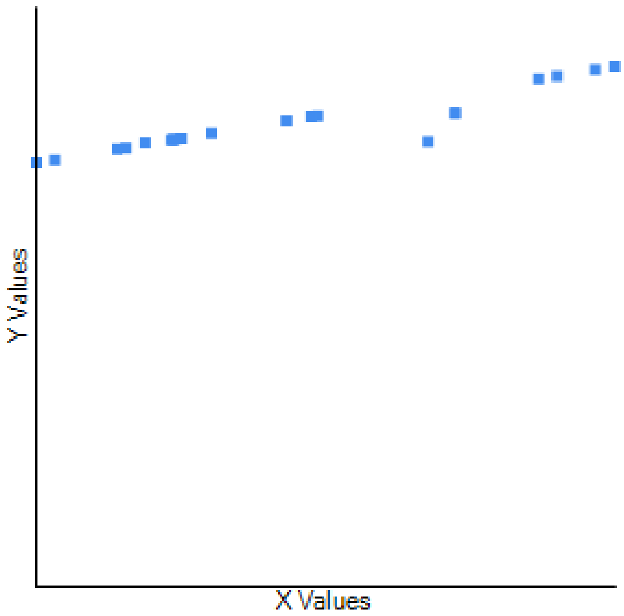

Fig. 24. Correlation between hours of sunshine throughout the year (h) and average monthly duration of sunlight across therange of *Centrobolus* Cook, 1897.

Minimum ocean water temperature was related to average monthly duration of sunlight (Fig. 25: r=-0.84285802, Z score=-3.01522781, n=9, p=0.001284).

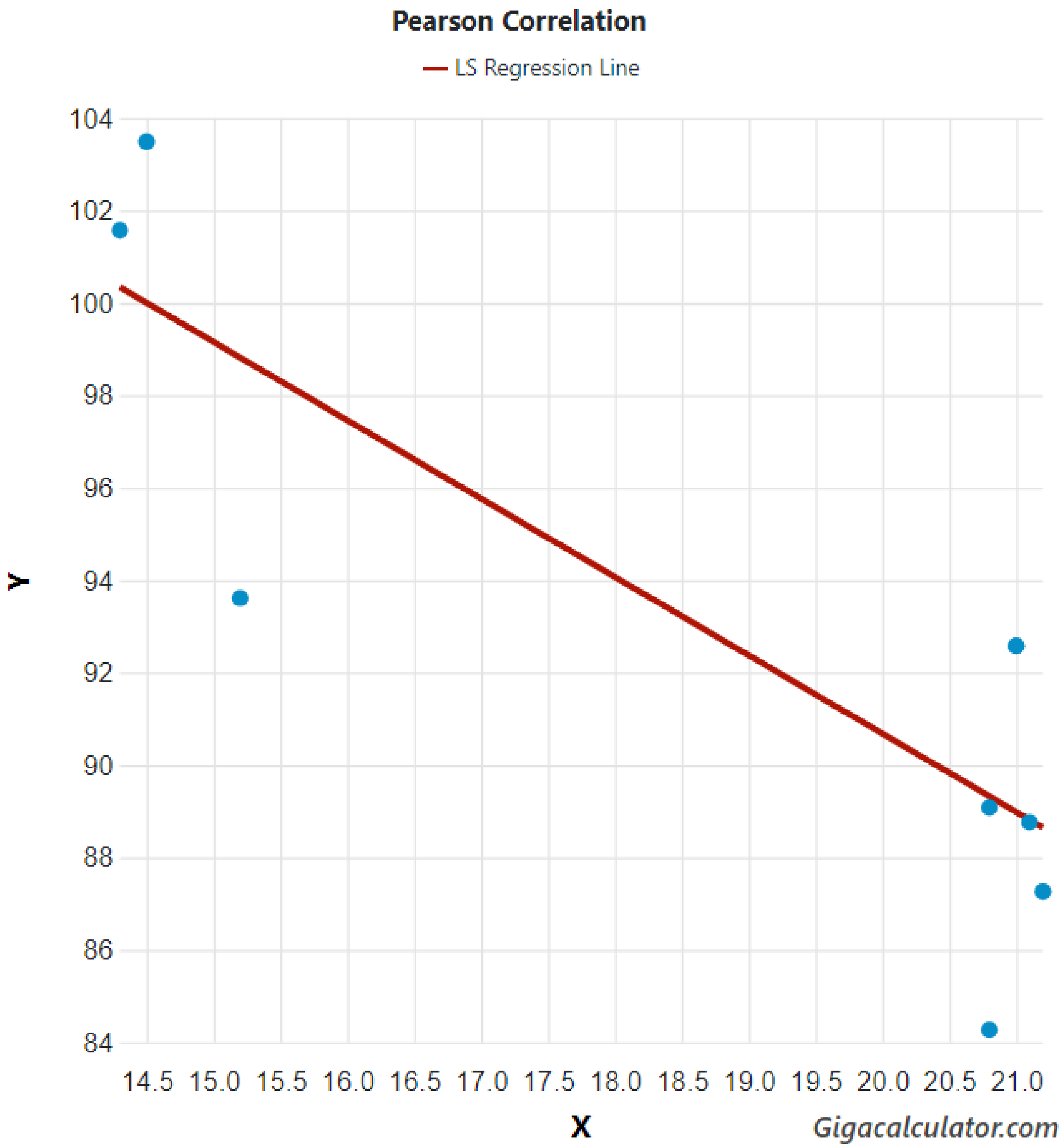

Fig. 25. Correlation between minimum ocean water temperature and average monthly duration of sunlight in *Centrobolus* Cook, 1897.

Mean ocean water temperature was related to average monthly duration of sunlight (Fig. 26: r=-0.85467114, Z score=-3.11876809, n=9, p=0.00090811).

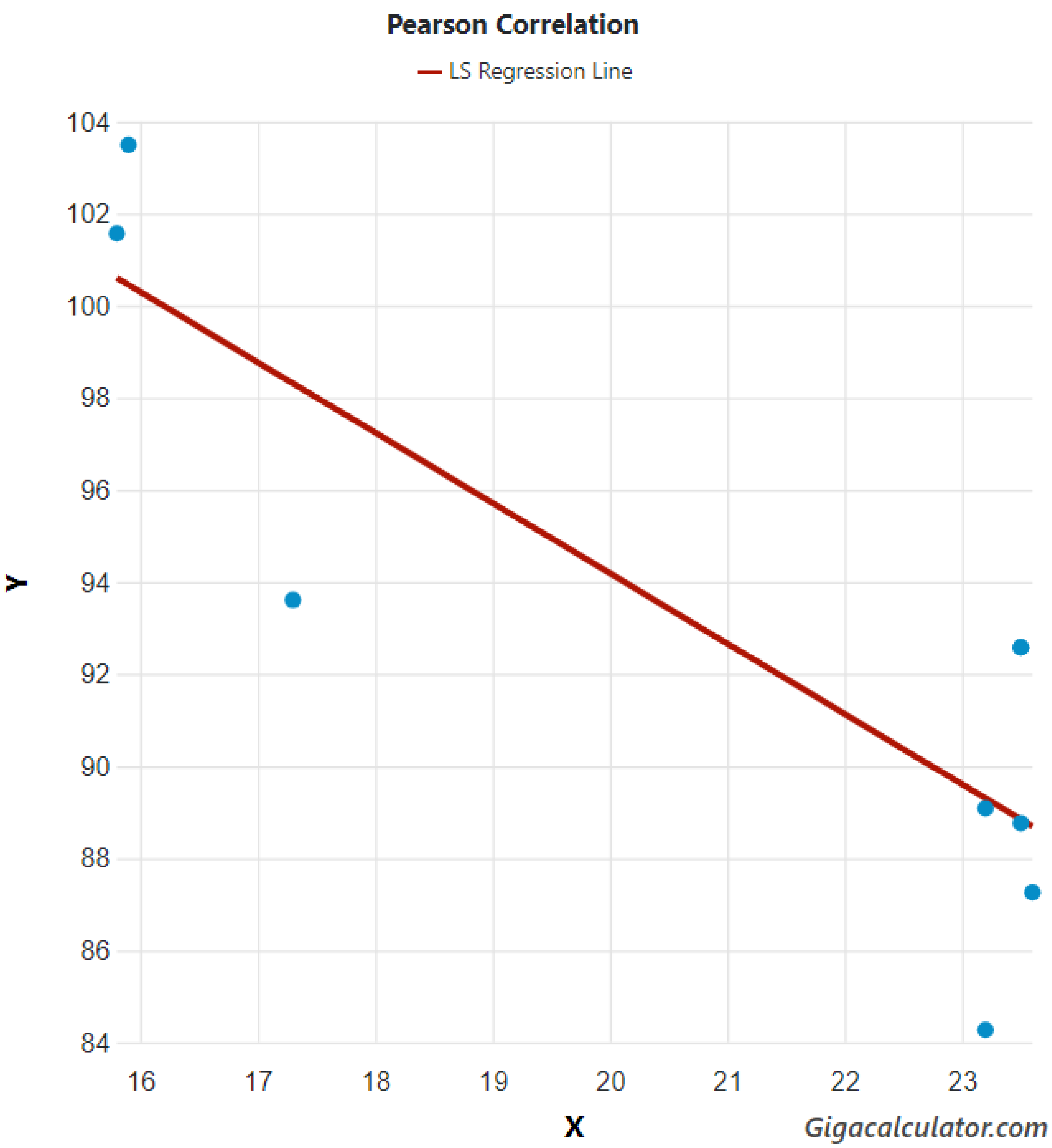

Fig. 26. Correlation between mean ocean water temperature and average monthly duration of sunlight in *Centrobolus* Cook, 1897.

Abundance was related to average monthly duration of sunshine (Fig. 27: r=-0.63046242, Z score=1.65957221, n=8, p=0.04850025).

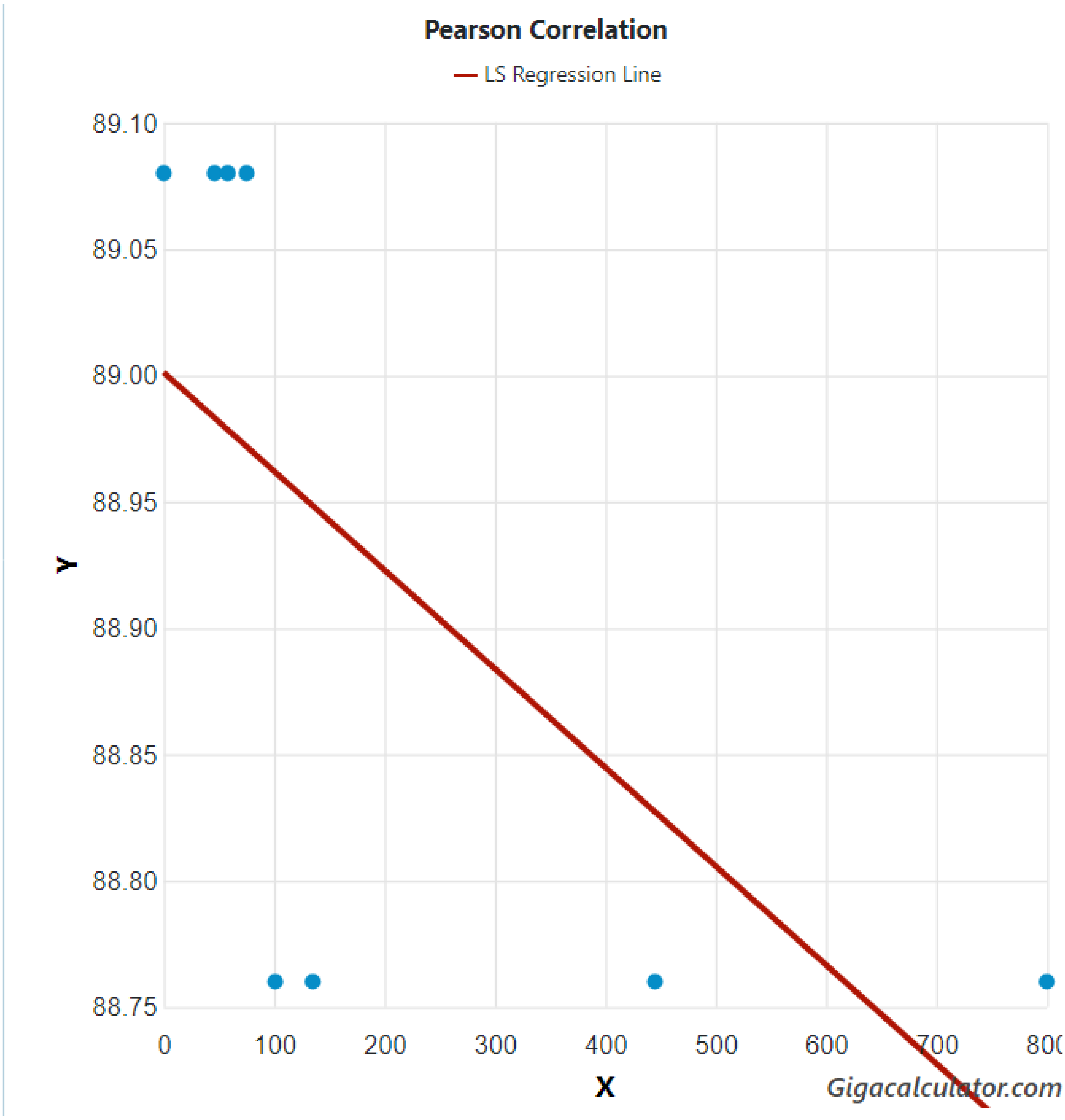

Fig. 27. Correlation between abundance and average monthly duration of sunshine across the range of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was correlated with mean ocean water temperature (Fig. 28: r=-0.85918934, Z score=-3.41365378, n=10, p=0.00032054).

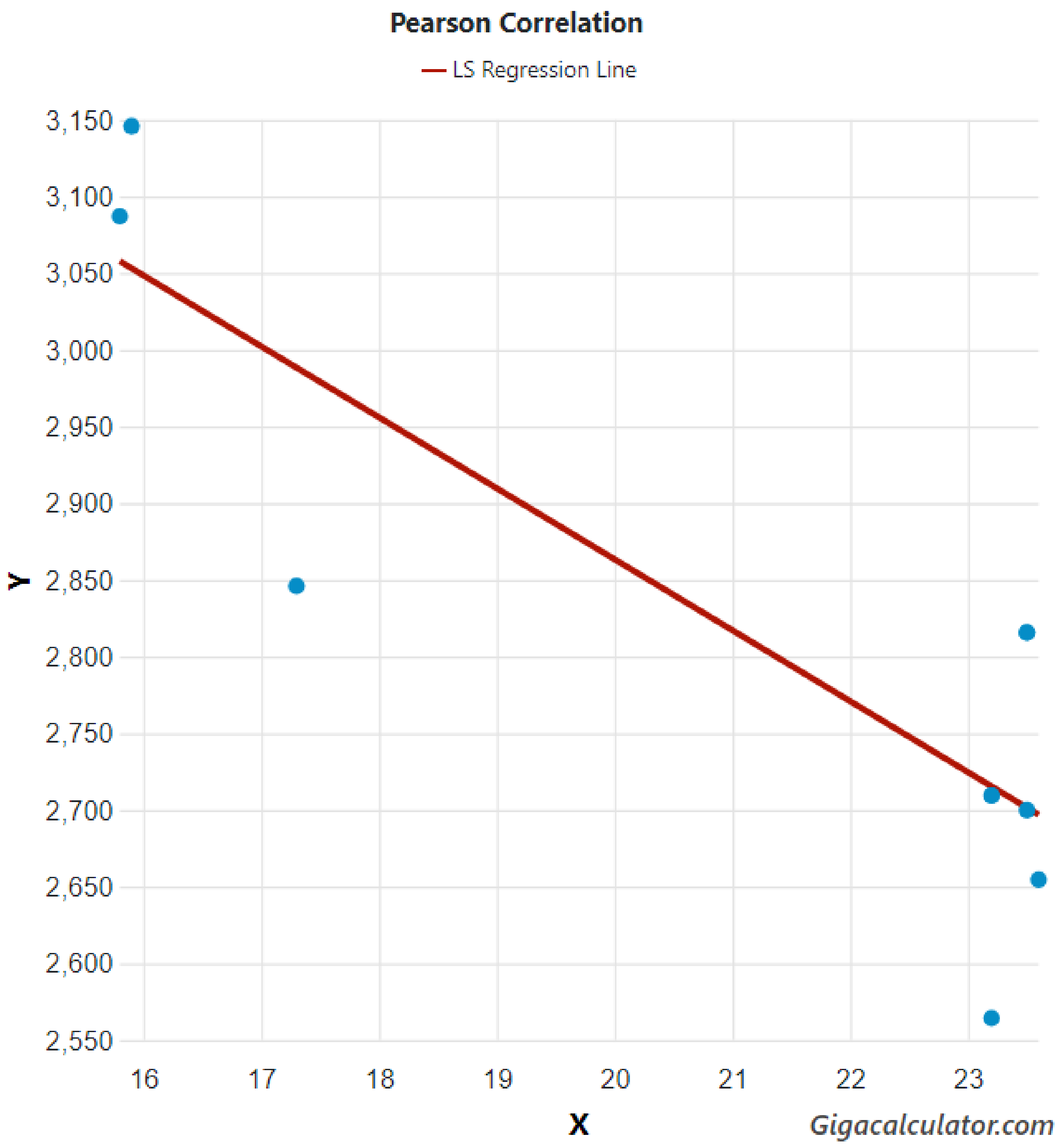

Fig. 28. Correlation between Hours of sunshine throughout the year (y) and mean ocean water temperature (x) across therange of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was related to highest duration of sunshine (Fig. 29: r= 0.8292, r^2=0.6876, n=22, p<0.00001).

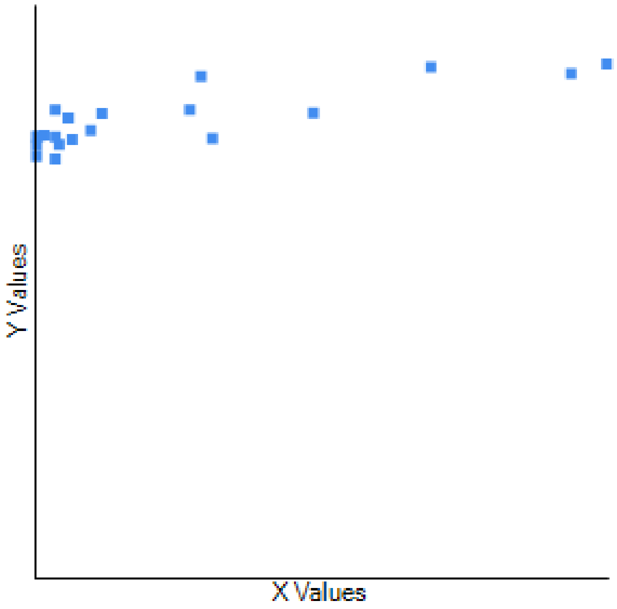

Fig. 29. Correlation between hours of sunshine throughout the year (h) and highest duration of sunshine across therange of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was related to longitude (Fig. 30: r=- 0.7201, r^2=0.5185, n=22, p=0.000158).

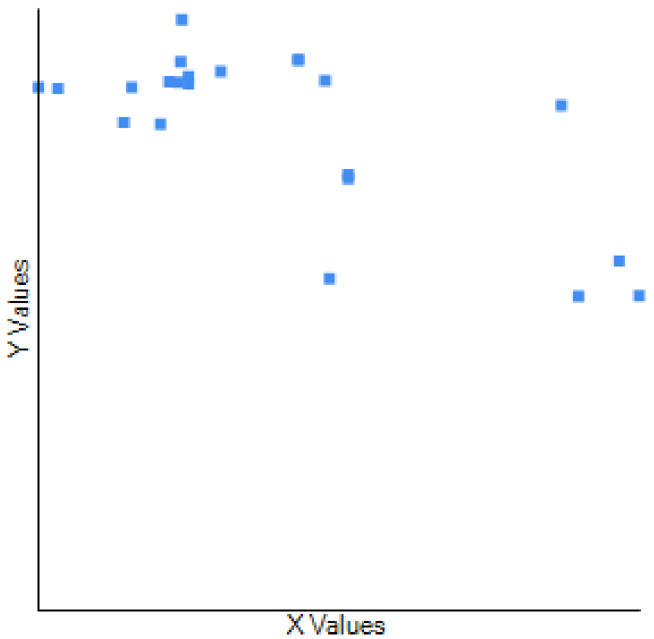

Fig. 30. Correlation between hours of sunshine throughout the year (h) and longitude across the range of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was correlated with temperature (Fig. 31: r=- 0.4449, r^2=0.1979, n=22, p=0.037964).

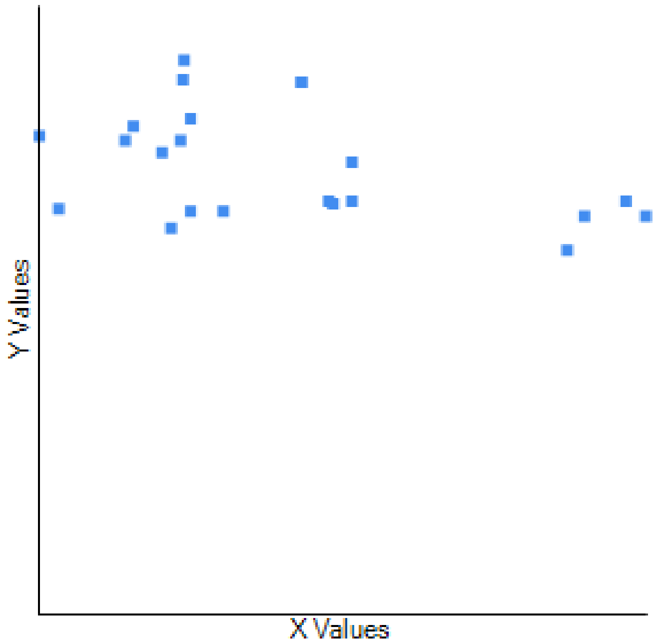

Fig. 31. Correlation between Hours of sunshine throughout the year (x) and temperature (y) across the range of *Centrobolus* Cook, 1897.

Surface-area-to-volume ratio was related to hours of sunshine throughout the year in males (Fig. 32: Pearson's r=0.54167894, Z score2.64379727, n=22, p=0.00409913) and in females (Fig. 33: Pearson's r=0.44390687, Z score=2.07956978, n=22, p=0.01878244).

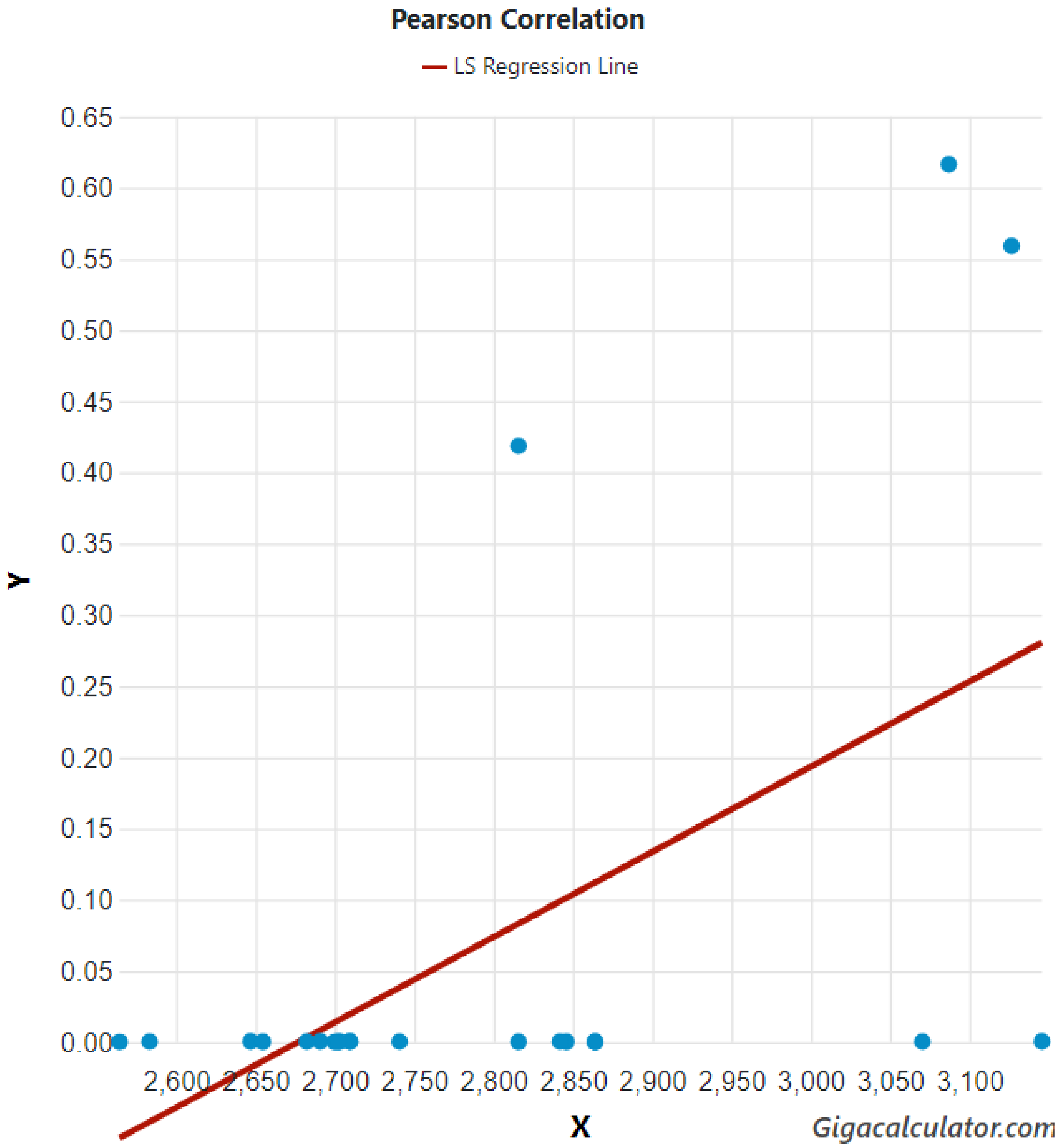

Fig. 32. Surface-area-to-volume ratio correlated hours of sunshine throughout the year in male *Centrobolus* Cook, 1897.

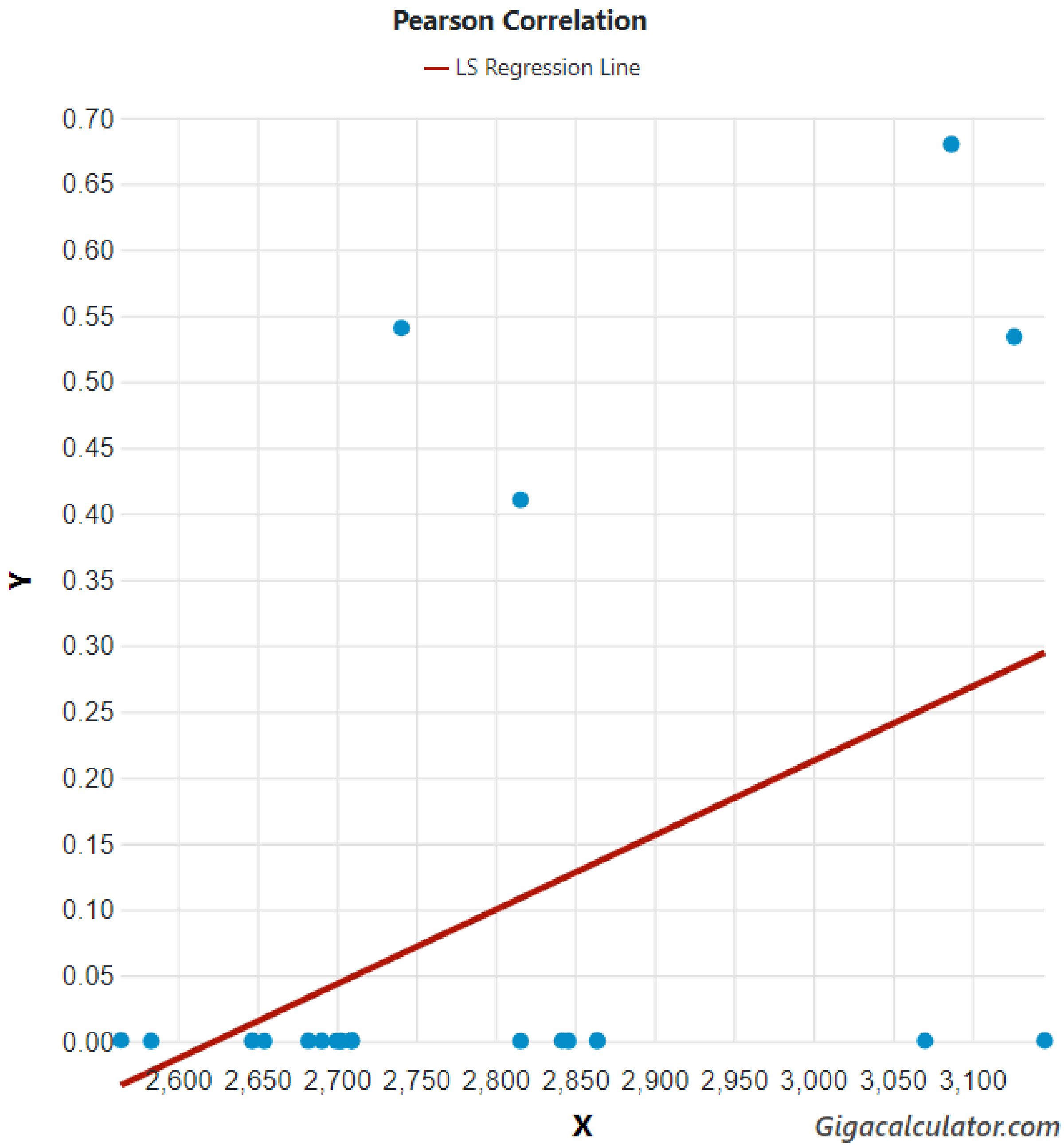

Fig. 33. Surface-area-to-volume ratio correlated to hours of sunshine throughout the year in female *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was correlated with precipitation (Fig. 34: r=- 0.7535, r^2=0.5678, n=22, p=0.000051).

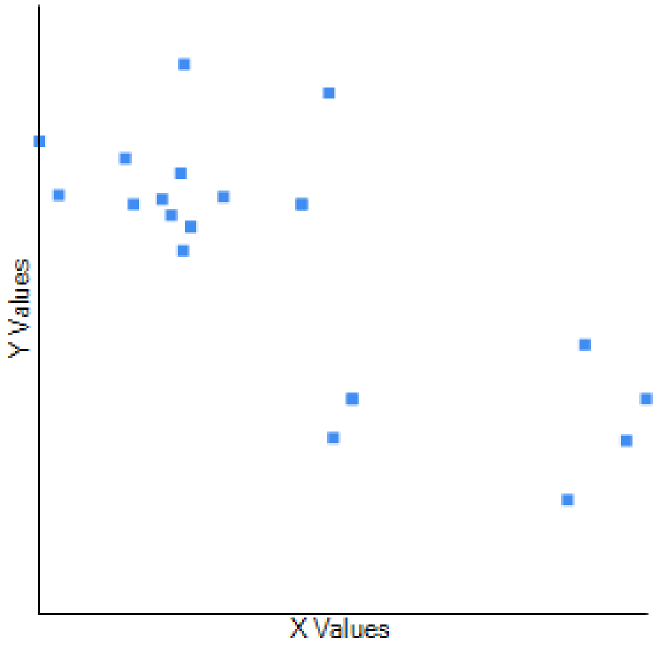

Fig. 34. Correlation between copulation duration (x) and lowest relative humidity (y) across the range of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year were correlated with moments of inertia (Fig. 35: r=- 0.6709, r^2=0.4501, n=10, p=0.033665).

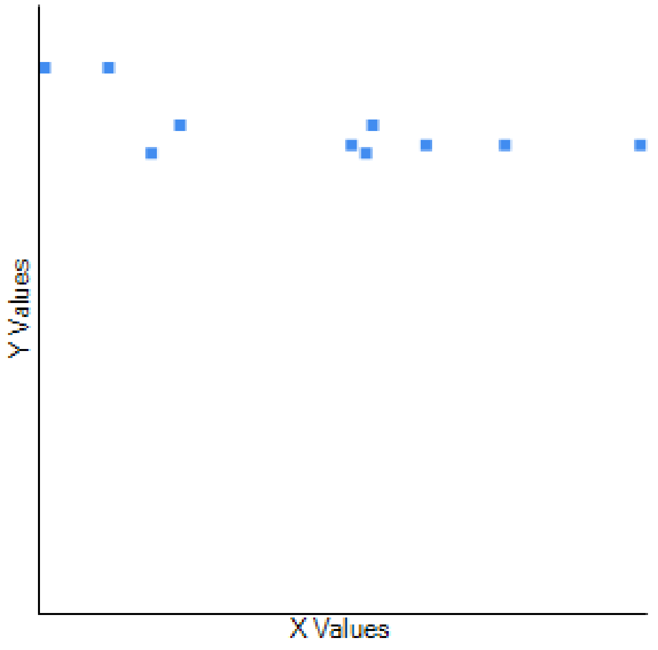

Fig. 35. Correlation between moments of inertia (Y) and hours of sunshine throughout the year (X) across therange of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year were correlated with species volume (Fig. 36: r=- 0.505, r^2=0.255, n=22, p=0.016523).

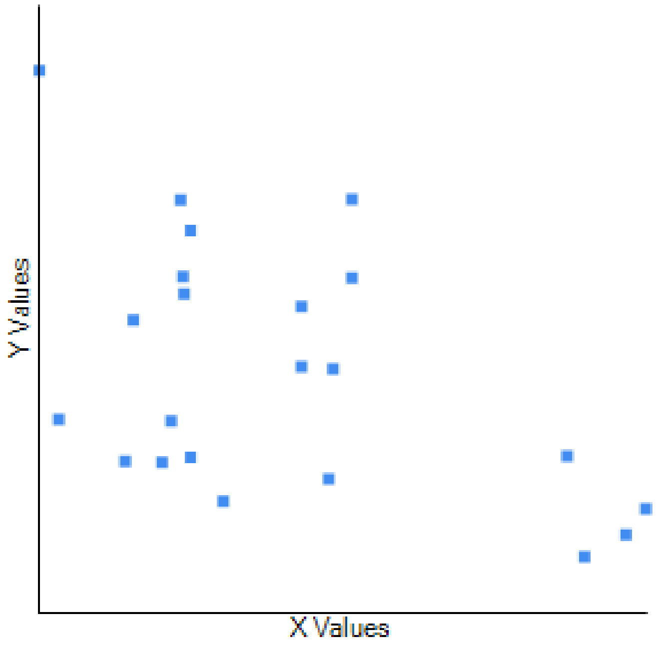

Fig. 36. Correlation between hours of sunshine throughout the year (x) and species volume (y) across the range of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was related to minimum temperature (Fig. 37: r=- 0.5656, r^2=0.3199, n=22, p=0.006037).

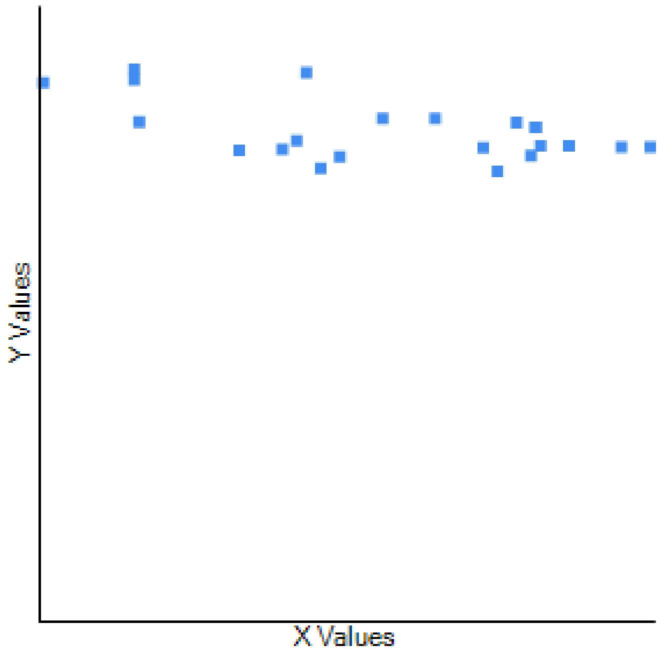

Fig. 37. Correlation between hours of sunshine throughout the year (h) and minimum temperature across therange of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was correlated with minimum ocean water temperature (Fig. 38: r=-0.84222549, Z score=-3.00988739, n=9, p=0.00130679).

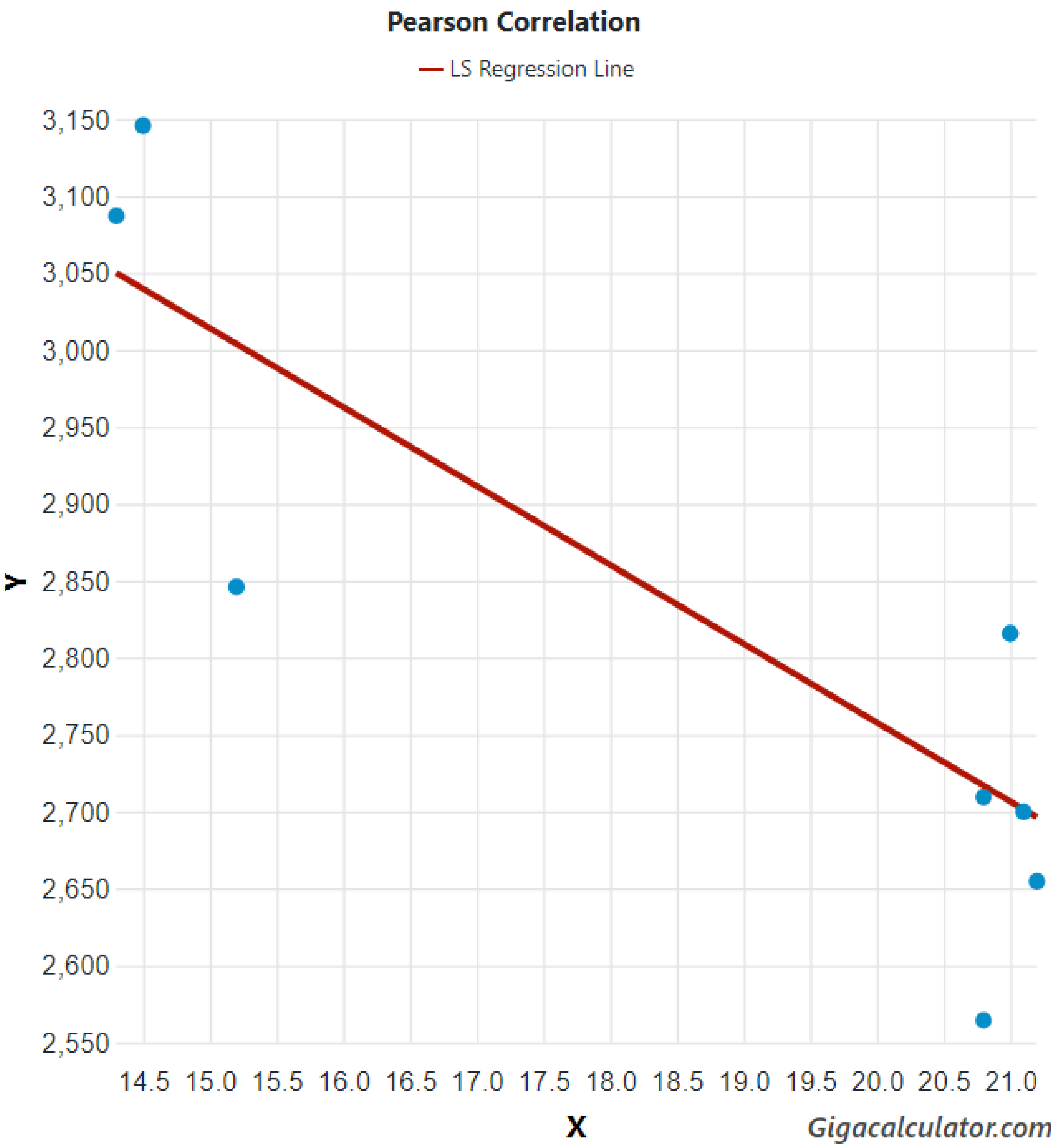

Fig. 38. Correlation between Hours of sunshine throughout the year (y) and minimum ocean water temperature (x) across therange of *Centrobolus* Cook, 1897.

The moments of inertia were correlated with highest duration of sunshine (Fig. 39: r=- 0.6579, r^2=0.4328, n=10, p=0.038658).

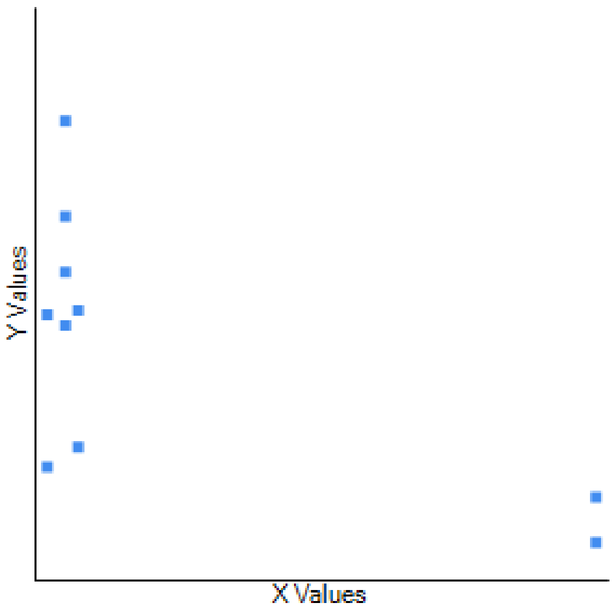

Fig. 39. Correlation between moments of inertia (Y) and highest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

The mass was correlated with highest duration of sunshine (Fig. 40: r= -0.7322, r^2=0.5361, n=10, p=0.016047).

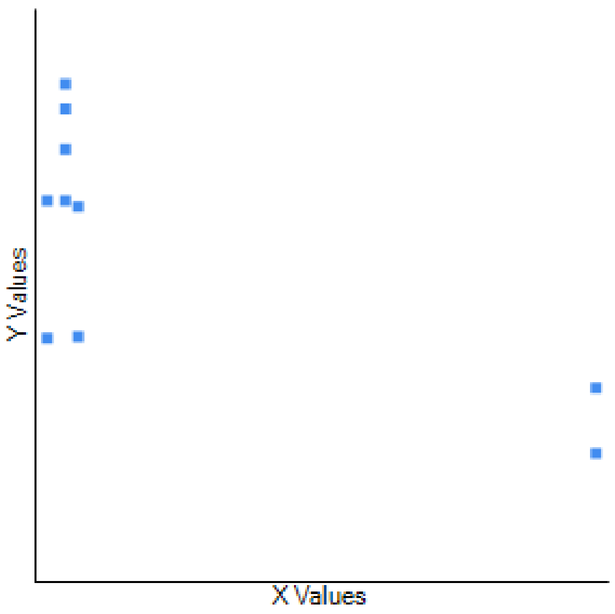

Fig. 40. Correlation between mass (Y) and highest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

The longitude was correlated with highest duration of sunshine (Fig. 41: r=- 0.8759, r^2=0.7672, n=22, p<0.00001).

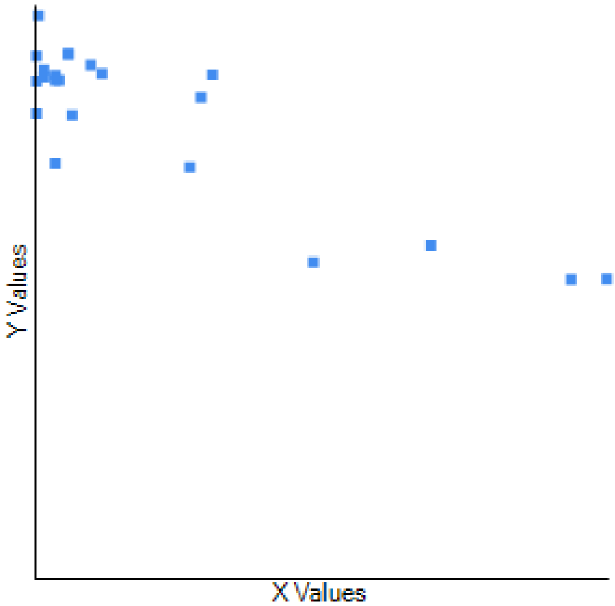

Fig. 41. Correlation between longitude (Y) and highest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

Lowest duration of sunshine in a month was related to highest total hours of sunshine in a month (Fig. 42: r=0.9396, r^2=0.8828, n=22, p<0.00001).

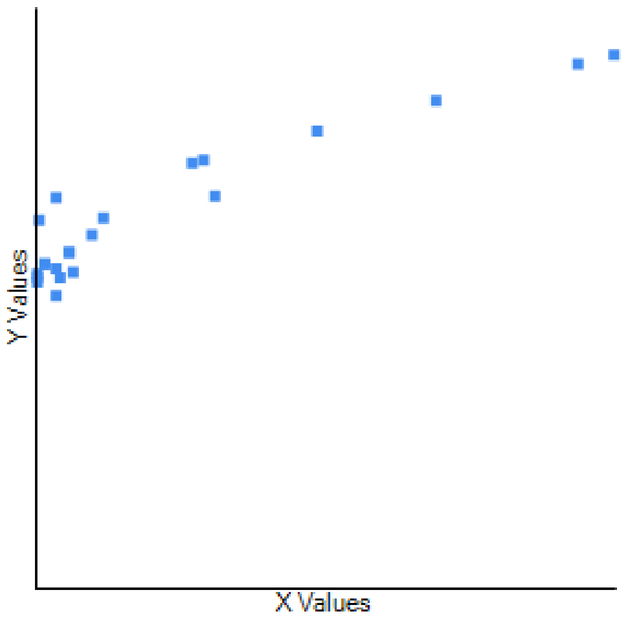

Fig. 42. Correlation between lowest duration of sunshine (h) and highest total hours of sunshine in a month across therange of *Centrobolus* Cook, 1897.

The latitude was correlated with highest duration of sunshine (Fig. 43: r=- 0.4684, r^2=0.2194, n=22, p=0.027902).

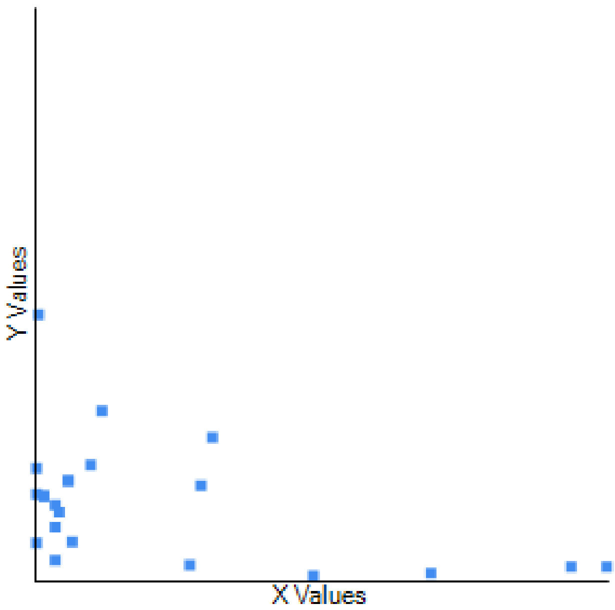

Fig. 43. Correlation between latitude (Y) and highest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

Precipitation was related to highest duration of sunshine (Fig. 44: $r=-0.6312$, $r^2=0.3984$, $n=22$, $p=0.001632$).

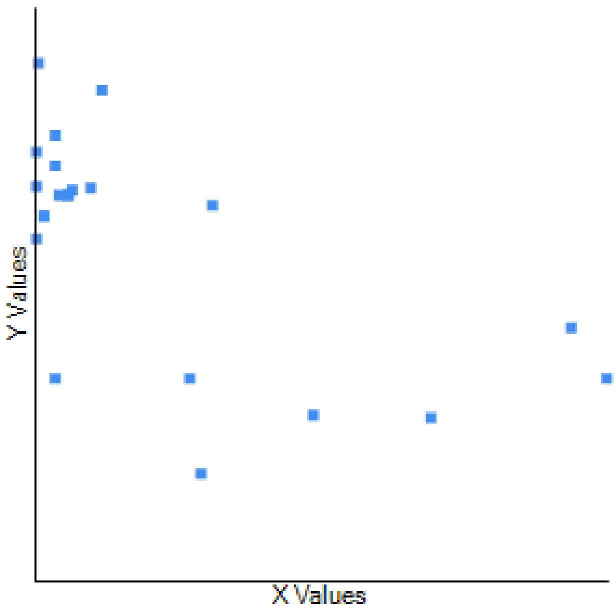

Fig. 44. Correlation between preciptation and highest duration of sunshine across the range of *Centrobolus* Cook, 1897.

The volume was correlated with highest duration of sunshine in a day (Fig. 45: r=- 0.5152, r^2=0.2654, n=22, p=0.014136).

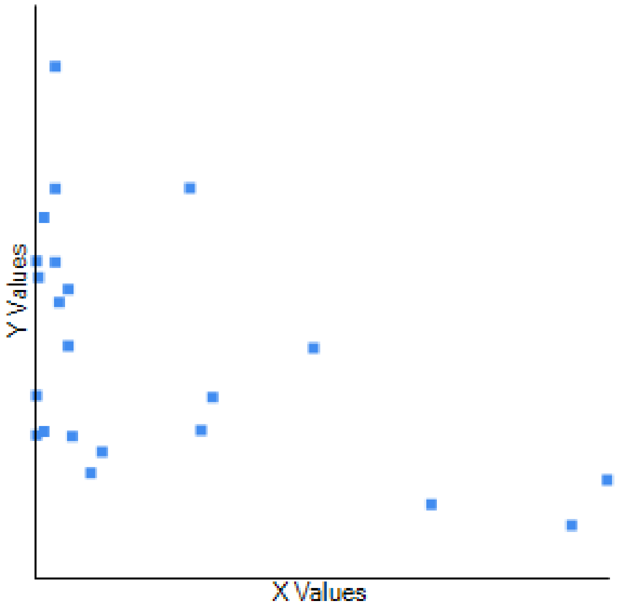

Fig. 45. Correlation between the volume (Y) and highest duration of sunshine in a day (X) across the range of *Centrobolus* Cook, 1897.

Minimum temperature was related to highest duration of sunshine (Fig. 46: $r = -0.6229$, $r^2=0.388$, $n=22$, $p=0.001958$).

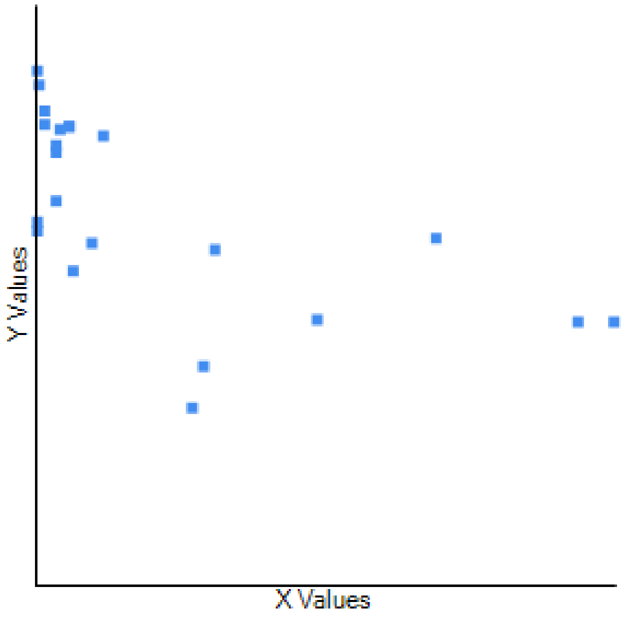

Fig. 46. Correlation between minimum temperature and highest duration of sunshine across the range of *Centrobolus* Cook, 1897.

Minimum temperature was related to highest duration of sunshine (Fig. 47: r= -0.6229, r^2=0.388, n=22, p=0.001958).

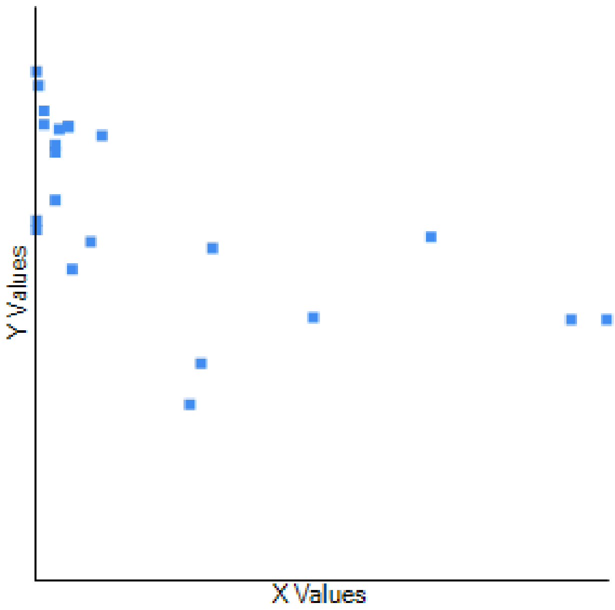

Fig. 47. Correlation between minimum temperature and highest duration of sunshine across the range of *Centrobolus* Cook, 1897.

Maximum temperature was related to highest hours of sunshine in a month (Fig. 48: r= -0.6182, r^2=0.3822, n=22, p=0.002167).

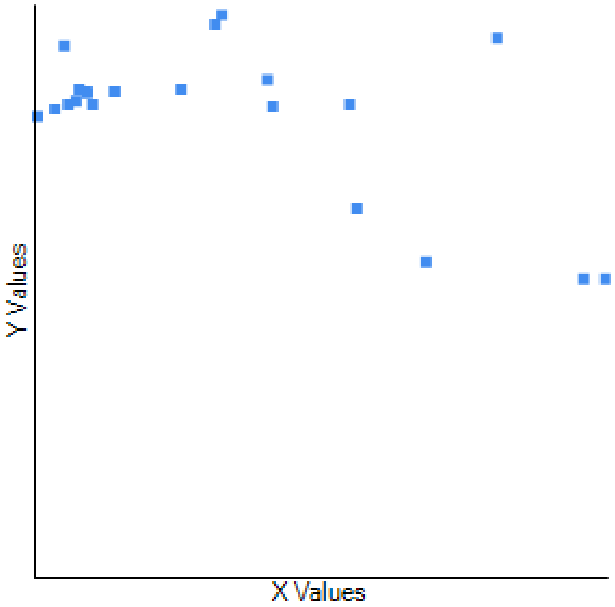

Fig. 48. Correlation between maximum temperature and lowest duration of sunshine across the range of *Centrobolus* Cook, 1897.

Minimum ocean water temperature was related to highest duration of sunshine (Fig. 49: r=-0.9592, r^2=0.9201, n=9, p=0.000043).

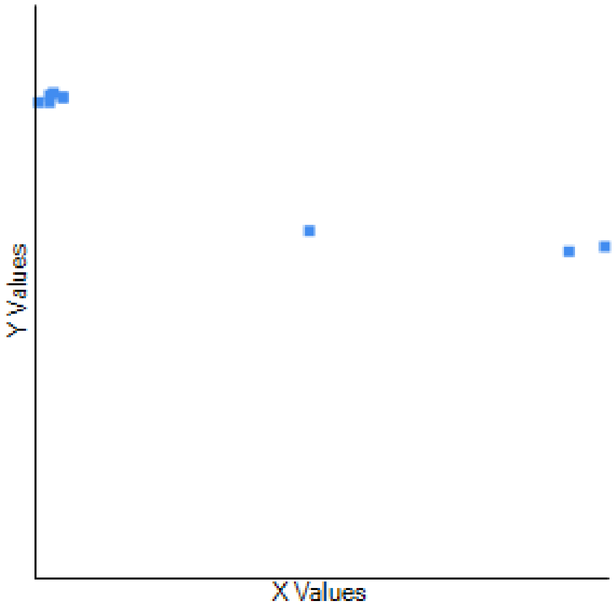

Fig. 49. Correlation between minimum ocean water temperature and highest duration of sunshine in *Centrobolus* Cook, 1897.

Abundance was related to highest duration of sunshine in a day (Fig. 50: r=0.63046242, Z score=1.65957221, n=8, p=0.04850025).

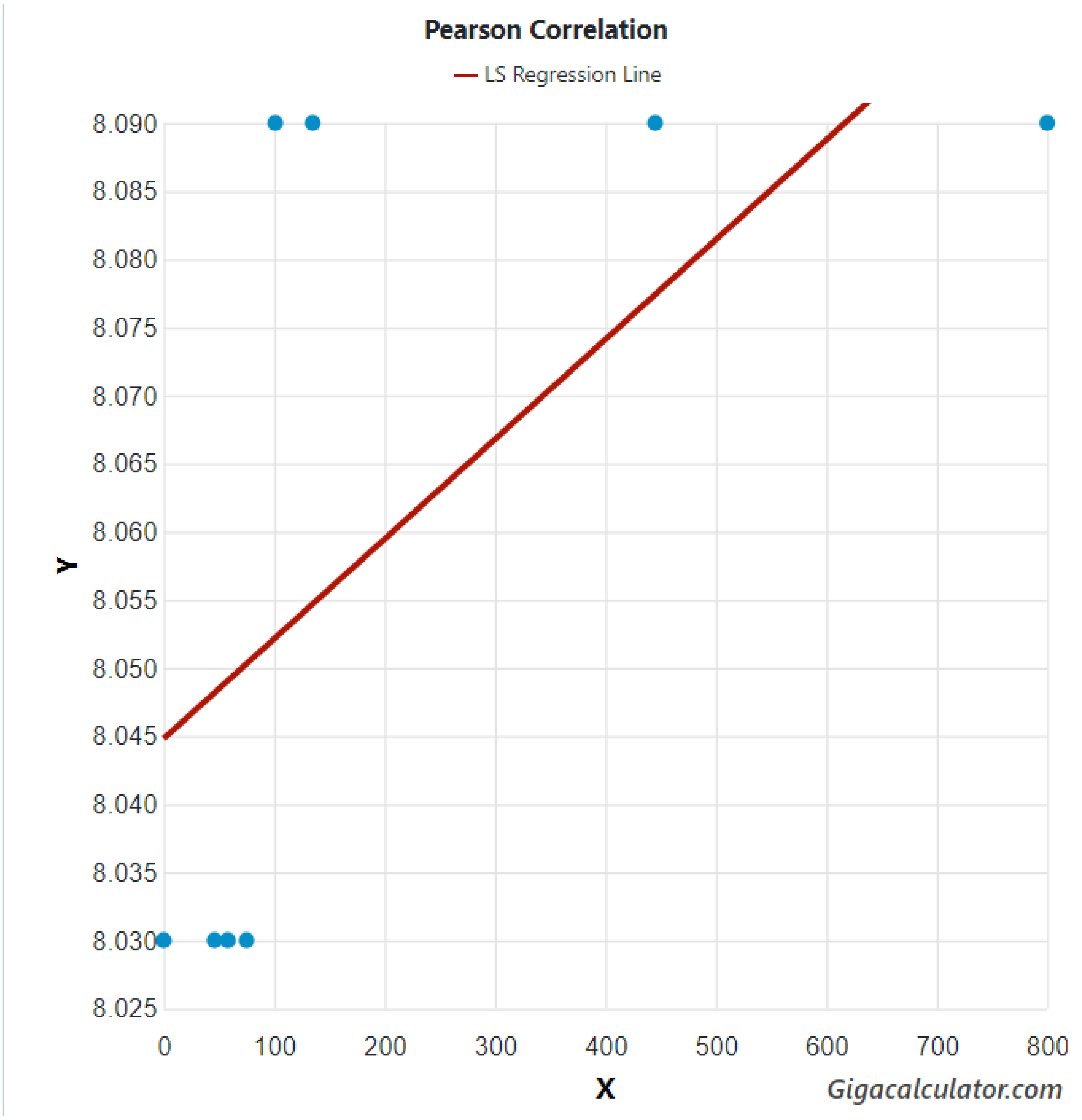

Fig. 50. Correlation between abundance and highest duration of sunshine in a day across the range of *Centrobolus* Cook, 1897.

Mean ocean water temperature was related to highest duration of sunshine (Fig. 51: r=-0.9721, r^2=0.945, n=9, p=0.000012).

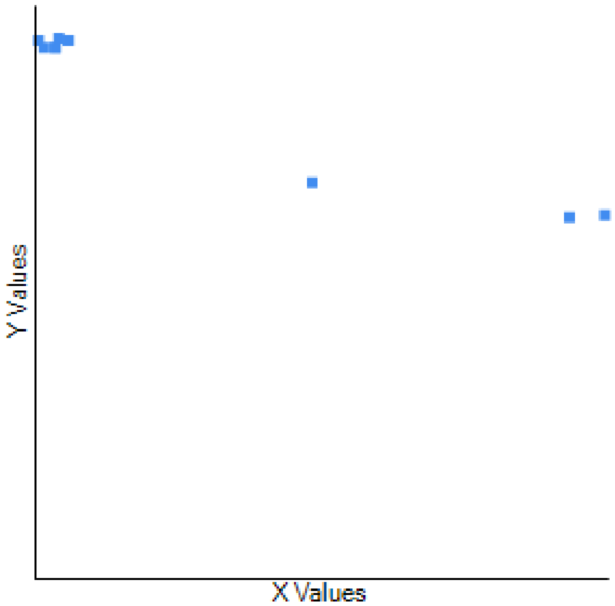

Fig. 51. Correlation between mean ocean water temperature and highest duration of sunshine in *Centrobolus* Cook, 1897.

The temperature was correlated with lowest duration of sunshine (Fig. 52: r=- 0.5342, r^2=0.2854, n=22, p=0.010438).

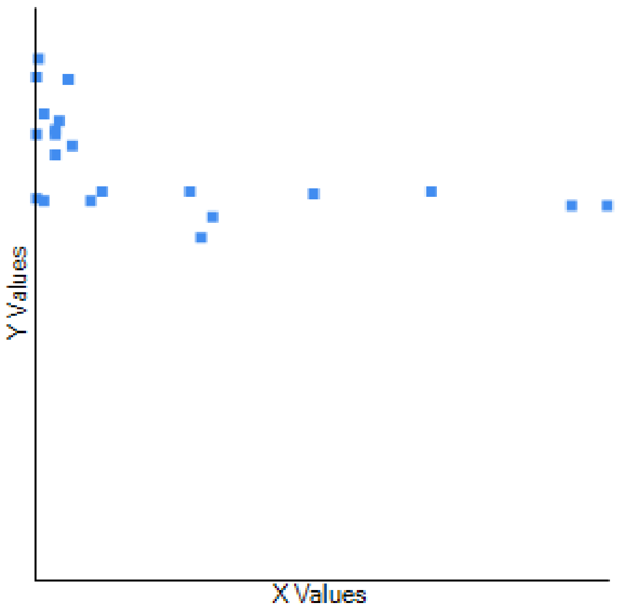

Fig. 52. Correlation between temperature (X) and highest duration of sunshine (Y) across the range of *Centrobolus* Cook, 1897.

Highest duration of sunshine was related to highest total hours of sunshine in a month (Fig. 53: r= 0.8586, r^2=0.7372, n=22, p<0.00001).

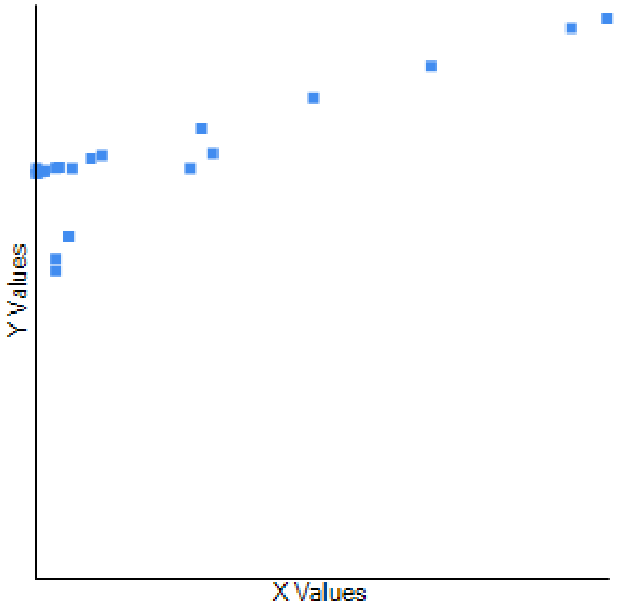

Fig. 53. Correlation between highest duration of sunshine (h) and highest total hours of sunshine in a month across therange of *Centrobolus* Cook, 1897.

Hours of sunshine throughout the year was related to lowest duration of sunshine (Fig. 54: r= 0.903, r^2=0.8154, n=22, p<0.00001).

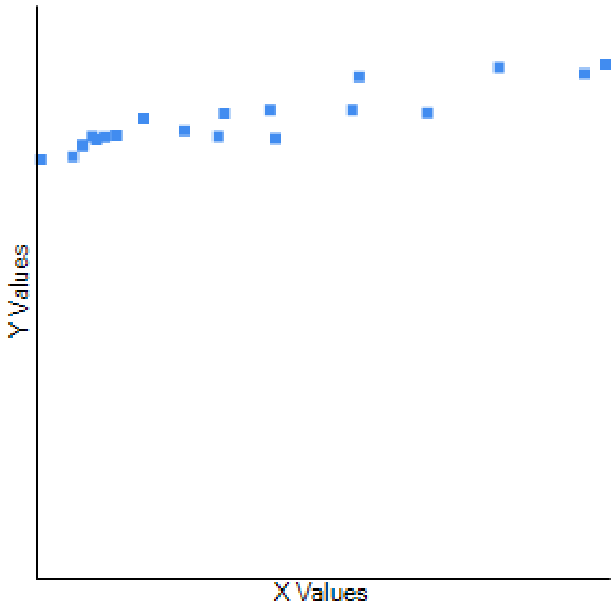

Fig. 54. Correlation between hours of sunshine throughout the year (h) and lowest duration of sunshine across therange of *Centrobolus* Cook, 1897.

The temperature was correlated with lowest duration of sunshine (Fig. 55: r=- 0.5688, r^2=0.3235, n=22, p=0.005738).

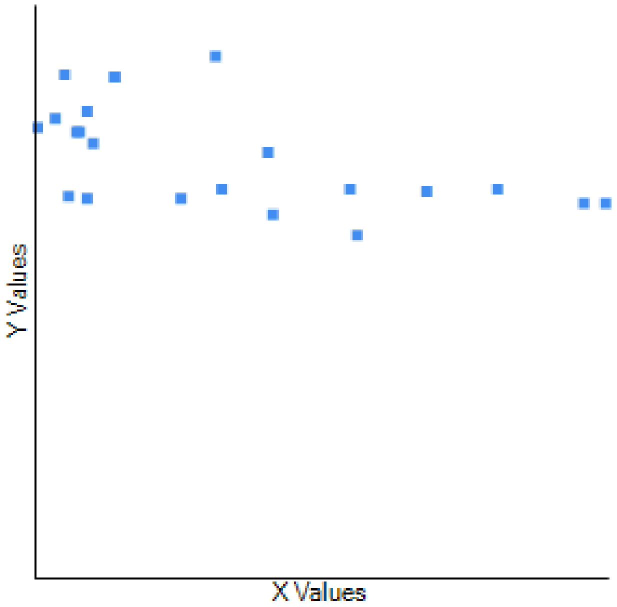

Fig. 55. Correlation between temperature (X) and lowest duration of sunshine (Y) across the range of *Centrobolus* Cook, 1897.

Precipitation was related to lowest duration of sunshine (Fig. 56: $r=-0.727$, $r^2=0.5285$, $n=22$, $p=0.000127$).

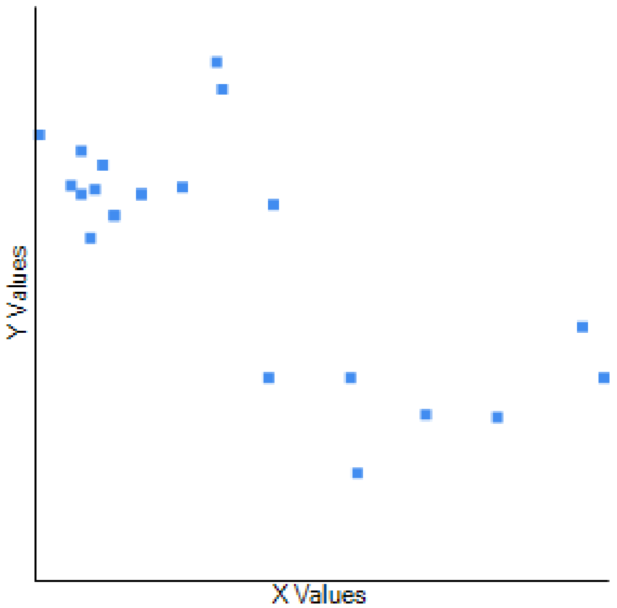

Fig. 56. Correlation between preciptation and lowest duration of sunshine across the range of *Centrobolus* Cook, 1897.

The mass was correlated with lowest duration of sunshine (Fig. 57: $r= -0.7424$, $r^2=0.5512$, $n=10$, $p=0.013925$).

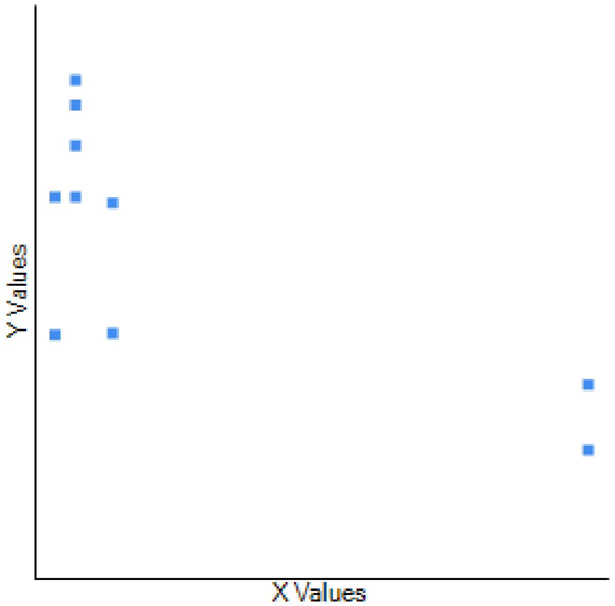

Fig. 57. Correlation between mass (Y) and lowest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

The longitude was correlated with lowest duration of sunshine (Fig. 58: $r=- 0.8491$, $r^2=0.721$, $n=22$, $p<0.00001$).

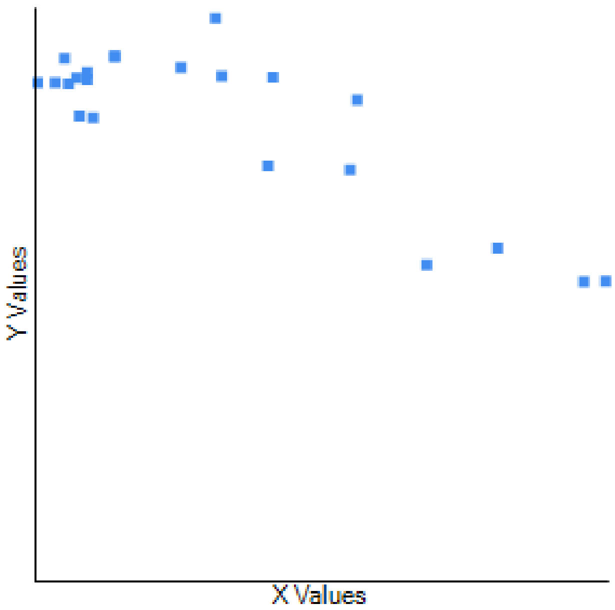

Fig. 58. Correlation between longitude (Y) and lowest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

The moments of inertia were correlated with lowest duration of sunshine (Fig. 59: r=- 0.6673, r^2=0.4453, n=10, p=0.035028).

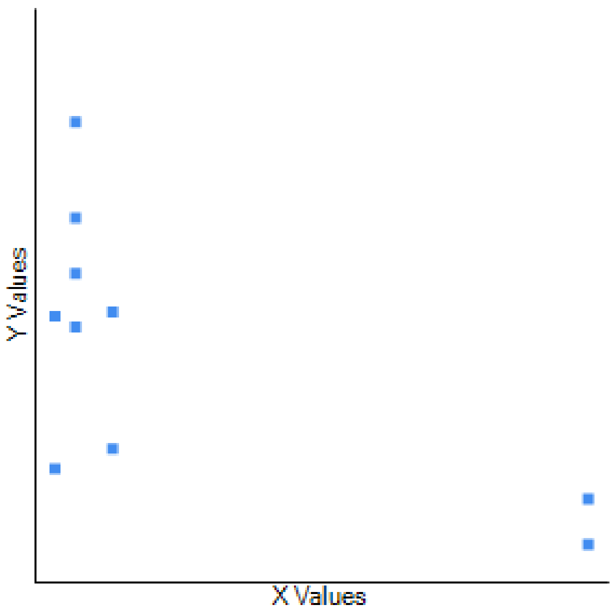

Fig. 59. Correlation between moments of inertia (Y) and lowest duration of sunshine (X) across the range of *Centrobolus* Cook, 1897.

Abundance was related to lowest duration of sunshine in a month (Fig. 60: r=-0.63046242, Z score=-1.65957221, n=8, p=0.04850025).

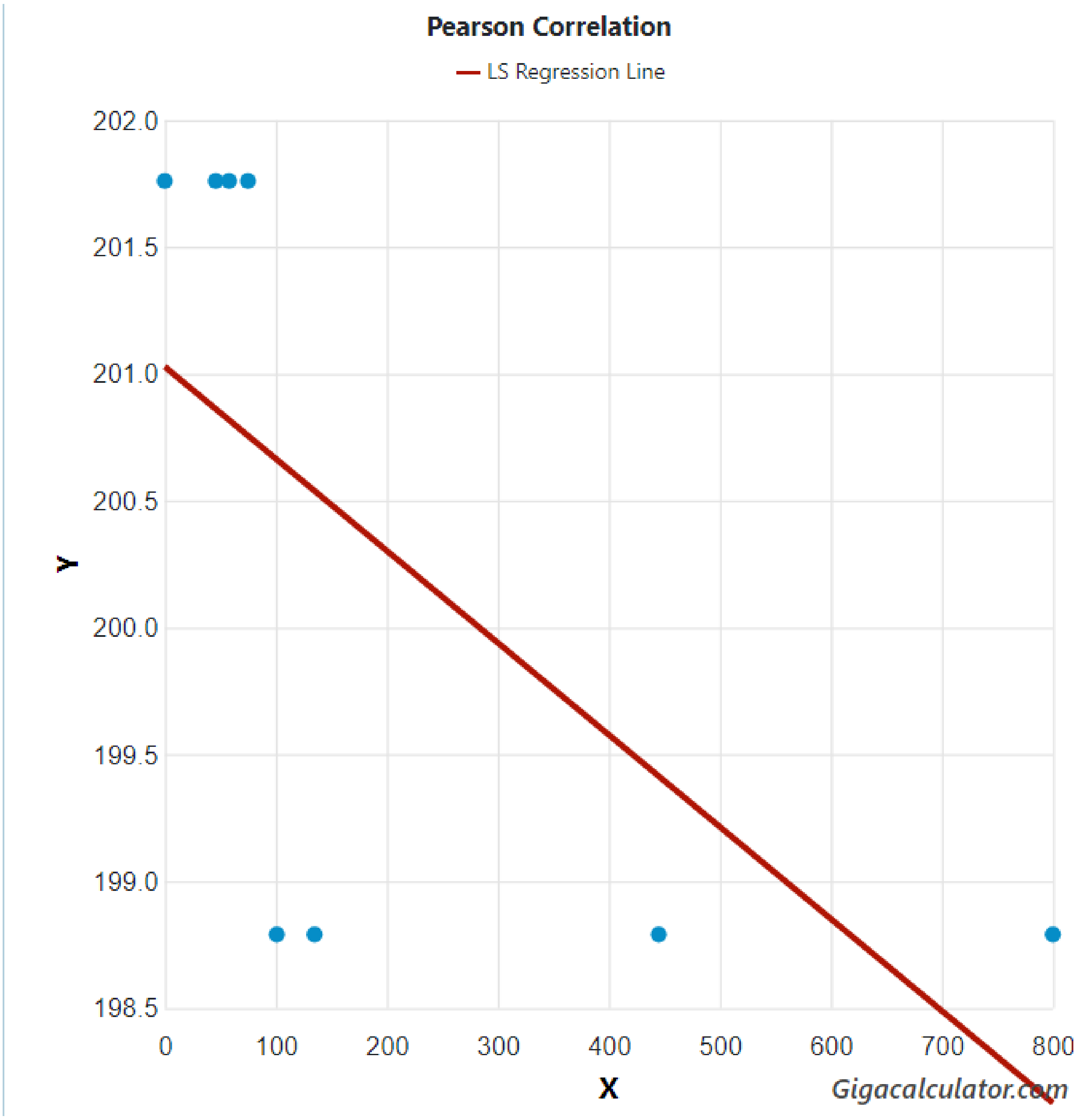

Fig. 60. Correlation between abundance and lowest duration of sunshine in a month across the range of *Centrobolus* Cook, 1897.

Lowest duration of sunshine was related to minimum precipitation (Fig. 61: $r=-0.4566$, $r^2=0.2085$, $n=22$, $p=0.032671$).

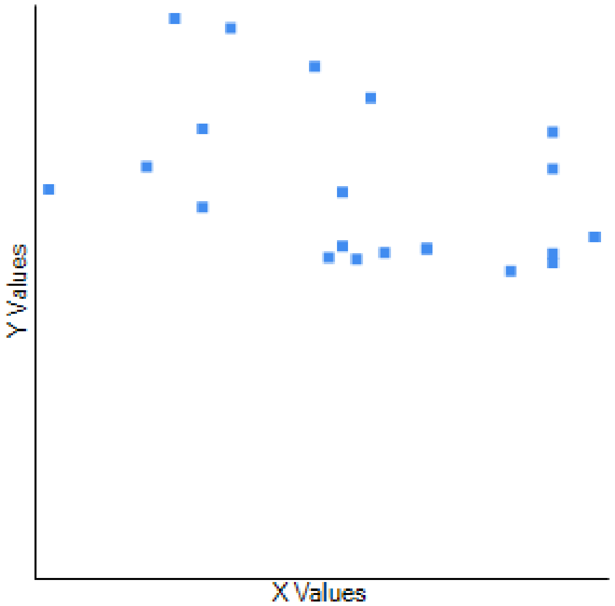

Fig. 61. Correlation between lowest duration of sunshine and minimum preciptation in *Centrobolus* Cook, 1897.

Minimum ocean water temperature was related to lowest duration of sunshine (Fig. 62: $r=0.9834$, $r^2=0.9671$, $n=9$, $p<0.00001$).

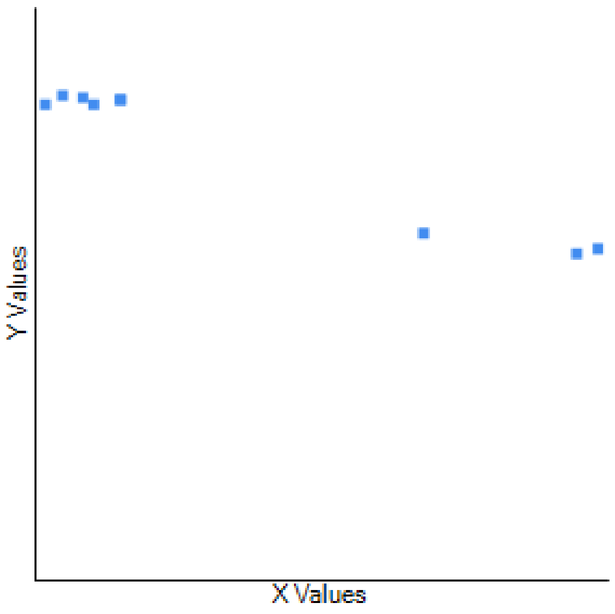

Fig. 62. Correlation between minimum ocean water temperature and lowest duration of sunshine in *Centrobolus* Cook, 1897.

Mean ocean water temperature was related to lowest duration of sunshine (Fig. 63: r=-0.9671, r^2=0.9353, n=9, p=0.000021).

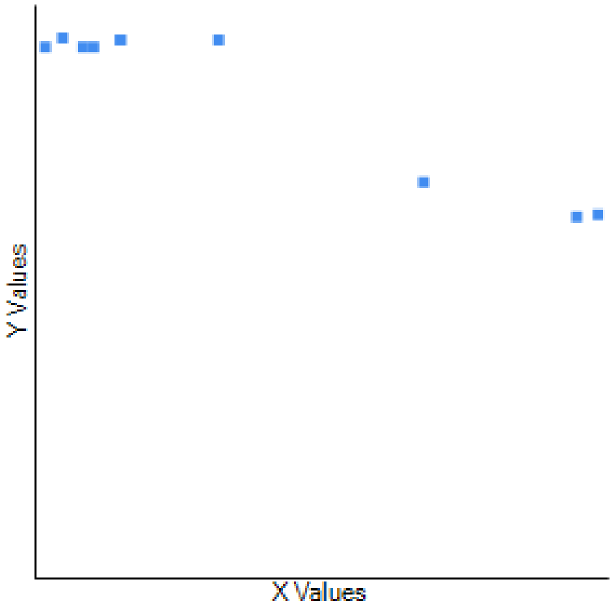

Fig. 63. Correlation between mean ocean water temperature and lowest duration of sunshine in *Centrobolus* Cook, 1897.

The volume was correlated with lowest duration of sunshine in a day (Fig. 64: r=- 0.5152, r^2=0.2654, n=22, p=0.014136).

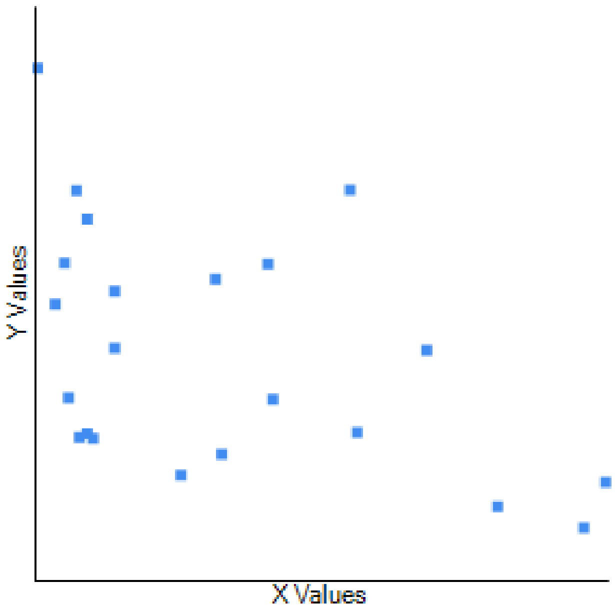

Fig. 64. Correlation between the volume (Y) and lowest duration of sunshine in a day (X) across the range of *Centrobolus* Cook, 1897.

Surface-area-to-volume ratio was related to lowest number of daily hours of sunshine in males (Fig. 65: Pearson's r=0.44835552, Z score=2.10377962, n=22, p=0.01769878) and was related in females (Fig. 66: Pearson's r=0.36699601, Z score=1.67794552, n=22, p=0.04667884).

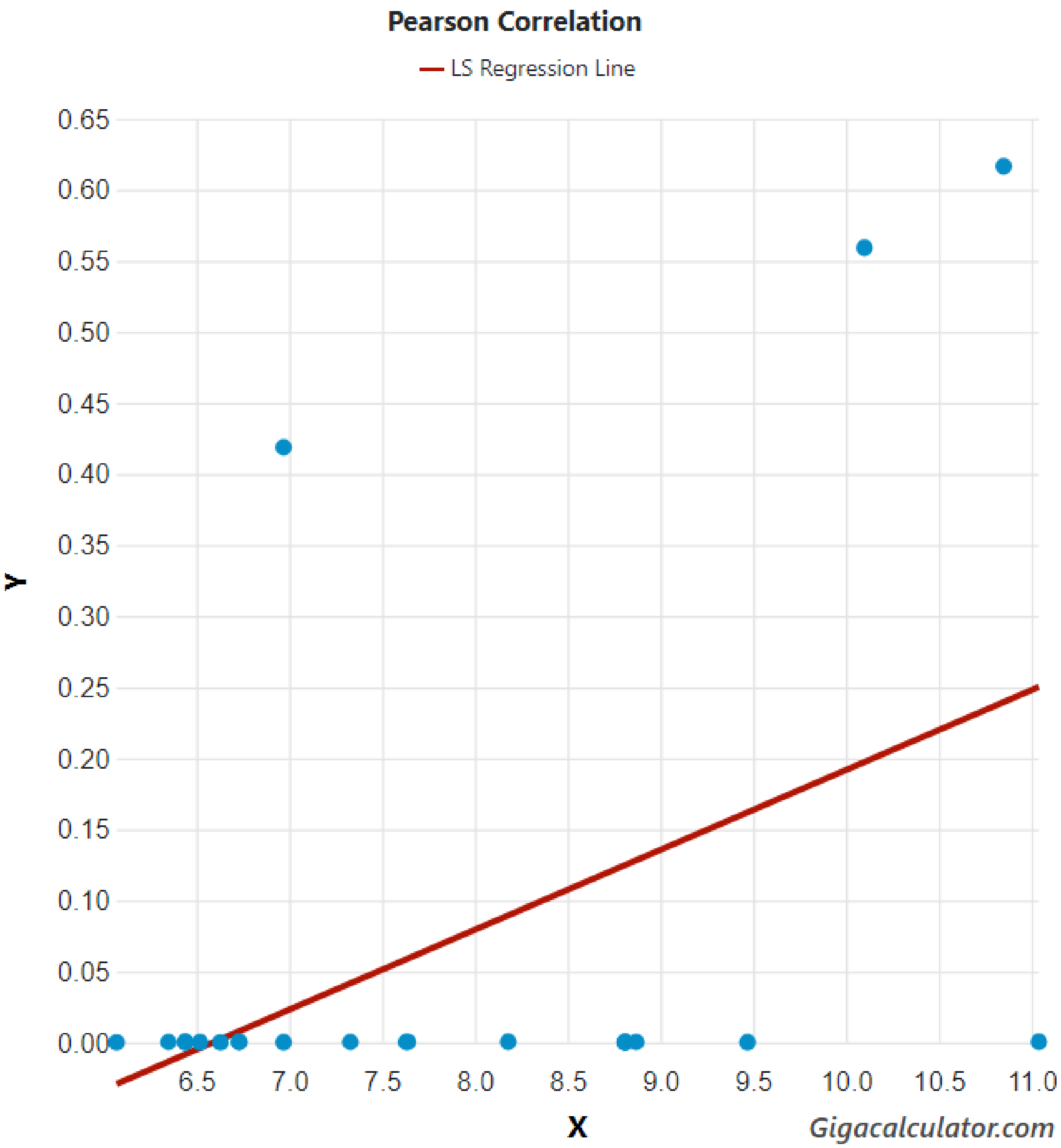

Fig. 65. Surface-area-to-volume ratio marginally correlated with lowest number of daily hours of sunshine in male *Centrobolus* Cook, 1897.

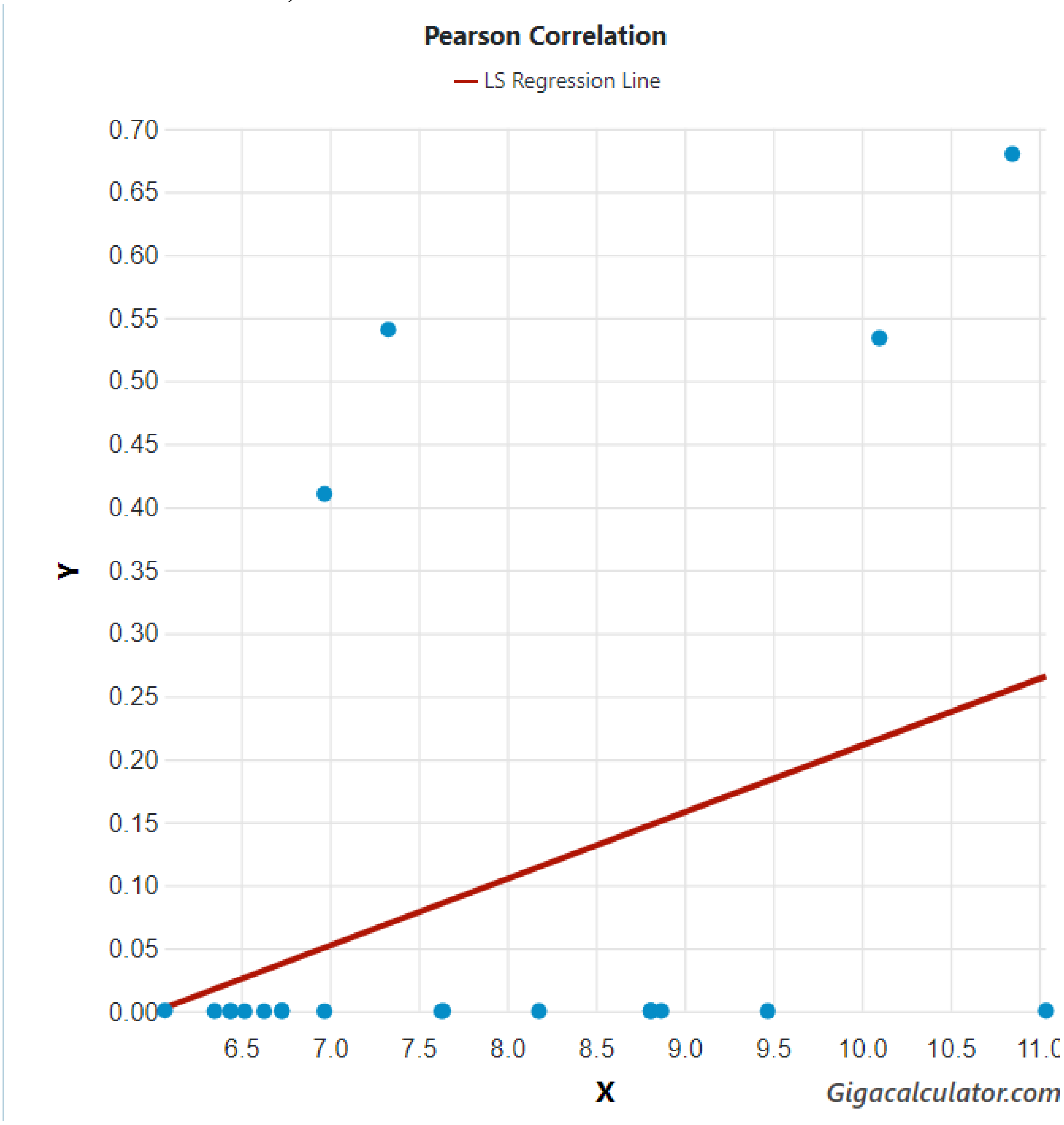

Fig. 66. Surface-area-to-volume ratio correlated to lowest number of daily hours of sunshine in female *Centrobolus* Cook, 1897.

Highest number of daily hours of sunshine in a month was tested for a correlation with lowest number of daily hours of sunshine in a day (Fig. 67: $r=0.7448$, $r^2=0.5547$, $n=22$, $p=0.00007$).

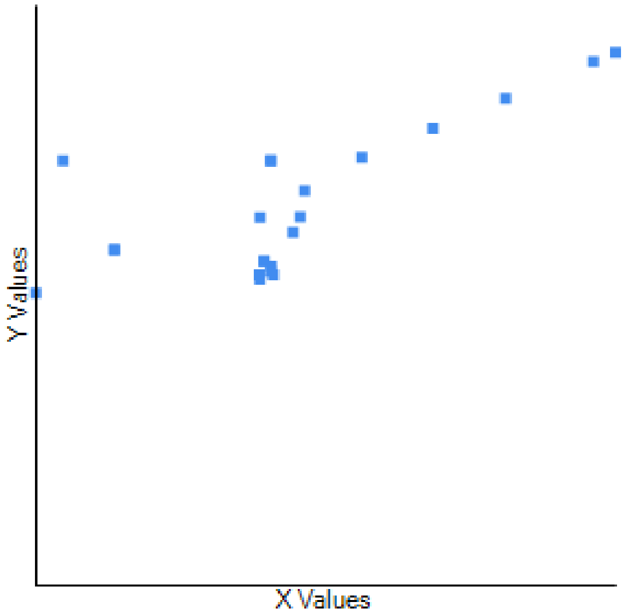

Fig. 67. Correlation between highest number of daily hours of sunshine in a month (X) and lowest number of daily hours of sunshine in a day (Y) across therange of *Centrobolus* Cook, 1897.

The hours of sunshine in a year was correlated with lowest number of daily hours of sunshine in a day (Fig. 68: r=0.8586, r^2=0.7372, n=22, p<0.00001).

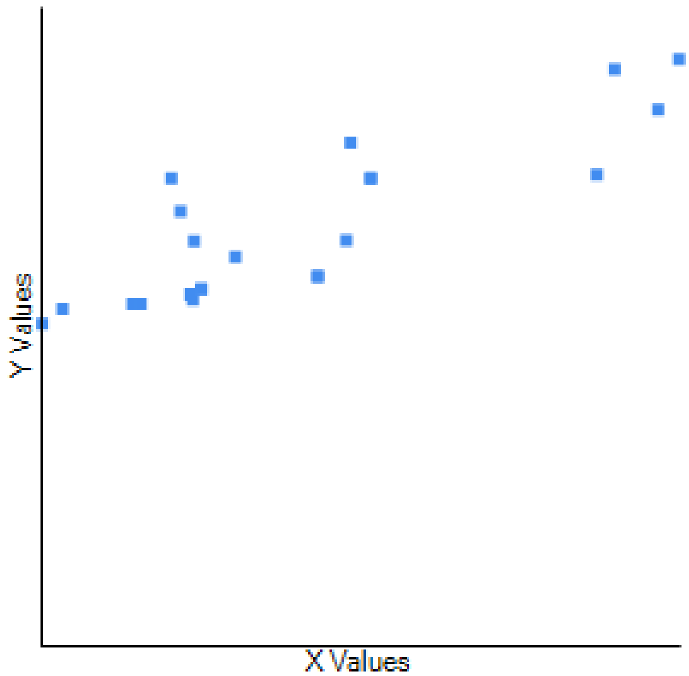

Fig. 68. Correlation between the hours of sunshine in a year (X) and lowest number of daily hours of sunshine in a day (Y) across therange of *Centrobolus* Cook, 1897.

The precipitation was correlated with lowest number of daily hours of sunshine in a day (Fig. 69: r=-0.7173, r^2=0.5145, n=22, p<0.000173).

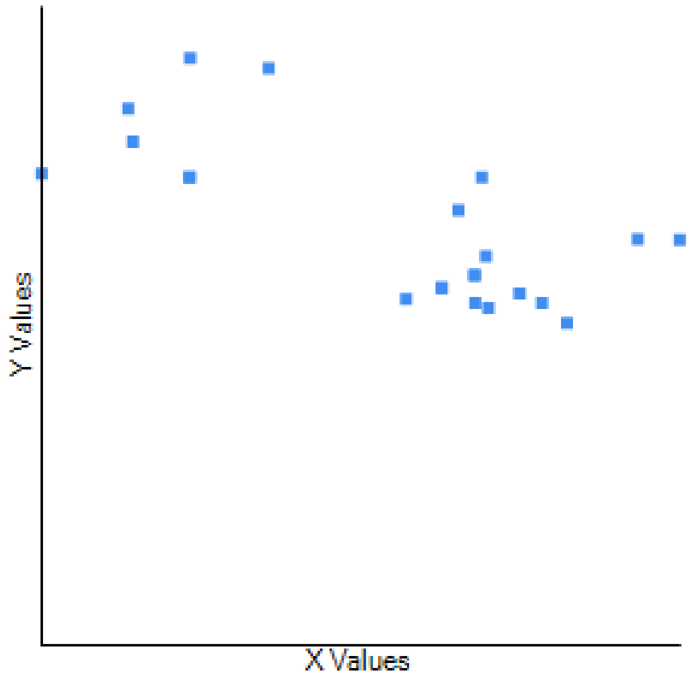

Fig. 69. Correlation between the precipitation (X) and lowest number of daily hours of sunshine in a day (Y) across therange of *Centrobolus* Cook, 1897.

The minimum temperature was correlated with lowest number of daily hours of sunshine in a day (Fig. 70: r=-0.7098, r^2=0.5038, n=22, p<0.000214).

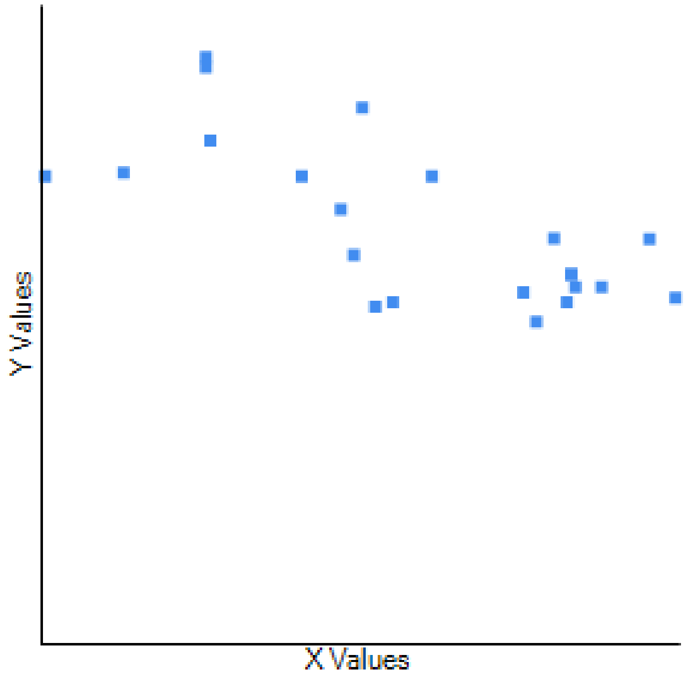

Fig. 70. Correlation between the minimum temperature (X) and lowest number of daily hours of sunshine in a day (Y) across therange of *Centrobolus* Cook, 1897.

The temperature was correlated with lowest number of daily hours of sunshine in a day (Fig. 71: r=-0.5325, r^2=0.2836, n=22, p=0.010645).

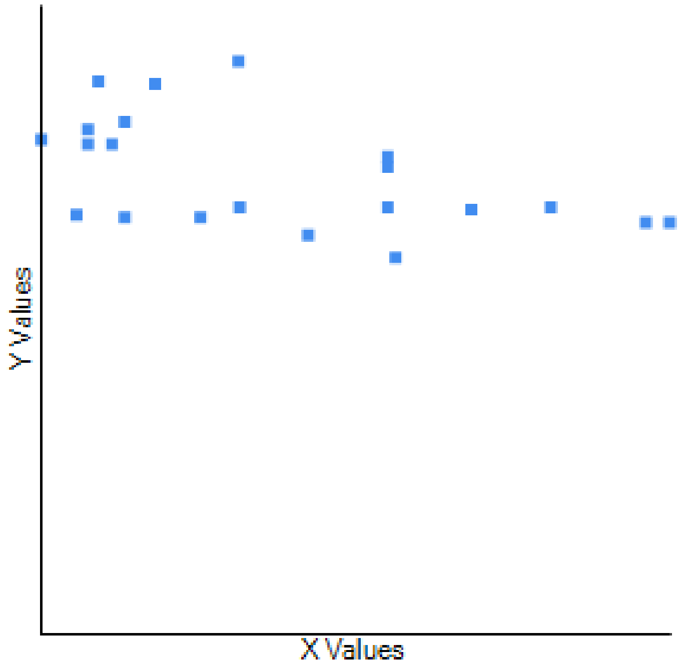

Fig. 71. Correlation between temperature (Y) and lowest number of daily hours of sunshine in a day (X) across therange of *Centrobolus* Cook, 1897.

The species volume was correlated with lowest number of daily hours of sunshine in a day (Fig. 72: r=-0.5147, r^2=0.2649, n=22, p=0.01418).

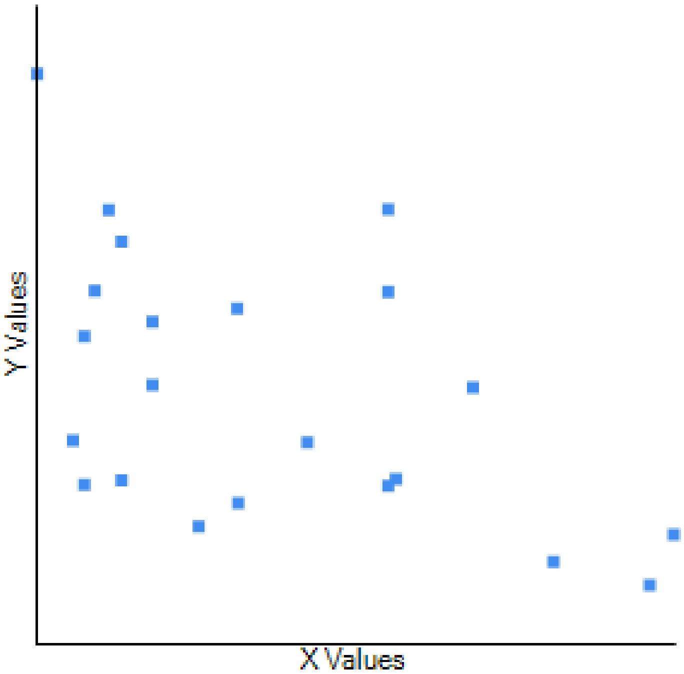

Fig. 72. Correlation between species volume (Y) and lowest number of daily hours of sunshine in a day (X) across therange of *Centrobolus* Cook, 1897.

The moments of inertia were correlated with lowest number of daily hours of sunshine in a day (Fig. 73: r=-0.6671, r^2=0.445, n=10, p=0.03514).

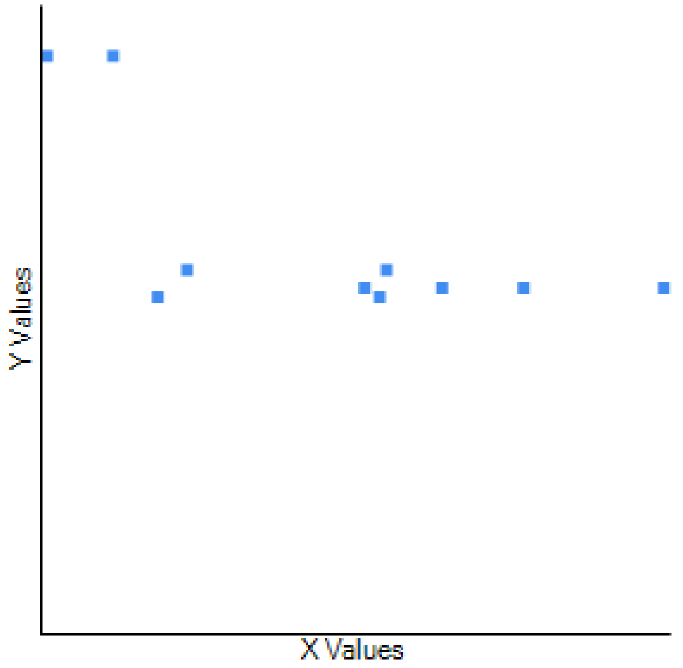

Fig. 73. Correlation between moments of inertia (Y) and lowest number of daily hours of sunshine in a day (X) across therange of *Centrobolus* Cook, 1897.

The month with the highest number of rainy days was correlated with lowest number of daily hours of sunshine in a day (Fig. 74: r=-0.5239, r^2=0.2745, n=22, p=0.01239).

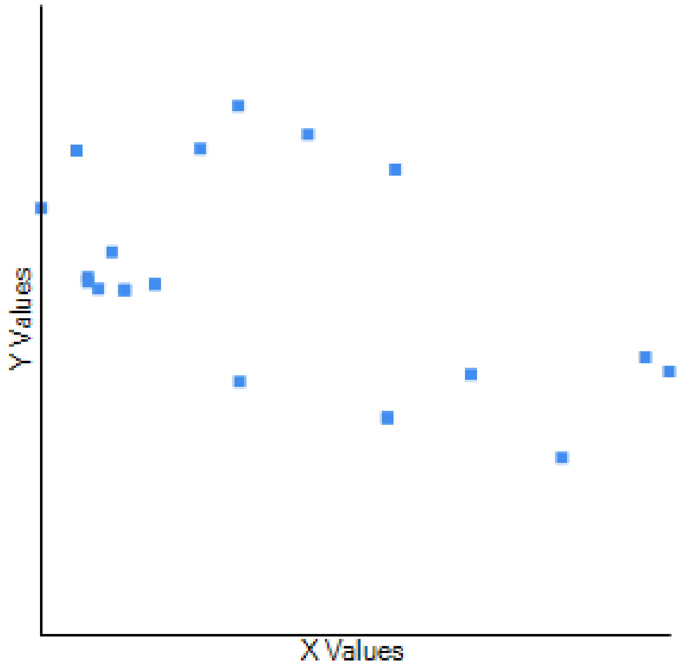

Fig. 74. Correlation between month with the highest number of rainy days (Y) and lowest number of daily hours of sunshine in a day (X) across therange of *Centrobolus* Cook, 1897.

The maximum temperature was correlated with lowest number of daily hours of sunshine in a day (Fig. 75: r=-0.6021, r^2=0.3625, n=22, p<0.003033).

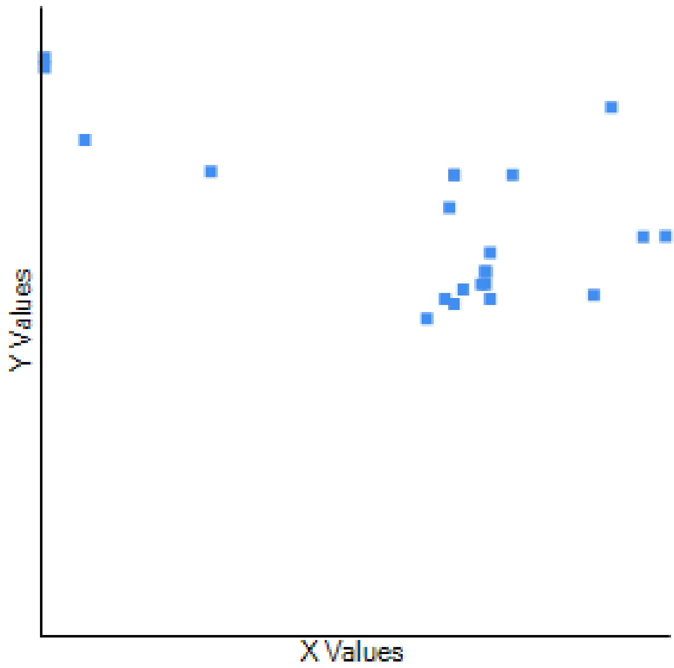

Fig. 75. Correlation between the maximum temperature (X) and lowest number of daily hours of sunshine in a day (Y) across therange of *Centrobolus* Cook, 1897.

The latitude was correlated with lowest number of daily hours of sunshine in a day (Fig. 76: r=- 0.4365, r^2=0.1905, n=22, p=0.04199).

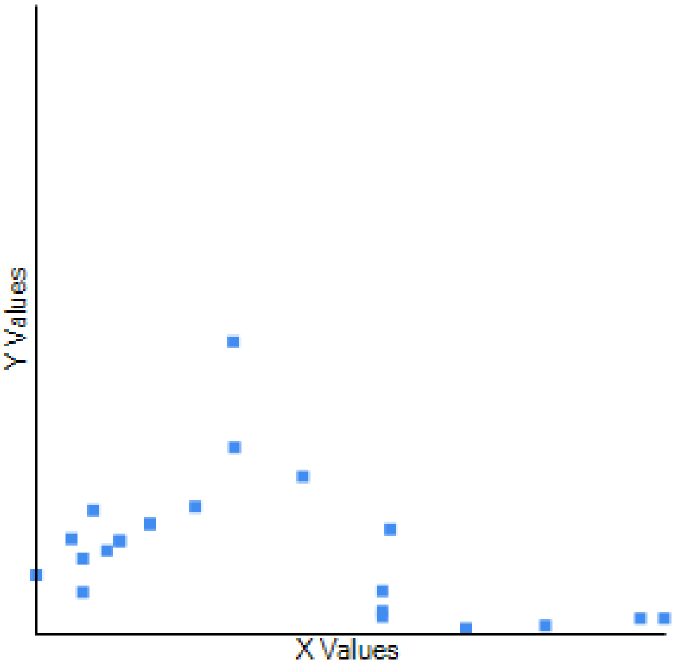

Fig. 76. Correlation between latitude (Y) and lowest number of daily hours of sunshine in a day (X) across therange of *Centrobolus* Cook, 1897.

The longitude was correlated with lowest number of daily hours of sunshine in a day (Fig. 77: r=- 0.8558, r^2=0.7324, n=22, p<0.00001).

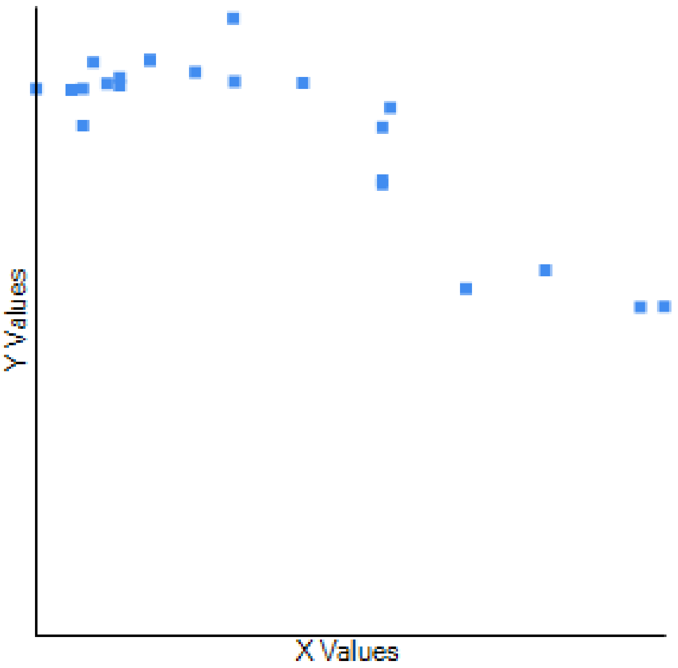

Fig. 77. Correlation between longitude (Y) and lowest number of daily hours of sunshine in a day (X) across therange of *Centrobolus* Cook, 1897.

Lowest number of daily hours of sunshine in a day was related to longitude (Fig. 78: r=-0.8558, r^2=0.7324, n=22, p<0.00001).

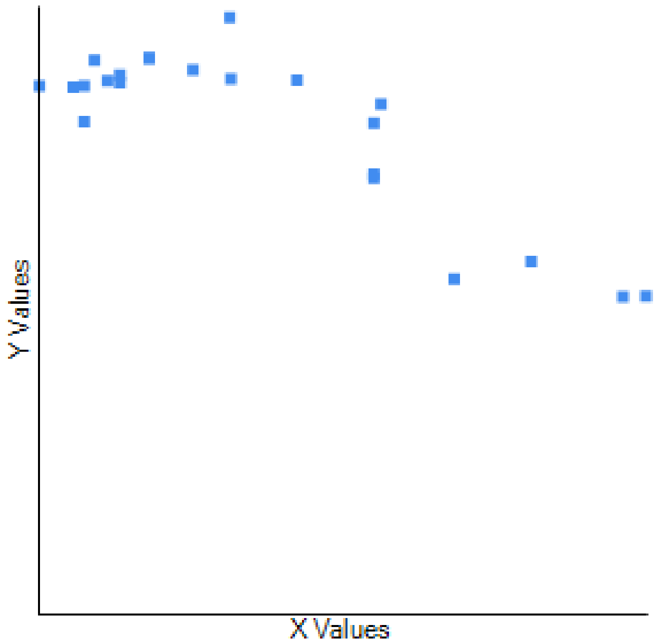

Fig. 78. Correlation between lowest number of daily hours of sunshine in a day and longitude across the range of *Centrobolus* Cook, 1897.

The lowest duration of sunshine was correlated with lowest number of daily hours of sunshine in a month (Fig. 79: r=0.9983, r^2=0.9966, n=22, p<0.00001).

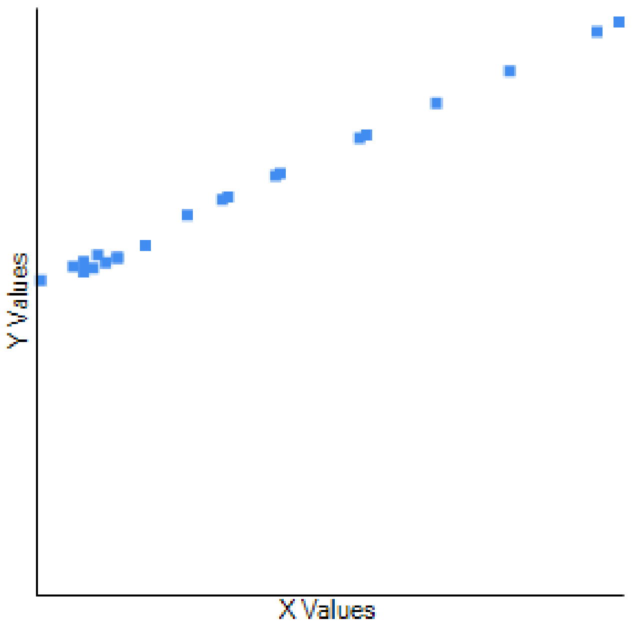

Fig. 79. Correlation between lowest duration of sunshine (X) and lowest number of daily hours of sunshine in a month (Y) across therange of *Centrobolus* Cook, 1897.

Lowest number of daily hours of sunshine was related to mean ocean water temperature (Fig. 80: r=-0.98270730, Z score=-6.27298913, n=10, p=0).

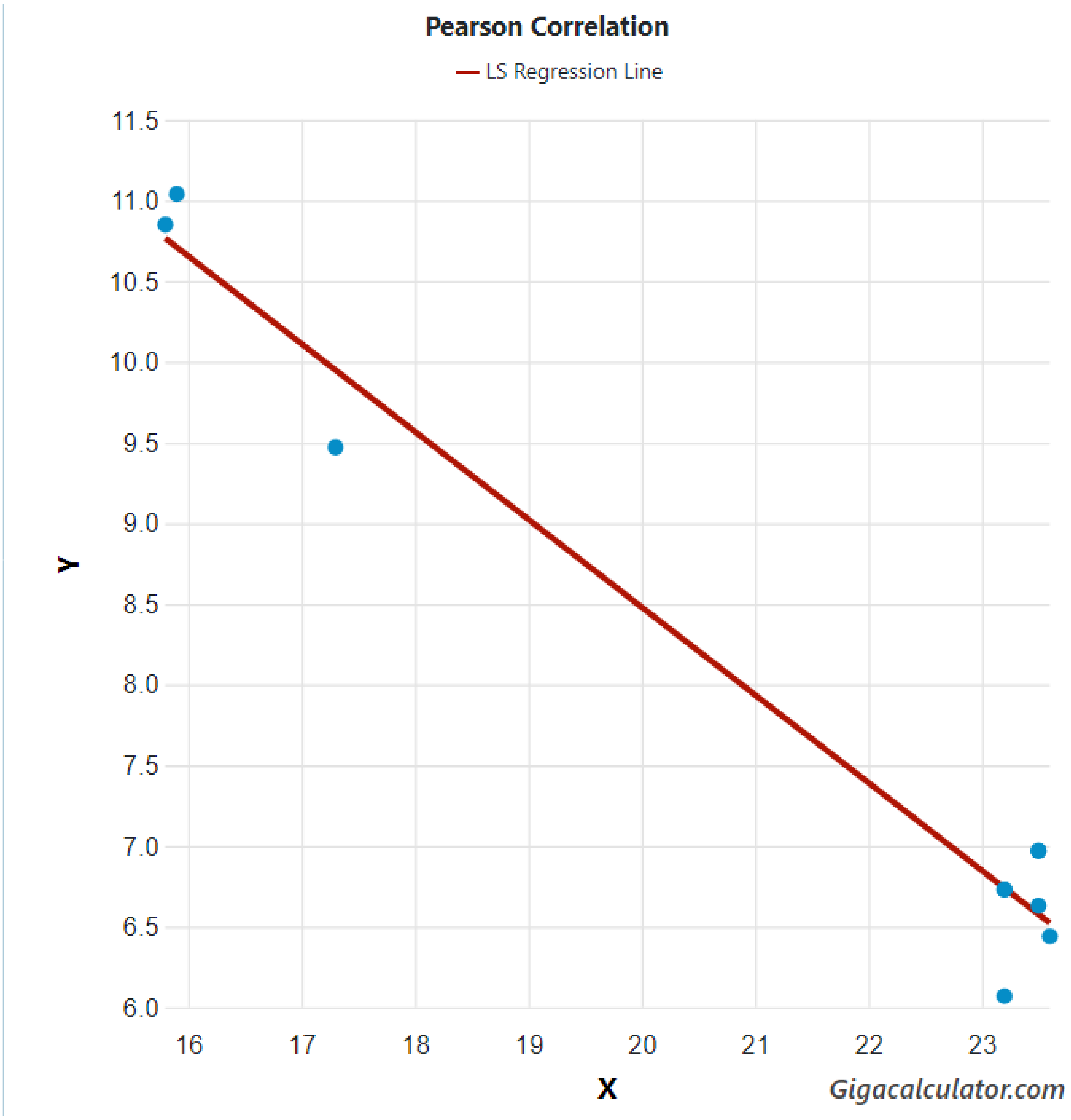

Fig. 80. Correlation between lowest number of daily hours of sunshine in a month (Y) and mean ocean water temperature (X) across the range of *Centrobolus* Cook, 1897.

Lowest number of daily hours of sunshine was related to highest ocean water temperature (Fig. 81: r= -0.63146459, Z score=-1.82204880, n=9, p=0.03422373).

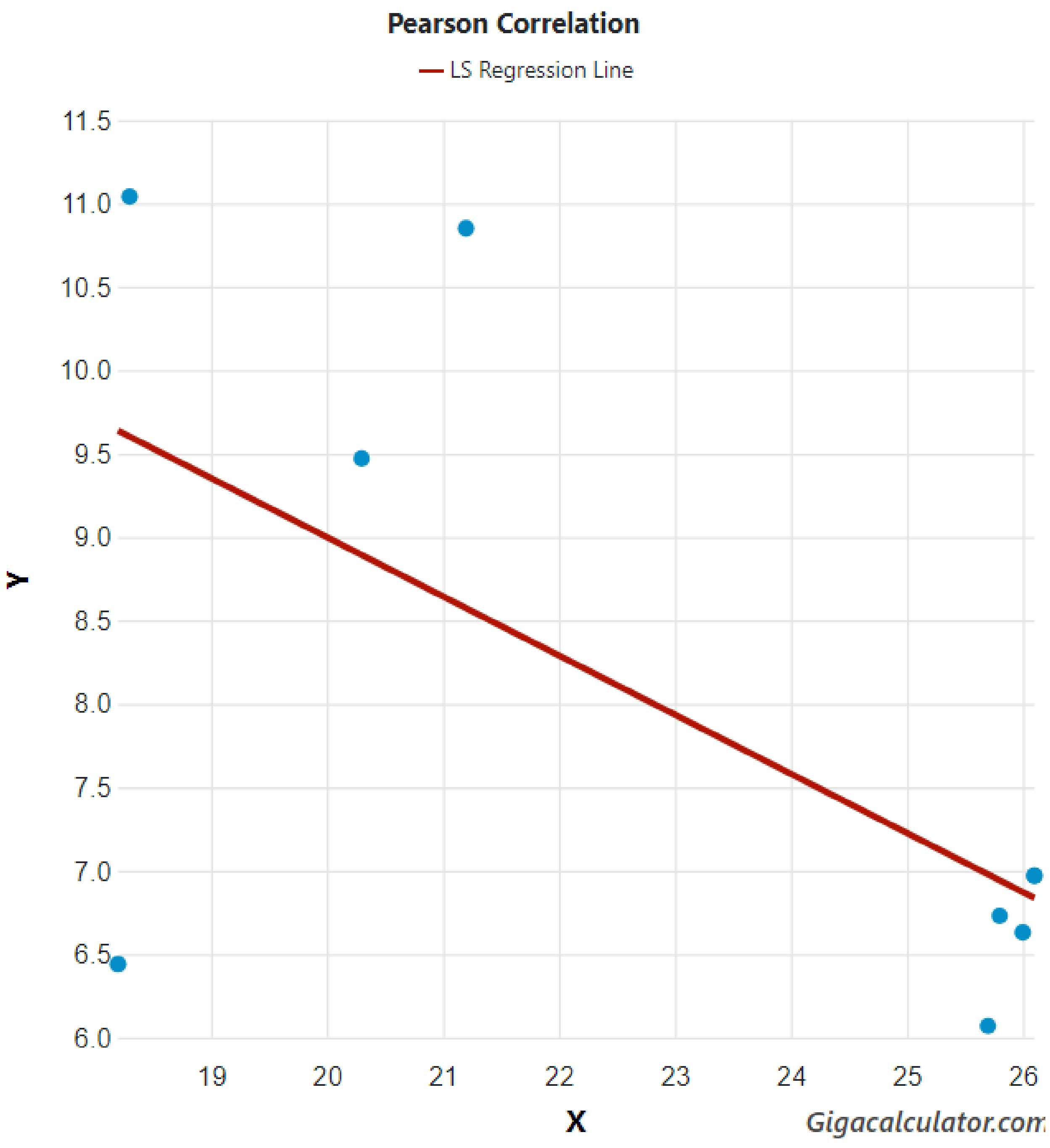

Fig. 81. Correlation between lowest number of daily hours of sunshine in a month (Y) and highest ocean water temperature (X) across the range of *Centrobolus* Cook, 1897.

Lowest number of daily hours of sunshine was related to minimum ocean water temperature (Fig. 82: r=-0.97723073, Z score=-5.46731092, n=9, p=0.00000002).

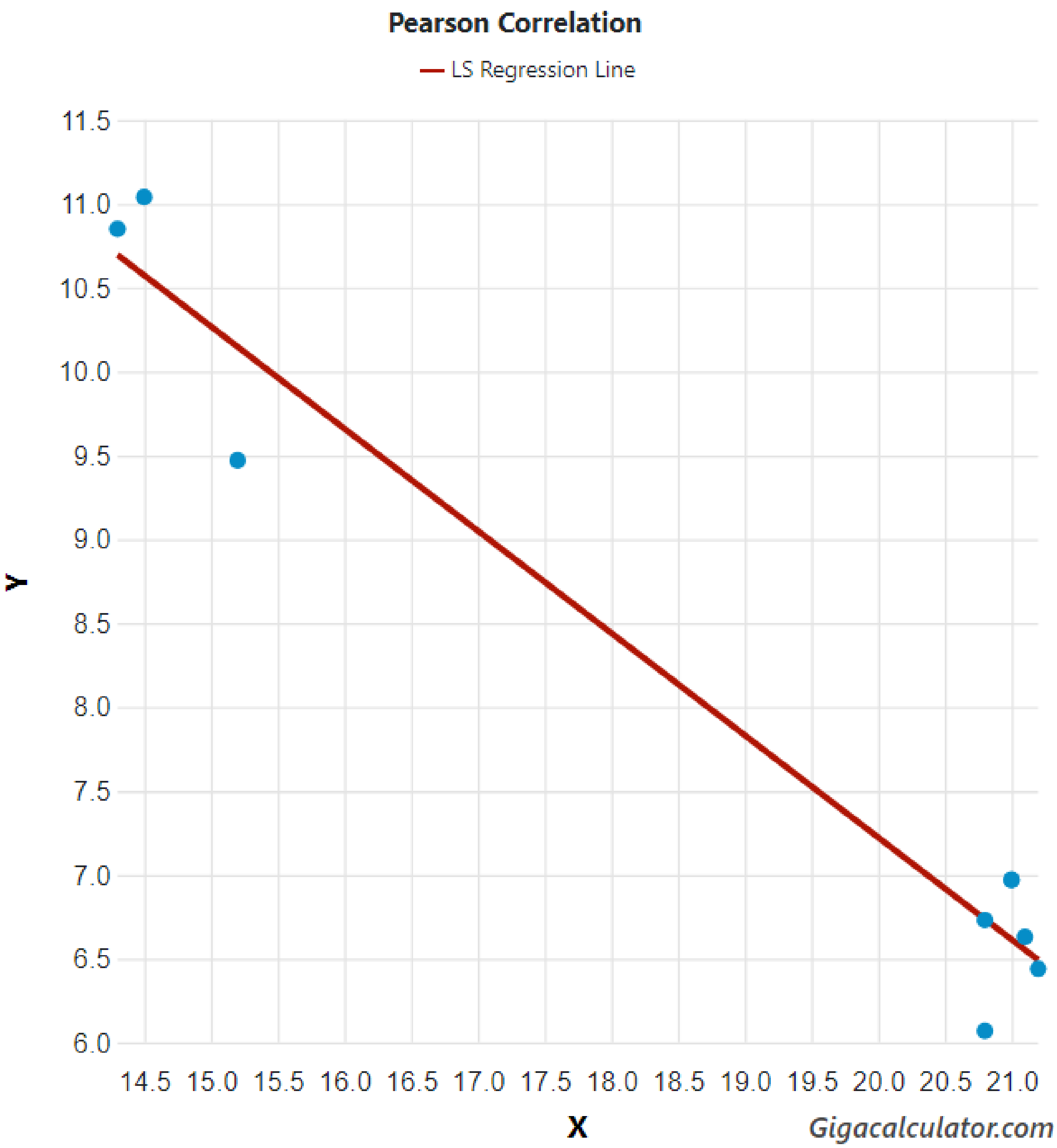

Fig. 82. Correlation between lowest number of daily hours of sunshine in a month (Y) and minimum ocean water temperature (X) across the range of *Centrobolus* Cook, 1897.

Minimum precipitation was correlated with lowest number of daily hours of sunshine in a day (Fig. 83: r=-0.41963355, Z score=-1.94950522, n=22, p=0.02561749).

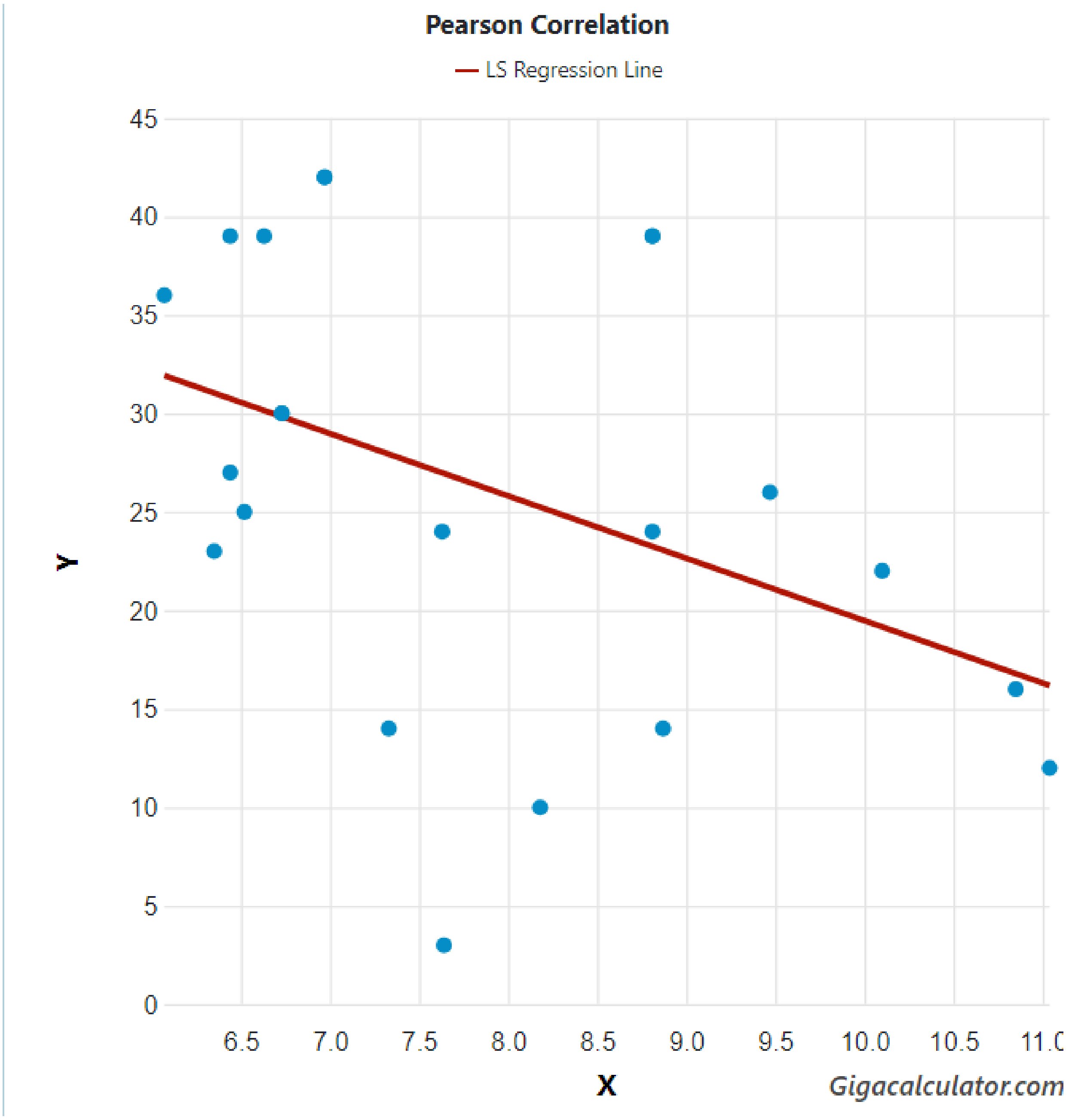

Fig. 83. Correlation between minimum precipitation (X) and lowest number of daily hours of sunshine in a day (Y) across therange of *Centrobolus* Cook, 1897.

Average monthly duration of sunlight was related to lowest daily hours of sunshine (Fig. 84: r= 0.8688, r^2=0.7548, n=22, p<0.00001).

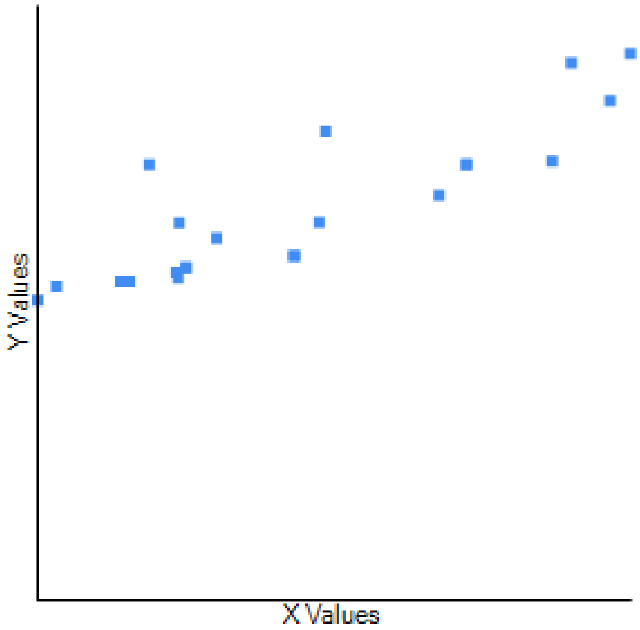

Fig. 84. Correlation between average monthly duration of sunlight (h) and lowest daily hours of sunshine across therange of *Centrobolus* Cook, 1897.

DISCUSSION

There is a correlation between numerous factors and sunshine in *Centrobolus*.

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APPENDIX 1. Hours of sunshine throughout the year across the range of *Centrobolus* Cook, 1897.
2690.72
2709.47
2740.74
3145.74
2846.04
2815.76
2703.13
2699.92
2709.47
2583.18
2864.06
3087.04
2646.85
2815.76
2654.59
2702.09
2864.06
2682.25
3126.58
2841.89
3070.45
2564.32

APPENDIX 2. Highest total hours of sunshine in a month (h) across the range of *Centrobolus* Cook, 1897.
259.73
248.89
256.60
342.21
293.68
209.20
247.85
250.86
248.89
247.77
250.72
336.32
247.65
209.20
251.38
250.72
195.55
250.72
312.99

258.55
274.85
188.32

APPENDIX 3. Temperature (degrees Celsius) in *Centrobolus* Cook, 1897.
15.9
20.4
16.6
16.4
16.9
21.9
22.8
19.5
16.6
16.7
17.0
16.4
19.5
21.9
20.1
22.0
18.6
19.0
17.0
17.0
15.0
19.7

APPENDIX 4. Male surface-area-to-volume ratios preceded by highest total hours of sunshine in a month throughout the year for 22 species of *Centrobolus* Cook, 1897.
259.73, 0.000510
248.89, 0.000486
256.60, 0.000365
342.21, 0.000485
293.68, 0.000245
209.20, 0.000218
247.85, 0.000294
250.86, 0.000136
248.89, 0.000393
247.77, 0.000335
250.72, 0.000156
336.32, 0.616435
247.65, 0.000510
209.20, 0.418711
251.38, 0.000220
250.72, 0.000223
195.55, 0.000169

250.72, 0.000357
312.99, 0.559114
258.55, 0.000422
274.85, 0.000349
188.32, 0.000136

APPENDIX 5. Female surface-area-to-volume ratios preceded by highest total hours of sunshine in a month for 22 species of *Centrobolus* Cook, 1897.

259.73, 0.000177
248.89, 0.000578
256.60, 0.540690
342.21, 0.000484
293.68, 0.000179
209.20, 0.000132
247.85, 0.000108
250.86, 0.000113
248.89, 0.000274
247.77, 0.000213
250.72, 0.000716
336.32, 0.679931
247.65, 0.000245
209.20, 0.4103607
251.38, 0.000138
250.72, 0.000113
195.55, 0.000135
250.72, 0.000314
312.99, 0.533940
258.55, 0.000335
274.85, 0.000318
188.32, 0.000751

APPENDIX 6. Precipitation (mm) in *Centrobolus* Cook, 1897.

919
893
962
498
408
944
1266
1015
893
966
497
621
1050
944
945
837

497
956
401
1200
265
1089

APPENDIX 7. Minimum precipitation (mm) across the range of *Centrobolus* Cook, 1897.

10
30
14
12
26
42
24
39
30
23
39
16
27
42
39
25
39
24
22
3
14
36

APPENDIX 8. Month with the highest number of rainy days in *Centrobolus* Cook, 1897.

19.90
13.73
19.33
10.50
10.40
13.97
21.03
15.23
13.73
19.27
8.67
11.07
14.07
13.97
14.26
13.7

78.67
8.67
7.10
10.10
18.50
16.97

APPENDIX 9. Species volume in *Centrobolus* Cook, 1897.

952
1894
557
522
1210
1518
1580
2043
775
962
2046
284
756
1221
1451
1666
1659
749
393
669
781
2683

APPENDIX 10. Longitude across the range of *Centrobolus* Cook, 1897.

30.786
31.084
31.400
18.357
19.350
32.049
34.394
30.754
30.666
30.393
25.173
18.348
28.433
32.078
30.456
31.952

25.396
28.317
20.383
30.867
29.418
30.451

APPENDIX 11. Highest daily hours of sunshine throughout a month (h) preceded by mean ocean water temperature (degrees Celsius)across the range of *Centrobolus* Cook, 1897.

23.20, 248.89
15.90, 342.21
17.30, 293.68
23.50, 209.20
23.50, 250.86
23.20, 248.89
15.80, 336.32
23.50, 209.20
23.60, 251.38
23.20, 188.32

APPENDIX 12. Highest daily hours of sunshine throughout a month (h) preceded by minimum ocean water temperature (degrees Celsius)across the range of *Centrobolus* Cook, 1897.

20.80, 248.89
14.50, 342.21
15.20, 293.68
21.00, 209.20
21.10, 250.86
14.30, 336.32
21.00, 209.20
21.20, 251.38
20.80, 188.32

APPENDIX 13. Minimum temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.14.5
19.9

14.8

11.4

11.5

19.8

21.6

18.7

20.5

15.3

17.7

11.4

15.7

19.8

19.7

22.2

16.6

13.6

15.0

19.4

9.5

19.0

APPENDIX 14. Maximum temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.
24.7
25.4

25.6

15.7

16.6

25.5

29.0

25.0

25.5

24.8

24.8

15.7

25.6

25.5

24.6

27.9

26.1

24.8

28.3

29.5

19.4

24.2

APPENDIX 15. Average monthly duration of sunlight across the range of *Centrobolus* Cook, 1897.

97.29
89.08
90.08
103.49
93.61
92.58
88.86
88.76
89.08
84.89
98.18
101.57
86.96
92.58
87.26
88.83
98.18
87.89
102.83
93.41
100.95

84.27
APPENDIX 16. Volume in *Centrobolus* Cook, 1897.
952
1894
557
522
1210
1518
1580
2043
775
962
2046
284
756
1221
1451
1666
1659
749
393
669
781
2683
APPENDIX 17. Minimum precipitation (mm) in *Centrobolus* Cook, 1897.
10
30
14
12
26
42
24
39
30
23
39
16
27
42
39
25
39
24
22
3
14

36

APPENDIX 18. Highest duration of sunshine in a day (h) across the range of *Centrobolus* Cook, 1897.
8.93
8.03
8.28
11.04
9.47
8.16
8.00
8.09
8.03
7.99
8.81
10.85
7.99
8.16
8.11
7.99
8.09
8.18
10.1
8.34
8.87
8.09
APPENDIX 19. Precipitation across the range of *Centrobolus* Cook, 1897.
919
893
962
498
408
944
1266
1015
893
966
497
621
1050
944
945
837
497
956
401
1200

265
1089

APPENDIX 20. Lowest duration of sunshine in a month (h) across the range of *Centrobolus* Cook, 1897.

252.02
201.76
227.1
342.21
293.68
209.2
236.52
198.79
201.76
196.7
272.96
336.32
199.61
209.2
193.09
195.55
250.72
203.3
312.99
238.19
274.85
188.32

APPENDIX 21. Temperature across the range of *Centrobolus* Cook, 1897.

15.9
20.4
16.6
16.4
16.9
21.9
22.8
19.5
16.6
16.7
17.0
16.4
19.5
21.9
20.1
22.0
18.6
19.0
17.0
17.0

15.0
19.7
APPENDIX 22. Longitude across the range of *Centrobolus* Cook, 1897.
30.786
31.084
31.400
18.357
19.350
32.049
34.394
30.754
30.666
30.393
25.173
18.348
28.433
32.078
30.456
31.952
25.396
28.317
20.383
30.867
29.418
30.451
APPENDIX 23. Minimum temperature across the range of *Centrobolus* Cook, 1897.
14.5
19.9
14.8
11.4
11.5
19.8
21.6
18.7
20.5
15.3
17.7
11.4
15.7
19.8
19.7
22.2
16.6
13.6
15.0
19.4

9.5
19.0
APPENDIX 24. Maximum temperature in *Centrobolus* Cook, 1897.
24.7
25.4
25.6
15.7
16.6
25.5
29.0
25.0
25.5
24.8
24.8
15.7
25.6
25.5
24.6
27.9
26.1
24.8
28.3
29.5
19.4
24.2
APPENDIX 25. Highest total hours of sunshine in a month in *Centrobolus* Cook, 1897.
259.73
248.89
256.60
342.21
293.68
209.20
247.85
250.86
248.89
247.77
250.72
336.32
247.65
209.20
251.38
250.72
195.55
250.72
312.99
258.55

274.85
188.32
APPENDIX 26. Hours of sunshine throughout the year across the range of *Centrobolus* Cook, 1897.
2690.72
2709.47
2740.74
3145.74
2846.04
2815.76
2703.13
2699.92
2709.47
2583.18
2864.06
3087.04
2646.85
2815.76
2654.59
2702.09
2864.06
2682.25
3126.58
2841.89
3070.45
2564.32
APPENDIX 27. Minimum ocean temperature (degrees Celsius) followed by average monthly duration of sunlight (h) in coastal *Centrobolus* Cook, 1897.
20.80, 89.08
14.50, 103.49
15.20, 93.61
21.00, 92.58
21.10, 88.76
14.30, 101.57
21.00, 92.58
21.20, 87.26
20.80, 84.27
APPENDIX 28. Mean ocean temperature (degrees Celsius) followed by average monthly duration of sunlight (h) in coastal *Centrobolus* Cook, 1897.
23.20, 89.08
15.90, 103.49
17.30, 93.61
23.50, 92.58
23.50, 88.76
15.80, 101.57
23.50, 92.58
23.60, 87.26

23.20, 84.27

APPENDIX 29. Abundance across two species of *Centrobolus* followed by average monthly duration of sunshine (h).

101, 88.76
445, 88.76
800, 88.76
135, 88.76
46, 89.08
58, 89.08
75, 89.08
0, 89.08

APPENDIX 30. The hours of sunshine throughout the year (h) preceded by mean ocean water temperature (degrees Celsius) in *Centrobolus* Cook, 1897.

23.20, 2709.47
15.90, 3145.74
17.30, 2846.04
23.50, 2815.76
23.50, 2699.92
23.20, 2709.47
15.80, 3087.04
23.50, 2815.76
23.60, 2654.59
23.20, 2564.32

APPENDIX 31. Highest duration of sunshine (h) across the range of *Centrobolus* Cook, 1897.

8.93
8.03
8.28
11.04
9.47
8.16
8.00
8.09
8.03
7.99
8.81
10.85
7.99
8.16
8.11
7.99
8.09
8.18
10.1
8.34
8.87
8.09

APPENDIX 32. Longitude across the range of *Centrobolus* Cook, 1897.
30.786
31.084
31.400
18.357
19.350
32.049
34.394
30.754
30.666
30.393
25.173
18.348
28.433
32.078
30.456
31.952
25.396
28.317
20.383
30.867
29.418
30.451
APPENDIX 33. Temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.
15.9
20.4
16.6
16.4
16.9
21.9
22.8
19.5
16.6
16.7
17.0
16.4
19.5
21.9
20.1
22.0
18.6
19.0
17.0
17.0
15.0
19.7

APPENDIX 34. Male surface-area-to-volume ratios preceded by hours of sunshine throughout the year for 22 species of *Centrobolus* Cook, 1897.
2690.72, 0.000510
2709.47, 0.000486
2740.74, 0.000365
3145.74, 0.000485
2846.04, 0.000245
2815.76, 0.000218
2703.13, 0.000294
2699.92, 0.000136
2709.47, 0.000393
2583.18, 0.000335
2864.06, 0.000156
3087.04, 0.616435
2646.85, 0.000510
2815.76, 0.418711
2654.59, 0.000220
2702.09, 0.000223
2864.06, 0.000169
2682.25, 0.000357
3126.58, 0.559114
2841.89, 0.000422
3070.45, 0.000349
2564.32, 0.000136
APPENDIX 35. Female surface-area-to-volume ratios preceded by hours of sunshine throughout the year for 22 species of *Centrobolus* Cook, 1897.
2690.72, 0.000177
2709.47, 0.000578
2740.74, 0.540690
3145.74, 0.000484
2846.04, 0.000179
2815.76, 0.000132
2703.13, 0.000108
2699.92, 0.000113
2709.47, 0.000274
2583.18, 0.000213
2864.06, 0.000716
3087.04, 0.679931
2646.85, 0.000245
2815.76, 0.4103607
2654.59, 0.000138
2702.09, 0.000113
2864.06, 0.000135
2682.25, 0.000314
3126.58, 0.533940
2841.89, 0.000335

3070.45 0.000318
2564.32, 0.000751
APPENDIX 36. Precipitation (mm) across the range of *Centrobolus* Cook, 1897.
919
893
962
498
408
944
1266
1015
893
966
497
621
1050
944
945
837
497
956
401
1200
265
1089

APPENDIX 37. The moments of inertia in *Centrobolus* Cook, 1897.
10.791
4.7021
4.00
1.36
8.9401
12.738
9.4659
9.3025
2.9376
16.078
APPENDIX 38. Species volume in *Centrobolus* Cook, 1897.
952
1894
557
522
1210
1518
1580
2043

775
962
2046
284
756
1221
1451
1666
1659
749
393
669
781
2683

APPENDIX 39. Minimum temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.

14.5
19.9
14.8
11.4
11.5
19.8
21.6
18.7
20.5
15.3
17.7
11.4
15.7
19.8
19.7
22.2
16.6
13.6
15.0
19.4
9.5
19.0

APPENDIX 40. The hours of sunshine throughout the year (h) preceded by minimum ocean water temperature (degrees Celsius) in *Centrobolus* Cook, 1897.

20.80, 2709.47
14.50, 3145.74
15.20, 2846.04
21.00, 2815.76
21.10, 2699.92
14.30, 3087.04
21.00, 2815.76

21.20, 2654.59
20.80, 2564.32
APPENDIX 41. The moments of inertia in *Centrobolus* Cook, 1897.
10.791
4.7021
4.00
1.36
8.9401
12.738
9.4659
9.3025
2.9376
16.078
APPENDIX 42. Highest duration of sunshine in four species of *Centrobolus* Cook, 1897 for which mass were recorded.
8.09
8.16
7.99
11.04
8.09
8.09
8.16
7.99
11.04
8.09
APPENDIX 43. The mass (g) across *Centrobolus* Cook, 1897.
1.29
1.97
2.48
2.00
2.27
2.61
1.28
2.00
0.68
1.02
APPENDIX 44. The longitude across *Centrobolus* Cook, 1897.
30.786
31.084
31.400
18.357
19.350
32.049
34.394
30.754
30.666

30.393
25.173
18.348
28.433
32.078
30.456
31.952
25.396
28.317
20.383
30.867
29.418
30.451

APPENDIX 45. Lowest duration of sunshine across the range of *Centrobolus* Cook, 1897.
8.13
6.73
7.33
11.04
9.47
6.97
7.63
6.63
6.73
6.35
8.81
10.85
6.44
6.97
6.44
6.52
8.09
6.56
10.1
7.68
8.87
6.07

APPENDIX 46. The latitude across *Centrobolus* Cook, 1897.
-26.1502
-29.7462
-27.8403
-34.0477
-34.5849
-28.7784
-18.6866
-30.2805

-29.7080
-29.6301
-33.9322
-34.0164
-32.5717
-28.7784
-30.7157
-28.0246
-33.6367
-32.5064
-34.4142
-24.5392
-29.0939
-31.6334

APPENDIX 47. Precipitation (mm) across the range of *Centrobolus* Cook, 1897.

919
893
962
498
408
944
1266
1015
893
966
497
621
1050
944
945
837
497
956
401
1200
265
1089

APPENDIX 48. Volume in *Centrobolus* Cook, 1897.

952
1894
557
522
1210
1518
1580
2043

775
962
2046
284
756
1221
1451
1666
1659
749
393
669
781
2683

APPENDIX 49. Minimum temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.

14.5
19.9
14.8
11.4
11.5
19.8
21.6
18.7
20.5
15.3
7.7
11.4
15.7
19.8
19.7
22.2
16.6
13.6
15.0
19.4
9.5
19.0

APPENDIX 50. Maximum temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.

24.7
25.4
25.6
15.7
16.6
25.5
29.0
25.0

25.5
24.8
24.8
15.7
25.6
25.5
24.6
27.9
26.1
24.8
28.3
29.5
19.4
24.2

APPENDIX 51. Minimum ocean temperature (degrees Celsius) in *Centrobolus* Cook, 1897.
20.80
14.50
15.20
21.00
21.10
14.30
21.00
21.20
20.80
APPENDIX 52. Abundance across two species of *Centrobolus* followed by highest duration of sunshine in a day (h).
101, 8.09
445, 8.09
800, 8.09
135, 8.09
46, 8.03
58, 8.03
75, 8.03
0, 8.03
APPENDIX 53. Mean ocean temperature (degrees Celsius) in *Centrobolus* Cook, 1897.
23.20
15.90
17.30
23.50
23.50
23.20
15.80
23.50
23.60
23.20

APPENDIX 54. The average temperature across *Centrobolus* Cook, 1897.
15.9
20.4
16.6
16.4
16.9
21.9
22.8
19.5
16.6
16.7
17.0
16.4
19.5
21.9
20.1
22.0
18.6
19.0
17.0
17.0
15.0
19.7
APPENDIX 55. Highest duration of sunshine across the range of *Centrobolus* Cook, 1897.
8.93
8.03
8.28
11.04
9.47
8.16
8.00
8.09
8.03
7.99
8.81
10.85
7.99
8.16
8.11
7.99
8.09
8.18
10.1
8.34
8.87
8.09

APPENDIX 56. Highest total hours of sunshine in a month (h) across the range of *Centrobolus* Cook, 1897.
259.73
248.89
256.60
342.21
293.68
209.20
247.85
250.86
248.89
247.77
250.72
336.32
247.65
209.20
251.38
250.72
195.55
250.72
312.99
258.55
274.85
188.32

APPENDIX 57. Hours of sunshine throughout the year across the range of *Centrobolus* Cook, 1897.
2690.72
2709.47
2740.74
3145.74
2846.04
2815.76
2703.13
2699.92
2709.47
2583.18
2864.06
3087.04
2646.85
2815.76
2654.59
2702.09
2864.06
2682.25
3126.58
2841.89
3070.45

2564.32
APPENDIX 58. Lowest duration of sunshine (h) across the range of *Centrobolus* Cook, 1897.
8.13
6.73
7.33
11.04
9.47
6.97
7.63
6.63
6.73
6.35
8.81
10.85
6.44
6.97
6.44
6.52
8.09
6.56
10.1
7.68
8.87
6.07
APPENDIX 59. The average temperature across *Centrobolus* Cook, 1897.
15.9
20.4
16.6
16.4
16.9
21.9
22.8
19.5
16.6
16.7
17.0
16.4
19.5
21.9
20.1
22.0
18.6
19.0
17.0
17.0
15.0

19.7

APPENDIX 60. Precipitation (mm) across the range of *Centrobolus* Cook, 1897.

919
893
962
498
408
944
1266
1015
893
966
497
621
1050
944
945
837
497
956
401
1200
265
1089

APPENDIX 61. The mass (g) across *Centrobolus* Cook, 1897.

1.29
1.97
2.48
2.00
2.27
2.61
1.28
2.00
0.68
1.02

APPENDIX 62. The longitude across *Centrobolus* Cook, 1897.

30.786
31.084
31.400
18.357
19.350
32.049
34.394
30.754
30.666

30.393
25.173
18.348
28.433
32.078
30.456
31.952
25.396
28.317
20.383
30.867
29.418
30.451

APPENDIX 63. The moments of inertia in *Centrobolus* Cook, 1897.

10.791
4.7021
4.00
1.36
8.9401
12.738
9.4659
9.3025
2.9376
16.078

APPENDIX 64. Abundance across two species of *Centrobolus* followed by lowest duration of sunshine in a month (h).

101, 198.79
445, 198.79
800, 198.79
135, 198.79
46, 201.76
58, 201.76
75, 201.76
0, 201.76

APPENDIX 65. Minimum preciptation (mm) in *Centrobolus* Cook, 1897.

10
30
14
12
26
42
24
39
30
23

39
16
27
42
39
25
39
24
22
3
14
36

APPENDIX 66. Minimum ocean temperature (degrees Celsius) in *Centrobolus* Cook, 1897.

20.80
14.50
15.20
21.00
21.10
14.30
21.00
21.20
20.80

APPENDIX 67. Mean ocean temperature (degrees Celsius) in *Centrobolus* Cook, 1897.

23.20
15.90
17.30
23.50
23.50
23.20
15.80
23.50
23.60
23.20

APPENDIX 68. Volume in *Centrobolus* Cook, 1897.

952
1894
557
522
1210
1518
1580
2043
775
962
2046

284
756
1221
1451
1666
1659
749
393
669
781
2683

APPENDIX 69. 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 70. 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

APPENDIX 71. Highest daily hours of sunshine throughout a month across the range of *Centrobolus* Cook, 1897.

259.73
248.89
256.60
342.21
293.68
209.20
247.85
250.86
248.89
247.77
250.72
336.32
247.65
209.20
251.38
250.72
195.55
250.72
312.99
258.55
274.85
188.32

APPENDIX 72. Lowest hours of sunshine in a day (h) across the range of *Centrobolus* Cook, 1897.

8.18
6.73
7.33
11.04
9.47
6.97
7.63

6.63
6.73
6.35
8.81
10.85
6.44
6.97
6.44
6.52
8.81
8.81
10.1
7.64
8.87
6.07

APPENDIX 73. Hours of sunshine in a year across the range of *Centrobolus* Cook, 1897.

2690.72
2709.47
2740.74
3145.74
2846.04
2815.76
2703.13
2699.92
2709.47
2583.18
2864.06
3087.04
2646.85
2815.76
2654.59
2702.09
2864.06
2682.25
3126.58
2841.89
3070.45
2564.32

APPENDIX 74. Precipitation across the range of *Centrobolus* Cook, 1897.

919
893
962
498
408
944
1266

1015
893
966
497
621
1050
944
945
837
497
956
401
1200
265
1089

APPENDIX 75. Minimum temperature across the range of *Centrobolus* Cook, 1897.

14.5
19.9
14.8
11.4
11.5
19.8
21.6
18.7
20.5
15.3
7.7
11.4
15.7
19.8
19.7
22.2
16.6
13.6
15.0
19.4
9.5
19.0

APPENDIX 76. The average temperature across *Centrobolus* Cook, 1897.

15.9
20.4
16.6
16.4
16.9
21.9
22.8

19.5
16.6
16.7
17.0
16.4
19.5
21.9
20.1
22.0
18.6
19.0
17.0
17.0
15.0
19.7

APPENDIX 77. The species volume in *Centrobolus* Cook, 1897.

952
1894
557
522
1210
1518
1580
2043
775
962
2046
284
756
1221
1451
1666
1659
749
393
669
781
2683

APPENDIX 78. The moments of inertia in *Centrobolus* Cook, 1897.

10.791
4.7021
4.00
1.36
8.9401
12.738
9.4659

9.3025
2.9376
16.078
APPENDIX 79. The month with the highest number of rainy days in *Centrobolus* Cook, 1897.
19.90
13.73
19.33
10.50
10.40
13.97
21.03
15.23
13.73
19.27
8.67
11.07
14.07
13.97
14.26
13.77
8.67
8.67
7.10
10.10
18.50
16.97
APPENDIX 80. Maximum temperature across the range of *Centrobolus* Cook, 1897.
24.7
25.4
25.6
15.7
16.6
25.5
29.0
25.0
25.5
24.8
24.8
15.7
25.6
25.5
24.6
27.9
26.1
24.8
28.3

29.5
19.4
24.2
APPENDIX 81. The latitude across *Centrobolus* Cook, 1897.
-26.1502
-29.7462
-27.8403
-34.0477
-34.5849
-28.7784
-18.6866
-30.2805
-29.7080
-29.6301
-33.9322
-34.0164
-32.5717
-28.7784
-30.7157
-28.0246
-33.6367
-32.5064
-34.4142
-24.5392
-29.0939
-31.6334
APPENDIX 82. The longitude across *Centrobolus* Cook, 1897.
30.786
31.084
31.400
18.357
19.350
32.049
34.394
30.754
30.666
30.393
25.173
18.348
28.433
32.078
30.456
31.952
25.396
28.317
20.383

30.867
29.418
30.451
APPENDIX 83. Lowest hours of sunshine in a month (h) across the range of *Centrobolus* Cook, 1897.
252.02
201.76
227.1
342.21
293.68
209.2
236.52
198.79
201.76
196.7
272.96
336.32
199.61
209.2
193.09
195.55
250.72
203.3
312.99
238.19
274.85
188.32
APPENDIX 84. Mean ocean water temperature (degrees Celsius) followed by lowest hours of sunshine in a day (h) across the range of *Centrobolus* Cook, 1897.
23.20, 6.73
15.90, 11.04
17.30, 9.47
23.50, 6.97
23.50, 6.63
23.20, 6.73
15.80, 10.85
23.50, 6.97
23.60, 6.44
23.20, 6.07
APPENDIX 85. Highest ocean water temperature (degrees Celsius) across the range of *Centrobolus* Cook, 1897.
25.80
18.30
20.30
26.10
26.00
21.20

26.10
18.20
25.70
APPENDIX 86. Minimum ocean water temperature (degrees Celsius) followed by lowest hours of sunshine in a day (h) across the range of *Centrobolus* Cook, 1897.
20.80, 6.73
14.50, 11.04
15.20, 9.47
21.00, 6.97
21.10, 6.63
14.30, 10.85
21.00, 6.97
21.20, 6.44
20.80, 6.07
APPENDIX 87. Minimum precipitation (mm) preceded by lowest hours of sunshine in a day (h) across the range of *Centrobolus* Cook, 1897.
8.18, 10
6.73, 30
7.33, 14
11.04, 12
9.47, 26
6.97, 42
7.63, 24
6.63, 39
6.73, 30
6.35, 23
8.81, 39
10.85, 16
6.44, 27
6.97, 42
6.44, 39
6.52, 25
8.81, 39
8.81, 24
10.1, 22
7.64, 3
8.87, 14
6.07, 36
APPENDIX 88. Average monthly duration of sunlight across the range of *Centrobolus* Cook, 1897.
97.29
89.08
90.08
103.49
93.61
92.58
88.86

88.76
89.08
84.89
98.18
101.57
86.96
92.58
87.26
88.83
98.18
87.89
102.83
93.41
100.95
84.27