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HIGHEST RELATIVE HUMIDITY IS A DIRECT PREDICTOR OF SEXUAL SIZE DIMORPHISM IN 40 FOREST RED MILLIPEDES *CENTROBOLUS* COOK, 1897

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***ABSTRACT*- 28 factors were tested for regression with sexual size dimorphism (SSD) in forest red millipedes *Centrobolus* Cook, 1897. Only one factor could successfully explain 20% of the variation in SSD. Highest relative humidity predicted SSD (R^2 = 0.2, F(1,38) = 9.74, p = 0.003) (β = 0.17, p = 0.003, α = -8.49, p = 0.032) and the converse was true (R^2 = 0.2, F(1,38) = 9.74, p = 0.003) (β = 1.19, p = 0.003, α = 64.81, p < 0.001). There was a significant medium positive relationship between SSD and highest relative humidity (r=0.4517, r^2=0.2041, n=40, p=0.003434).**

I. INTRODUCTION

Forest red millipedes provide an interesting model to test the effects of climatic factors on sexual size dimorphism (SSD). Here 28 factors are tested for the efffects on SSD in 40 red millipedes *Centrobolus*.

II. MATERIALS AND METHODS

SSD was measured in 40 species of red millipedes *Centrobolus* Cook, 1897 from length and width measurements (given) used to calculate cylindrical volumes of males and females. 28 regressions were performed to determine significant effects at https://www.statskingdom.com/linear-regression-calculator.html.

III. RESULTS

Highest relative humidity predicted SSD (R^2 = 0.2, F(1,38) = 9.74, p = 0.003) (β = 0.17, p = 0.003, α = -8.49, p = 0.032) (Figure 1 & 2) and the converse was true (R^2 = 0.2, F(1,38) = 9.74, p = 0.003) (β = 1.19, p = 0.003, α = 64.81, p < 0.001) (Figure 3 & 4). Results of the kolmogorov test indicated that there is a non significant difference from the normal distribution in highest relative humidity, (D(40) = 0.13, p = 0.498). Results of the kolmogorov test indicated that there is a significant difference from the normal distribution in SSD, (D(40) = 0.33, p = 0.000271). There was a significant medium positive relationship between SSD and highest relative humidity (Figure 5, r=0.4517, r^2=0.2041, n=40, p=0.003434).

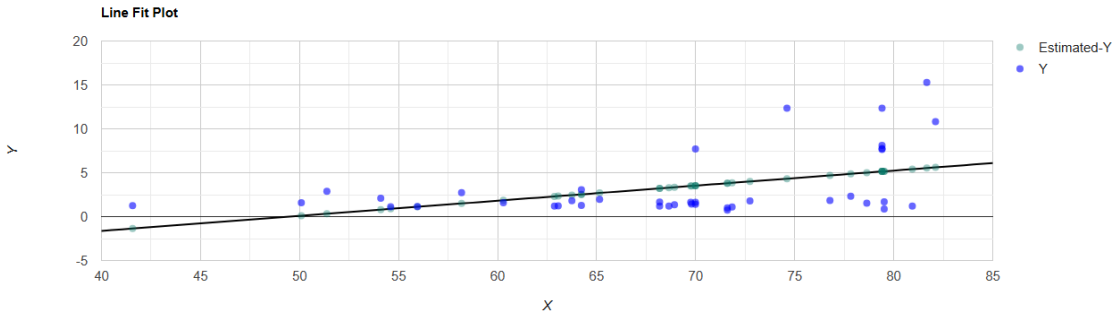

Figure 1. Regression of highest relative humidity and sexual size dimorphism (SSD) in 40 forest red millipedes *Centrobolus* Cook, 1897.

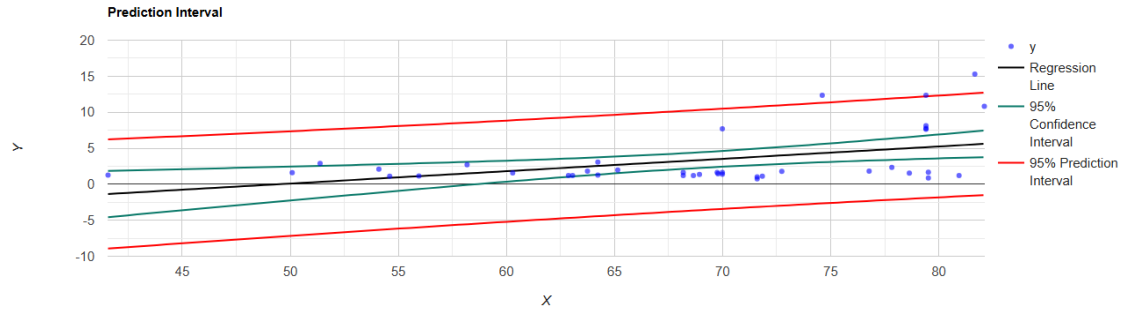

Figure 2. Prediction of highest relative humidity and sexual size dimorphism (SSD) in 40 forest red millipedes *Centrobolus* Cook, 1897.

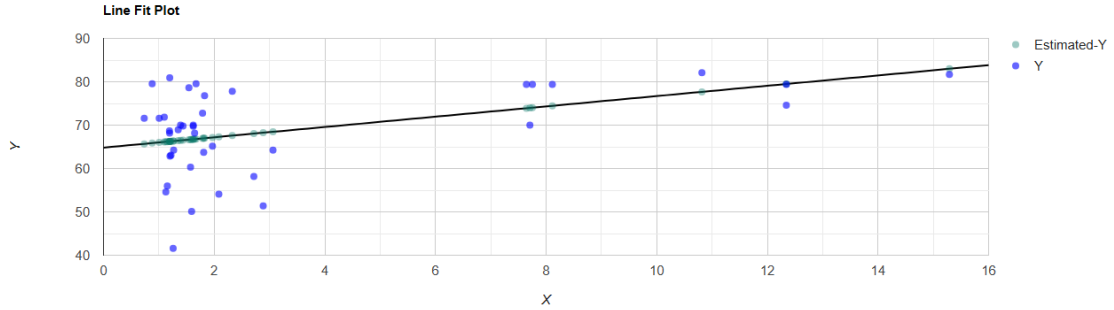

Figure 3. Regression of sexual size dimorphism and highest relative humidity in 40 forest red millipedes *Centrobolus* Cook, 1897.

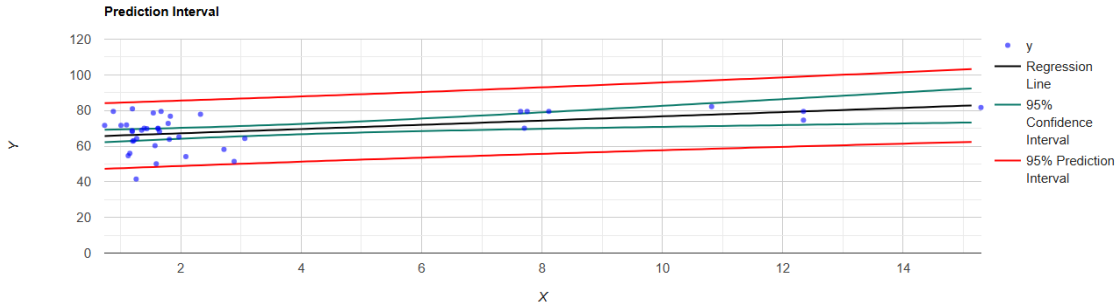

Figure 4. Prediction of sexual size dimorphism and highest relative humidity in 40 forest red millipedes *Centrobolus* Cook, 1897.

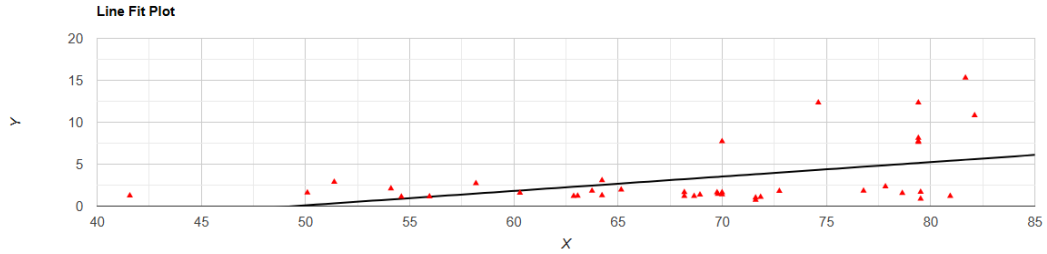

Figure 5. Significant medium positive correlation of sexual size dimorphism and highest relative humidity in 40 forest red millipedes *Centrobolus* Cook, 1897.

IV. DISCUSSION

SSD between 0.735 and 15.291 could be predicted with highest relative humidity (51.38-82.11%) in forest red millipedes. This is the first known study to document the relationship between humidity and SSD. There was a significant medium positive relationship between SSD and highest relative humidity.

APPENDIX 1. Highest relative humidity across the range of *Centrobolus* Cook, 1897.

51.38
72.74
68.65
79.52
62.87
79.41
50.09
71.60
68.93
79.41
68.18
58.18
63.06
69.79
60.29
74.61
69.99
64.23
77.83
79.52
71.60
54.10
68.18
69.75
69.99

80.94 1.810
65.15
64.23
76.78
78.64
79.41
54.60
69.99
79.41
82.11
55.95
41.57
71.84
81.67
63.75

APPENDIX 2. Sexual size dimorphism (SSD) across the range of *Centrobolus* Cook, 1897.
2.886
1.790
1.191
1.672
1.201
7.753
1.592
1.006
1.349
12.343
1.646
2.717
1.219
1.436
1.572
12.343
1.392
3.063
2.327
0.879
0.735
2.084
1.194
1.621
1.621
1.196
1.969
1.267
1.826
1.543
8.113
1.126
7.707
7.644
10.817
1.153
1.258
1.098
15.291