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PREDICTED MATING FREQUENCIES FOR CALCULATED AND CONTROLLED MASSES AT DISTANT LATITUDES AND LONGITUDES IN RED MILLIPEDES *CENTROBOLUS* COOK, 1897

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Abstract

Solutions in the form of simultaneous equations are given for precited mating frequencies (z) from calculated mass (x) across latitude and longitude in red millipedes Centrobolus. The solution to the simultaneous equation z-0.16x+0.32=y-2.46x+34.6 (LATITUDE-MASS-MATING FREQUENCY SIMULTANEOUS EQUATION) was x=-0.43+14.9+0.43y. The solution to the simultaneous equation z-0.16+0.33=w-6.40x-17.63 (LONGITUDE-MASS-MATING FREQUENCY SIMULTANEOUS EQUATION) was x=-0.16z-2.87+0.16w. This generated a further simultaneous equation -0.43z+14.87+0.43y=-0.16w-2.87+0.16x which was solved as x=111+1.0w+2.71y-2.71z where the x was the mass and w, y, and z were longitude, latitude and the mating frequency, respectively. When the northern-most, southern-most, eastern-most and western-most species GPS co-ordinates were substituted into these equations the expected mating frequencies were 15.1 (C. immaculatus), -1.32 (C. dubius), 0.15 (C. promontorius), and 15.1 (C. immaculatus); when mass was explained. The higher expected mating frequencies differing by three orders of magnitude were in the northern-most and western-most species for this genus.

Keyword: *mass, solution. frequency .longitude. latitude*

INTRODUCTION

A forest genus of diplopods belonging to the Order Spirobolida found along the eastern coast of southern Africa was the subject of this study. The millipede genus *Centrobolus* is found in the temperate South African subregion, its northern limits on the east coast of southern Africa being about -17° latitude S [1-88]. 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 762-1016 mm, 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.

In this paper, the aim is to predict estimated mating frequencies at extreme latitudes and longitudes for members of the red millipede genus *Centrobolus* as this correlates with post-insemination associations [88].

MATERIALS AND METHODS

Three linear equations were calculated for combinations of mass, latitude, longitude, and mating frequency in *Centrobolus* Cook, 1897.

y = 2.46079046 · x + -34.58499122 (mass(x)-latitude(y) equation),

w = 6.39972815 · x + 17.63047846 (mass(x)-longitude(w) equation), and

z = 0.15590994 · x + -0.31794719 (mass(x)-mating frequency(z) equation).

These were solved at https://www.equationcalc.com/simultaneous-equations-solver.

RESULTS

Three simultaneous equations and the solutions are given for the four factors:

Latitude-mass-mating frequency simultaneous equation

z - 0.15590994 · x +0.31794719 = y - 2.46079046 · x +34.58499122 (LATITUDE-MASS-MATING FREQUENCY SIMULTANEOUS EQUATION).

x=-0.433862z+14.867171+0.433862y (LATITUDE-MASS-MATING FREQUENCY SIMULTANEOUS EQUATION SOLUTION).

Longitude-mass-mating frequency simultaneous equation

z - 0.15590994 · x + 0.31794719 = w - 6.39972815 · x - 17.63047846 (LONGITUDE-MASS-MATING FREQUENCY SIMULTANEOUS EQUATION).

x=-0.160158z-2.874591+0.160158w (LONGITUDE-MASS-MATING FREQUENCY SIMULTANEOUS EQUATION SOLUTION).

For the final equation mass was removed:

Latitude-mass-mating frequency longitude-mass-mating frequency

-0.433862z+14.867171+0.433862y=-0.160158w-2.874591+0.160158x (LATITUDE-MASS-MATING FREQUENCY=LONGITUDE-MASS-MATING FREQUENCY SIMILTANEOUS EQUATION).

y=0.630855z-40.892639+0.369145w (LATITUDE-MATING FREQUENCY=LONGITUDE-MATING FREQUENCY SIMULTANEOUS EQUATION SOLUTION).

DISCUSSION

The mating frequencies are predictable across latitude and longitude when mass is controlled. The mating frequencies are given in the equation y=0.630855z-40.892639+0.369145w. When the northern-most, southern-most, eastern-most and western-most co-ordinates were substituted into this equation the predicted mating frequencies were 15.074255 (*C. immaculatus*), -1.323937 (*C. dubius*), 0.147731 (*C. promontorius*), and 15.074255 (*C. immaculatus*); when mass was explained. The higher predicted mating frequencies are in the north-western species for this genus.

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