Replicability of Light Pollution Effects on Timing of Butterfly Metamorphosis

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Light pollution disrupts diurnal light cycles that insect orders such as Lepidoptera (butterflies and moths) adapted to over generations as a cue to time important life events like metamorphosis. In a prior science fair study, artificial light of 300 lux at night extending the light cycle to 17.5 h and 24 h caused Painted lady butterflies (Vanessa cardui) to develop from caterpillars more quickly in Fall 2020. The goal of this continuation research project is to determine how well this original 2020 data captured how daylight hours change rate of development from caterpillar to chrysalis to butterfly. V. cardui were studied because they are native in Texas and are not pests. In April, early and late October 2021, 40 caterpillars (5 each in 8 cups of food) from Insect Lore (Schafer, CA) were put two cups each in 0, 9.5, 17.5 or 24 h artificial light, to monitor timing of chrysalis formation and butterfly emergence. These light cycles were selected as negative control, Texas November and June, and positive control, respectively. Weights of caterpillars were the same for all treatments in each experiment, but varied between experiments. Caterpillars kept in dark developed at the same rate as 17.5 h light exposed ones in all experiments. In April – May 2021 the 24 h light exposed caterpillars developed into chrysalis and butterflies faster than all other groups. In October – November 2021 17.5 and 24 h light exposed caterpillars developed faster than 9.5 h. Artificially extended light consistently sped up development.

Awards Won:

American Statistical Association: In-Kind membership to ASA for all winners, including honorable mentions

American Statistical Association: Honorable Mention