**ReadMe for “Time series.R”**

The following ReadMe gives a brief overview of how to use “Time series.R” to plot the population dynamics predicted by the DDE model as well as produce the panels in Figure 2 of the manuscript.

**Input:** User-defined species name and location for an insect population

**Output:** Plots of habitat temperature in the recent and future climates, predicted adult density and field census data (if desired, for *Clavigralla shadabi* or *Apolygus lucorum*), and juvenile and adult densities in the recent and future climates.

**To run:**

1. Update variable *species* (line 19) and *location* (line 20) with a species name and location from “Temperature response parameters.csv”.
2. To plot model population dynamics with field census data, set *census* to TRUE in line 23
3. To change plotting parameters (such as x- and y- axes values), change values in lines 53-58
4. Run the script

**Potential issues:**

* The script only works if the working directory (see line 10) is in the main folder of the downloaded GitHub repo
* The variable *species* (line 19) and *location* (line 20) must exist within “Temperature response parameters.csv” and match the “Population” and “Location” columns exactly
* If elapsed time limit error occurs or lines are missing from the plots, try clearing the global environment and then running the script again (see line 15).

**Script details:**

Lines 5-23 Load required packages, set working directory and have user enter required information

Lines 26-43 Read in habitat temperature parameters, field census data, and model time-series data

Lines 46-68 Set parameters and plotting options, and format model output to align with census data

Lines 71-156 Construct habitat temperature plots for the recent and future time period as well as the temperature bands around the warmest half of the year for habitat temperature and insect density plots in tropical/subtropical and temperate habitats

Lines 159-171 Construct field census data plots (if desired)

Lines 174-223 Construct population dynamics plots predicted by the DDE model (“DDE population model.py”), including juvenile and adult density in the recent and future climates

Lines 226-279 Draw plots of habitat temperature (Fig. 1A,B), model and field census plots (Fig. 1C,D; if desired), predicted juvenile density in the recent and future climates (Fig. 1E,F), and predicted adult density in the recent and future climates (Fig. 1G,H) (Note: to produce plots in a new window, remove “#” from line 228, run line 228, and then highlight and run the lines corresponding to the desired plot)

Lines 282-289 Run linear regression analyses of model predictions versus field census data