**ReadMe for “Temperature response parameters.R”**

The following ReadMe gives a brief overview of how to use “Temperature response parameters.R”. ***Please note that running this script is not strictly necessary for the populations in the manuscript as all temperature response parameters already exist in “Temperature response parameters.csv” in the “Model Parameters” folder.*** Also, please note that the nonlinear least squares regression function *nls* in R must be given a ‘start’ list of rough parameter estimates. To do this efficiently, this script uses the parameter estimates in “Temperature response parameters.csv” in the ‘start’ list of *nls*, which is a circular method for parameter estimation. All parameters, however, were initially estimated by providing rough estimates in the ‘start’ list of *nls*, and can thus be estimated *a priori* by ‘seeding’ each parameter column in “Temperature response parameters.csv” with a rough estimate of each parameter.

**Input:** User-defined species name and location for an insect population or all = TRUE

**Output:** Updated “Temperature response parameters.csv” file (if save = TRUE) or print out (if save = FALSE) with the temperature response parameters for either a specified population (if all = FALSE) or all populations (if all = FALSE)

**To run:**

1. Update variable *species* (line 13) and *location* (line 14) with a species name and location from “Temperature response parameters.csv”. If a new population is added to “Temperature response parameters.csv”, then parameters must be ‘seeded’ by adding a rough estimate to each parameter column (this is used in the ‘start’ list in *nls* to estimate parameters via nonlinear regression). Set all = TRUE if the script is to be run for all populations in “Temperature response parameters.csv” or set all = FALSE if the script is to be run just for the specified population.
2. To save parameter fits (over existing values in “Temperature response parameters.csv”), change “save” from FALSE to TRUE in line 18
3. 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 13) and *location* (line 14) must exist within “Temperature response parameters.csv” and match the “Population” and “Location” columns exactly
* Some modifications to the “start” list in *nls* functions throughout the script may be needed for new populations not in “Temperature response parameters.csv”

**Script details:**

Lines 5-10 Install required packages and set working directory

Lines 12-18 Have user enter required information

Lines 18-41 Read in, and then find selected population in, “Temperature response parameters.csv”

Lines 43-45 Obtain data for selected population (note: *Apolygus lucorum* is automatically set to its location in “Temperature response data.csv”)

Lines 47-62 Remove columns that do not contain temperature data and set minimum and maximum values for x-axes and reference temperature for *nls* functions below

Lines 65-95 Fit parameters for intrinsic growth rate, *rm*, via *nls* (note: for *Clavigralla tomentosicollis* in Burkina Faso, *rMax* (“rMax”) and *Topt,r* (“Toptr”) are set to data and *nls* is used to estimate *Tmax,r* (“Tmaxr”) and *σr* (“sr”))

Lines 98-111 Fit parameters for the net reproductive rate, *R0*, via *nls*

Lines 114-127 Fit parameters for the per capita birth rate, *b*, via *nls*

Lines 130-155 Fit parameters for the juvenile per capita mortality rate, *δJ*, via *nls* (note: for *Myzus persicae* in Canada Chatham and *Aulacorthum solani* in US Ithaca, (“dJTR”) is set to data and *nls* is used to estimate *AJ* (“AdJ”))

Lines 158-180 Fit parameters for the adult per capita mortality rate, *δA*, via *nls* (note: for *Aulacorthum solani* in Brazil, (“dATR”) is set to data and *nls* is used to estimate *AA* (“AdA”))

Lines 87-93 Save model parameters (if desired) or print model fits for a specified species