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Worked with: Sarah Guitart and another student (forgot to ask his name!)

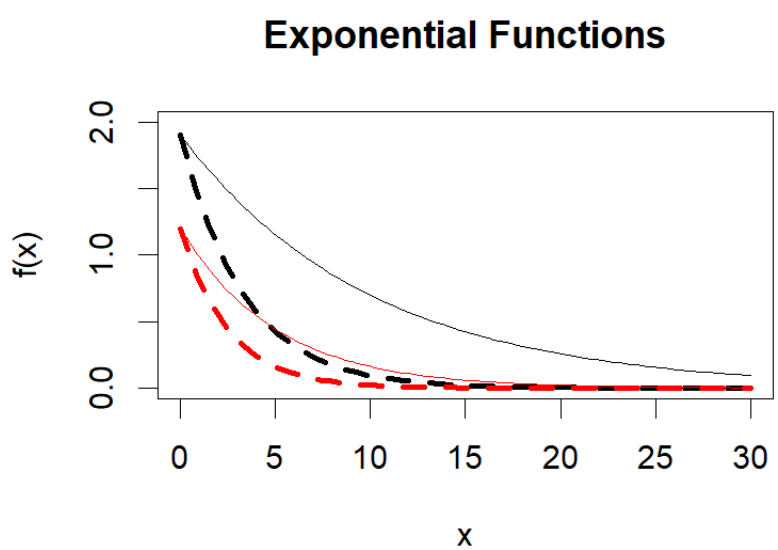
ECO 634 Lab 5 – Uncertainty, Samples, and Populations

Exponential Functions Q1-4

Q1 (2 pts.): Show the R code you used to create `exp_fun()`

```
exp_fun = function(x, a, b)
{
return(a * exp(-b * x))
}
```

Q2 (4 pts.): In your lab report, include a single figure containing **four** negative exponential curves with the specified parameter values and line colors/textures.



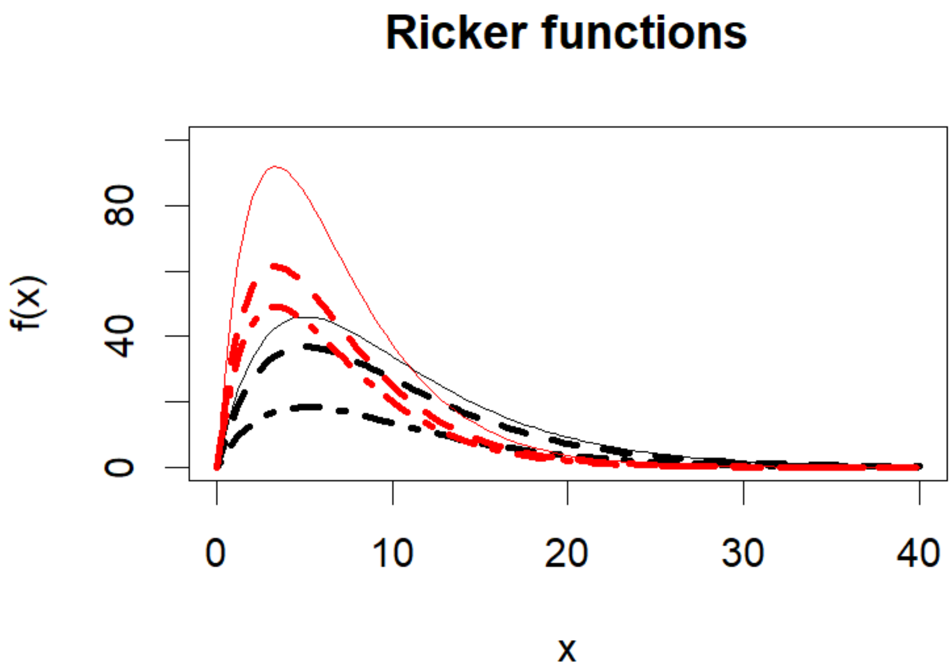
Q3 (2 pts.): Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter `a`

Parameter a is the initial height of the exponential curve, which is the starting y value for these curves. When we decrease the value of a, the curve is shorter because it starts at a lower y value.

Q4 (2 pts.): Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter `b`

The value of parameter b is the rate of decay of the curve, which is the steepness of the curve. A higher value of b means a steeper slope because it is a faster rate of decay, meaning it approaches 0 in a shorter period of time.

Q5 (6 pts.): In your lab report, include a single plot containing 6 Ricker curves with the specified parameter values.



Q6 (2 pts.): Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter a

The parameter a is the value of the starting slope of the curve. The red lines all have higher values for a than the black lines, and it shows how a higher value for a results in a steeper slope and the curve ends up with a larger height at the peak. The curves with smaller values for a end up with a wider distribution.

Q7 (2 pts.): Observe how the curves vary as you change the two parameters' values. Qualitatively describe what happens to the curve as you vary parameter b

The parameter b is related to the x values of the curve. The top of the curve has an x value of 1/b. All of the red lines have the same value of b and all of the black lines have the same, smaller, value of b. The large value of b results in a curve that is compressed and shifted to the left, meaning the peak of the curve occurs at a smaller value of x.

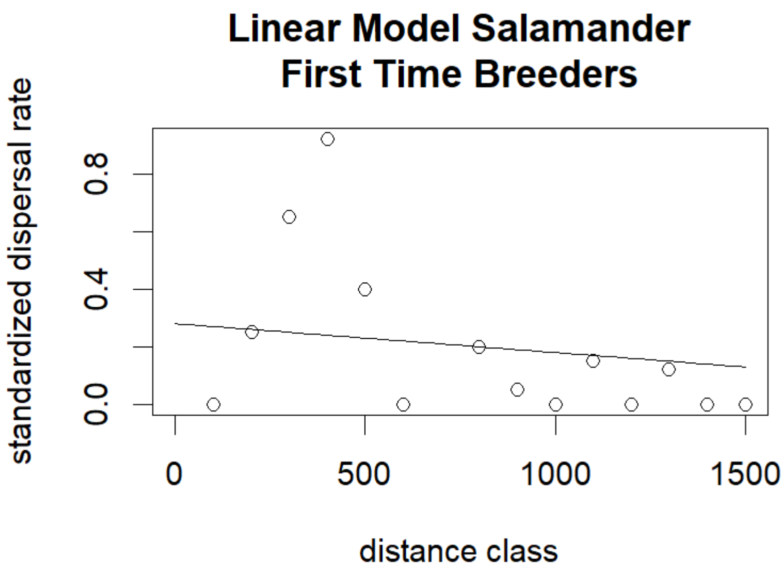
Salamander Models Q 8-13

Q8 (2 pts.): Linear Model. Provide the values of the slope, x1, and y1 parameters you chose. Briefly describe how you chose the values.

x1: 800
y1: 0.2
slope: -0.0001

I looked for a plausible x and y value to use as a start and then added the line to the plot to see if it visually fits the data points. Then I decided the slope was too flat, so I adjusted the slope by subtracting zeros until the line seemed to fit the data.

Q9 (2 pts.): In your lab report, include a scatterplot of the salamander data with your fitted linear model.

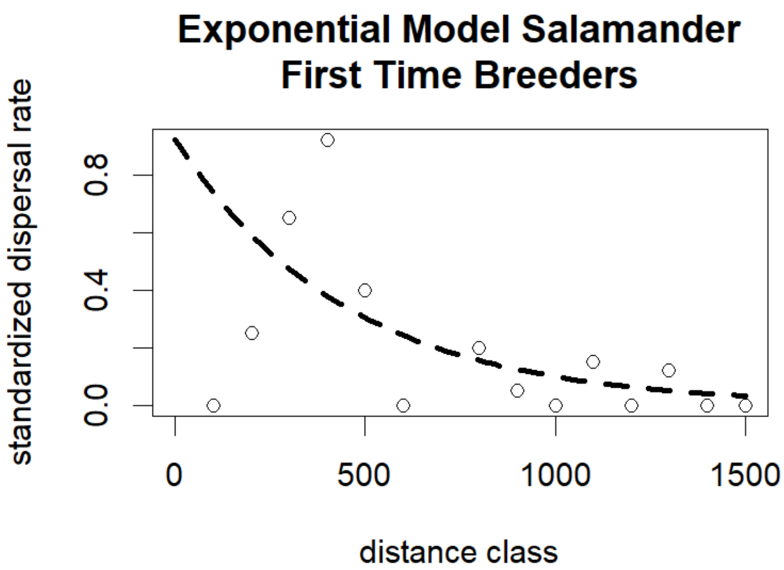


Q10 (2 pts.): Exponential Model. Provide the values of the a and b. Briefly describe how you chose the values.

a=0.92
b=1/500

I chose the value for a by using the summary function for the data frame and then selecting the maximum value for standardized dispersal rate. I think this makes sense because a is supposed to be the heighest point of the exponential curve. In order to find a potential value for b, I calculated a/e = 0.92/e = 0.338. This is the y value at the point where 1/b is equal to the corresponding x value for the exponential curve. When I look at the scatterplot when y is 0.4, I'm guess that the x value for the fitted exponential curve should be around 450, so 450 = 1/b, which means b=1/450.

Q11 (2 pts.): In your lab report, include a scatterplot of the salamander data with your fitted exponential model.

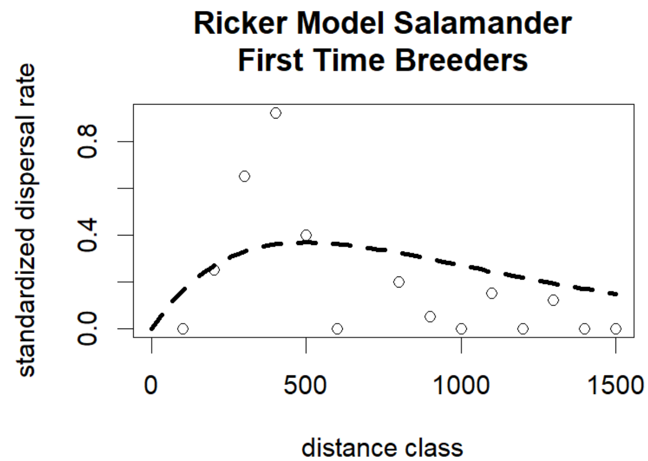


Q12 (2 pts.): Ricker Model Provide the values of the a and b. Briefly describe how you chose the values.

a=0.2/100
b=1/500

The a parameter is equal to the slope at the start of the curve, so I guessed that it should be about 0.2/100 based on the rise/run I would expect to fit these data points. The x value at the highest point of the curve is equal to 1/b. I guessed that the highest point of the curve would fall around x=500, so 500 = 1/b or b = 1/500.

Q13 (2 pts.): In your lab report, include a scatterplot of the salamander data with your fitted ricker model.



Q14 (4 pts.): Show the R code you used to create your data frame of model residuals.

#calculate the predicted yvalues based on my estimated model parameters

#add y_predicted variable as a new column in the dataset

dat_dispersal$y_predicted <- line_point_slope(dat_dispersal$dist.class, 800, 0.2, -0.0001)

#calculate residuals and add to datasetas a new column

#residuals are the difference between the predicted and observed values

dat_dispersal$resids_linear <- dat_dispersal$y_predicted - dat_dispersal$disp.rate.ftb

Q15 (3 pts.): In your lab report, include histograms of the residuals for each of your three models. You may create a single figure with three panels, or include three separate figures.