Unveiling Lizard Evolution:
Graphical Insights into Behavioral Ecology in the Era of Climate Change

Student Worksheet – Teacher version

Think-Pair-Share: Habitat and Microhabitat

- ***Think:*** spend 1 minute thinking about and writing down examples of microhabitats
- ***Pair:*** spend 1 minute talking to your neighbor about examples and benefits
- ***Share:*** communicate an example to the class

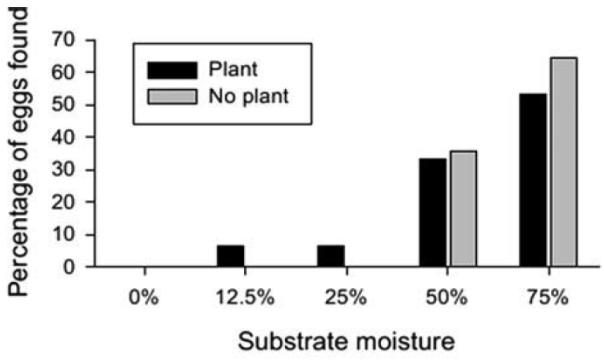
Microhabitats are local habitats that are constructed by the activity of ecosystem engineering species and are habitable for other additional species.
An example of a microhabitat would be the cool, dark and moist conditions provided underground for ants, worms, and moles. A single tree contains multiple microhabitats!
The habitat contains all an animal needs to survive such as food and shelter. A microhabitat is a small area which differs somehow from the surrounding habitat.

Discussion Question 1

With your neighbors, discuss this mystery graph!

- Describe the trend of the data.

Percentage of eggs found are increasing as the substrate moisture goes up.
[The values are increasing.]



- What research question could be answered by this graph? What do you think these data represent?

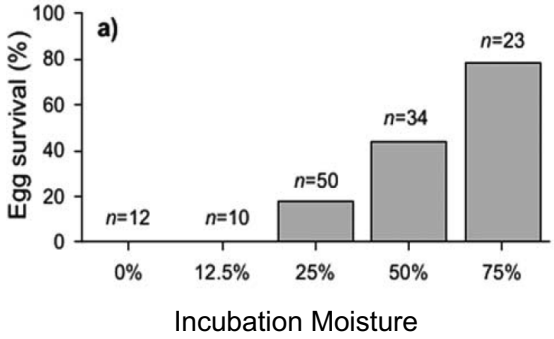
The RQ can be: What is the nest-site choice as the microhabitat variable, e.g. substrate condition, changes?
The data represent how many eggs lizards laid in different vegetation condition (plant vs. no plant) and variable substrate moisture. This infers lizard's nest-site choice.

Discussion Question 2

With your neighbors, answer these questions:

- Name a title.
  Effect of incubation moisture on hatching success of eggs.

- Make a conclusion from this figure.



The hatching success of eggs increases as the incubation condition is more moisture.

- Explain how the data supports your conclusion.

The data supports the conclusion that the hatching success of eggs increases as the incubation condition becomes more moist. This can be observed from the figure, where there is a clear positive trend between the level of moisture in the incubation environment and the hatching success rate of eggs. The data points at the higher moisture levels consistently exhibit higher hatching success rates, while the points at lower moisture levels demonstrate lower success rates. This pattern further strengthens the conclusion that increased moisture in the incubation environment enhances the chances of successful hatching.

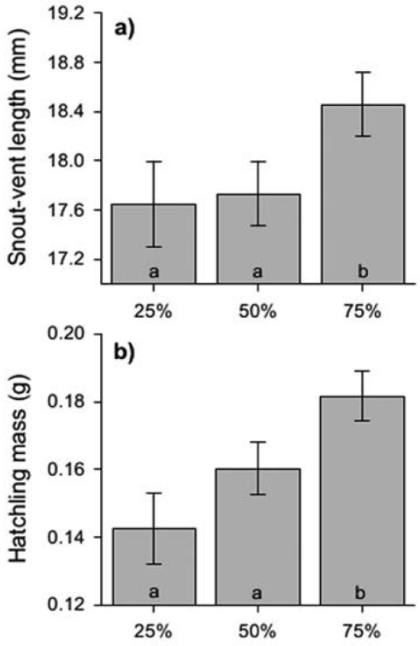
- How does the lizard population respond or adapt to extreme climate events through the nest-site choice?

In this study, the data shows Lizards may respond by selecting nest sites that offer higher level of moisture conditions for egg development.

Discussion Question 3

- What does this graph show?

Effect of egg incubation moisture on hatchings in terms of AVL and body mass.



The Next Research Question: Discussion 4

Given data from hatchling's morphological measurements, what could be the next research question for the authors to ask?

A. *How is hatchling's survival rate different ?*
B. *How is hatchling's development different?*
C. *How do hatchlings find home?*
D. *What do different hatchling diets look like?*

Either A or B can be a good Next RQ.

Discussion Question 5

Use three sentences to summarize what you can observe. One sentence for each graph.

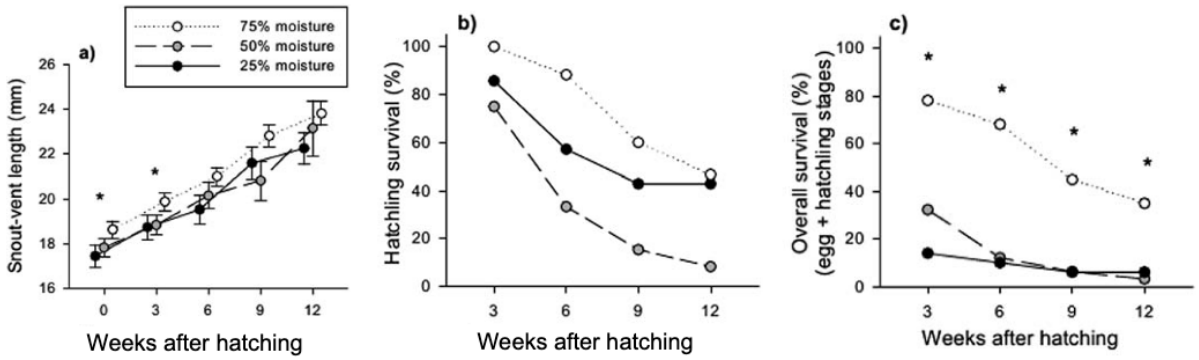


Figure 4 - The effect of egg incubation moisture on (a) change in VSL, and (b,c) hatchling survival through 12 weeks after hatching.

What's the significance of these findings?

This is a very open question. Students might not be able to expand their knowledge. Then use the next slides - microhabitats to direct them to think about the environmental conservation, global climate change etc.

Microhabitat Reviews:

- What specific microhabitat conditions did the authors use as independent variables in the experiment?
    1. Moisture condition (yes!)
    2. Vegetation (yes!)
    3. Temperature
    4. Soil microbes

5. decomposing log
6. Light intensity
7. Soil pH
8. Salinity of water

- Why are microhabitats important to species evolution?

Microhabitats have extraordinary potential to buffer climate and likely reduce mortality during extreme climate events.

microhabitats influence physiological characteristics which will be essential to predicting the species' ecological and evolutionary responses to global change,

- How does climate change affect microhabitats?

Student can discuss the following ways in which climate change impacts microhabitats:

1. *Temperature changes alter the thermal conditions within microhabitats.*
2. *Precipitation patterns cause changes in the availability of water in microhabitats.*
3. *Altered species interactions*
4. *Habitat loss and fragmentation*
5. *Increased stress and disease susceptibility*
6. *etc.*

Discussion Question 6

With your neighbors, brainstorm ideas:

- What questions do you have about Dr. Warner's path to this work, or where he is today?

Open questions to students.