

DATA *Nugget*

Is your salt marsh in the zone?

Featured scientist: James Morris from the University of South Carolina

Research Background:

Tides are the rise and fall of ocean water levels, and happen every day like clockwork. Gravity from the moon and sun drive the tides. There is a high tide and a low tide, and the average height of the tide is called the **mean sea level**. The mean sea level changes seasonally due to the warming and cooling of the ocean throughout the year. It also changes annually due to a long-term trend of ocean warming and the melting of glaciers. Scientific evidence shows that climate change is causing the sea level to rise faster now than it has in the past. As the climate continues to warm, it is predicted that the sea level will continue to rise.



Scientist James collecting plants in a Massachusetts marsh, part of the Plum Island Ecosystems Long Term Ecological Research site.

Salt marshes are wetlands with plains of grass that grow along much of the ocean's coast worldwide. These marshes are important habitats for many plants and animals, and protect our shores from erosion during storms. They grow between mean sea level and the level of high tide. Marshes flood during high tide and are exposed to the air during low tide. The health of a salt marsh is determined by where it sits relative to the tide (the "zone"). A healthy marsh is flooded only part of the time. Too much flooding and too little flooding are unhealthy. Because they are so important, scientists want to know if salt marshes will keep up with sea level rise caused by climate change.

In the 1980s, scientist James began measuring the growth of marsh grasses. He was surprised to find that there was a long-term trend of increasing grass growth over the years. James wanted to know if grasses could continue to keep up with rising sea levels. If he could experimentally manipulate the height of the grasses, relative to mean sea level, he might be able to figure out how grasses will do when sea levels are higher. To test this, James invented a way to experimentally grow a marsh at different

elevations relative to mean sea level. He built a device he called the “marsh organ”. This device is made of tubes that stand at different elevations and are filled with marsh mud and planted with marsh grasses. He measured the growth of the grass in each of the pipes. If grasses will continue to grow taller in the future with higher water levels, then plants growing in pipes at lower elevations should grow more than plants growing in pipes with higher elevations.

Scientific Question: How does the elevation of the marsh organ pipe, relative to mean sea level, affect plant growth?

Scientific Data:

Use the data below to answer the scientific question:

Salt Marsh Elevation, Relative to Mean Sea Level (cm)	Dry Plant Biomass (g/pot)
-5	0
-5	0.5
-5	0.2
30	2
30	4
30	3
60	4.5
60	4
60	3.5
90	5
90	5.2
90	4
120	3
120	3.5
120	2
150	1
150	0.5
150	0.5



A picture of James' “marsh organ” which holds plants at different elevations relative to mean sea level. He gave it that name because it resembles organ pipes!

Salt Marsh Elevation	Mean Dry Plant Biomass
-5	
30	
60	
90	
120	
150	

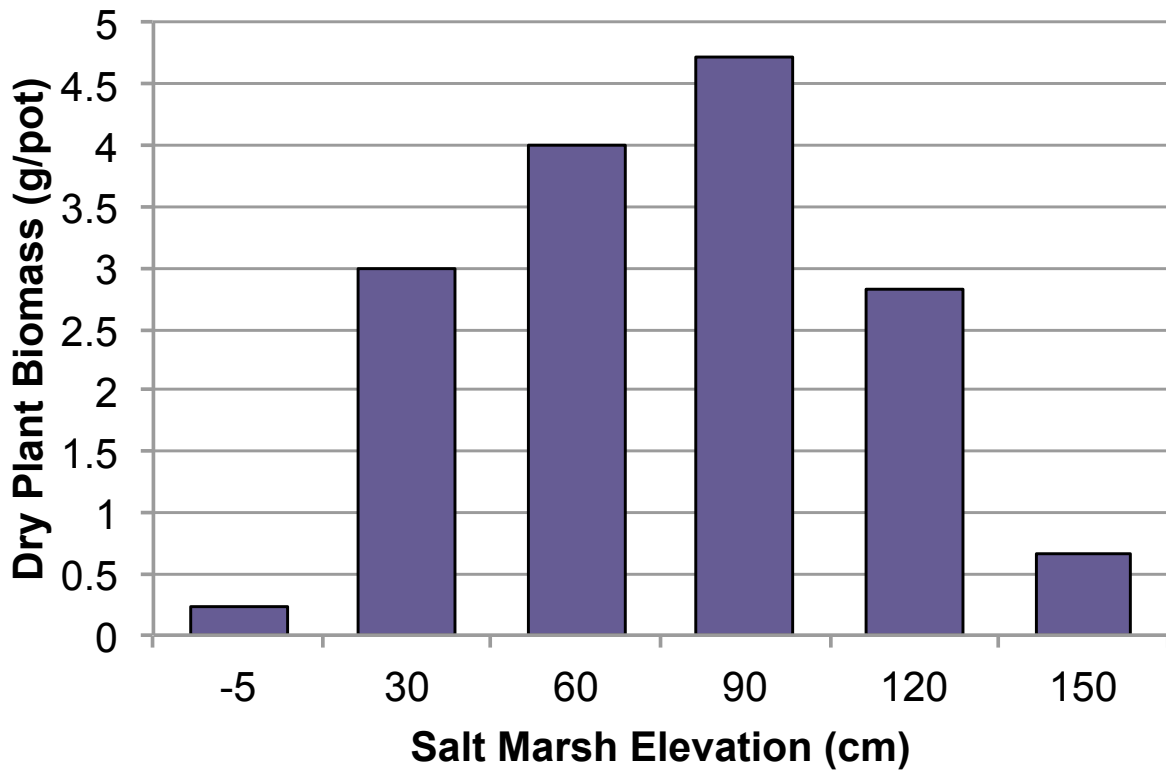
**Dry Plant Biomass is aboveground plant weight per pot after one growing season*

What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Below is a graph of the data: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Interpret the data:

Make a claim that answers the scientific question.

Name_____

What evidence was used to write your claim? Reference specific parts of the table or graph.

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the effect of mean sea level on salt marshes, and how climate change may impact mean sea level in the future.

Your next steps as a scientist:

Science is an ongoing process. Did this study fully answer the scientific question?

Name _____

Think about what this data means for future marshes facing rapidly rising sea levels. What new question do you think should be investigated?

What hypothesis would you like to test? A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

What data will you graph to answer the question?

Independent variable(s): _____

Dependent variable(s): _____

For each variable, explain why you included it and how it could be measured.