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DATA Nugget

Growing kelp for community

Featured scientist: Caitlin McKinstry (she/her) from the Native Village of Eyak. Written with Rosel Burt and Melissa Kjelvik from Prince William Sound College.

Research Background:

When thinking about farming, many people imagine fields of corn or soybeans, or even their own vegetable garden. All of these crops are grown on land, but what about growing food in the ocean? Alaska Natives who live along the coast have been harvesting **kelp,** a group of seaweeds, from the wild for thousands of years. Kelp is very nutritious and is full of vitamins and minerals. It is used in a variety of dishes, from soups to salads. Kelp also provides structure for herring to lay their eggs, another traditional food source that coastal Alaska Native communities harvest. Kelp has other purposes too, including soil fertilizer and food additive applications.

Recently, there has been a surge of interest in farming kelp at a larger scale along the Alaskan coast. Farming kelp involves cultivating kelp at a site to grow larger for harvest. Caitlin is a biologist who works for the Native Village of Eyak within the Prince William Sound of Alaska. The Tribe wants to start a kelp farm to provide a nutritious food source for its community members. Caitlin was tasked with designing the farm setup and testing how much kelp can be grown. Her first step was to find a site. She had to consider environmental factors that help the kelp grow. Kelp need particular nutrients and cool water temperatures. She also had to make sure the site was easy to get to and that it was protected from intense weather like high winds and large waves.

To get started, Caitlin talked to the members of the Eyak community to learn where they have historically found kelp, called **Traditional Knowledge**. She listened to their suggestions, which were based on current and long-term connections with the local environment. This helped her identify a site that is a short boat ride. Caitlin also had discussions with other kelp farmers in Alaska and read scientific research articles to learn more about how to set up a kelp farm and which species would be a good fit. She decided to grow sugar kelp because it has a sweeter taste and grows well in other places with similar conditions.

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She designed the farm to grow the kelp vertically in the water. To do this, she would place lines vertically in the water for kelp to attach and grow at different depths. This design maximizes the amount of kelp grown below the surface, which is good to minimize interference with boats and animals. While vertical lines have benefits, there could be drawbacks too. Kelp needs sunlight for photosynthesis, which it uses to grow. But the deeper you go in the water, the less sunlight there is. The kelp at the surface will get plenty of light, but the kelp attached to the line in deeper water might not get enough. The kelp at the bottom could also get blocked or shaded by the kelp above it.

Caitlin wanted to know if there is a time of year when kelp had the fastest growth rates. This information would help her know when to harvest kelp from the site. She also wanted to know whether depth affected the kelp growth. If it turned out that kelp didn't grow on her vertical lines in deeper water, she may have to try another design. She predicted that kelp grown in the first 1-2 meters from the surface would grow more over a season because it would receive the most sunlight.

To assess her kelp farm plan, Caitlin worked with partners to **seed** lines with fertilized sugar kelp spores. Each of these spores can grow into a large kelp blade that can be up to 5 meters long. The seeded lines were then installed vertically at the farm site in the fall of 2022. Caitlin and her colleagues set up 532 vertical lines that were each 10 meters long. In total, over 2 miles of seeded line were installed on the farm! The lines were attached to a horizontal line to secure them in place and were spaced out so they had room to grow.

Each month, Caitlin and her colleagues monitored the kelp growth by measuring the length of kelp **blades**, or leaf-like structures, on 5-8 of the seeded lines. On each line, they measured kelp blades at different depths so they could see how the kelp was growing at different depths.

Left: seed line one week after planting in November. Middle: kelp at the farm in April. Right: kelp blades after the harvest in June.

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Scientific Questions: How does the size of kelp change over the growing season? How does depth affect kelp blade length?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

Sampling Month	**Depth** (m)	**Average blade length** (mm)
December	1	32.1
January	1	88.8
February	1	200.1
March	1	666.7
April	1	1372.7
June	1	1440.4
December	3	17.8
January	3	54.8
February	3	115.4
March	3	350.7
April	3	948.6
June	3	1003.8
December	5	11.6
January	5	32.3
February	5	68.7
March	5	182.4
April	5	674.3
June	5	822.1
December	7	8.3
January	7	16.3
February	7	36.8
March	7	71.8
April	7	350.9
June	7	593.3

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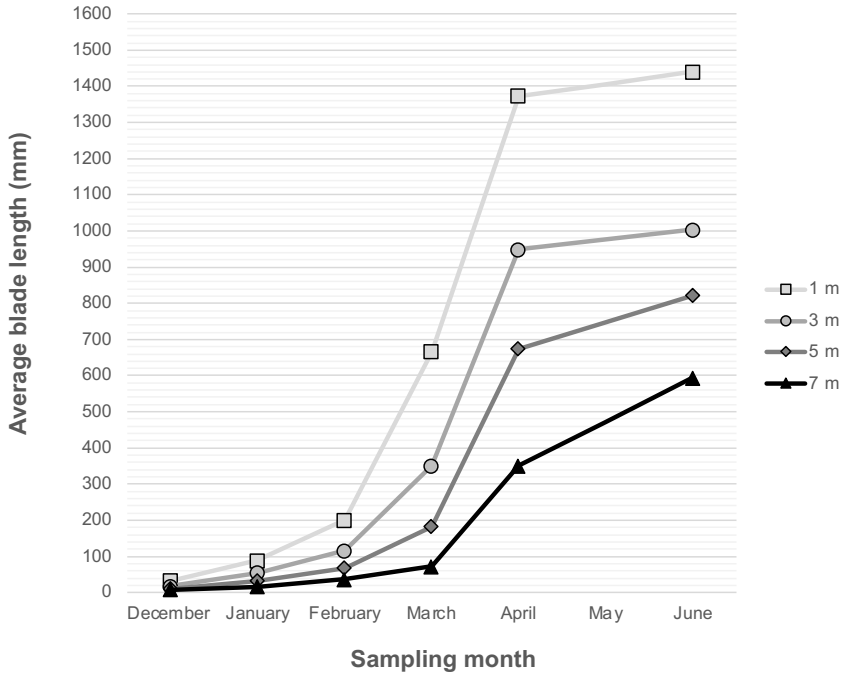
What data will you graph to answer the question?

Independent variables: _____

_____

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: How does the size of kelp change over the growing season? How does depth affect kelp length?

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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 how environmental conditions may affect kelp growth.

Did the data support Caitlin's hypothesis? Use evidence to explain why or why not. If you feel the data are inconclusive, explain why.

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on Caitlin's research? How do your questions build on the research that has already been done?