Shore to Sea Floor Lab

Name _____

Date _____

Period _____

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Do Now These tuna swim in the open ocean near Hawaii, close to the surface where sunlight reaches. The water below them is about 4,700 meters deep. That is almost 3 miles. 2 minutes, before you open the lab

A. Predict: how deep can the sunlight go before it is almost all gone?

☐ About 10 meters ☐ About 200 meters ☐ All the way to the bottom

B. Plants and algae need sunlight to make food. What do you think animals eat in the dark water far below?

_____

☐ I can use real ocean data to describe the open sea's three zones.

☐ I can explain why most ocean life is in the coastal zone.

☐ I can name the services a coastal ecosystem gives people, and use numbers to argue for keeping it.

Part 1. Dive down (Tab 1)

SEP 4 Analyzing and Interpreting Data · CCC Scale, Proportion, and Quantity

Pick each depth: **0**, **100**, **200**, **1,000** and **4,000** m. Press **Record** at each one. Copy your dive log.

1. Your dive log, near Hawaii.

Depth	Light (% of the surface)	Temperature (°C)	Pressure (atm)
0 m			
100 m			
200 m			
1,000 m			
4,000 m			

2. The light is almost all gone by about

☐ 10 m ☐ 200 m ☐ the sea floor

Example: 50 atm is 50 times 1 atm. 30°C – 10°C = 20°C colder.

3. The pressure at 4,000 m is about _____ times the pressure at the surface.

The water at 4,000 m is _____ °C colder than at the surface.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 4 to 6.

WORD BANK for Q4: euphotic · bathyal · abyssal · coastal · estuary (use one word twice)

4. The _____ zone is bright, the _____ zone is dim, and the _____ zone is dark. Only the _____ zone has enough light for photosynthesis.

5. Which zone does each one live in? Tick one box in each row.

What the probe saw	Zone
A sea cucumber eats dead bits on the cold, dark floor at 4,000 m	☐ euphotic ☐ bathyal ☐ abyssal
Phytoplankton drift and make food from sunlight	☐ euphotic ☐ bathyal ☐ abyssal
Lanternfish with big eyes hunt in dim light at 500 m	☐ euphotic ☐ bathyal ☐ abyssal

6. No plants or algae grow at 4,000 m. The food for the animals there comes from

☐ sunlight on the sea floor ☐ dead bits that drift down from above ☐ plants that grow in the dark

Part 2. Coast or open sea (Tab 2)

SEP 4 Analyzing and Interpreting Data · CCC Patterns

Tap all seven letters on the map, **A** to **G**. Copy each one from **Your site log**. Then press **Show the names**.

7. Chlorophyll is the green coloring in tiny algae. More chlorophyll means more algae.

Site	A	B	C	D	E	F	G
Chlorophyll (mg/m³)							
Sea floor depth (m)							

8. The sites with more than 1 mg/m³ of chlorophyll all have a sea floor

☐ less than 100 m deep ☐ more than 3,000 m deep

Example: 6.0 ÷ 0.05 = 120, so 6.0 is about 120 times as much as 0.05. Use a calculator.

Site A has about _____ times as much chlorophyll as site C. (Divide A by C.)

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 9 to 11.

WORD BANK for Q9: shelf · sunlight · nutrients · ice · trench

9. The coastal zone runs from the high-tide line out to the edge of the continental _____. It has more algae because _____ reaches much of the water and rivers bring _____ from the land.

10. What kind of ecosystem is each site? Tick one box in each row.

Site	Ecosystem
B: Monterey Bay	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
G: Sapelo Sound	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
A: Lower New York Bay	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
F: The Sargasso Sea	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea
D: The Sundarbans	☐ estuary ☐ coastal wetland ☐ kelp forest ☐ open sea

11. Site A is an estuary. Its water is **brackish** , a mix of ☐ fresh and salt water ☐ hot and cold water

Tick the **two** services coastal ecosystems give people:
☐ a nursery for young fish ☐ deeper water for ships ☐ slowing storm waves ☐ more sunlight

Part 3. Roots against waves (Tab 3)

SEP 3 Investigations · SEP 5 Mathematics · CCC Structure and Function

Pick **Young and thin**. Set the width to **0**, **100**, **200** and **500** m, and press **Send the storm waves** each time. Then do the same with **Old and dense**.

12. Plan check. What job does each one have? Tick one box in each row.

In this test	Job
Height of the waves at the houses	☐ changed ☐ measured ☐ kept the same
Width of the forest	☐ changed ☐ measured ☐ kept the same
Height of the storm waves coming in	☐ changed ☐ measured ☐ kept the same

13. Waves at the houses (cm).

Width	Young, thin	Old, dense
0 m		
100 m		
200 m		
500 m		

Example: waves 100 cm tall reach the houses at 40 cm. (100 – 40) ÷ 100 × 100 = 60% smaller.

14. Old and dense, 200 m wide: the waves got (100 – _____) ÷ 100 × 100 = _____ % smaller.

In the old forest, the first 100 m cut the waves by _____ cm. The next 100 m cut them by _____ cm.

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 15 to 17.

WORD BANK for Q15: roots · energy · smaller · leaves · bigger

15. The mangrove's many thin _____ each take some of the wave's _____, so the wave gets _____ as it moves through the forest.

16. Model check. This lab is a model. Which one does it leave out?
☐ how wide the forest is ☐ the tide and how deep the water is ☐ how thick the forest is

17. Besides slowing waves, mangroves give two more services. Tick **two** .
☐ young fish and shrimp grow up in the roots ☐ they make the waves taller ☐ their mud stores carbon
☐ they make the water saltier

Wrap it up

SEP 7 Engaging in Argument from Evidence · CCC Stability and Change

18. A town says: "Clear 200 m of old, dense mangroves and build houses with an ocean view. A seawall will do the same job." Do you agree? Make a claim. Use two numbers from this lab and one service a seawall cannot give.

My claim: I ☐ agree ☐ disagree

Evidence 1: with 200 m of old, dense mangroves, the waves at the houses were _____ cm. With no mangroves they were _____ cm.

Evidence 2: a service a seawall cannot give is _____

NYSSLS: toward HS-ESS2-5, HS-ESS2-7. Environmental Science, Chapter 6, Lesson 6.3. Data: NOAA World Ocean Atlas, NASA MODIS, McIvor (2012), Narayan (2025).