Life in the Zones

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Topic: oceans, ocean life

Overview

This lesson is part of an upper elementary science unit on oceans and it is assumed that the students have completed lessons and have knowledge on the geological characteristics of the ocean. This lesson will demonstrate how life in the ocean varies based on the zone, or depth, in which they live. A marine food web will be explored with a strong emphasis on the importance of the smallest living organisms being the foundation for the marine food web. The relationships between biological characteristics and geological characteristics will be analyzed.

Special Note: An earlier lesson titled "Mapping the Sea Floor" found in Ranger Rick's *NatureScope: Diving into Oceans* (pg 12 & 13*)* is a perfect lesson to preclude this series of lessons entitled Life in the Zones. The students can refer to their student made graph of the ocean floor and build upon these geological features to analyze the ocean's zones and what living organisms live in these zones.

Grades: 4-5

Time Allotment:

Three 45-minute lessons

Learning Objectives:

On completion of this lesson students will be able to:

- create and interpret a model of a basic marine food web including floating organisms (plankton), swimming organisms, and organisms living in the ocean:

This lesson addresses Va. Science SOL 5.6.

Media Components

Hardware

- An LCD projector
- Computer with Internet connectivity
- A SmartBoard (optional) or screen
- Speakers
- Computer lab

Web resources

- A subscription to United Streaming online database
- (optional) A classroom subscription to http://www.enchantedlearning.com
- websites:
  http://www.partnersinrhyme.com/soundfx/watersounds.shtml
  (download ocean sounds)
  http://www.partnersinrhyme.com/soundfx/animals/WhalesDolphinsSeal.shtml
  (download whale, dolphin, and seal sounds)

http://agrolink.moa.my/dof/edukit/seaocean/factsheet1.html
http://agrolink.moa.my/dof/edukit/seaocean/index.html
(use for an example of a marine food web)
http://www.enchantedlearning.com/coloring/oceanlife.shtml

Videos and/or segments used:

- Oceans: Earth's Last Frontier. Rainbow Educational Media, 1995.
- 30 Nov. 2004 http://unitedstreaming.com. Segments: Exploring the Oceans (5:52) and
- Descending into the Depths: Exploring the Ocean Floor (8:07).
- Oceans Alive: The Food Web. Environmental Media Corporation/Marine Grafics, 1990 3 Dec. 2003. http://unitedstreaming.com. (5:00)
- Oceans Alive: Plankton. Environmental Media Corporation/Marine Grafics, 1990 3 Dec. 2003. http://unitedstreaming.com. (5:00)

Materials and Student Handouts

- *NatureScope: Diving into Oceans* National Wildlife Federation, 1992
- Exploring the Deep Dark Sea. Gibbons, Gail. Little, Brown, 1999.
- Graphic of the ocean floor profile-1 per student (attached)
- Pyramid handout-1 per student (attached)
- Sorting Cards-1 set per two students (3 pages per set, attached)
- Assessment and Rubric worksheet-1 per student (attached)
- 3 different markers or highlighters-yellow, green, blue-1 set per student

Teacher Preparations

- Download .wav files of ocean and animal sounds
- Bookmark or PortaPortal the Enchanted Learning website.
- Copy, cut and bag the sorting cards so that each individual, team or group has a set for sorting.
- Duplicate graphic and assessment and rubric worksheets.
- Have presentation system available to project web site
- Have a bulletin board started that depicts the geological features of the ocean (refer to SOL vocabulary)
- Download video clips from United Streaming and have them saved in a secure location. Organize them by sequence being used OR embed in PowerPoint presentation for ease of showing.
- Reserve computer lab.

Introductory Activities

Day 1

1. Focus: In science today, we are going to begin our lesson by listening to a series of sounds. As you listen, write down in your science journal,\ what you believe these sounds represent. The sounds may be living or nonliving things. Make your best guess. Once you have guessed, your job will be to predict where you might find this sound!
Play: Begin the listening activity with the downloaded ocean sounds from the web site. Have students listen and predict what they are hearing.
Pause: Once the students have guessed that it is the ocean, discuss the specific ocean sound and describe where in the ocean this sound must be and why.
Follow-up: What area of the ocean could make this sound? Why do you believe this is a part of the ocean? (The surf… where land meets water or the continental shelf). What beaches have you visited? Does all of the ocean waters touch or combine? Why do you think we have different ocean names? (so we can use them as a point of reference or understand where in the world we are referring) "Can you name all the oceans of the world? (have students respond)

2. Focus: Let's take a quick look at the oceans of the world.
Activity: Using a classroom computer and projection device, show the following web site, http://agrolink.moa.my/dof/edukit/seaocean/factsheet1.html)
Follow-up: Which ocean do we visit when we visit Virginia Beach? What is another country that borders the Atlantic Ocean besides the United States? Can you remember about how much of our planet is covered with oceans? (about 71%)

3. Focus: Now let's review the geological features of the ocean floor that we have studied. Use your graphic of the ocean floor as we look at the screen. (Pass out the ocean floor graphic.)
Activity: Using the same site, scroll further down. Point to each of the features and have students give their geological names. (continental shelf, continental slope, continental rise, mid-ocean ridge, abyssal plain, and trench) Discuss any necessary characteristics that are needed for clarification.
Follow-up: Refer to the student's ocean floor mapping graph and/or the bulletin board in the classroom that has the geological features displayed and labeled.

4. Focus: Now, I want you to listen to the next series of sounds. Please write what you believe you are hearing in your science journal, numbering them as we go. You may use any small space for writing your prediction.
Play: the downloaded whale sound (#1), the dolphin sound (#2), and the seal sound (#3).
Pause: after each sound to let students write their guesses in their journals.
Follow-up: Are these living or non-living things? Why do you think this? If they are alive, where do they live? (Allow student responses and lead them to the ocean.) Which region (or depth of the ocean) do you think they would live? Why do living things live in specific regions or areas? (look for any answer that focus on food needs, environmental needs, survival needs, etc.)

5. Focus: You were right that these were animals. They are sea mammals: the whale #1, a dolphin #2, and a seal #3. Knowing that these animals are mammals is a helpful clue as to where in the ocean they might live.
Activity: Think about the depths of the ocean and make a prediction about where these animals might live and why. (Allow responses.)
Follow-up: They would live not too far down so that they could come to the surface to breath oxygen because these animals are all mammals.

Learning Activities

1. Focus: Most marine plants and animals are adapted to living in one of three ocean regions-the sunlight, twilight, and midnight zone. Let's take a look at where these regions are and later on we will explore what makes them different and what types of living organisms might live in each one.
Activity: Have the students refer to the ocean floor profile on the web site http://agrolink.moa.my/dof/edukit/seaocean/factsheet1.html using a projection device and a SmartBoard (or refer to their ocean floor profile in their science notebooks or the class bulletin board). **Note:** the activity is done in detail in the following numbers.
Teacher models: Using the SmartBoard highlighters, and the ocean profile graphic, the teacher highlights each zone and labels them. Note: The SmartBoard graphic can be captured and saved in the Notebook feature of SmartBoard tools.
Follow-up: As this activity is done, the students highlight each region a different color and labels them in their notebook graphic. (the class bulletin board can be labeled at this time as well or later)

2. Focus: Let's highlight the "sunlight zone" yellow, because yellow reminds me of the sun. This region makes up only a small part of the ocean. I wonder why? Any ideas?
Activity: Highlight and label the zone
Follow-up: Accept reasonable answers about the sun shining down through the water for only so far.

3. Focus: Next, let's highlight the "twilight zone" a darker color because it is getting deeper and darker. Let's use green. This zone goes down to 3000 feet below the surface. Can you imagine what that must look and feel like?
Activity: Highlight and label the zone.
Follow-up: Accept any reasonable answers that speak of darkness, colder temps, and more pressure.

4. Focus: Finally, let's highlight the "midnight zone" using the blue marker. This zone starts at 3000 feet and goes all the way to the ocean floor!" If you were able to see down there, what might you see?
Activity: Highlight and label the zone.
Follow-up: Accept any answer that could include abyssal plain, trenches, seamounts, fierce-looking predators, fish w/ lights, or total darkness, etc.

Tomorrow we will begin to examine these zones, their characteristics and the different living things that can be found in these various depths of the ocean."

5. Focus: I'm going to read a book to you. While I read, keep your journals handy and jot down anything you hear that is new or different from what we've already learned or anything unusual or unexpected.
Activity: Read aloud the book Exploring the Deep Dark Sea by Gail Gibbons
Follow-up: Allow students to tell anything new or different they heard or anything unusual or unexpected.

Learning Activities

Day 2
1. Focus: Let's take a look at our ocean floor profile graph and think about the three zones that we have added to this graph. What do the names tell us about these zones?
Activity: Review yesterday's activity, having the students name the zones and characteristics.
Follow-up: Accept any reasonable answer that refers to the amount of light that reaches the varied depths. Add to the class bulletin board if you have not already done so.

2. Focus: Have you ever wondered how we know about the ocean floor and the depths of the ocean? Do you wonder what kinds of animals can be found in these deep areas of the ocean? Are there plants in the deepest parts of the ocean? Why or why not? Let's take a look a look at two video clips that can help us begin to understand the answers to some of these questions.
The ocean is a large frontier for us to learn about! Let's go in a boat or get in our imaginary submersible. This first video will help us gather information about ocean water, especially the upper zone of the ocean.
Play: Oceans: Earth's Last Frontier, segment- Exploring the Oceans" (5:52).
Stop: at the end.
Follow-up: Did you learn anything about the ocean that surprised you? Were we able to answer any of our questions? (accept appropriate responses)

3. Focus: Now, let's go a little deeper in the ocean and see what else we can learn about this vast frontier. Remember to listen for characteristics about each of the depths, or zones, in the ocean. Take notice of the living organisms that are mentioned in this clip and think about their importance for life on earth. Look closely at the geological features of the ocean that are featured in this clip. Think about how the environment affects the living organisms in this clip.
Play: video clip Oceans: Earth's Last Frontier, segment -Descending Into the Depths: Exploring the Ocean Floor (8:07).
Stop: the clip after (6:21).
Follow-up: Did you learn anything about the ocean that surprised you? Were we able to answer any of our questions? (accept appropriate responses)

4. Focus: Let's look at some ocean characteristic cards (and/or ocean/animal picture cards) and let's work with our learning team to sort these cards. I want you to think like scientists and generate three sorts based on what you know or can infer about these zones, or depths, of the ocean. Please work with your partners and be prepared to share why you sorted them in the ways that you decide. We will share our reasons with the class. I am interested in *why* you placed a card in a certain zone. Your thinking and discussions are the most important part of this activity! Have fun! I will be walking around and listening to your discussions."
Activity: Give "Learning Teams" a baggie with descriptor cards (or picture cards). Have the three zones in a different font size and/or card color for easy "zone" headers.
Note: Different cards can be used to differentiate for instruction. Grouping students in heterogeneous learning teams may address differentiation needs as well.
Follow-up: Observe and listen to the students while they sort. After adequate time…
Say: Now, let's share some of your thoughts on where the descriptor cards fit. Were there any cards that you could have placed in more than one zone? Which descriptors were they? What are some key words that helped you decide which zone the descriptor cards belonged?" Have teams or individuals share where they placed each card and why.

Optional Follow-up Lesson or Culminating Activity: Make a pull-through that shows the different zones of life in the ocean utilizing a lesson titled "From Surface to Sea Floor" found in Ranger Rick's *NatureScope: Diving into Oceans*, pgs 29, 30, 32 and 35.

Learning Activities

Day 3
1. Focus: Today we are going to begin learning more about the living organisms in the ocean and what they eat. I know in third grade, you studied food chains from different biomes. I know in fourth grade, you examined food chains or food webs in your ecosystem unit. Do you understand the difference between a food chain and web?
Activity: Explain that a chain is a simple line of who eats what and is part of the food web. Draw a simple food chain on the board if needed for retention check, i.e.: Sun-plant-rabbit-hawk-death-decomposers-scavengers-and/or back to soil)
Follow-up: Have students put a food chain and a food web in their journals to ensure that they understand the differences between a chain and a web.

2. Focus: Today, while we learn about the marine food web, we are going to hear another term that is associated with food webs. Sometimes the food web is associated with a pyramid, having layers that stack on each other… depending on each other. (Give each student a coy of the pyramid handout). Each layer depends on the one or ones below it, making the bottom layer the most important of all!"
Activity: Let's look at the pyramid from the land perspective. What do you think would be at the top? (Students should say humans.) What would we put underneath? (Animals) And underneath that? (Plants)
Follow-up: Have students continue the pyramid orally or in their journals.

3. Focus: We are now going to learn about the marine food web as part of our unit on oceans. Will this marine food web have the same classes of animals as a desert food web or the temperate forest food chain that I modeled? (hmm… maybe some, such as mammals, but there will be many more fish, microorganisms that float in water, etc.) What organisms do you believe are the foundation for this pyramid? (The students may or may not know this answer. If no one knows it… introduce the word "Plankton" and write it on the board.) Let's watch a video segment on plankton, find out what they are, what some characteristics are, and the 2 types of plankton. Feel free to jot down notes in your journal.
Play: video segment Oceans Alive: The Food Web (5:00).
Stop: at the end.
Follow-up: What is plankton? (microorganisms and other visibly small organisms) What are some characteristics? (both plant and animal…wanderers of the ocean… the foundation of the food web… phytoplankton produces much of the earth's oxygen.) Name the 2 types of Plankton. (Phytoplankton and zooplankton)
The word *plankton* is derived from a Greek word that means "drifter" or "wanderer". Plankton includes both plant and animal organisms that are tiny and many or even microscopic! The plants are called phytoplankton and the animals are called zooplankton." (write these words on the board under the umbrella term, plankton)
(Optional demo) Have a closed clear plastic jar filled with water. Place small pieces of glitter, buttons, sequins, etc. and shake it up and watch the items spiral, float and drop. These items represent living organisms, such as plankton, that float and are carried through the water by currents, waves or water movement)

4. Focus: Let's watch a second video clip and see if we can learn more about plankton and which ocean zone we might find the plankton living. While you are watching, I want you to think about what the foundation for the Ocean or Marine Food web will be. What will we write on the bottom layer of our food pyramid? If you think you know, let's listen carefully and see if our prediction is correct."
Play: video segment Oceans Alive: Plankton (5:00).
Stop: when the segment is over.
Follow-up: Were we correct? Does plankton go at the bottom?

Culminating Activities

Day 4 and 5
1. Focus: Let's complete our bulletin board or wall mural by adding some living organisms. We will develop a Marine Food Web. (Use website for ideas: http://agrolink.moa.my/dof/edukit/seaocean/index.html) Let's use string to show which animals eat what. We will need to draw an arrow at the end of each string pointing to the mouth of the predator. We will go to the lab to do some research.
Activity: Using the Enchanted Learning website, the students can choose an ocean animal to research what the organism eats. (prey/predator relationships). The students can print out and/or draw their own animal to place on the bulletin board in the correct

zone. String should be used to connect the organisms together w/ an arrow (triangular construction paper) pointing into the mouth of the animal that is the predator.
Note: Teachers may want to assign specific ocean animals or allow students to draw slips of paper with ocean animals listed to ensure a wide variety.
Follow-up: Have the students observe the completed food web and add any additional information

Assessment

- The students will each develop an SOL type question based on the completed bulletin board that depicts a marine food web, the ocean zones and the geological features of the ocean floor. The questions will be written on index cards, with answers on the back. The questions may be used as an interactive component for the bulletin board. (See Assessment/Rubric sheet.)

Community Connections

- Monitor local streams that flow into Chesapeake Bay for health by counting macro invertebrates.
- Make efforts to conserve water locally.
- Invite a marine biologist to come and speak to the class
- Explore the local watershed via fieldtrips or local scientists and learn how human impact effects our water supply
- Do research on tourism and industry in Virginia that is supported by the fact that we border the Atlantic Ocean and take a field trip to an industry or museum that attracts tourists.

Cross-Curricular Extensions

Math

- Graphing the ocean floor; Word problems involving food web and ocean depths

Language Arts

- Creative writing assignments such as "Journey to the Bottom of the Ocean"; Picture poetry or cinquains that involve descriptive words for the zones or for specific sea animals; Science Journal entries based on higher order questions posed during video clips or activities; Reflective writing based on predictions or questions (based on what one learns and what one wants to know more about); Nonfiction and fiction guided reading, independent reading or read-alouds using ocean related books.

Research

- Topics could include: marine life, sea exploration, or geological features using reference books, online encyclopedias and databases, and nonfiction text.

Science

- Integrate this unit with the classification of animals, weather, and geology units

Social Studies

- Plot points on a world map using longitude and latitude that shows exploration routes or boundaries of tectonic plates, or active volcanoes. (i.e. discover the "ring

of fire")

Art

- Draw sea animals using art medium or productivity software such as KidPix
- Share Knowledge - Publish or share knowledge via artwork, drama, use of multimedia software, oral presentation or written text.

Assessment

- Develop one question for a peer to answer that will show their understanding of the ocean's geological features, the zones and the marine food web. Your question can address any of these single topics or a combination of how these topics are interrelated. Challenge yourself to make the best SOL question possible. Please include the correct answer (or an example of an appropriate answer) that you are expecting from your peer. (answers do NOT have to be written responses). Choose one or more of the following *Powerful Verbs* in your question:

  Describe
  Diagram
  Relate
  Interpret
  Compare
  Explain
  Predict
  Identify
  Generate
  Modify
  Give examples…

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Possible points for your question and answer: (maximum 4 points)

1 point = Question is clear and easy to understand
1 point = Question can be answered based on bulletin board or previous lessons associated with ocean ecosystems
1 point = a *Powerful Verb* was used in the question in a meaningful way
1 point = the answer is very clear and shows an understanding of the question

About the Author

Janelle Catlett is a technology teacher at Woodbrook Elementary School in Albemarle County.

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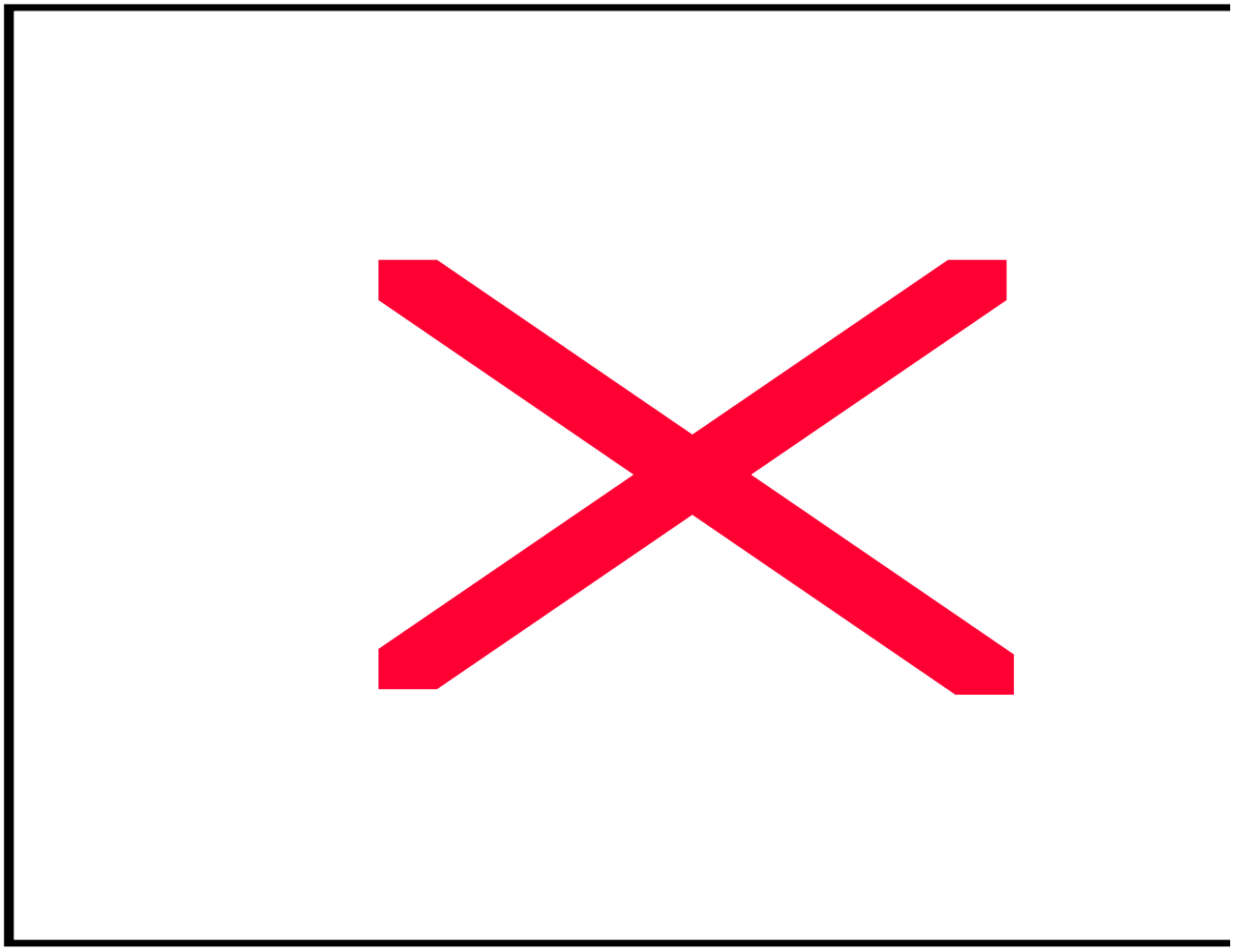

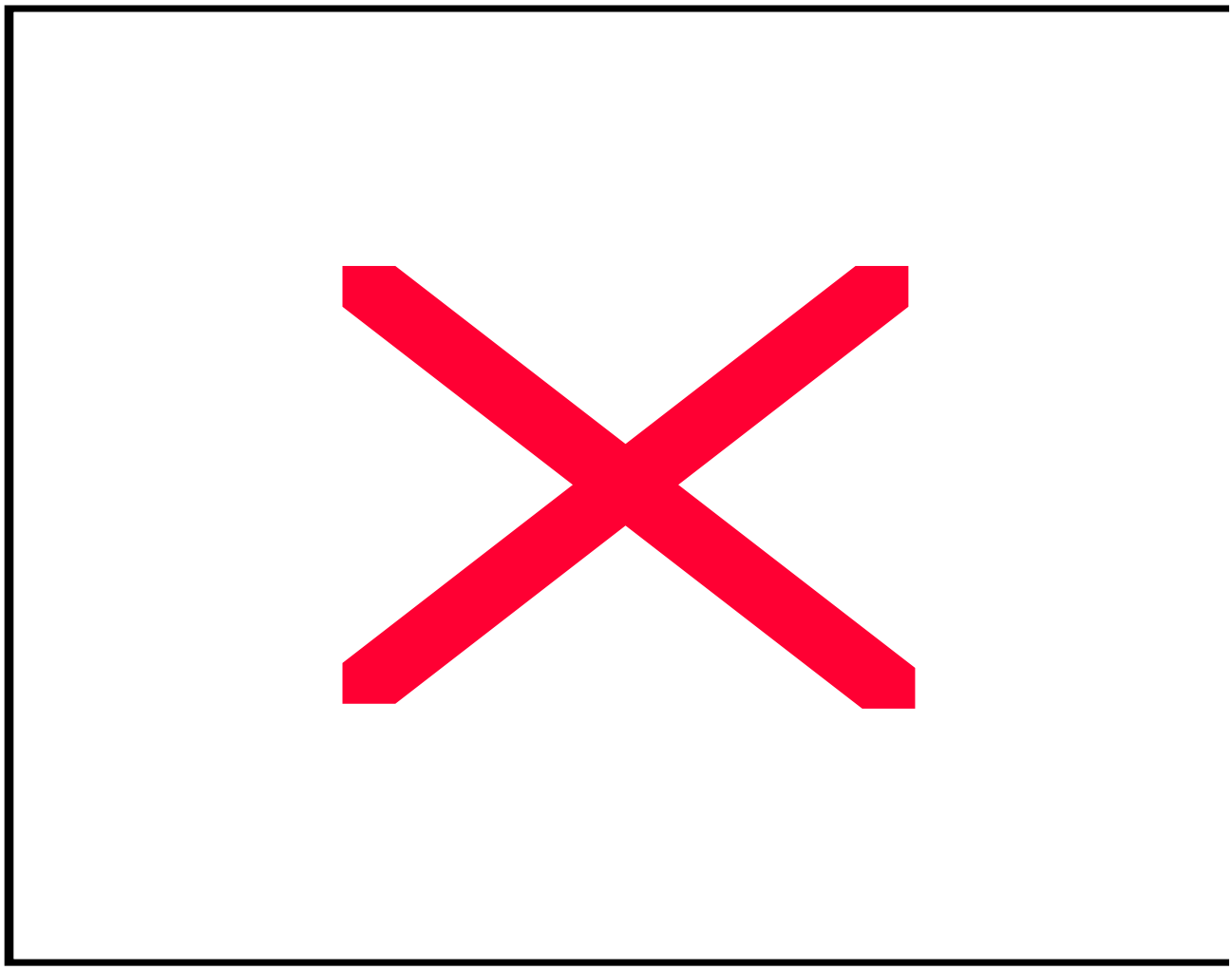

This zone is cold, dim and unchanging.	**This zone has crushing pressure, is very cold and is completely dark.**
This is the ocean's basement.	**This zone makes up three quarters of the total ocean.**
The temperatures are near-freezing all the time.	**Scavengers are animals that eat animal remains and dead animals. Many scavengers live in this zone.**
Many organisms that live in this zone are small, tend to grow slowly and live for a long time. They have a very low metabolic rate,	**Deep layers of silt, or ooze, stretch across the abyssal plains which are found in this zone. Some burrowers and crawlers live in this**
Special Vent communities found along deep-sea ridges have clusters of sea life that is not typical for this zone. These animals live off of special bacteria that come from the hot mineral-rich water from the cracks in the Earth. What zone is	**Chunks of flesh from dead whales and other remains from large animal carcasses float down to this bottom zone and provide food for the deep-sea animals that live in this zone.**
Scientists estimate that only one percent of all marine animals live in this zone.	**A pretty deserted sea-floor is the base for this zone.**
The animals that live in this zone are often small and fierce looking with sharp teeth and a gaping mouth. They may not eat often so they have adaptations that help them eat when they find prey! What zone is this?	

As you go more than 3000 ft down, the light gradually dims, the temperatures drop and the pressure increases. You are now in	This zone casts dim, blue light that barely forms silouettes because most of the sunlight has been absorbed in the layer
This zone is for animals only. No plants can live here.	Many organisms that live in this zone have special light-producing organs on their bodies.
This zone has dimly lit mid-waters.	Bioluninescence, or the production of light by living creatures, is a common characteristic of organisms that live in these waters.
Some animals such as lantern fish and mid-water zooplankton swim up from this zone to the sunlight zone during the night.	
Twilight Zone	**Sunlight Zone**
Midnight Zone	

Most marine plants and animals live in this zone.	**This is the ocean's greenhouse.**
The only zone that has enough light to support plant life.	**More than 90 percent of all known marine species live here.**
Drifters such as jellyfish, young crabs, young fish, and microscopic plants and animals live here.	**Organisms called plankton, move along with the winds and the currents in this zone.**
Whales and porpoises are mammals that spend their time in this zone. Can you explain why?	**Planktonic organisms include zooplankton (animal plankton) and phytoplankton (plant plankton grow near the**
Many animals come to this zone or fly above this zone, to eat plankton or plankton eating animals.	**This zone has the most variety in temperature and may even vary from season to season, and day and night.**
This zone has a lot of life over the continental shelves and provide fishermen with a wealth of catches!	**Bays, marshes and harbors are all part of this zone and are like nurseries.**
Nutrients can be brought up to this zone by upwellings, or waters that move up the continental slope. These nutrients are food for many living organisms.	**Fishing boats spend a lot of time floating over this zone and we swim in this zone, too.**
Dead plants and animals that die in this zone, often sink deeper in the ocean, or decompose along the way, releasing nutrients.	