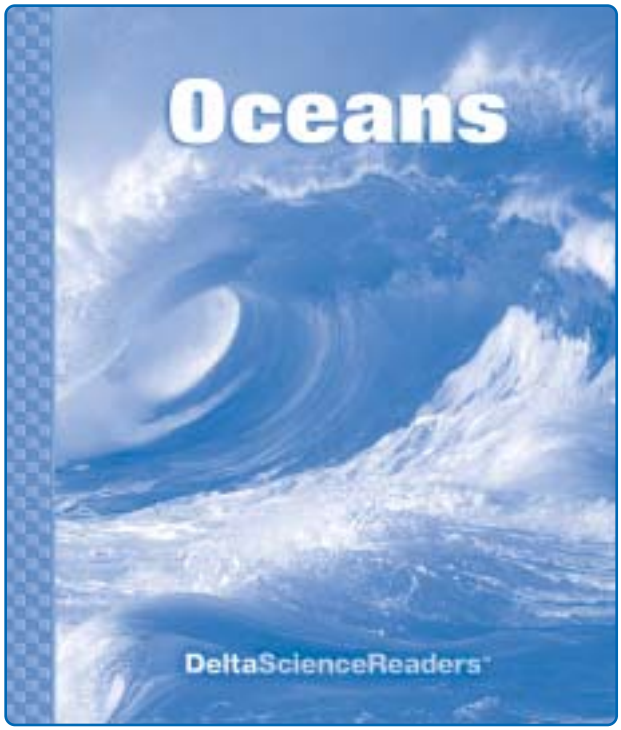
DELTA SCIENCE READER

Oceans



Delta Science Readers *are nonfiction student books that provide science background and support the experiences of hands-on activities. Every* ***Delta Science Reader*** *has three main sections: Think About . . . , People in Science, and Did You Know?*

Be sure to preview the reader Overview Chart on page 4, the reader itself, and the teaching suggestions on the following pages. This information will help you determine how to plan your schedule for reader selections and activity sessions.

Reading for information is a key literacy skill. Use the following ideas as appropriate for your teaching style and the needs of your students. The After Reading section includes an assessment and writing links.

OVERVIEW

In the Delta Science Reader *Oceans*, students explore the ocean, the great body of salt water that covers nearly three-fourths of Earth's surface. They learn about the composition of ocean water, features of the ocean floor, how ocean waters move, and how oceans affect weather and climate. They find out about the many resources the ocean provides. They also read about marine biologist Dr. Sylvia Earle and undersea explorer Jacques-Yves Cousteau. Finally, students learn about deep-ocean exploration.

Students will

- learn why Earth is called the water planet
- explore the features of the ocean floor
- discover facts about ocean water, its resources and habitats, and how oceans affect weather and climate
- read about how the ocean moves in waves, currents, and tides
- find out about animal adaptations to life in various ocean habitats
- examine nonfiction text elements such as table of contents, headings, and glossary
- interpret photographs and diagrams to answer questions
- complete a KWL chart

READING IN THE CONTENT AREA SKILLS

- Set a purpose for reading
- Recognize causes and effects related to the salinity, pressure, density, and currents of ocean water
- Identify main ideas and supporting details in text sections
- Describe the sequence of events in the formation of tides
- Categorize information about ocean habitats
- Interpret graphic devices
- Summarize
- Demonstrate critical thinking

NONFICTION TEXT ELEMENTS

Oceans includes a table of contents, headings, photographs, illustrations, captions, boldfaced terms, labels, graphic symbols, diagrams, maps, and a glossary.

CONTENT VOCABULARY

The following terms are introduced in context and defined in the glossary: *abyssal plain, atoll, bay, continental rise, continental shelf, continental slope, coral reef, crest, current, deep-water current, density, desalination, estuary, gulf, headland, hydrothermal vent, intertidal zone, jetty, marine biologist, mid-ocean ridge, near-shore zone, nekton, ocean, ocean basin, open-ocean zone, plankton, rift, salinity, sea-floor spreading, seamount, shoreline, submersible, surface current, tide, tide pool, trench, trough, upwelling, water cycle, water pressure, wave.*

BEFORE READING

Build Background

Access students' prior knowledge of oceans by displaying and discussing the cover. Ask, *What is happening in this picture?* (A large wave is breaking.) *Where would you see large waves such as this?* (in the ocean, at the beach)

Read the title aloud, and invite students to share what they know about the topic from their personal experiences and hands-on explorations in science. To stimulate discussion, ask questions such as these: *What are the names of Earth's oceans? What is ocean water like? What things live in the oceans?*

Begin a group KWL chart by recording facts students know about oceans in the K column and questions they have about oceans in the W column. You may want students to copy the KWL chart so they can maintain their own charts as they read.

K What I Know	W What I Want to Know	L What I Learned	+ What I Want to Explore Further

Preview the Book

Explain that when students preview nonfiction, they should look at the title, the table of contents, headings, boldfaced words, photographs, illustrations, charts, graphics, and captions.

Then preview the book with students. Call attention to the various nonfiction text elements and explain how they can help students understand and organize what they read. Ask questions such as these: *How do the headings help you predict what you will read about? What do you see in this picture? How do you think it will help you understand the text?* Explain that the words in boldface type are important words related to oceans. Point out that these words are defined in the glossary. Choose one word and have students find its definition in the glossary.

Preview the Vocabulary

You may wish to preview some of the vocabulary words before reading, rather than waiting to introduce them in the context of the book. Possibilities include creating a word wall, vocabulary cards, sentence strips, or a concept web.

For example, have students categorize words. List words from the glossary that can be grouped in different ways, such as *atoll, coral reef, current, headland, tide,* and *wave*. After helping students define the words, ask, *Into what groups can we put these words? What would be a good name for each category?* (Ocean Landforms—atoll, coral reef, headland; Ways Ocean Water Moves—current, tide, wave)

Set a Purpose

Discuss with students what they might expect to find out from the book, based on their preview. Encourage them to use the questions on the KWL chart to set an overall purpose for reading.

GUIDE THE READING

Preview the book yourself to determine the amount of guidance you will need to give for each section. Depending on your schedule and the needs of your class, you may wish to consider the following options:

- **Whole Group Reading** Read the book aloud with a group or the whole class. Encourage students to ask questions and make comments. Pause as necessary to clarify and assess understanding.
- **Shared Reading** Have students work in pairs or small groups to read the book together. Ask students to pause after each text section. Clarify as needed and discuss any questions that arise or have been answered.
- **Independent Reading** Some students may be ready to read independently. Have them rejoin the class for discussion of the book. Check understanding by asking students to explain in their own words what they have read.

Tips for Reading

- If you spread out the reading over several days, begin each session by reviewing the previous day's reading and previewing what will be read in the upcoming session.
- Begin each text section by reading or having a volunteer read aloud the heading. Have students examine any illustrations or graphics and read accompanying captions and labels. Discuss what students expect to learn, based on the heading, illustrations, and captions.
- Help students locate context clues to the meanings of words in boldface type. Remind them that these words are defined in the glossary. Provide help with words that may be difficult to pronounce.
- As appropriate, model reading strategies students may find helpful for nonfiction: adjust reading rate, ask questions, paraphrase, reread, visualize.

Think About . . . (pages 2–13)

Pages 2, 3 *Why Is Earth the Water Planet?* and *Ocean Water*

- Before students read, direct their attention to the photograph of Earth seen from space that is on the table of contents page. Ask, *What is the main feature of Earth that you see?* (the oceans) Then have students read page 2 to discover why Earth is called the water planet.
- Elicit facts about Earth and its oceans. Ask, *What makes Earth the water planet?* (About three-fourths of its surface is covered by water.) *What is most of Earth's water?* (salty ocean water) *What are the names of Earth's four main oceans?* (Pacific, Atlantic, Indian, Arctic) Direct attention to the map and guide students to recognize that the oceans are all interconnected.

- Continue questioning to assess understanding. Ask, *What is a sea?* (a smaller part of an ocean) *What are gulfs and bays?* (areas of an ocean or sea that are partly enclosed by land) *What is the difference between a gulf and a bay?* (A gulf is bigger than a bay.)

- Have students read page 3 to find out the properties of ocean water. Then ask, *What three properties of water does this page tell about?* (salinity, water pressure, and density) Check understanding by having students explore causes and effects related to these properties. Ask, *What is salinity?* (the measure of how salty water is) *What factors affect salinity? What effects do these factors have?* (Evaporation of water makes the water saltier. Fresh water entering the ocean makes the water in that area less salty.) *What is water pressure?* (the weight of water pushing down on the ocean floor) *How does depth affect water pressure?* (The deeper you go, the higher the water pressure is.) *What is density?* (the amount of matter in a given volume) *What affects the density of ocean water, and how?* (Temperature and salinity affect the density of ocean water. Cold, salty water is denser than warmer, less-salty water.)

- Direct students' attention to the diagram at the top of the page, and have students explain how the diagram shows that water pressure increases with depth. (The water coming out of the bottom hole goes farther than the water from the top hole. There is more water pressing down on the bottom levels so the water pressure is greater. The greater pressure pushes the water out farther.)

- If necessary, provide help with the pronunciation of *sodium chloride* (SO-dee-um KLOR-ide), *salinity* (suh-LIN-ih-tee), and *hydrometer* (hi-DROM-ih-ter).

Pages 4, 5 *Features of the Ocean Floor*

- Generate interest in the text by asking, *Have you ever wondered what the land under the oceans looks like? What ideas do you have about it?* Invite volunteers to share their ideas. Then explain: *The land under the oceans has some of the same features as the land on the continents. It has mountains and valleys, flat plains, and even volcanoes!* Have students read pages 4 and 5 to find out about features of the ocean floor. Tell students to look on the diagram for the boldfaced terms in the text so that they can identify the features that are mentioned. When students have completed reading, ask, *How did the diagram help you understand the meanings of the boldfaced terms?* (The diagram showed in picture form what the text described.)

- Point out that three boldfaced terms have the word *continent* in them. Ask students to explain what the *continental shelf, continental slope,* and *continental rise* are. (The continental shelf is the part of the continent along its edge that is underwater. The continental slope is the steep drop toward the ocean bottom. The continental rise is the place where sediments from rivers pile up.)

- Point to the remaining features in the diagram and ask students to describe what each feature is. (The abyssal plain is the flattest part of the ocean basin. Seamounts are underwater volcanoes. Mid-ocean ridges are chains of underwater mountains. A rift is a valley along the top of the ridge. Trenches are deep valleys in the bottom of the ocean.)

- If necessary, provide help with the pronunciation of *abyssal plain* (uh-BISS-uhl plane) and *atoll* (AT-ol).

Further Facts

- Most of the islands in the Pacific Ocean—including the Hawaiian Islands and the Philippines—were formed by underwater volcanoes. New islands are still forming.

- Underwater mountains are among the highest in the world. Two of the three volcanoes that form the island of Hawaii (called the Big Island) rise more than 9,144 meters (30,000 feet) above the ocean floor.

Page 6 *Where Ocean Meets Land*

- Access students' prior knowledge of shorelines by inviting volunteers to share their experiences of an ocean beach. Ask them to describe what the beach looked like and any features that come to mind. Then have students read page 6 to learn about what happens where the ocean meets the land.

- Ask, *What effect do water and wind have on shorelines?* (They change shorelines.) *What are some specific effects that waves have?* (Waves can erode the land and create a rocky shore. They can create headlands. They can deposit sand and form a sandy beach.) *What is a positive effect of jetties? What is a negative effect?* (Jetties protect beaches from erosion. Jetties can prevent sand from being deposited in another area.)

- Ask students to state the main idea—the most important point—of the final paragraph. (An estuary is the home of many sea animals and an important nursery for fish and other sea animals.)

- If necessary, provide help with the pronunciation of *estuary* (ES-chew-air-ee).

Page 7 *How Does Ocean Water Move?* and *Waves*

- Have students read the text about waves on page 7. Then have them look at the diagram and read the caption and labels. Ask, *What did you learn by studying the diagram and reading the text?* (how ocean waves move) *What actually moves forward in a wave?* (the energy) *What happens to the water particles?* (They travel in a circle and return to where they were originally.)

- Ask students to explain what causes a wave to break against the shore. (Rubbing against the ocean floor causes the bottoms of waves to slow down in shallow water. The top of the wave moves faster than the bottom of the wave. This causes the wave to get higher. It curls over on itself and breaks.)

- You may wish to tell students that *tsunami* is a Japanese word that means "harbor wave."

- If necessary, provide help with the pronunciation of *trough* (troff) and *tsunami* (su-NAHM-ee).

Page 8 *Currents*

- Have students read the text about currents on page 8 and examine the accompanying diagram and its caption. Ask, *What are currents?* (rivers of water in the ocean) You may wish to explain that, unlike waves, currents actually move water from place to place.

- Ask, *What causes surface currents?* (winds and Earth's movement) You may wish to explain that wind systems—called prevailing winds—are caused by the uneven heating of Earth's curved surface by the sun. Prevailing winds blow continuously across the surface of Earth, setting ocean currents in motion. Point out the arrows in the diagram that show the directions of the trade winds and westerlies. Ask, *What is the difference between surface currents in northern oceans and surface currents in southern oceans?* (Surface currents in northern oceans move clockwise; surface currents in southern oceans move counterclockwise.) If necessary, explain that *clockwise* means "in a circle from left to right," and *counterclockwise* means "in a circle from right to left." Direct attention to the arrows in the diagram that show surface currents. Elicit that the blue arrows indicate cold surface currents and the red, warm surface currents. Have students locate the Gulf Stream and the California Current.

- Ask, *What causes deep-water currents?* (differences in the density of water) *What is upwelling? What causes upwelling?* (Upwelling is when deep, cold currents rise to the surface. It is caused by strong winds pushing warm surface water away from the land.)

- You may wish to tell students that ocean currents can transport thousands of times more water than any river on land. The volume of water in the flow of the Gulf Stream alone is 100 times that of the Mississippi River.

Page 9 *Tides*

- Have students read the text about the tides on page 9 and study the diagram. Ask, *What is the tide?* (the regular rise and fall of sea level) Assess students' understanding by having them describe the sequence of events in the formation of tides. (The Moon's gravity pulls on Earth and causes a bulge of water on the side of Earth closest to the Moon. Earth's motion in space causes a second bulge on the opposite side of Earth. These bulges are the high tides. The low spaces between them are the low tides. As Earth turns on its axis and the Moon travels around Earth, the bulges of water move.)

- You may wish to tell students that rivers that enter the ocean are affected by tides. Tidal water can travel upriver for miles. Rivers with narrow channels that constrict the entering tidal water create what is called a tidal bore—a wall of water moves upstream as a wave. One of the most impressive tidal bores occurs in the Bay of Fundy in Nova Scotia, Canada. When the Moon is full or new, the tidal bore may reach a height of several meters!

- Students may be interested to know that the kinetic energy of tides—the energy of the moving water—can be used to generate electricity. A dam is built across a tidal bay. As the water flows in and out with the tides, it turns underwater turbines in the dam, generating electricity.

Page 10 *How Do Oceans Affect Weather and Climate?*

- Before students read page 10, write the words *weather* and *climate* on the board. Ask, *What is the difference between weather and climate?* If necessary, explain: Weather *refers to day-to-day conditions, such as rain, sunshine, and snow*. Climate *refers to the average weather conditions in an area over long periods of time*.

- Have students read page 10 to discover how oceans affect weather and climate. Check comprehension by having students describe the sequence of events in the water cycle. (Energy from the sun warms Earth's land and water. Some of the water changes into a gas called water vapor. Water vapor rises into the atmosphere and cools. When it cools, it condenses into water droplets and forms clouds. Water droplets in clouds fall as rain. Some of the rain falls on bodies of water, and the cycle starts again.)

- Direct students' attention to the map at the bottom of the page. Explain that the colored lines show ocean currents. Ask, *What is the main idea of the last paragraph?* (Ocean currents affect the entire Earth's climate.) *What details in the text and the diagram support this main idea?* (Ocean currents carry heat around the planet.)

  El Niño (Spanish for "the boy child") is a giant area of heated water that forms periodically, at approximately 3–4-year intervals, in the Pacific Ocean along the western coast of South America. El Niño is a vast energy reserve that affects weather worldwide and has caused droughts in some areas, above-average rainfall and flooding in others, and severe storms.

- If necessary, provide help with the pronunciation of *precipitation* (prih-sip-ih-TAY-shuhn).

Page 11 *Ocean Resources*

- Before students read page 11, challenge them to name as many ocean resources as possible. List examples students suggest. Then have students read the text. Ask, *What new ocean resources did you learn about?* Add resources to the list on the board as students mention them. Then ask, *What was the most surprising ocean resource you learned about?* (Responses will vary.)

- If necessary, provide help with the pronunciation of *phytoplankton* (fi-toe-PLANK-tuhn), *desalination* (dee-sal-ih-NAY-shuhn), and *carrageenan* (kare-uh-JEE-nuhn).

Pages 12, 13 *Ocean Habitats*

- Ask students what habitats are. If necessary, explain: *A habitat is the place or environment where a plant or an animal naturally lives and grows*. Then have students read to find out about ocean habitats.

- Point to each habitat pictured in turn as you have students identify the main ideas about each ocean zone. You may wish to use the facts provided to create a three-column Ocean Habitats chart that contains information about the intertidal, near-shore (or neritic), and open-ocean zones. For each zone, ask, *Where is this zone located? What is the main feature of this zone? What organisms live in this zone?* Record the information about each aspect of the zone in a different row on the chart.

- If necessary, provide help with the pronunciation of *ecosystem* (EE-koe-sis-tuhm), *algae* (AL-jee), *diatom* (DIE-uh-tom), *zooplankton* (zo-uh-PLANK-tuhn), and *anemone* (uh-NEM-uh-nee).

People in Science (page 14)

Marine Biologists

- Before they read, ask students how they think scientists learn about oceans and the organisms that live in the oceans. (Students may mention using instruments from ships, catching and studying sea life, exploring underwater with scuba equipment, and using submarines or submersibles.) Then have them read page 14 to find out about marine biologists.

- Encourage speculation about the importance of marine biology for our everyday life. Ask, *How can learning how human activities might be changing marine life be useful?* (Accept reasonable responses.)

- Point out that Sylvia Earle's degree was based on studies of ocean plants. Ask, *How are ocean plants important to sea life?* (Some sea animals live among ocean plants, such as kelp forests. Many sea animals eat plants.)

- Before having students read the caption with the photograph of Jacques-Yves Cousteau, ask whether students have ever heard of him or seen one of his films or a television program about him. Encourage volunteers to share what they know about Cousteau's explorations.

- If necessary, provide help with the pronunciation of *Jacques-Yves Cousteau* (ZHAHK-eev koos-TOE).

Further Facts

- Dr. Earle's specialty is botany. She has made a lifelong study of aquatic plant life. Earle believes that understanding vegetation is the first step in understanding any ecosystem.

- Dr. Earle was one of the first underwater explorers to use self-contained underwater breathing apparatus (SCUBA) gear.

- In 1970 Earle and four other scientists lived for two weeks in a chamber 15.2 meters (50 feet) below the ocean surface as part of a project to study undersea habitats.
- Since 1998 Earle has been explorer-in-residence at the National Geographic Society.
- Dr. Earle was named Time magazine's first "hero for the planet" in 1998.
- Jacques-Yves Cousteau had trained as a flyer in the French navy until an accident ended his aviation career. Swimming as part of his rehabilitation set him on a new path.
- In 1950 Cousteau acquired the ship Calypso, a retired minesweeper, which he converted into a marine laboratory. For the next forty years, Calypso sailed around the world as Cousteau and his associates filmed and studied the oceans.
- Cousteau won three Academy Awards for his films: The Silent World (1956), The Golden Fish (1959), and World Without Sun (1964).

Did You Know? (page 15)

About Deep-Ocean Exploration

- Direct students' attention to the graphic. Read the labels with students, and call on volunteers to describe what they see. Have students compare the different depths to which the scuba diver and the other things pictured can go.
- Have students read page 15 to find out about problems associated with deep-ocean exploration and solutions to the problems. Ask, *What problems did people have to overcome in order to explore the ocean's depths?* (extreme water pressure, cold, darkness) *How have submersibles overcome these problems?* (They are made strong enough to survive the high pressure and cold temperature.)
- Ask, *What makes the discovery of hydrothermal vents so thrilling?* (It was discovered that organisms can survive in absolute darkness and live near the hot water springs.)
- If necessary, provide help with the pronunciation of *submersible* (sub-MUR-sih-buhl), *Trieste* (tree-EST), *Mariana* (mah-ree-AH-nuh), and *hydrothermal* (hi-dro-THUR-muhl).

AFTER READING

Summarize

Complete the KWL chart you began with students before reading by asking them to share the answers to their questions. Call on volunteers to retell each text section. Then have students use the information in the KWL chart to write brief summary statements.

Discuss with students how using the KWL strategy helped them understand and appreciate the book. Encourage them to share any other reading strategies that helped them understand what they read.

Direct attention to the fourth column in the chart and ask: *What questions do you still have about oceans? What would you like to explore further?* Record students' responses. Then ask, *Where do you think you might be able to find this information?* (Students might mention an encyclopedia, science books, and the Internet.) Encourage students to conduct further research.

Review/Assess

Use the questions that follow as the basis for a discussion of the book or for a written or oral assessment.

1. What are the three main properties of ocean water? (salinity, water pressure, density) Explain what each property is. (Salinity is the measure of how salty water is. Water pressure is the weight of water pushing down on the water below it or on

the ocean floor. Density is the amount of matter in a given volume of something.)

2. What are three ways in which ocean water moves, and what causes each type of movement? (Waves carry energy through the water; most waves are caused by wind. Currents are moving rivers of water in the ocean; they are caused by winds, Earth's movement, and differences in water density. Tides are the regular rise and fall of sea level caused by the pull of the Moon's gravity and Earth's motion in space.)

3. How do oceans affect weather and climate? (Oceans affect the weather because of their part in the water cycle. Water that evaporates from oceans returns as precipitation, which is part of Earth's weather. Ocean currents carry heat around the planet, which affects the climate.)

4. Name five resources from oceans. (Answers may include oxygen from the phytoplankton, fish and other seafood, medicines, fresh water from desalination, oil and natural gas, energy from waves, and minerals.)

Writing Links/Critical Thinking

Present the following as writing assignments.

1. How do tides affect organisms that live in the intertidal zone of the ocean—the shallow area near shorelines that is under water during high tide and exposed to air during low tide? What adaptations help these organisms survive? (The intertidal zone is above water at low tide. Organisms have to find ways to keep moist and adapt in order to stay alive while exposed to air. Some burrow in the sand. Incoming tides can have a strong force. Many organisms attach themselves to rocks to keep from being washed away. Many intertidal dwellers have shells that protect them from the crashing waves.)

2. The salty water at Earth's poles is colder than water at the equator. Explain how this difference leads to density currents. (The salty, cold water at the poles sinks and moves along the ocean bottom toward the equator. The warmer water at the equator rises to the surface and flows toward the poles to replace the water moving toward the equator. The cold water gets warmer and rises, and the warm water gets colder and sinks, so the cycle keeps repeating.)

Science Journals: You may wish to have students keep the writing activities related to the Delta Science Reader in their science journals.

References and Resources

For trade book suggestions and Internet sites, see the References and Resources section of this teacher's guide.