Welcome To Our World.
It’s Your World, Too.

IMAX
UNDER THE SEA 3D

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Worksheet 5:

When calcium carbonate is placed in acid, bubbles will form around the material. After soaking in the acid, calcium carbonate materials will soften and start to dissolve.

It can blend in with more than one type of environment.

Worksheet 3:

1. a) Answers may vary. Example: walking stick insect; 1. b) To hide from predators; 2. a) It can change its coloring.

3. Shark, eel, dragon: lives in ocean, is a predator, uses surprise to catch prey; Shark, eel: sharp teeth, longer than 2 feet; Dragon, eel: eats crustaceans; Shark: swims faster than 15 miles an hour; Dragon: has leaf-shaped fins.

Lesson Ideas:

Students will learn how adaptations help animals hunt and protect themselves from predators.

Skills/Curriculum:

• Reading comprehension
• Critical thinking
• Animal adaptations
• Predators/Prey

Lesson Ideas:

Students will learn about the geography of the Indo-Pacific region.

Skills/Curriculum:

• Map-reading
• Geography
• Latitude and longitude
• Coral reefs

Lesson Ideas:

Students will learn about the animal adaptation called camouflage.

Skills/Curriculum:

• Experimenting
• Collecting data
• Camouflage
• Colors/Patterns

Lesson Ideas:

Students will hone their own skills at scientific observation and data collection by studying a region in nature.

Skills/Curriculum:

• Observation
• Collecting data
• Ecosystems
• Biodiversity

Lesson Ideas:

Students will learn how carbon dioxide causes ocean water to become acidic through a dynamic hands-on activity.

Skills/Curriculum:

• Experimenting
• Fossil fuels
• Carbon dioxide and Acids
• Coral reefs

Lesson Ideas:

Have your students imagine that each of them is the first scientist to enter a rain forest. What observations would they make? How would they record these observations to share with other scientists?

Lesson Ideas:

Have research expedition students extend the lesson by researching the climate of Australia and comparing it to that of the United States.

Lesson Ideas:

Start a discussion by asking students why it might be useful for an animal to blend in with its surroundings. When might it want to stand out?

Lesson Ideas:

Have students do research to find out how much carbon dioxide they are responsible for releasing each year. They can calculate their "carbon footprint" at: www.zerofootprintkids.com

Lesson Ideas:

Start a discussion by having students compare their body characteristics to those of an animal, such as a lion. How are these characteristics adapted to each lifestyle?

Lesson Ideas:

Have your students extend the lesson by researching the climate of Australia and comparing it to that of the United States.

Lesson Ideas:

Start a class discussion by having students extend the lesson by researching the climate of Australia and comparing it to that of the United States.

Lesson Ideas:

Have students imagine that each of them is the first scientist to enter a rain forest. What observations would they make? How would they record these observations to share with other scientists?

Worksheet 1:

Creepy Creature Files

Worksheet 2:

Journey at Sea

Worksheet 3:

Hiding Out

Worksheet 4 (available online):

Research Expedition

Worksheet 5 (available online):

Acidic Oceans

NSES Standards:

• K–4: Characteristics of organisms
• 5–8: Diversity and adaptations of organisms

Lesson Ideas:

Each of the activities inside provides eye-opening extensions connected to viewing Under the Sea. IMAX films are ideal teaching tools that:

• Present new knowledge in a powerful, popular medium
• Inspire thoughtful and lively classroom discussion
• Motivate students for extended learning

Field trips are economical and easily arranged. To book a field trip, contact your local IMAX theatre today! For locations near you, visit www.IMAX.com.
CREEPY Creature Files

Ocean creatures have many adaptations—or characteristics—that help them catch prey or keep from getting caught themselves. Read the descriptions that follow on the unusual adaptations of some animals that live in the Indian and Pacific Oceans. Then answer the questions below on a separate sheet of paper.

1. In your own words, describe how the lionfish defends itself from predators.

2. Compare the body shape of a great white shark with that of a sea dragon. How do these characteristics help each animal catch prey?

3. Great white sharks, giant moray eels, and sea dragons look very different, but they also have many similarities. Using the list of characteristics to the right, draw a Venn diagram to compare the creatures.

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**LIONFISH**
- SIZE: Up to 15 inches long
- DIET: Small fish
- The lionfish's needlelike spines are filled with venom. Lionfish hunt other animals, but they use venom for defense. If threatened, a lionfish injects venom into the attacker.

**GIANT MORAY EEL**
- SIZE: Up to 10 feet long
- DIET: Fish and crustaceans, such as shrimp
- Giant moray eels hunt by hiding in small crevices. If prey swims by, the eel swoops out. The eel's teeth point backward to keep prey from slipping out.

**SEA DRAGON**
- SIZE: Up to 18 inches long
- DIET: Tiny crustaceans, such as sea lice
- The sea dragon has many leaf-shaped fins that help it blend in with seaweed. If prey floats by, the sea dragon sucks it up with its straw-shaped mouth.

**GREAT WHITE SHARK**
- SIZE: Up to 21 feet long
- DIET: Large fish, marine mammals, such as seals
- The great white shark's sleek body helps it swim up to 15 miles per hour. The shark often hunts by swimming beneath prey. The shark bursts upward and catches the meal in its mouth.

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See Under the Sea to uncover more unusual ocean creatures. Create a new case file on one of the creatures in the movie. What adaptations does your creature use to hunt prey or hide from predators?

The lionfish's stripes actually help it blend into the coral reef. This adaptation helps it sneak up on prey.

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The Coral Triangle is home to 3,000 species of fish, including the diagonal-banded sweetlips.

JOURNEY at Sea
The movie Under the Sea explores the waters of the Indian and Pacific Oceans, which include some of the world’s most important coral reefs. These underwater structures, built by tiny coral animals, provide food and shelter to ocean life. The “Coral Triangle” (highlighted in the map below), has reefs that are home to the most diverse community of sea organisms in the world. Some of these reefs are at risk from threats such as pollution and global warming. Study the map below to learn more. Then use the map to answer the questions that follow.

1. Which city shown on the map is located closest to the Great Barrier Reef?
   a. Perth  
   b. Adelaide  
   c. Sydney  
   d. Brisbane

2. Which of the following is located furthest north?
   a. Raja Ampat Islands  
   b. Coral Sea Islands  
   c. Great Barrier Reef  
   d. Sydney, Australia

3. Which of the following is located south of the Tropic of Capricorn?
   a. Raja Ampat Islands  
   b. Great Barrier Reef  
   c. Papua New Guinea  
   d. Cape Catastrophe

4. Which of the following Australian cities is located farthest south?
   a. Perth  
   b. Adelaide  
   c. Sydney  
   d. Brisbane

BONUS ACTIVITY Under the Sea

On the map, track the filming expeditions for Under the Sea. Choose one location from the film and write a paragraph about the region. Include in your description organisms that live there as well as environmental threats in the area.

The Coral Triangle is home to 3,000 species of fish, including the diagonal-banded sweetlips.
HIDING Out

Many sea organisms use camouflage to help them survive. They use color and shape to hide from other organisms. Check out three masters of disguise below, and then answer the questions on a separate sheet of paper.

BLENDING IN

1. The bumpy skin and dark green and brown coloring of the stonefish make it look like a piece of coral or rock on the ocean floor. This camouflage helps the stonefish hunt. The stonefish sits quietly on the sea floor. When a fish swims by, the stonefish leaps up.

   a. Can you think of another animal that blends into its surroundings like the stonefish?

   b. The stonefish uses camouflage to help it hunt. What is another reason why an animal might want to blend into its surroundings?

QUICK CHANGE

2. Cuttlefish can change the color of their skin to match their surroundings. A cuttlefish swimming over sand may turn its body into a smooth tan color. Over gravel, the cuttlefish’s body will suddenly show different-colored spots.

   a. How is the cuttlefish’s camouflage different from the stonefish? What advantages might this give it?

MASTER MIMIC

3. Octopuses can change color and they can also alter the shape of their bodies to hide out. An octopus may roll up into a ball to look like a rock, or change the texture of its skin to look like the rough surface of a coral.

   a. The mimic octopus can change its appearance to look like many other organisms. Research the mimic octopus and describe some of the ways it uses disguise on a separate sheet of paper.

BONUS ACTIVITY

Which animal from Under the Sea do you think was the best camouflage artist? Write a persuasive paragraph that explains why you chose the animal. Be sure to describe how that animal uses camouflage.

Octopuses have special cells in their skin that can change color.
RESEARCH Expedition

When researchers investigate a new area of the ocean, they record their observations to share with other scientists. At right is an example of some notes a scientist might have taken about a research area in the film *Under the Sea*. In the activity below, you’ll embark on your own research expedition—around your home or school.

**PART 1:** Imagine that you are a scientist studying the region around your home or school. Cut out the attached notecards and use them to record your observations about the area. Draw sketches of the organisms you see on the backs of the cards.

**PART 2:** Scientists count the number of different organisms in a region to estimate **biodiversity**. They determine whether a large or small variety of organisms live in the region. Use your observations to determine whether your region has a high or low biodiversity.

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**Date:** December 2008  
**Location:** 2 miles north of Wai Island, Raja Ampat Islands

I counted 24 different types of coral. The biggest coral I saw was a pink brain coral. I saw two different types of cuttlefish. They were both roughly 18 inches long. One had bright red and yellow coloring on its skin (see sketch).

I saw a green turtle eating a jellyfish.

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**BONUS ACTIVITY**

Which geographic area shown in *Under the Sea* had the highest biodiversity? After watching the movie, create a journal entry about the organisms you saw in that region.

The flamboyant cuttlefish is one of the many diverse creatures living in the oceans around Australia and Indonesia.
ACIDIC Oceans

Hands-on Activity

Every day, human activities pollute the air and oceans. One of the oceans’ biggest pollution problems is carbon dioxide gas. To create energy, cars and factories burn fossil fuels, such as oil and coal. This process releases carbon dioxide into the air. This gas causes Earth’s climate to warm by trapping the sun’s heat. It also affects the chemistry of the oceans because some of the carbon dioxide is absorbed into ocean water.

When carbon dioxide is absorbed into the oceans, it causes the seawater to become more acidic. The acidic water can harm sea organisms that have shells, such as coral. Try the activity below to find out how this happens.

**Materials**

5 clear plastic cups:
- One filled with ¼ cup water
- One filled with ¼ cup vinegar
- Three others for labeling (see Step 1 to the right)

Spoon

Marker

3 pieces of material made of calcium carbonate, such as shells (available at pet stores or craft stores), chalk, or antacid tablets

**Procedure**

1. Label one plastic cup “clean,” another one “polluted,” and a third one “very polluted.”

2. Pour ¼ cup of water into each of the three cups. Add ¼ cup of vinegar to the “polluted” cup. Add ½ cup of vinegar to the “very polluted” cup. Like carbon dioxide, vinegar causes the water to become acidic.

3. Observe the calcium carbonate material. Is the surface smooth or rough? Does the material feel hard or soft? This material is similar to the shells of animals such as coral.

4. Use the spoon to place one piece of the calcium carbonate material in each cup. Observe what happens.

5. After 10 minutes, use the spoon to remove the material from the cups. How has the material changed? Based on your findings, how might acidic water affect sea life?

**BONUS ACTIVITY**

After seeing Under the Sea, create a poster that explains other effects of carbon dioxide on the ocean’s coral reefs. For instance, how does carbon dioxide affect the temperature of the oceans? Research the ways in which your daily activities cause carbon dioxide to be released into the air. Include that information on your poster, along with tips on how to reduce your carbon dioxide contribution.