Muse® Teacher Guide: February 2022

Muse®

Whales, Dolphins, and Porpoises!

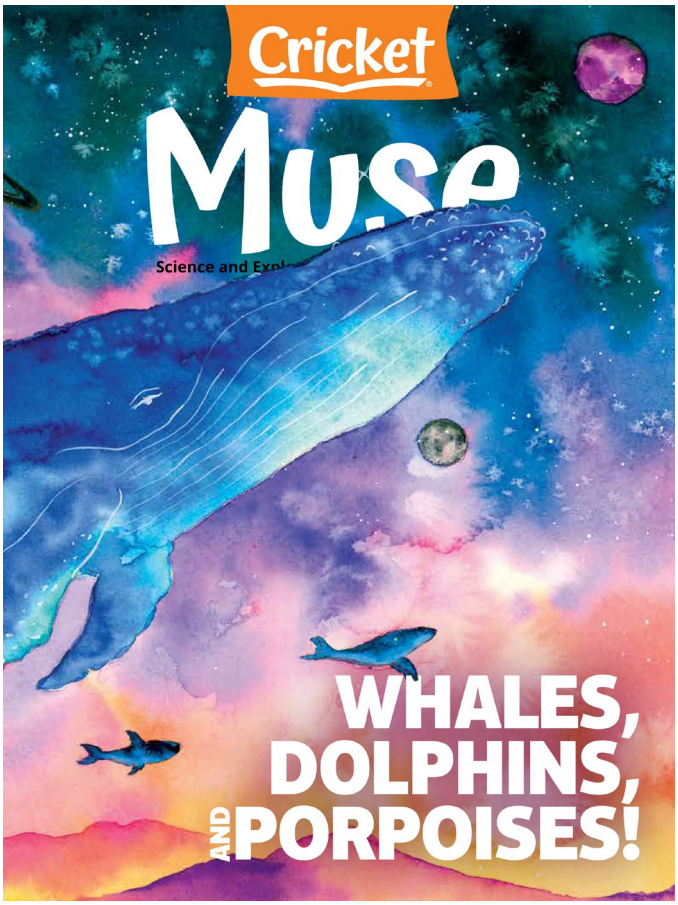
Marine mammals are often referred to as sentinels of ocean health, providing insight into marine ecosystems. Known for their beauty, grace, and social nature, many of these animal species are threatened by climate change. This issue of MUSE studies the play, as well as the peril, of these amazing sea creatures.

CONVERSATION QUESTION

Why are marine mammals so unique?

TEACHING OBJECTIVES

- **Students will learn about the evolution of whales.**
- **Students will learn why whales may be instrumental in our fight against climate change.**
- **Students will learn about the purposeful play of dolphins.**
- **Students will examine the structure and function of a modern whale's body parts.**
- **Students will analyze cause-and-effect relationships.**
- **Students will analyze animal behavior.**
- **Students will research the connection between climate change and natural selection.**
- **Students will practice proper usage of hyphenated compound words.**
- **Students will study the six stages of play in children.**



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **Where Whales Came From**
  Expository Nonfiction, ~900L
- **A Whale-Sized Battle Against Climate Change**
  Expository Nonfiction, ~1300L
- **Dolphin Fun and Games**
  Expository Nonfiction, ~900L

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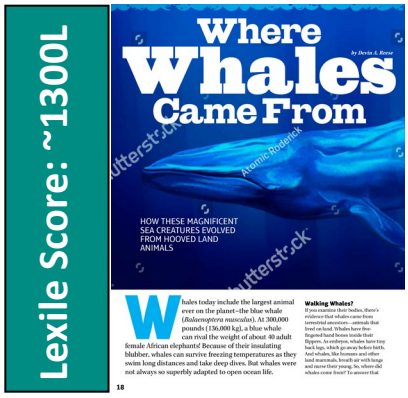
Where Whales Came From

pp. 18–21, Expository Nonfiction

This article follows the evolutionary path of the modern whale. Readers will learn how these magnificent sea creatures evolved from hooved land animals.



RESOURCES

Structure and Function: Whale Tails

OBJECTIVES

- Students will learn about the evolution of whales.
- Students will examine the structure and function of a modern whale's body parts.
- Students will research the connection between climate change and natural selection.

KEY VOCABULARY

- ***terrestrial* (p. 18)** relating to or occurring on land
- ***cetaceans* (p. 19)** mammals that live in the ocean
- ***natural selection* (p. 21)** the process by which plants and animals can adapt to changes in their environment and are able to survive and reproduce while those that cannot adapt do not survive

ENGAGE

Conversation Question: Why are marine mammals so unique?

Pose the question, "What is the largest animal on the planet?" Have students share responses. Then reveal the answer (blue whale). Read this sentence from the first paragraph of the article: "At 300,000 pounds, a blue whale can rival the weight of 40 adult female African elephants." Rephrase the statement for emphasis: "In other words, a blue whale weighs 40 times more than one female African elephant." Have students use a mathematical process to determine the weight of one female African elephant. (Answer: 7,500 pounds)

INTRODUCE VOCABULARY

Post and review the three vocabulary words. Inform students that all of these terms can be found in the article. Have them use the title and the vocabulary terms to predict the content of the article. Revisit the predictions after the reading and challenge students to write a brief summary of the article, incorporating all three words.

READ & DISCUSS

Have students reread the article in small groups to answer the questions below.

1. Describe the largest animal on the planet, the blue whale.
2. According to the DNA, what animals are whales related to?
3. What characteristics led scientists to believe that Indohyus was an ancestor of the whale?
4. How do whale tails move differently from fish tails? How does this movement help show that a whale is a mammal?
5. Where have scientists found evidence that helps explain the evolution of whales?

SKILL FOCUS: Structure and Function

INSTRUCT: Elicit from students that the main idea of the article is to provide details about the evolutionary process of whales, as they transitioned from land to marine animals. Present the *Structure and Function: Whale Tails* graphic organizer. Tell students to use information from the article to record the function of modern whale body parts.

ASSESS: Circulate and discuss content with students. Collect graphic organizers to assess their ability to understand the structure-and-function relationship.

EXTEND

Biology Lead a discussion on climate change and focus on how a rapidly changing environment is affecting many species' ability to adapt fast enough through natural selection. Divide the class into three groups to study the following factors: precipitation changes, global temperature changes, habitat changes. Have each group create a brief presentation detailing how their assigned factor is affecting natural selection. Groups should include visuals, examples, and research facts. Groups will present their findings to the class.

Whale Tails

Structure and Function: Use information from the article to describe the function of each whale body part.

Modern Whale Body Part	Function of Body Part
blubber	
tail	
blowhole	
air sacs	
baleen	

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A Whale-Sized Battle Against Climate Change

pp. 38–39, Expository Nonfiction

Readers will go on an underwater journey to discover how one of our great allies against climate change may be hidden beneath the waves. This article explores how whales sequester enormous amounts of carbon in their bodies, resulting in less carbon dioxide in the atmosphere.

RESOURCES

Cause and Effect: Carbon Keepers

OBJECTIVES

- Students will learn why whales may be instrumental in our fight against climate change.
- Students will analyze cause-and-effect relationships.
- Students will practice proper usage of hyphenated compound adjectives.

KEY VOCABULARY

- ***phytoplankton* (p. 39)** microscopic plant organisms that float in the ocean
- ***copepod* (p. 39)** small crustaceans that are found in saltwater and freshwater

ENGAGE

Conversation Question: Why are marine mammals so unique?

Activate prior knowledge of the topic by asking students what they know about the industrial hunting of whales, which peaked in the U.S. during the mid-1800s. Why were the whales hunted? (lamp oil, meat) Although the practice of whale hunting has mostly ended around the world, whales are still trying to recover from its impact. What new threats do whales face?

INTRODUCE VOCABULARY

Post and read aloud the vocabulary words. Inform students that many scientific terms have Greek roots. Demonstrate by breaking apart the terms and showing root meanings. Then compare to actual definitions.

phyto = plant/**plankton** = drifter

cope = oar/**pod** = foot

Ask: "How can knowing the meaning of Greek roots help you figure out the meaning of unfamiliar words?" *Fun Fact:* The character named Plankton from the TV show "SpongeBob SquarePants" is based on a real planktonic animal—the copepod!

READ & DISCUSS

Post the questions prior to reading. Read the article aloud, pausing when answers are revealed and encouraging students to elaborate.

1. Why are whales great allies in curbing climate change?
2. What happens to the carbon trapped in a whale carcass?
3. How do tiny phytoplankton process carbon dioxide?
4. What can humans do to protect whales?
5. How is climate change affecting the well-being of whales?

SKILL FOCUS: Cause and Effect

INSTRUCT: Review cause-effect relationships: relationships in which one event makes another event happen. Then lead students in a discussion that guides them to recognize the many cause-and-effect relationships presented in this article. Introduce the *Cause and Effect: Carbon Keepers* graphic organizer, and advise students that they will be recording these relationships. Students should focus on how the relationship is beneficial for climate change.

ASSESS: Review the worksheet. If there is not a legitimate cause-and-effect relationship between events recorded, direct students to revisit the text and adjust answers.

EXTEND

Language Arts Display the article title and point out the hyphenated compound adjective *whale-sized*. Explain that a compound adjective is hyphenated if placed before the noun it modifies: "whale-sized battle" (**whale-sized:** compound adjective / **battle:** noun). Provide examples: *long-term plan, record-breaking time, three-legged stool*. Have students list ten hyphenated compound adjectives.

Carbon Keepers

Cause and Effect Read the statements about whales in the chart. Describe the positive climate effects that result from each fact.

Statement: Whales store more carbon than other animals.
Statement: Large whales can sink to the bottom of the sea when they die.
Statement: Whales help the phytoplankton sequester more carbon dioxide.

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Dolphin Fun and Games

pp. 44–45, Expository Nonfiction

We know that human play fosters cognitive and physical growth in children. This article explores how dolphins may be enjoying the same benefits from play.

RESOURCES

Analyzing Behaviors: Playtime

OBJECTIVES

- Students will learn about the purposeful play of dolphins.
- Students will analyze animal behavior.
- Students will study the six stages of play in children.

KEY VOCABULARY

- ***captive* (p. 45)** the state of being kept in a place, such as a pen or a cage, and not being free to leave
- ***expel* (p. 45)** to push or force something out
- ***instinctual* (p. 45)** based on feelings or desires that do not come from thinking or learning
- ***agile* (p. 45)** able to move quickly and easily

ENGAGE

Conversation Question: Why are marine mammals so unique?

Entice students into a game of "20 Questions" in which they will try to guess the topic of the article (dolphins). In this game, the players are allowed to ask yes/no questions one by one in order to unravel the mystery. Instead of calling out the answer, have students write their guess on a piece of paper after each question. At the end of the questions, did all students have the word *dolphin* written?

INTRODUCE VOCABULARY

Display the following statements and underline the key vocabulary terms. Review how to infer the meanings of new words by using context clues and background knowledge. Then have partners work in pairs to determine the meaning of each word. Reveal definitions.

- Captive animals often do not have the skills to return to the wild.
- Heart muscles contract to expel blood.
- A baby's attachment behaviors are instinctual.
- Although Jake is often clumsy, he is a surprisingly agile dancer.

READ & DISCUSS

Reinforce comprehension of the concepts in the article by using the following prompts to direct discussion.

1. How do dolphins make ring-shaped bubbles?
2. Why do scientists believe that dolphins understand how to take turns?
3. Explain locomotor play and its benefits.
4. How can a dolphin's play help it survive?

SKILL FOCUS: Analyzing Behaviors

INSTRUCT: This article presents the reader with detailed information regarding the different playful behaviors of dolphins. Present the *Analyzing Behaviors: Playtime* graphic organizer and tell students that they will need to consult the article and use critical thinking skills to record and explain how particular dolphin behaviors can be interpreted as fun, educational, challenging, and/or social.

ASSESS: Review the worksheet with the class.

EXTEND

Psychology Although the six stages of children's play were first outlined in 1929, the theory is still widely accepted today. Help students make a further connection to the text by explaining that humans also have "purposeful play." Familiarize them with the six stages:

1. Unoccupied Play	4. Parallel Play
2. Solitary Play	5. Associative Play
3. Onlooker Play	6. Cooperative Play

Why is each stage of play important? Challenge students to learn more.

Playtime

Analyzing Behaviors Review the article and highlight purposeful play behaviors. Use details and examples to explain how a dolphin's playtime can be interpreted as fun, learning, facing challenges, and socializing.

Fun

Learning

Dolphins

Socializing

Facing Challenges