Jean-Michel Cousteau OCEAN ADVENTURES

PBS

Seabird Survival Adaptation Card Game

Students will play a fun and engaging card game to learn about seabird adaptations and explore some of the environmental challenges (natural and human-induced) seabirds face. The game focuses on the Common Murre.

SUBJECTS
Science

GRADE LEVEL
Grades 4 through 8

TIME
30 minutes

OBJECTIVES
Students will be able to

- play a small group card game to learn about seabird adaptations.
- study Common Murre specific adaptations.
- understand how seabirds adapt to different environmental challenges.
- learn about several of the hazards that face seabirds and marine life.

MATERIALS

- Adaptation Cards, Environmental Challenge Cards, and Human-Made Challenge Cards (one set per group of five students)
- Common Murre decoys (if available from local restoration programs or carvers) or photos. Illustrations and photos are readily available in field guides to birds. You can find copyrighted photos online; see Web Links below.
- Bird bone
- Pictures of predators, preferably including an animal that feeds on Common Murres
- Common Murre egg model or photo (See Web Links below) (optional)

All organisms have adaptations that help them survive. Some adaptations are structural, that is, physical features like the bill on a bird. Other adaptations are behavioral, or things organisms do to survive. Bird calls and migration are behavioral adaptations.

Adaptations are the result of evolution. They usually occur because a gene mutates or changes by accident. Some mutations can help an animal or plant survive better than others in the species without the mutation. For example, a bird born with a slightly longer beak than that of other birds in the species can catch more food. Because the bird can catch more food, it is healthier than the other birds, lives longer and breeds more. The bird passes the gene for a longer beak on to its offspring. They also live longer and have more offspring and the gene is inherited generation after generation. Eventually, over thousands of years, the beneficial mutation—the longer beak—is found throughout the species. Over time, animals that are better adapted to their environment survive and breed. Animals that are not well adapted to an environment may not survive.

Different adaptations help organisms meet the challenges they encounter in their environments. Many of these challenges are natural, like temperature extremes and predation. Human actions such as marine debris and oil spills are not natural and organisms may not be equipped, or adapted, to survive these challenges.

In this activity, the Common Murre is used to demonstrate adaptations common to many seabirds. Environmental challenges are explored in light of those adaptations.

TEACHER PREPARATION

1. **Prepare Deck of Cards:** Copy the card pages and cut up the cards. You need one complete deck per group of five students. A complete deck includes:
   - 3 copies of each of the 12 Adaptation Cards
   - 3 copies of each of the 12 Environmental Challenge Cards
   - 1 copy of each of the 4 Human-Made Challenge Cards (note: different border to help differentiate the Environmental and Human-Made Challenge Cards)

   For easier identification, print the Adaptation Cards on different colored paper than the Challenge Cards.

- Rule chart or overhead
- Copy of *Voyage to Kure* episode of ***Jean-Michel Cousteau: Ocean Adventures*** (optional)
- *Voyage to Kure* Viewing Guide, found at pbs.org/oceanadventures/educators (optional)

WEB LINKS

Common Murre images: Monterey Bay Aquarium
http://www.mbayaq.org/efc/living_species/default.asp?inhab=455

WhatBird: The Ultimate Bird Guide (copyrighted)
http://identify.whatbird.com/obj/164/_/Common_Murre.aspx

Common Murre egg photo: U.S. Geological Survey
http://www.mbr-pwrc.usgs.gov/id/framlst/i0300id.html

STANDARDS

National Science Education Standards Grades 5-8
http://www.nap.edu/catalog/4962.html

Unifying Concepts and Processes:
Form and Function

Life Science - Content Standard C:
Reproduction and heredity
Regulation and behavior
Diversity and adaptations of organisms

Science in Personal and Social Perspectives - Content Standard F:
Natural hazards

2. **Laminate:** To avoid card tears and losses, laminate the playing cards (optional).

3. **Shuffle:** Shuffle each deck, keeping Adaptation Cards and Challenge Cards separate, before distributing the cards. (note: Environmental and Human-Made Challenge Cards are shuffled together)

4. **Rules Poster:** Prepare a basic rules poster or overhead to assist in explaining the basic rules of the game. The basic rules are listed following Step 4 in Procedures.

PROCEDURE

1. **Introducing Seabirds:** Students should already know what a seabird is and understand their importance in food webs. Show a decoy (optional) or photo of a Common Murre and introduce the species. Ask students to imagine being a seabird and spending most of their life at sea even when it is raining and cold. Ask if they think it's an easy life.

   Use ideas from the *Voyage to Kure* Viewing Guide to set the scene. Pay particular attention to the Segment Suggestions for the seabirds theme (film clips from Tern Island).

2. **Discuss Adaptations:** An adaptation is any feature (physical or behavioral) that increases the success of an organism in survival or reproduction, that is, any characteristic that helps an animal or plant survive in its environment. An example of a physical adaptation is that birds have hollow bones to be able to fly (show hollow bone prop). An example of a behavioral adaptation is that Common Murres nest in colonies to prevent predation (show predator picture). Common Murres have another really interesting physical adaptation: the shape of their eggs. Because they nest so close to cliff edges, they have pear shaped eggs so that their eggs will roll in a circle instead of off the cliff edge (show Murre egg and have a student demonstrate the adaptation). Common Murres have all of the adaptations in this game, as do many other seabirds. (Keep this discussion brief as students will learn more from the game itself).

3. **Discuss Environmental Challenges:** These are challenges an organism meets in its environment. Challenges can be natural or brought about by humans. For instance, Murres must protect themselves and their eggs from gulls and ravens, a natural environmental challenge. Murres must also avoid plastic trash in the ocean where they hunt for food, and example of a non-natural challenge. Explain that certain adaptations can help seabirds or other organisms survive their environmental challenges.

Ocean Literacy: Essential Principles and Fundamental Concepts
http://coexploration.org/oceanliteracy/

Essential Principle #5: The ocean supports a great diversity of life and ecosystems.

d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

f. Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is "patchy." Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.

Essential Principle #6: The ocean and humans are inextricably interconnected.

e. Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

g. Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

4. **Explain the Game:** Post or project the basic game rules (see below) and explain the game. To maintain students' full attention, explain the rules of the game before passing out the cards.

Rules:

- Each small group will receive two sets of cards: adaptation cards and environmental challenge cards (including both natural and human-induced challenges).
- The object of the game is to collect as many environmental challenge-adaptation card matches as possible.
- Each player will start with four adaptation cards. The rest of the adaptation cards and the environmental challenge cards should be placed face down in two piles in front of all the players.
- The first player draws an environmental challenge card. He/she reads aloud (to share the information) the challenge and the adaptation needed to meet that challenge and reviews his/her cards looking for a match. If she/he has the right adaptation, the student has a match and places that pair of cards in front of them. The student draws another adaptation card from the pile so he/she maintains four adaptation cards in hand. (Note: players should always have four adaptation cards until play is nearing an end and there are none left to draw.)
- Player 1 continues to play as long as she/he can match the next environmental challenge card. When the student cannot match the challenge, his/her turn is over and the environmental challenge card is left face-up for the next player.
- Play moves clockwise to the next player. If the player has the adaptation card that matches the showing environmental challenge card, he/she may take it and place the pair down in front of them. The student can take only the very top card; any cards below the top card are out of play. (Another way to explain this is to say that a player may only "steal" from the used environmental challenge pile once per turn.)
- Each player also gets to draw at least once per turn from the environmental challenge pile. Each turn continues until the player cannot make a match.
- If any player draws a non-natural environmental challenge card, their turn is automatically over. There are no adaptations that match those cards.
- The game ends when one player runs out of adaptation cards or the educator says time is up (most likely).
- At that time, players count their matches and determine the winner.

5. **Distribute Cards and Begin Play:** Divide the class into groups of five students each. Distribute the cards and let the game begin. Continue until adaptation cards are used up or allotted time is over.

Seabird Survival Card Game Basic Rules

- The object of the game is to collect as many matches as possible.
- Each player should always have four adaptation cards.
- When it is your turn, you pick an environmental challenge card from the pile.
- If you have the adaptation card that matches that challenge, you get to keep both cards and lay your match down on the table in front of you.
- You may keep playing until you cannot make a match.
- You may "steal" one used environmental challenge card (from the top of the pile) per turn.
- The game ends when a player runs out of adaptation cards or time is called.

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6. **Discussion:** Initiate a discussion with the students with the following questions:
   - What did you learn about seabirds?
   - What seabird adaptation did you find most interesting?
   - How do adaptations help birds and animals survive?
   - What were some of the natural environmental challenges the birds faced?
   - What were some of the human-made environmental challenges the birds faced?
   - What were the sources of the human-made environmental challenges and what could be done to avoid them?

EXTENSIONS

- Draw a Common Murre and label its adaptations.
- Design a coastal marine creature and explain its adaptations.
- Play the marine mammal adaptation game found at http://www.aeoe.org/conference/resources/2005/marinemammals/adaptationgame.pdf.

FURTHER RESOURCES

Additional educator resources for ***Jean-Michel Cousteau: Ocean Adventures*** can be found at **pbs.org/oceanadventures.**

- **The Common Murre Restoration Project**
  http://www.fws.gov/sfbayrefuges/murre/murrehome.htm
- **PRBO Conservation Science Education**
  http://www.prbo.org/cms/index.php?mid=40&module=browse
- **Oikonos Ecosystem Knowledge Seabird Projects**
  http://www.oikonos.org/projects/projects.htm
- **Project Puffin and the Seabird Restoration Program**
  http://www.audubon.org/bird/puffin/

CREDITS

Adapted with permission from *Webs Under Waves: Exploring the Coastal Marine Environment* published by the San Francisco Bay National Wildlife Refuge Complex. For more information, visit www.fws.gov/sfbayrefuges/murre/education.htm

The activity was created by Phaela Peck and inspired by a marine mammal adaptation game found at http://www.aeoe.org/conference/resources/2005/marinemammals/adaptationgame.pdf.

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Adaptation Cards

ADAPTATION CARD **Down feathers**	ADAPTATION CARD **Hollow bones**	ADAPTATION CARD **Air sacs**
Down feathers are the fluffy under feathers that keep a bird warm.	Birds have hollow bones to keep their weight down so it is easier for them to fly.	Flying is harder than walking, so birds have air sacs to help them take in more oxygen.
ADAPTATION CARD **Beak designed for catching fish**	ADAPTATION CARD **Wings that act as paddles**	ADAPTATION CARD **Legs set further back, feet more broadly webbed**
Seabirds use their beaks for preening, nest construction, courtship and defense. Murres have long beaks for catching fish!	Most seabirds dive for their food. Some, like the Murre have wings that can be used for flying underwater!	Seabirds have legs set further back and broadly webbed feet to help them move easily under water.

Adaptation Cards

ADAPTATION CARD **Salt glands**	ADAPTATION CARD **Dense bones, strong ribcage**	ADAPTATION CARD **Nest in colonies**
Seabirds can drink salt water since they have salt glands above their eye sockets.	Seabirds have denser bones that help them dive deep. Their strong rib cage protects them from water pressure!	Murres nest together in large colonies for protection from predators like gulls.
ADAPTATION CARD **Oil gland**	ADAPTATION CARD **Nest on cliff edges**	ADAPTATION CARD **Pear shaped eggs**
Most seabirds have an oil gland that helps them stay waterproof.	Murres nest on steep cliff edges to reduce competition for nest space with other seabirds.	Even though Murres lay eggs on bare cliff edges, their eggs don't usually fall off. This is because they are pear shaped and will roll in a circle when bumped.

Environmental Challenge Cards

ENVIRONMENTAL CHALLENGE CARD

It's cold high up in the air.

Adaptation you need:
Down feathers

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You need extra oxygen to be able to fly so much.

Adaptation you need:
Air sacs

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You have to fly a lot!

Adaptation you need:
Hollow bones

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You need to catch a slippery fish for dinner.

Adaptation you need:
Beak designed for catching fish

If you don't have this adaptation:
Your turn is over.

Environmental Challenge Cards

ENVIRONMENTAL CHALLENGE CARD

You need to swim underwater to catch your lunch.

Adaptation you need:
Wings that act as paddles

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You have to drink salt water.

Adaptation you need:
Salt glands

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You have to move quickly in the water.

Adaptation you need:
Legs set further back, feet more broadly webbed

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

It is cold and wet in the ocean and when you get out!

Adaptation you need:
Oil gland

If you don't have this adaptation:
Your turn is over.

Environmental Challenge Cards

ENVIRONMENTAL CHALLENGE CARD

You have to dive deep to catch your breakfast.

Adaptation you need:
Dense bones and a strong ribcage

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You have competition for nesting areas from other seabirds.

Adaptation you need:
Nest on cliff edges

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

You have to stay safe from predators like gulls.

Adaptation you need:
Nest in colonies

If you don't have this adaptation:
Your turn is over.

ENVIRONMENTAL CHALLENGE CARD

Your eggs are very close to the cliff edge.

Adaptation you need:
Pear shaped eggs

If you don't have this adaptation:
Your turn is over.

Human-Made Challenge Cards

HUMAN-MADE CHALLENGE CARD

There is trash in the ocean that can hurt you.

Adaptation: None

If you don't have this adaptation:
Pick up one piece of trash and then your turn is over.

HUMAN-MADE CHALLENGE CARD

You are entangled in a fishing net.

Adaptation: None

If you don't have this adaptation:
Think of one reason birds get tangled in fishing nets and then your turn is over.

HUMAN-MADE CHALLENGE CARD

There is plastic in the ocean that you mistake for food.

Adaptation: None

If you don't have this adaptation:
Think of one plastic thing that could get into the ocean and then your turn is over.

HUMAN-MADE CHALLENGE CARD

You swim through an oil spill and have oil all over your feathers

Adaptation: None

If you don't have this adaptation:
Think of one way you can help keep oil out of the ocean and then your turn is over.