Blowholes & Blubber

Introduction

Orcas are warm-blooded mammals that spend their lives in cold seas. Like humans, they need to stay warm. Under their skin, orcas have a thick layer of fat called ***blubber***. Blubber provides insulation that keeps heat in and cold out. Blubber fat can also be burned as energy when orcas can't find food. Orcas breathe air like humans but spend much of their time underwater. On top of their heads, orcas have ***blowholes*** that are like nostrils. When they surface to breathe, a muscle flap on their blowhole opens to let in air. When they dive, the muscle flap closes to provide an air-tight seal underwater. Orcas are voluntary breathers - they have to remember to breathe. Humans are autonomic breathers – we breathe without thinking about it. When they rest, orcas cannot sleep like humans. They rest with half their brain while the other half stays awake to breathe.

Orcas have smooth skin and sleek, streamlined bodies that help them move easily through water without drag. Their distinctive black and white colors break up their outline that hides them while hunting. Instead of legs, orcas have tail ***flukes*** that help them swim fast and travel long distances. Instead of arms, orcas have paddle-shaped ***pectoral fins*** that help them turn, steer and touch their family. A ***dorsal fin*** on their back helps them steer and keep their balance. Orcas have a mouthful of 40-56 conical-shaped teeth that they use for grasping and tearing their food. Orcas swallow their food without chewing.

Key Concepts

- Blubber provides insulation that helps orcas stay warm in cold water.
- Orcas are voluntary breathers, while humans breathe automatically.
- An orca's blowhole controls breathing while surfacing and diving.
- An orca's body shape is adapted for efficient breathing and swimming.
- Orcas use their fins and tail flukes to travel, maneuver and touch each other.

National Science Education Standards

Science as Inquiry – Ability to Do Scientific Inquiry, Understanding About Scientific Inquiry (K-4)

Life Science – Characteristics of Organisms. Organisms and their Environments (K-4)

National Council for Teachers of English/ International Reading Association Standards:

4. Students adjust their use of spoken, written and visual language to communicate effectively with a variety of audiences and for different purposes.
8. Students use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge.
12. Students use spoken, written and visual language to accomplish their own purposes.

Inquiry Questions

- Why do humans and orcas need to stay warm in cold environments?
- How do humans stay warm in winter? In cold water?
- Why does blubber provide the best insulation in cold water?
- What would happen if a hungry orca burns up too much blubber for energy?
- Why does an orca need to be aware of breathing? Why can humans be unaware?
- Why do orcas have large torpedo-shaped bodies and smooth skin?
- How does an orca's black and white color provide camouflage?
- Why are fins more useful than hands if you live in the sea?
- If you had fins and a tail, what could you do that you can't do with arms and legs?

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Activity #1–Be an Orca Scientist

In this activity, students take on the role of orca scientists to make predictions and conduct an experiment to learn how blubber helps orcas stay warm in the cold sea.

Materials Needed: 2 half-gallon Ziploc freezer bags, Crisco, rubber glove, duct tape, stopwatch, bucket of water & ice

Preparation:

1. ***To make blubber glove:*** Fill one Ziploc bag with about a cup of Crisco. Turn another empty Ziploc bag inside-out and attach to bag w/Crisco. Zip inner bag to outer bag so Crisco is sealed between. Squish Crisco around evenly. Seal edges with duct tape.

2. Use rubber glove by itself. To try other insulation materials (bubble-wrap, cotton balls, foam packing balls), make additional gloves and fill with insulation materials.

3. Fill bucket with water and ice.

Procedure:

1. Scientists use a toolkit of questions to help them find answers.

SCIENCE TOOLKIT	**ASK**	What do you want to know?
	THINK	How can you find out?
	EXPLORE	What did you do? Observe?
	SHARE	What did you learn?

2. Students pair up into teams and take turns as ***tester*** and ***recorder***. One student tests gloves while the other records time and test results.
3. Each student team makes predictions about different kinds of insulation on **Staying Warm with Blubber** worksheet.

Blubber Glove test

1. Place bare hand in ice water and remove it when cold. Record time on worksheet.
2. Insert one hand in blubber glove. Place hand with blubber glove in bucket of ice water.
3. Remove hand when cold and record time on worksheet.
4. Test rubber glove the same way. Record time on worksheet.
5. Repeat until all student teams have a chance to test the gloves.

Activity #2–Make Life-sized Orca Dorsal Fins

In this activity, students create life-size dorsal fins for Granny, Ruffles, Suttles and Mako.
Materials Needed: black poster board, white & gray acrylic paint, scissors, blank index cards, tape
Procedure:

1. Draw a life-size dorsal fin and saddle-patch for each orca on poster board. Dorsal fins sizes: Ruffles J-1 (6 ft. tall), Granny J-2 (3 ft.), Suttles J-40 & Mako J-39 (2ft.).
2. Cut out and paint dorsal fin/saddle patch for each orca. Make a nametag to identify each orca dorsal fin. Attach to wall or make a stand.
3. Find dorsal fin shapes and saddle-patch photos for each orca at the Center for Whale Research: **http://www.whaleresearch.com/orca_ID.html**

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Staying Warm With Blubber

Name	Date

Directions: Student teams take turns as tester and recorder.

Tester: Make a prediction about how long you can hold hand in ice water before it gets cold. Test bare hand, blubber glove, rubber glove and gloves with other materials.

Recorder: Record time with stopwatch. Write results on worksheet.Switch jobs and repeat.

Materials	Predictions How long before your hand gets cold in ice water?	Results Record time hand held in water	Which is Best? Which is best way to stay warm? Number from best to worst (1 = best)
Bare Hand			
Blubber glove			
Rubber glove			

Results:

Which is the best insulation?

Why do you think so?

Why did we test the water with a bare hand?