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OCEAN EXPLORATION TRUST

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Science Lesson: Surviving Cold Waters

Objective: TLW explore ways marine animals have adapted for survival in cold water.

“Look Fors”: TL uses vocabulary from the discussion, videos and STEM projects to analyze how marine animals have adapted for survival in cold waters.

Background: Most animals ROV *Hercules* encounters are invertebrates, which do not regulate body temperature like mammals. Anywhere in the world, the temperature of most water on the seafloor is 39°F. Most seafloor creatures live at that temperature at all times. Animals that infrequently visit the deep sea, like deep-diving whales, must have adaptations to handle the cold temperatures.

- TTW share this Nautilus Live video of baitball being chased by a six-gill shark and a sea lion on the seafloor: <https://nautiluslive.org/video/2017/07/28/bait-ball-engulfs-shark-sea-lion-pursuit>. TTW encourage students to think about how they stay warm and how the animals seen stay warm in cold water allowing TL to brainstorm possible adaptations, and guide a discussion including staying warm through insulation-like, including preventing water contact with a waterproof layer or blubber.
 - The sea lion uses blubber insulation to keep warm. The shark does not have a warm body temp.
- TL is encouraged to brainstorm new ideas of cold water adaptations TL would like to learn about to further drive the focus of instruction as well.

1. Engage

- TTW read *Southern Ocean* by Emily Rose Oachs <https://www.getepic.com/app/read/51243> and lead the discussion about **adaptations** of each animal for life in cold water.
- **Waterproofing Model:** TLW explore the cold-water adaptation used by birds of trapping air under waterproof feathers for insulation with this activity. Using the paper and pencil, TLW draw a penguin. TTW lay the penguin pictures on a baking sheet and spray the drawing with cooking spray, allowing the paper to absorb the oil.
- Tilting the baking sheet at an angle, TLW spray a water bottle onto the oiled drawings. TL should observe how the water beads on the drawing and trickles off. This is an example of how certain marine life utilize oils to meet their needs in cold waters.

2. Explore

Key

TTW: The Teacher (Will)

TLW: The Learner (Will)

WG: Whole Group work

SG: Small Group work

IOT: In Order To

- Non-stick cooking spray (vegetable oil)
- Baking sheet
- Printing/copy paper
- Pencil
- Bowl
- Ice water
- Shortening (cooking fat)
- Water bottle

Supplies

Student Work

No documents provided.

- TLW watch the video [Whales and Seals Feast on Krill](#). TTW discuss how migration is a helpful behavioral adaptation for life in cold water.
- TLW watch the video: [How do Whales, Penguins, and Polar Bears Keep Warm?](#) In order to survive in cold waters, marine life (e.g. whales, walrus, penguins) has developed the physical adaptation of insulating blubber.
- TTW guide the discussion of the **physical** and **behavioral adaptations** animals develop to meet their needs for survival. TT should use supporting essential questions (*Evaluate*) to guide the discussion.

3. Explain

Supporting essential questions that can be used to evaluate student understanding:

- In your own words, how would you describe any of the cold-water adaptations learned in our discussions?
- Why do you feel it is necessary for marine life to undergo adaptations in cold waters?
- How would you describe the effects of cold water on your finger, with and without shortening (cooking fat)? How does that compare to the adaptations of marine life (e.g. whales, seal, penguins)?
- As an ocean explorer, what other questions about animal adaptation would you want to explore?

5. Evaluate

- **Blubber STEM experience:** Extend with an insulating experience for students which can be modified with the video, *Fun with Blubber!* (*Additional Resources*).
- TTW set-up a bowl of ice water. TLW use their index finger to test the feel and temperature of ice water and discuss how cold water feels against their skin.
- TLW will dip an index finger in shortening (cooking fat) and repeat the experiment. TTW discuss how the coating of shortening is a model for blubber using the following *guiding questions*:
 - How does the temperature feel insulated?
 - How would insulation benefit animals in cold water?

4. Extend

Animal Showcase:

Inspire your young explorers by showcasing a new ocean animal each class/club meeting.

TT may showcase the *Sperm Whale* using the exciting video below. Sperm whales are adapted to thrive in the deep ocean with a thick blubber layer for insulation, powerful swimming muscles to dive and surface to breathe, and echolocation to find food in the total darkness. Use the links below to learn more about sperm whales, supporting the lesson by looking for other behavioral and physical adaptations.

<https://nautiluslive.org/video/2015/04/15/rare-sperm-whale-encounter-rov>

<https://nautiluslive.org/blog/2015/04/16/sperm-whale-encounter-experts-answer-your-questions>

http://www.aquariumofpacific.org/onlinelearningcenter/species/sperm_whale

Additional Resources and Links

- Nautilus Live exploration highlights of animals with blubber: [Sea Lions](#), [Pilot whales](#), [Sperm whale](#)
- Reading ELA addition - *The Arctic Ocean* by Juniata Rogers <https://www.getepic.com/app/read/56277>
- For more on the Blubber experiment: *Fun with Blubber!* <https://www.youtube.com/watch?v=DQGAcqhkGs>