



## **Skin, Scales and Skulls**

Virginia Aquarium and Marine Science Center

*This activity outline was developed for use in a variety of informal venues. By design, it provides the content, pedagogy and strategy necessary for implementation by both the novice and experienced informal educator. It is expected that this outline will be adapted and improved upon by the user. We welcome your feedback!*

### **Synopsis of the Activity**

This activity will introduce aquarium visitors to the concept that animals have a variety of features that help to protect their bodies. Through hands-on investigation, visitors will determine the function and importance of animal body coverings.

### **Audience**

The target audience is the general public, but the activity could be modified for school group presentations.

### **Setting**

This activity can be conducted in any space if the program materials are contained in a locking cart and the cart is mobile. The ideal setting would be near a habitat containing one of the animals whose body covering is included in the activity.

### **Activity Goals**

Through hands-on investigation, visitors will learn about the various features animals have that help to provide protection for their bodies. Visitors will examine an array of skins, scales and skulls from fish, mammals and reptiles and investigate function, composition, similarities and differences.

### **Concepts**

- 1) Animals need protection from predators and disease
- 2) Not all animals have the same body coverings
- 3) Skeletons can be internal or external
- 4) Some animals go through a process called molting when they grow

### **Ocean Literacy Principles**

5. The ocean supports a great diversity of life and ecosystems.
  - a. Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.
  - c. Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.
  - 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.

- e. The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor. Most of the living space on Earth is in the ocean.

### **Materials**

River otter pelt  
Seal Skin  
Sturgeon skin  
Horseshoe crab molt  
Assorted crab molts (blue, spider, hermit)  
Sea Turtle scutes  
Sea Turtle shells  
Fish scales  
Fish vertebrae  
Alligator and crocodile skulls  
Dolphin skull  
8 large clear Rubbermaid containers  
Pictures of animals

### **Prep Section**

Make sure that your Curiosity Cart contains the required skins, scales and skeletons for the program to be conducted (see above). Ensure that all items are in usable condition and not damaged. Clean out containers of any artifacts or debris.

### **Procedure and Set-up**

Select an area in the informal science education center for the activity to take place based on anticipated visitation for the day. Set out the items in random order for visitors to look at and touch at their leisure. Place the containers next to the cart so they are ready to be used in the activity.

### **Guiding Questions**

Describe how each of these items feels.

What do you think this item might be? How do you know?

What animal do you think each of these items came from? What is your evidence? How do you know?

How might this item help an animal survive in its habitat?

What are some of the differences between these items on the cart? Similarities?

Sort these items into different groups.

Which of these objects are from animals that live in the ocean? What advantage does this type of covering give the animal?

Why would an animal need to protect itself? How can an animal protect itself?

What is an exoskeleton? What are the advantages and disadvantages of having an exoskeleton?

What adaptations do we have to help us protect ourselves? How are these similar to or different from the objects you see here?

## Activity Description

### 1. Identifying the Objects

To begin the activity, invite visitors to look at and touch the animal items that have been set out on the Curiosity Cart. Once they have had time to look over some of the items initiate a conversation with them about the items they are touching. Use the following questions and tasks to get the conversation started or going. Remember to encourage visitors to ask their own questions as well as invite them to respond to each others' comments and questions.

- Describe how that object looks and feels.
- Tell visitors that all these objects came from different ocean animals. Let's figure out together what animal and what part of the animal?
- As visitors offer suggestions on the animal and animal part, ask them what evidence they used to make that decision.

### 2. Free Sort

Invite visitors to sort the objects using any common characteristics they notice. Visitors can place similar items in the Rubbermaid containers. As the visitors sort, ask them to share with everyone:

- Why did you place these items together?
- What characteristics did you use to sort?
- Can any item can be placed in more than one category?

As they share the characteristics they used to sort, you may tell them information about the objects, such as what animal it came from, composition, or definitions of items. Invite visitors to ask questions about any of the objects. You can answer these questions and then follow up with another question, or invite other visitors to answer the questions.

### 3. Protection and Survival Discussion

Now that the visitors are familiar with the objects and, hopefully, are more comfortable with sharing their ideas out loud, guide the conversation to focus on how the items might help the animals they came from survive in their habitat. Use the following questions and tasks to get the conversation started or going. Remember to encourage visitors to ask their own questions as well as invite them to respond to each others' comments and questions.

- Let's take a closer look and compare the objects. How are the objects similar and different?
- What is the common feature among all of the objects?
- How would the objects protect the animals they come from?
- Why would an animal need to protect itself?
- What is an exoskeleton? What are the advantages and disadvantages of having an exoskeleton?
- What body protection do you have? How is your body protection similar and different from these objects?

### **Related Activities/Extensions/Modifications**

Selected artifacts could be placed on a table top, countertop or cart top and smaller groups of visitors could participate in a shorter interactive program focusing on molts, skins or skulls.

Visitors could also look at skulls only and determine similarities and differences between the teeth or mouth shape.

### **Additional Resources**

Marine Mammals: Evolutionary Biology By Annalisa Berta, James L. Sumich, Kit M. Kovacs

Fish Anatomy by Howard Ayers

The Anatomy of the Sea: Over 600 Creatures of the Deep by David Ponsonby, Georges Dussart

### **Background**

The above named resources will provide information on each of the selected artifacts. Each institution has its own collection of animal skulls, scales and skins from which they can compile a selection to be used in this activity.

The following information is from Wikipedia.org:  
(See also Vocabulary section above)

Skin performs the following functions:

- Protection: an anatomical barrier from pathogens and damage between the internal and external environment in bodily defense; [Langerhans cells](#) in the skin are part of the [adaptive immune system](#).<sup>[4][3]</sup>
- **Sensation**: contains a variety of nerve endings that react to **heat and cold**, touch, pressure, vibration, and tissue injury; see [somatosensory system](#) and [haptics](#).
- Heat regulation: the skin contains a blood supply far greater than its requirements which allows precise control of energy loss by radiation, convection and conduction. Dilated blood vessels increase perfusion and heat loss while constricted vessels greatly reduce cutaneous blood flow and conserve heat. [Erector pili muscles](#) are significant in animals.
- Control of evaporation: the skin provides a relatively dry and semi-impermeable barrier to fluid loss.<sup>[4]</sup> Loss of this function contributes to the massive fluid loss in [burns](#).
- Aesthetics and communication: others see our skin and can assess our mood, physical state and attractiveness.
- Storage and synthesis: acts as a storage center for lipids and water, as well as a means of synthesis of [vitamin D](#) by action of [UV](#) on certain parts of the skin.
- Excretion: [sweat](#) contains [urea](#), however its concentration is 1/130th that of [urine](#), hence [excretion](#) by sweating is at most a secondary function to temperature

- regulation.
- Absorption: Oxygen, nitrogen and carbon dioxide can diffuse into the epidermis in small amounts, some animals using their skin for their sole [respiration organ](#) (contrary to popular belief, however, humans do not absorb oxygen through the skin).[8] In addition, medicine can be administered through the skin, by ointments or by means of adhesive [patch](#), such as the [nicotine patch](#) or [iontophoresis](#). The skin is an important site of transport in many other organisms.
  - Water resistance: The skin acts as a water resistant barrier so essential nutrients aren't washed out of the body.

### **Vocabulary**

Molt- also known as **shedding** or for some species, **ecdysis**, signifies the manner in which an animal routinely casts off a part of its body (often but not always an outer layer or covering), either at specific times of year, or at specific points in its life-cycle. Molting can involve the epidermis (skin), hair or fur, exoskeleton, or other external layer. In some species, other body parts may be shed, for example, wings in some insects. Examples include old feathers in birds, old hairs in mammals, old skin in reptiles, and the entire exoskeleton in arthropods.

Skull- The **skull** is a bony structure found in the head of many animals. The skull supports the structures of the face and protects the head against injury. Protection of the brain is only one part of the function of a bony skull. For example, a fixed distance between the eyes is essential for stereoscopic vision, and a fixed position for the ears helps the brain to use auditory cues to judge direction and distance of sounds. In some animals, the skull also has a defensive function (e.g. horned ungulates); the frontal bone is where horns are mounted.

Exoskeleton- The supporting structure of an organism that is on the outside of the body. Arthropods, such as insects, crustaceans, and spiders all have exoskeletons. Birds, mammals, and reptiles have "endoskeletons," meaning they have bones inside their bodies.

Skin- the largest organ of the integumentary system made up of multiple layers of epithelial tissues that guard underlying muscles and organs.

Scale – a small rigid plate that grows out an animal's skin to provide protection. Scales may overlap, as in bony fish, or form denticles, as in cartilaginous fish (sharks and rays). Scales in reptiles may be called scutes, as in crocodiles and turtles.

Fur – the dense collection of hair in some mammals, usually functioning for insulating the underlying skin.