

**INQUIRY SKILLS**

- Observe and record
- Look for patterns
- Compare and contrast
- Present data

## Lesson 2: *What Can We Learn from a Skull?*

**THE LESSON AT A GLANCE**

Students:

- Read the beginning of the *Mystery Mammals Story*
- Discuss functions and features of skulls
- Observe photocards of skulls and develop a plan for comparing them
- Observe and record data on the five mystery skulls
- Compare the five mystery skulls with the two known skulls

**RECOMMENDED TIME: 2 OR 3 CLASS SESSIONS**

**MATERIALS**

2 skulls

5 class sets of photocards of 5 mystery mammals' skulls

1 reproducible master of the *Mystery Mammals Story* – Chapter 1

Hand lenses

1 CD – skull photographs

\*Rulers and tape measures

\*Protective padding for the skulls

Journals

\*TEACHER PROVIDES THESE ITEMS

**GETTING READY**

1. Set out the two skulls as before. Be prepared to show them to the class when you read the *Story*, and to demonstrate how to handle them properly.

**NOTE**

The photos of the mystery mammals' skulls are life-sized.

2. If you wish to have students follow along as you read the Story, plan to make an overhead transparency or additional copies of the selection for the class.
3. Organize students into five groups.
4. Decide how you will distribute objects to the groups for this investigation and for the rest of the unit. You will remember that there are two options. The more challenging and preferred option is to distribute objects randomly from lesson to lesson so that all groups have the opportunity to examine all the objects. The second option is to designate one mystery animal per team. In this case, each team would always get the objects belonging to the same animal. Please see pp. 27-28 in the Introduction for more details.
5. If desired, set up a computer with the CD of the skull photographs.

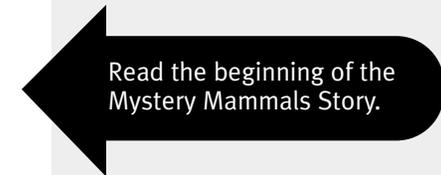
## THE INVESTIGATION

1. Read the following Story to the class. Display the skulls and photocards where suggested, but do not distribute them yet. Pause where indicated in the Story to allow students to respond to questions.

### The Mystery Mammals Story

Juan and his best friends Larry and Carla have joined a new group at the City Natural History Museum called the Junior Investigators. They are going to help the museum's **curators** set up a study center just for kids. The new Young Naturalists' Center will feature animals of all kinds: insects, reptiles, amphibians, fish, birds, and mammals.

The museum keeps a small warehouse full of collections that people have donated. The collections include quite a number of animal specimens the curators can't use for one reason or another. Some specimens are in poor condition or are not good



### WORD BANK

**Curator** – A person who takes care of or supervises the collections in a museum or zoo.

**TEACHER'S NOTE**

To heighten interest, I began with the anticipatory set-up as described in the Story. I got an old cardboard box and put in the two skulls, a set of photocards, and a small diary. I taped it shut and tied it with string.

examples to study. Some are improperly labeled, or worse, have no labels at all. And some are duplicates of what the museum already has on display. The museum has offered these specimens to be used in the Young Naturalists' Center. It will be the job of the Junior Investigators to work with the curators to make sense of them, to pick out the best examples for display, and then to help the curators set up exhibits and activities that will be fun learning experiences for the young visitors.

Juan and his team have been given a large, beat-up cardboard box marked simply "My Mammal Collection" to investigate. It is tied up with string and taped securely shut. They open the box carefully, and right on top is an old journal and two skulls. The journal begins:

"Grandmother and I were walking in the woods one summer morning and surprised a red-tailed hawk feeding on this animal."

***Display the squirrel skull.***

"We knew from the remains—the head and the bushy tail—that it was a squirrel."



Squirrel Skull

**Questions:**

- What other **predators** do you think eat squirrels?
- How does a squirrel protect itself from predators?

The diary continues:

“Months passed before Grandmother and I came back to the same spot in the woods. All that was left of the squirrel by then was its skull. We called the museum and got information on how we could safely collect, clean, and preserve the skull.”

“The other skull is a sad story. For the past several years, people in a new housing development nearby have been angry and upset because small animals have been disappearing from their yards—a pet goose, several cats, and a prize winning poodle. One night, the owner of a small pot-bellied pig heard a commotion in his yard. He saw an animal leap into the pigpen. So he got out his gun and shot the intruder. It was a coyote.”

***Display the coyote skull.***

Coyote Skull

**WORD BANK**

**Predator** – An animal that lives by killing and eating other animals.

**WORD BANK**

**Prey** – Prey can be a verb or a noun. For example, coyotes **prey** on mice, and are skillful at hunting their **prey**.

**DEMONSTRATE HOW TO HANDLE THE SKULLS**

During the discussion, model how to handle the skulls properly. Caution students to support the skull from below and to use both hands to cradle it gently. Show them how to separate and rejoin the jaws with care, and remind them to work over the padded surfaces.

Discuss function and features of skulls.

**Questions:**

- Coyotes are predators, and normally **prey** on small animals such as mice, rabbits, and chipmunks in the wild. Why do you think coyotes went into the new housing development to prey on pets in people's yards?

Then the diary says:

“I am fascinated by the two skulls, and have spent many hours examining them, drawing them in my journal, and writing about their similarities and differences. For instance, I have noticed that the eye sockets of the two animals are placed differently, and that their teeth have very different shapes. I wonder about how these animals lived, how they survived the cold winters, and what kinds of families they had.”

“Over the years, I have collected five other mammal skulls. I gave my five other skulls to the museum, but I have kept good life-sized photos of them for myself.”

**End of Story*****Display five photocards.***

Point out to students that the photocards are numbered but not labeled and give no indication of what the mammals might be. This is the mystery that students will have to solve: What are the five mammals?

**Questions:**

- Who do you think might have sent this mammal collection to the museum?
- What else do you think could be in the box that will give us clues to identify the mystery mammals?



DISCUSSION

2. Use the two known skulls to discuss their function and features. Try some of these questions:

- Why do mammals have skulls? What does your skull do? What does it protect?

- How are the two skulls alike? How are they different? How are they like your own skull?
- What features on the skull could we count or measure?
- What clues do the two skulls give you about how the animal looked? For instance, what shape was its face? Where were its eyes and nose? How strong was its jaw?
- How big is its brain case?
- What features tell you about the animal's diet?

3. Place the skulls on their pads in an easily accessible location. Provide hand lenses, tape measures, and rulers. Let students know that the skulls will be available for them to use when they want to make comparisons with the photocards of the mystery mammals.

4. Distribute one set of five photocards of the mystery mammals to each group of students.

After a brief period of observation, ask students to suggest features of the skulls that they could use as points of comparison. They might mention some of the following:

- overall size - width, length from front to back
- eye sockets - size and position, distance between the sockets
- snout - length, shape, position of nose holes
- cheekbones - size of opening
- comparative sizes - length of the snout relative to the total length of the skull; length of the brain case relative to the total length of the skull
- teeth - shape, number, size
- weight (of the two real skulls)



5. Ask each team to complete a thorough examination of each of the five mystery skulls, and have them record their findings in their journals. You may want to suggest a chart format (such as the one illustrated below) to help students record their data in a systematic way.

## TEACHER'S NOTE

### Management Option

*Students really wanted to get their hands on the real skulls, and I felt it was important to take advantage of their high level of interest. So we set up a skull center and a schedule, and rotated teams through the real skull center first. Everyone got a chance to measure, weigh, draw, and label a real skull. Then we moved on to the mystery mammals and the photocards.*

Observe photocards and suggest how to compare them.

## NOTE

The next Investigation focuses on teeth, so although it is useful for students to make preliminary observations of teeth now, they should concentrate more on the other features.

## TIP

Remind students that the skull photocards are life-size.

Observe and record data on the five skulls.

## LOOKING MORE CLOSELY

The CD included in the kit offers students an opportunity to make very close observations of the 5 mystery skulls. Using the zoom capability, students can focus in on a particular feature and view it at high magnification. They can also use the CD to display several skulls at once, and compare and contrast such characteristics as eye placement, brain case, and dentition.

The images on the CD are not life-sized, so students will need to return to the photocards to take measurements.

Compare mystery photos with the two known skulls.

## CHECKPOINT

### Recording Skills

- The skulls are difficult items to draw and require complex written descriptions. Take note of how much effort the student expends, whether the descriptions are complete and accurate, and whether the drawings are an honest attempt to record what the student actually observed rather than a stereotypical representation.
- Also take note of how well students organized their data on the skulls. It will be important for them to be able to retrieve and analyze the data in coming lessons.
- Acknowledge that these were difficult tasks, and reassure students that they will improve with practice. Offer coaching to students who seem to be struggling.

## SAMPLE SKULL OBSERVATION CHART

Date: \_\_\_\_\_

Skull Number: \_\_\_\_\_

### Measurements:

Length from front to back \_\_\_\_\_

Length of snout \_\_\_\_\_

Distance between eye sockets \_\_\_\_\_

Size of eye sockets \_\_\_\_\_

Size of openings in cheekbones \_\_\_\_\_

Other Observations \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



JOURNAL

6. As the class works on the photocards, have each team take a turn examining the two known skulls. They should draw, label, and measure them, and add the data to their recording charts.

### JOURNAL PROMPT

Give students these prompts:

- Examine both real skulls.
- Draw and label them.
- Include measurements.
- Add your data to the skull observation pages in your journal.

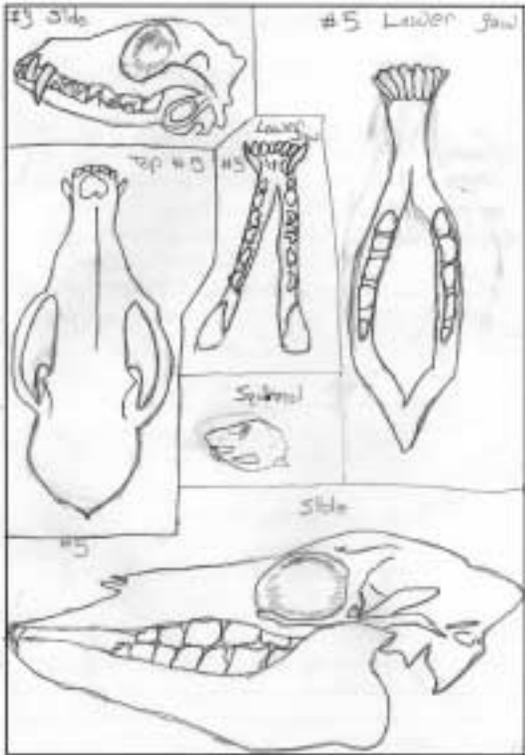
Observations of Skulls + Skull pictures

Date: (4-27-02) Location: classroom  
(4-28-02)

Skull	(#4)	(#3)	(#5)
Between eyes	2 1/2 in.	1 1/2 in.	1 1/2 in.
Eye opening	1 1/2 in.	1 in.	1 1/2 in.
Nose opening	2 in.	3/4 in.	3/4 in.
Top to Bottom (H)	3 1/2 in.	2 1/2 in.	2 1/2 in.
Side to Side (W)	3 3/4 in.	2 1/2 in.	3 in.
Front to Back (L)	5 1/2 in.	3 1/2 in.	5 1/2 in.
(#2)	(#5)	no teeth	teeth
2 1/2 in.	2 1/2 in.	in	3/4 in.
2 in.	2 1/2 in.	in	3/4 in.
2 1/2 in.	2 1/2 in.	in	3/4 in.
2 in.	4 in.	in	1 1/2 in.
2 1/2 in.	4 1/2 in.	in	2 1/2 in.
4 1/2 in.	4 1/2 in.	in	2 1/2 in.
		right + compound	
		Gg	2 1/2 in.

New Questions:  
How acipetate found any disease mammals?

3



4

Initial Skull Observations