THE ACADEMY OF NATURAL SCIENCES

A Teacher's Guide to
Discovering Dinosaurs Outreach & Meet the Dinosaurs Discovery Lesson
Grades Pre-K -2

To be used in conjunction with Meet the Dinosaurs at the Academy or with our Discovering Dinosaurs Outreach. These are not stand-alone activities!

Description Dinosaurs continue to inspire people of all ages, but what exactly classifies an animal as a dinosaur? When and where did they live and how do we know?

Outcomes Students will understand what makes a dinosaur a dinosaur and will be able to name and give characteristics of prehistoric animals that were and were not dinosaurs. Students will examine the methods by which paleontologists study dinosaurs and their relatives.

Suggested Activities Before Your Outreach/Discovery Lesson:

Vocabulary

dinosaur	body fossil	carnivore
herbivore	trace fossil	

- Create a K-W-L chart about dinosaurs and fill in what the students already know about dinosaurs and what they want to know. Leave the "What We Learned…" column blank and have students fill in new information after the outreach or lesson. Discuss the word "dinosaur."
- Discuss extinction with your students. Show your students animated and computer-generated images and videos of dinosaurs. Are those images real? Could someone really videotape a dinosaur like *Tyrannosaurus rex*? Why not? How do we know what they might have looked like? Do we know what noises dinosaurs made? A great resource with short clips of dinosaurs from the special "When Dinosaurs Roamed America" can be found at http://dsc.discovery.com/convergence/dinos/video/video.html

Suggested Activities After Your Outreach/Discovery Lesson:

Classroom Activities:

- Discuss the lesson with your students. What new ideas or information did they learn? Was anything confusing? What did they like best? Fill in the final column of the K-W-L chart.
- Make your own trace fossils. Purchase or make clay. Press hands and feet into the clay and allow the clay to dry overnight to simulate fossilization. The teacher should create "mystery fossils" without the students' knowledge. Then, provide the students with the pre-made "mystery fossils." Allow different adults and pets (as long as it is safe for the animal) to

create fossils. Enlist dolls and action figures to create very small fossils. Push feathers and cloth into clay. Make footprints in socks and handprints in gloves. Push plants, shells, and other natural objects in the clay. Ask students to interpret the fossils. What sort of animal would have made the impression? Do just animals leave fossils behind? Write or draw the story of the mystery animals.

- Not all animals that lived at the time of the dinosaurs were dinosaurs! (You would have learned this during the class). Review the characteristics of dinosaurs with your students. Were Pterasoarus dinosaurs (no) Why or why not? Were Plesisasurs dinosaurs? (why or why not)?
- Read Dinosaurumpus by Tony Mitton together as a class. Talk about how dinosaurs might have moved. Walk like alligators and other modern reptiles (legs out to the sides) and then walk like dinosaurs (legs under your body). Have your students identify animals in the book that are NOT dinosaurs (alligators, Pterasaurs (flying reptiles), rats).
- Make "trackways" in your classroom. Use the attached Dinosaur Activities: Trackways to tell dino-stories. Some suggestions for activities are attached to the templates. Go to The Discovery Channel at http://dsc.discovery.com/guides/dinosaur for video clips depicting how dinosaurs might have moved. Not all of the animals in Dinosaurupus are Dinosaurs. Discuss with your children what is and what is not a dinosaur. (
- Create your own dinosaurs. Create dinosaurs that would have been herbivores or carnivores, dinosaurs that were fast or slow, and dinosaurs that could jump high or climb. Draw a picture of what your dinosaur might have looked like. Pay attention to claws, teeth, tails, and scales (or feathers!).

Homework Assignments:

- Try the "Dinosaur Detectives" handout (attached) and reinforce what makes a dinosaur a dinosaur.

Interdisciplinary Activities:

- Color the attached illustrations of dinosaurs. Discuss what each dinosaur might have eaten, how big they might have been, and where they might have lived.
- Create the attached "Dinosaur Flipbook" to explore the different types of dinosaurs. Give each student a copy of all four of the Dinosaur Flipbook pages. You may find it helpful to print the first and second pages on cardstock. On the first and second pages, cut along the left, bottom, and right side of the "Flip to Find" boxes making sure to leave the top line attached. Glue the first page to the third and the second to the fourth making sure to not glue your newly formed "Flip to Find" flaps. Allow the students to draw a picture of each kind of dinosaur under the flaps. Allow them to share their books with parents and friends.

Writing/Drawing Prompts:

- What would a dinosaur's home look like?
- I am a (a dinosaur of the student's choosing). Every day I…

Class Project Ideas:

- Write and perform a play that would show the rest of the school what you have learned about dinosaurs. Allow groups of students to research different dinosaurs to portray in your play.

Show how a bone becomes a fossil. Portray a paleontologist. Invite other classes to see your play and encourage them to ask questions about dinosaurs after the performance.

Resources for Students

- Discover just one of the stories of the Academy's very own *Hadrosaurus foulkii* in The Dinosaurs of Waterhouse Hawkins by Barbara Kerley
- Eyewitness: Dinosaurs by Dr. David Norman and Dr. Angela Milner
- How Big Were the Dinosaurs? By Bernard Most
- Maia: a Dinosaur Grows Up by John R. Horner and James Gorman
- Check out Dragonfly TV for a look at how two kids just like you investigate which animals lived with the dinosaurs- http://pbskids.org/dragonflytv Click on "Earth and Space" and then "Dinosaurs"
- Dinosaurs (The Ecosystems Xplorer) by Nicholas Harris
- The Time-Life Guides: Dinosaurs edited by Michael K. Brett- Surman
- Play FrizzTV's dinosaurs quiz to discover which dinosaur was really the longest. http://www.scholastic.com/magicschoolbus/theme/animals.htm

Additional Resources for Educators

- Read Dinosaurs: The most complete, up-to-date encyclopedia for dinosaur lovers of all ages by Dr. Thomas R. Holtz Jr.
- The website of The Academy of Natural Sciences includes wonderful information on the dinosaurs that can be found in our very own Dinosaur Hall: http://www.ansp.org/museum/dinohall
- For a quick reference guide to all things prehistoric, pick up a copy of Smithsonian Handbooks: Dinosaurs and Prehistoric Life by Hazel Richardson
- Additional dinosaur activities can be found in Janice Van Cleave's Dinosaurs for Every Kid.
- For some of the more probing questions about fossils, what happened to the dinosaurs, and the connections between dinosaurs and other animals, check out University of California Museum of Paleontology at http://www.ucmp.berkeley.edu/.
- Last Child in the Woods by Richard Louv. This is a wonderful book for any educator who wants to bring nature back into the classroom.
- Janice Van Cleave's Animals: Mind-Boggling Experiments You Can Turn into Science Fair Projects- by Janice VanCleave (general animal resource)
- How Nature Works (How It Works) by David Burnie (general animal resource)
- A Dictionary of Nature: 2,000 Key Words Arranged Thematically by David Burnie (general animal resource)

National Benchmarks for Science Literacy

1, 5

Pennsylvania Academic Standards in Environment and Ecology

4.7

Pennsylvania Science Standards on Science and Technology

3.2, 3.3, 3.5

Philadelphia Core Curriculum Grade Levels

K, 1, 2

New Jersey Standards

5.5, 5.8

Dinosaur Flip Book by _____.

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Flip to Find…

a dinosaur that was a carnivore.

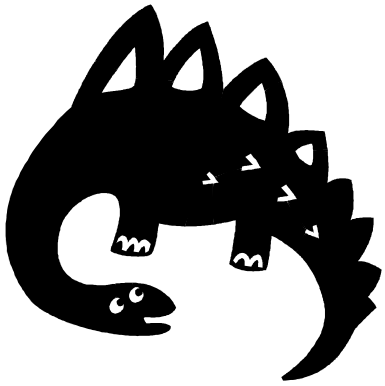
Flip to Find…

a dinosaur that was very big.

Flip to Find…

a dinosaur that had horns or spikes.

Flip to Find…



a dinosaur that has a long neck.

Flip to Find...

a dinosaur that was an herbivore.

Flip to Find...

a dinosaur that was small.

Flip to Find...

a dinosaur that had sharp claws.

Flip to Find...

my favorite dinosaur.

This is a _____.

This is a _____.

This is a _____.

This is a _____.

This is a _____.

This is a _____.

This is a _____.

This is a _____.

Dinosaur Activities: Trackways

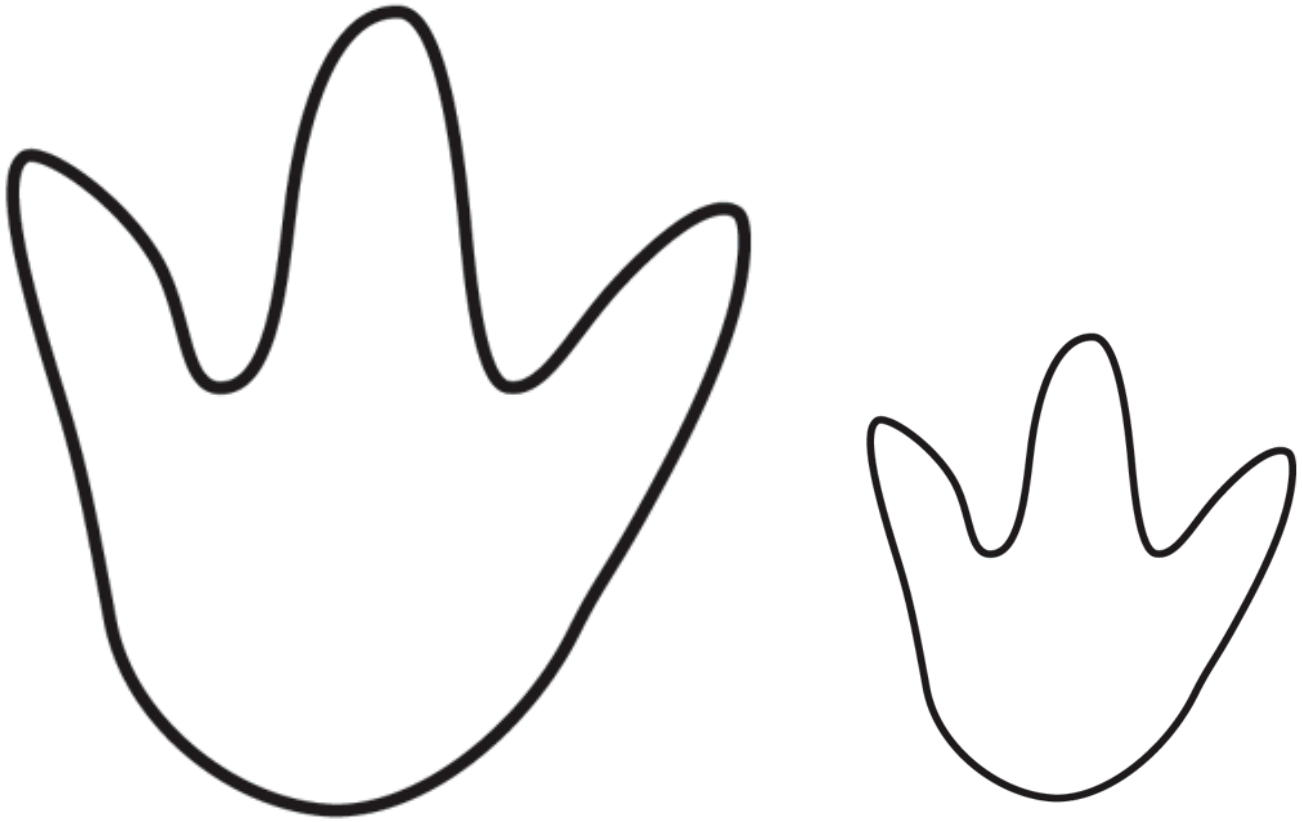
Paleontologists don't necessarily need the bones of a dinosaur to learn about them. We can also look at things left behind by dinosaurs called trace fossils. Trace fossils like footprints, eggs, and coprolites (fossilized dino dung) can give clues about the size, speed, eating habits, and family structure of animals that went extinct millions of year ago. We can see how dinosaurs might have interacted by studying sets of footprints sometimes referred to as trackways.

Below are recreations of theropod dinosaur footprints. Theropods were dinosaurs that walked upright on two legs like we do. Theropod species have been found that are very large (like T-rex) and relatively small (like *Deinonychus* which stood about 3 feet tall)

Copy this page onto a transparency sheet and project onto a larger piece of paper. Move the projector back until the smaller footprint is about 8 inches long. Trace the footprints onto the paper and cut out both the larger and the smaller prints. Make at least 10 sets of the prints.

Discuss trace fossils with your students. Show them a small and a large footprint. What can we learn about these two dinosaurs? Have the students walk quickly and slowly, jump and walk on their tiptoes. How do their steps change? Lay out just one set as if the animal was walking (either the large or the small). Move the footprints closer to each other and ask the class to guess about what that means. Move them farther apart. What does that tell us? What was the dinosaur doing? How big was the dinosaur? Was it fast or slow?

Then, lay out both sets of footprints. If the sets are side by side what could that mean? If one set follows the other, what was happening when those prints were made? Does the scene change when the smaller footprints are behind the larger footprints and vice versa? What might it mean if one set disappears in the middle of a trackway? Allow the students to create their own trackways to tell the stories of long-extinct dinosaurs.



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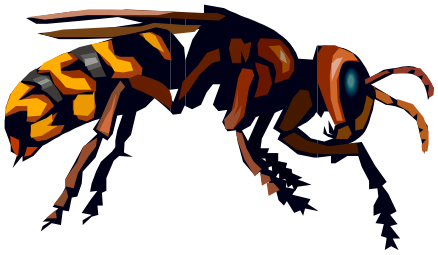
Name:_____

Dinosaur Detectives!

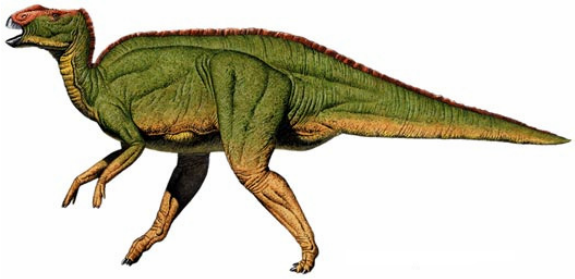
1. Put a red X on the animals that *fly without feathers.*
2. Put a blue X on the animals that *have hair or fur.*
3. Put a green X on the animals that *are not extinct.*
4. Put a yellow X on the animals that *live in water.*
5. Circle the animals that do not have an X on them.

Hint: Some animals may have more than one X.

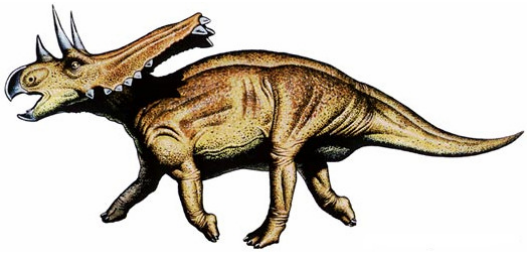
Dog



Bee

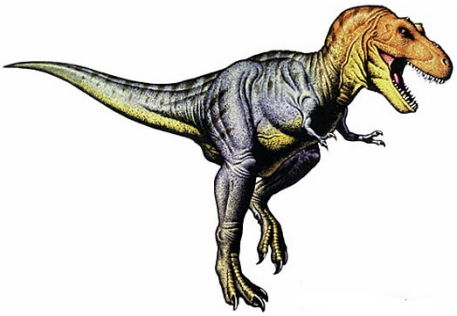


Hadrosaurus

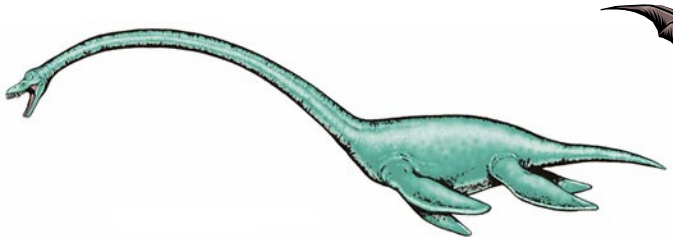


Chasmosaurus

Fish



Tyrannosaurus



Elasmosaurus

Bat

Human

Please turn over.

6. Count the number of animals that have a red **X**.

_____ animals

These are not dinosaurs. Dinosaurs did not fly without feathers.
Let's keep going!

7. Count the number of animals that have a blue **X**.

_____ animals

These are not dinosaurs. Dinosaurs did not have hair or fur.
Let's keep going!

8. Count the number of animals that have a green **X**.

_____ animals

These are not dinosaurs. Dinosaurs are extinct (except for birds!)
Let's keep going!

9. Count the number of animals that have a yellow **X**.

_____ animals

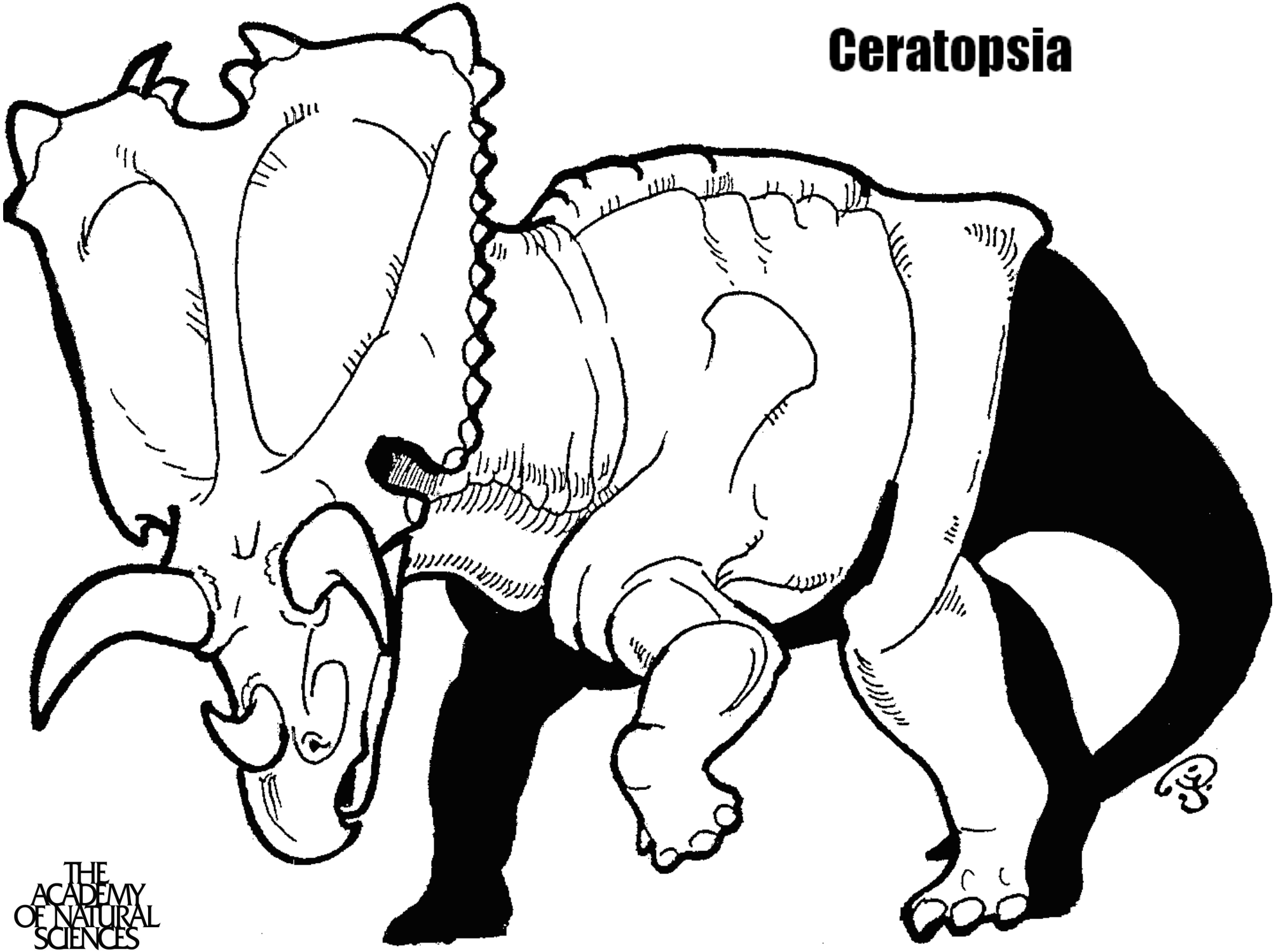
These are not dinosaurs. Dinosaurs did not live in water.
Let's keep going!

10. Count the number of animals that are circled.

_____ animals

Good job! You found the dinosaurs.

Ceratopsia



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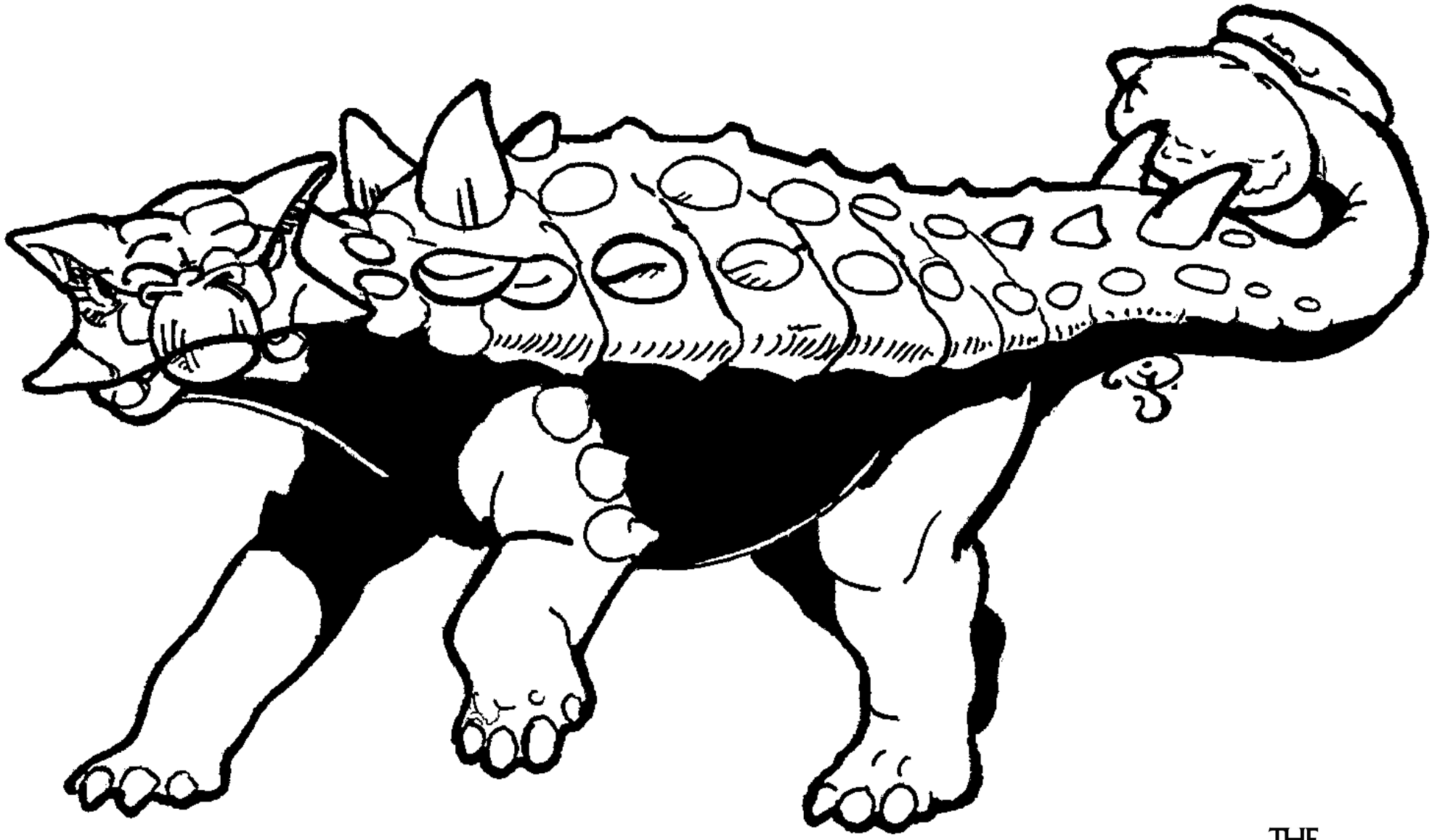
Ankylosaurus



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